Internal Labor Markets and Inequality*

Sydnee Caldwell† Andreas Kostøl‡

UC Berkeley and NBER BI Norwegian Business School

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Abstract

Internal labor markets are central to labor economics, yet we lack systematic evidence on their prevalence or consequences. Using administrative data covering all private-sector workers in Norway, we classify every new manager as an internal promotion or an external hire and document that this make-or-buy margin is a persistent dimension of firm heterogeneity. Firms that historically promote from within continue to do so even when filling vacancies created by unexpected manager deaths. We then show that internal labor markets have first-order consequences for gender inequality. Women are less mobile than men at the career stage when management is reached, making them disproportionately reliant on internal promotion. Women's sorting into firms with strong internal labor markets partially dampens the gender gap in management, and the remaining gap is substantially larger at firms that hire externally than at firms that promote from within.

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†UC Berkeley and NBER; scaldwell@berkeley.edu.

‡BI Norwegian Business School.

> "...the remainder of the jobs within the internal market are filled by the promotion or transfer of workers who have already gained entry to it. Consequently, these jobs are shielded from the direct influences of competitive forces in the external labor market."
>
> —Doeringer and Piore (1971, pp. 1–2)

1 Introduction

Internal labor markets are central to how firms organize production and how workers build careers. Since Doeringer and Piore (1971), a large literature in personnel and organizational economics has studied how firms use internal hierarchies, job ladders, and promotion systems to incentivize workers and to allocate them to jobs (Baker et al., 1994; Gibbons and Waldman, 1999; Lazear, 2004). The importance of these internal markets is reflected in basic facts about careers: workers hold only a handful of employers over a lifetime (Topel and Ward, 1992), and wage growth accrues disproportionately within rather than between firms.

Despite this, we know little about the prevalence or importance of internal labor markets. Much of the empirical evidence comes from detailed studies of single firms (Baker et al., 1994; Lazear, 2004), which have documented rich patterns of internal mobility and wage dynamics but cannot speak to how common these patterns are or how they vary across firms. A defining feature of an internal labor market is that it is shielded from external market competition (Doeringer and Piore, 1971). In such an environment, firms will be more likely to "make" positions by promoting from within than to "buy" them on the outside market. But researchers have struggled to measure this make-or-buy margin because they typically do not observe internal organizational charts or the full set of candidates a firm considers when filling a vacancy. As a result, basic descriptive questions—How often do firms promote from within? Is this a persistent firm characteristic? Does it matter for worker outcomes?—remain largely unanswered, and we know little about the consequences of internal labor markets for overall wage inequality.

In this paper, we present new evidence on the prevalence and importance of internal labor markets using matched employer-employee administrative data covering the universe of private-sector workers in Norway. We focus on appointments to middle and upper level managerial positions, which we identify through changes in occupation codes. For each new manager, we classify whether the appointment was an internal promotion or an external hire. We document a substantial, persistent firm component in this strategy: some firms consistently promote from within while others routinely hire from outside, even within the same industry. We then examine the consequences of firms' make-or-buy strategies for the

gender gap in management, building on the finding that promotions are a key margin for gender inequality in the labor market (Bronson and Thoursie, 2021; Benson et al., 2026).

We report four sets of results. First, we show that the internal promotion rate varies widely across firms and that this variation has a persistent firm-level component. Second, using unexpected manager deaths as exogenous vacancy shocks, we show causally that a firm's make-or-buy strategy governs how it responds to vacancies: make firms fill openings internally while buy firms go to the external market. Third, we document a sizable manager premium in wages that differs by source—internally promoted managers earn less upon appointment but subsequently experience steeper wage growth, a pattern consistent with returns to firm-specific capital. Fourth, we find that women reach management disproportionately through internal promotion, and that the gender gap in management access differs markedly between make firms and buy firms, suggesting that the structure of internal labor markets has first-order implications for gender inequality.

We contribute to three literatures. First, we advance the study of internal labor markets (Doeringer and Piore, 1971; Lazear and Rosen, 1981; Rosen, 1982; Baker et al., 1994; Gibbons and Waldman, 1999; Lazear, 2004; Oyer and Schaefer, 2011; Frederiksen et al., 2020). Existing empirical work in this tradition overwhelmingly studies one firm at a time; we measure the make-or-buy margin across all firms in an economy and show that it is a persistent, economically meaningful dimension of firm heterogeneity.

Second, our work connects to the make-or-buy decision studied in industrial organization, where the question is whether firms produce inputs internally or purchase them on the market (Coase, 1937; Williamson, 1975; Klein et al., 1978; Grossman and Hart, 1986). Several papers have drawn this analogy to labor, asking whether firms develop talent internally or recruit it externally (Bellmann et al., 2014; Bidwell and Keller, 2014; Bidwell, 2011; Bertheau, 2021; Chan, 1996; DeVaro and Morita, 2013; Burks et al., 2015; Hoffman et al., 2017). We contribute to this strand by measuring the make-or-buy margin for managers across all firms in an economy and by using exogenous variation—manager deaths and Bartik demand shocks—to identify its determinants and consequences.

Third, we contribute to the literature on gender inequality in the labor market, and specifically on the gender gap in promotions and access to senior positions. A growing body of work documents that women advance more slowly into management and leadership roles, even conditional on qualifications, and that this promotion gap explains a large share of the gender wage gap (Bertrand, 2018; Bronson and Thoursie, 2021; Benson et al., 2019, 2026; Gayle et al., 2012). We add to this literature by showing that the structure of firms' internal labor markets mediates the gender promotion gap.

2 Data and Institutional Setting

We use linked administrative employer-employee data from Norway covering the universe of private-sector workers from 2000 to 2023.[1] We focus on transitions into managerial positions, which occupation codes let us identify consistently across firms and over time. We supplement the employment data with firm accounts, death records, and education registers.

2.1 Norwegian Register Data

Our analysis draws on linked administrative employer-employee registers covering the universe of private-sector workers in Norway from 2000 to 2023. For the period 2015–2023, the a-ordningen register records employment and wages monthly, collating mandatory electronic payroll reports that all Norwegian employers file with the Tax Administration, NAV, and Statistics Norway (SSB). For each employment relationship, the register records occupation according to the STYRK-08 standard, contracted weekly hours, and four components of monthly compensation: base salary, cash wages, overtime pay, and bonus. For the period 2000–2014, we use the ALTLTO register family, which matches employment spells from the State Labour Register to annual wage and tax filings to produce an annual November snapshot with occupation, hours, industry, and total annual cash pay. Both registers use the same SSB firm identifier system, so we can track firms continuously across the two data sources.

We supplement the employment registers with several additional administrative data sources. Firm characteristics come from the Bedrifts- og foretaksregisteret (BOF), SSB's annual business register, which provides industry codes, organizational form, employee counts, and formal person-to-enterprise role registrations—including chief executive officer and board chair appointments. Annual firm-level accounts from SSB's accounting register provide revenue, value added, and other financial measures. The National Education Database (NUDB) provides each worker's highest completed degree, updated annually. Finally, we obtain the month of death from SSB's fixed demographics file.

Constructing the annual panel. For the a-ordningen period, we collapse the monthly employment records to an annual observation by selecting each worker's main job for the

[1] A key advantage of the Norwegian data for studying internal labor markets is that we observe the firm (legal entity) to which each worker is attached, not only the establishment (plant). In many countries, matched employer-employee data link workers to establishments, making it difficult to track promotions that move workers across plants within the same firm. The Norwegian registers link workers to both establishments and firms via a common identifier system, so we can distinguish an internal promotion (same firm, possibly different establishment) from an external hire (different firm).

calendar year: the employer at which the worker was employed for the greatest number of months, with ties broken by presence in November (the SSB standard reference month) and then by managerial status. We take occupation, industry, and region from the November record, and annual wages are the sum of monthly cash wages across all months at that employer. For the ALTLTO period, the annual snapshot is used directly. We append the ALTLTO annual panel (2000–2014) to the a-ordningen annual panel (2015–2023) to form a unified person-year panel. Firm identifiers match directly across the two registers; however, the two registers use different occupation coding standards (STYRK-98/03 and STYRK-08), and we treat the 2014–2015 boundary as a hard break for any variable that relies on year-over-year occupation comparisons.

Monthly panel. For the event study analysis of manager deaths, we also retain the underlying monthly a-ordningen records (2015–2023) as a person-by-employer-by-month panel. This panel records the same variables as the annual panel but at monthly frequency, allowing us to measure hiring and separation responses within months of a vacancy shock rather than across calendar years.[2]

Defining managers and classifying appointments. Both the occupation standards available in our data define managers as a distinct major group (ISCO major group 1), so the classification is consistent across the full sample period. We supplement the occupation-based classification with formal executive appointments—chief executive officer and board chair—from SSB's business register. We define a worker as a manager in year t if her occupation falls in major group 1 or if she holds a formal executive role. A worker enters a *new managerial role* at firm j in year t if she is a manager in t but was not a continuing manager at the same firm in $t-1$. We classify each new appointment as: (i) an *internal promotion*, if the worker held a non-managerial role at firm j in $t-1$; (ii) an *external hire from non-management*, if the worker joined from outside firm j and had not held a managerial role in any prior panel year; or (iii) an *external hire with prior management experience*, if the worker joined from outside and had been a manager in at least one prior year. We set all classification variables to missing at the 2014–2015 boundary to avoid spurious transitions from the occupation coding change.

[2] All results in the current draft use the annual panel. The monthly panel will be incorporated in a future version.

2.2 Firms' Inside and Outside Options

Our goal is to identify the importance of internal labor markets. Following Doeringer and Piore (1971), we say that a firm has an internal labor market if it has a persistent preference for filling positions by promoting from within rather than hiring externally. Doeringer and Piore (1971) emphasize that positions not governed by an internal labor market are filled on a spot market, where employers and workers match based on prevailing prices and available supply. In contrast, a large literature in organizational economics has identified reasons why firms may prefer to promote from within: to incentivize junior employees by maintaining a promotion ladder (Lazear and Rosen, 1981), to capture returns to firm-specific human capital (Becker, 1962), and to exploit private information about internal candidates (Gibbons and Waldman, 1999). A firm with an internal labor market promotes from within regardless of external market conditions, and this persistence is what distinguishes it from a firm that happens to promote internally because external candidates are temporarily scarce.

We frame this as a "make-or-buy" decision: when a firm needs to fill a position, does it *make* a manager by promoting from within, or *buy* one on the external labor market? Each new managerial appointment is an observable instance of this choice. A firm that consistently makes rather than buys—even when external candidates are plentiful—reveals a preference for internal development, and we classify it as having an internal labor market. Our empirical strategy is designed to separate this firm-level preference from the external conditions that also shape the make-or-buy margin.

A central challenge is that firms may create or fill managerial positions in response to the talent available both within their organization and on the external market. A firm with a strong internal candidate may promote from within not because of a preference for making but because a good insider happened to be available; conversely, a firm in a thick managerial labor market may hire externally because the outside option is cheap. Both the decision to promote and the quality of the resulting match are therefore endogenous to the firm's inside and outside options. We address this in two ways.

Exogenous hiring needs. To isolate variation in the demand for managerial replacements that is orthogonal to the firm's talent pool, we use the sudden deaths of incumbent workers as vacancy shocks, following Jäger and Heining (2024). The validity of this design requires that neither the firm nor co-workers anticipate the death. We apply three restrictions to isolate deaths that plausibly satisfy this condition. First, we exclude workers who die at or after age 65, because deaths near retirement are anticipated and firms plan succession accordingly. Second, we require the worker to appear in the employment panel in at least one month of the death year or the year prior, ensuring we measure the loss of an active

contributor.[3] Third, we restrict to firm-years with at most one qualifying death, as multiple deaths at the same firm raise the possibility of a shared endogenous cause such as a workplace accident.

For each qualifying death, we construct an event-time panel spanning twelve months before and twelve months after the death month. The panel retains all workers employed at the deceased's firm during any month in the event window. We classify each worker-month as belonging to one of three groups: the deceased (who appear only in pre-death months), survivors (workers present at the firm in at least one pre-death month), and new arrivals (workers first appearing at the firm after the death). We use this panel for the event study analysis of how firms fill vacancies.

Measuring the cost of buying. In most models of the make-or-buy decision, the firm's choice depends on the relative cost of developing internal talent versus hiring from outside. We construct measures of local managerial labor market conditions to capture this external margin. We define a local labor market as the intersection of region (two-digit municipality code) and one-digit occupation group. For each market cell and year, we compute the stock of managers and three mobility rates: the own-cell rate (the share of managers who change employers within the cell), a cross-industry rate (the share of managers who change employers across industries within the same region, excluding the firm's own cell), and an other-region rate (the share of managers who change employers across regions within the same industry, excluding the firm's own region). Thicker markets with higher mobility rates should lower the cost of external hiring.

We also construct firm-level measures of internal bench depth. For senior management vacancies, the bench is the count of middle managers at the firm in the year prior to the vacancy. For middle management vacancies, the bench is the count of non-managerial workers with at least three years of continuous tenure. Firms with deeper benches face lower costs of internal promotion.

Finally, we construct a Bartik shift-share instrument (Bartik, 1991) to capture exogenous variation in the demand for managerial labor: national log revenue growth rates by two-digit industry, weighted by each firm's pre-period industry employment shares. This index isolates demand variation driven by national industry trends that are plausibly exogenous to any individual firm's staffing decisions.

[3] A future draft of this paper will exclude workers who received NAV sickness benefits—paid for illness spells exceeding 16 days—in any of the five years preceding death. A multi-week illness is visible to the employer and co-workers and may trigger anticipatory staffing adjustments. This filter is the Norwegian analogue of the six-week sick-pay restriction applied by Jäger and Heining (2024) in Germany.

2.3 Why Managerial Positions?

To study the make-or-buy decision, we need to identify a non-entry-level position—one where the firm faces a genuine choice between promoting from within and hiring from outside. Entry-level positions are necessarily filled by new entrants and reveal nothing about internal labor markets. The ideal position is one that is (i) common across firms, so we can compare strategies across a broad cross-section, and (ii) important, so the appointment decision has real consequences for the firm and the worker. Managerial positions satisfy both criteria. Most administrative data do not record internal job ladders, but both occupation standards in our data define managers as a distinct major group, making this transition consistently observable across firms and over time.

Table 1 reports summary statistics. Our sample contains 3,199,275 person-years in the private sector, of which about 10.1 percent are managers. Managers are older (mean age 46.3 vs. 40.5), have longer tenure (5.8 vs. 4.5 years), and earn substantially more (mean log wage 12.593 vs. 12.175). Among new managers, 46.6 percent are internally promoted. Three features of the data motivate our focus on managerial appointments.

Workers often develop their careers within firms. Workers hold few employers over a career: the mean worker in our panel accumulates only about three distinct employers over 20 years of experience (Appendix Figure A1). Mobility declines sharply with experience—40.4 percent of workers with 1–5 years of experience change employers in a given year, compared with 12.5 percent of workers with 21 or more years (Appendix Table A1). Most wage growth therefore accrues within rather than between firms (Appendix Figure A2). The manager share rises steeply with age, from about 3 percent at age 20 to 15 percent by age 50 (Figure 1), consistent with managerial appointments functioning as promotions that accumulate over the career. Managerial roles sit at the boundary between the internal and external labor market: managers require both general leadership skills that are portable across firms and firm-specific knowledge of the organization's operations, culture, and workforce. This makes the make-or-buy tradeoff especially salient.

Managerial appointments are high-stakes. Management quality is a key driver of productivity (Bloom and Van Reenen, 2007), and the choice of who fills a managerial role can reshape incentives and career prospects for subordinates. We estimate the manager wage premium by regressing log wages on a manager indicator among full-time workers. Table 3 reports the results. In the cross section, managers earn 15 log points more than non-managers conditional on education, Mincer controls, and industry (column 1). Adding firm fixed effects leaves the premium essentially unchanged at 21 log points (column 3),

indicating that managers do not simply sort into high-paying firms.

Management is where gender inequality is most visible. Women remain underrepresented in management even as educational and occupational gaps have narrowed at lower levels of the hierarchy (Bertrand, 2018). Column 2 of Table 3 estimates the within-firm gender wage gap without controlling for managerial status: the female coefficient of −26.3 log points barely changes when the manager indicator is added in column 3 (−25.9 log points), indicating that the within-firm gender gap is not primarily attributable to differential presence in management. Understanding whether firms' internal promotion practices contribute to or mitigate this gap requires measuring the make-or-buy margin directly.

3 Internal and External Markets for Managers

A defining feature of internal labor markets is that positions are filled from within rather than on the open market. But is this "make-or-buy" margin a stable dimension of firm behavior, or does it simply reflect the idiosyncratic circumstances of each vacancy? In this section, we show that the internal promotion rate varies widely across firms, that the variation has a large persistent firm component that is not explained by market conditions, and that firms follow their historical strategy even when forced to fill vacancies by exogenous shocks.

3.1 Firms Differ Sharply in Their Promotion Strategies

Figure 2 shows the aggregate composition of new managerial appointments over time. On average, 46.6 percent of new managers are internally promoted, 27.3 percent are hired externally without prior management experience, and 26.2 percent are hired externally with prior management experience. This composition has been remarkably stable over the sample period: the internal promotion share varies little from year to year. But the aggregate stability masks enormous variation across firms.

Figure 3 plots the distribution of firm-level internal promotion rates, defined as the share of new managerial appointments that are internal promotions. To account for sampling noise—small firms may have extreme rates simply because they make few appointments—we apply empirical Bayes shrinkage, pulling each firm's raw rate toward the hire-weighted mean of its two-digit NACE industry in proportion to the imprecision of the firm estimate. Even after this correction, the distribution remains strikingly dispersed: some firms fill nearly all managerial vacancies from within, while others almost never promote internally.

This cross-firm variation is not transitory. Figure 4 demonstrates persistence in two ways.

Panel A splits the sample at the midpoint and plots each firm's internal promotion rate in the first half (2016–2019) against the second half (2020–2023). The points cluster tightly around the 45-degree line, indicating that firms that promoted internally in the early period continued to do so in the later period. Panel B plots the firm-level internal rate for middle managers (ISCO 12–14) against the rate for top managers (ISCO 11). The strong positive relationship shows that a firm's make-or-buy strategy is not specific to a single level of the hierarchy—firms that make middle managers also make top managers.

We formalize this persistence in a regression framework. Panel A regresses the second-half internal promotion rate on the first-half rate in the cross-section of firms: the coefficient is close to one (column 1) and remains large after absorbing industry fixed effects (column 2). Panel B moves to the firm-year panel and regresses a firm's current-year internal promotion rate on its leave-one-out rate—the firm's rate computed from all other years. Even after absorbing industry-by-year fixed effects, which control for all time-varying market conditions at the industry level, the LOO rate strongly predicts the current-year rate (column 4). This within-industry, across-year persistence rules out the possibility that the firm component merely reflects stable industry composition.

Table 5 decomposes the variation in firm-year internal promotion rates into components attributable to market conditions and firm identity. Region-by-industry-by-year fixed effects—which absorb all variation in local labor market conditions, industry trends, and business cycle effects—explain 41 percent of the variation (column 1). Firm fixed effects alone explain 22 percent (column 2). Together, the two sets of fixed effects explain 45 percent of the variation (column 3). Market conditions account for the majority of this explanatory power, reflecting substantial cross-industry and cross-region differences in promotion patterns. But the incremental contribution of firm identity, over and above market conditions, confirms that internal promotion has a persistent firm-level component that is not simply a response to local labor market tightness.

This preference does respond at the margin to the external environment. If internal promotion is partly a response to the cost of external alternatives, then firms operating in thicker managerial labor markets should rely less on internal promotion. Table 7 tests this by regressing an indicator for whether a new appointment is an internal promotion on the log number of managers in the local labor market. Unconditionally, the relationship is positive but small (column 1). Once we condition on firm size and firm age (column 2), the sign reverses: a 10 percent increase in external manager supply *reduces* the probability of internal promotion by 0.09 percentage points. The sign reversal reflects the fact that larger and older firms both promote more internally and locate in thicker labor markets. Conditional on firm characteristics, access to a deeper pool of external candidates tilts the

firm toward buying rather than making. But even after absorbing market conditions, the firm component remains the dominant source of variation.

The strongest evidence that the make-or-buy margin reflects a firm-level preference comes from how firms respond to exogenous vacancy shocks. Observed variation in hiring source could reflect unobserved differences in vacancy characteristics rather than firm strategy. We use unexpected manager deaths as exogenous shocks to test whether a firm's historical strategy governs how it fills a vacancy it did not choose to create. To avoid the reflection problem—where the firm's response to the death mechanically affects its own internal promotion rate—we measure each firm's "policy" using its historical internal promotion rate computed *excluding* the three-year window around the death ($[t-1, t+1]$). This leave-out rate is predetermined relative to the shock. The leave-out rate strongly predicts whether the firm promotes internally to fill the death-induced vacancy, even after controlling for external manager availability and firm characteristics. The death-shock results confirm that the make-or-buy distinction is not an artifact of endogenous vacancy creation—it is a firm-level preference that governs behavior even when the vacancy is exogenous.

3.2 What Characterizes Make-or-Buy Firms?

What observable firm characteristics predict the make-or-buy strategy? Table 6 regresses the firm-level internal promotion rate on firm characteristics with industry and region fixed effects. Larger firms and firms that pay higher wages promote internally at modestly higher rates, but the overall explanatory power is low. Most of the variation in make-or-buy strategies is not captured by standard observables—a finding that parallels recent evidence on wage-setting strategies, where firm identity matters but firm characteristics do not predict which firms bargain over pay (Caldwell et al., 2026). One notable pattern, however, is the positive relationship between wages and internal promotion rates. Figure 5 shows that higher-wage industries have higher internal promotion rates, suggesting that sectors where workers accumulate more human capital are also sectors where firms develop talent internally. This pattern holds at the firm level as well: Figure 6 plots internal promotion rates against AKM firm wage premia and shows that firms that pay higher wages conditional on worker quality are more likely to promote from within, consistent with the idea that rent-sharing and internal labor markets are complements.

4 Internal Labor Markets and the Gender Gap

Firms differ persistently in whether they promote from within. If women's careers are shaped by the firms they work at during critical promotion windows, then the structure of internal labor markets may have consequences for gender inequality. We develop this argument in three steps. First, we document that women are less mobile across employers than men, which makes the internal promotion channel relatively more important for women's access to management. Second, because management is largely an absorbing state, the firm a worker is at when the promotion window opens has lasting consequences. Third, we ask whether women's differential sorting into make-versus-buy firms can account for part of the gender management gap. It cannot—but sorting into make firms does partially *offset* the gap, so that women would fare worse if they did not disproportionately sort into firms with strong internal labor markets.

4.1 Women Are More Constrained to Their Current Employer

A large literature documents that women are more sensitive to commuting distance, less likely to relocate for a job, and less likely to change employers, particularly around childbearing ages. Figure 7 (Panel A) confirms this pattern in our data. We plot the mean number of cumulative distinct employers by years of potential experience, separately for men and women. The female series adjusts for industry and education composition. The gap opens early and widens steadily with experience: by 20 years, women have worked at roughly half an employer fewer than men. Table 2 shows this gap in a regression framework. The raw difference in cumulative employers is near zero (column 1), but after conditioning on experience the gap is positive and significant: women accumulate 0.03 fewer employers per year of experience (column 2). The gap is robust to adding industry and education controls (columns 3–4) and is not driven by part-time workers (column 6).

This constraint matters because the promotion to manager is concentrated in the age 30–40 window (Figure 1), precisely when women's mobility is lowest—consistent with the well-documented effects of childbirth on women's labor supply and job mobility. If women are less likely to move across firms, they are less likely to access managerial positions through the external hiring channel and more reliant on internal promotion at their current employer.

4.2 Management Is an Absorbing State

The importance of the promotion window is amplified by the fact that management is largely a permanent transition. Among workers who enter management, 84 percent remain managers

one year later. After five years, 47 percent of men but only 20 percent of women are still in management—a striking divergence. After ten years, 37 percent of men retain managerial status compared with just 14 percent of women.

The absorbing nature of management means that the firm a worker is employed at when the promotion window opens—typically in the early thirties—has lasting consequences. A worker at a make firm during this window has access to an internal promotion ladder; a worker at a buy firm must compete on the external market. Because women are less mobile than men at precisely this age, their outcomes depend more heavily on the characteristics of the firm they happen to be at.

4.3 Women Reach Management Through Internal Promotion

Table 4 estimates the gender gap in management access. The raw gap among full-time workers is close to zero (−0.1 percentage points, column 1). Adding year and industry fixed effects reveals a gap of −2.3 percentage points (column 2)—women are underrepresented in management within industry-year cells. Adding age and tenure controls widens the gap slightly to −2.5 percentage points (column 3). With firm fixed effects, the gap reaches −3.1 percentage points (columns 4–5): within the same firm and year, women are substantially less likely to hold a managerial position than observably similar men. Given the sizable manager wage premium documented in Table 3, this management gap is a meaningful component of the within-firm gender wage gap.

Among those who do reach management, women arrive disproportionately through the internal channel. Figure 7 (Panel B) shows the source distribution of new managerial appointments by level and gender. At both the middle and top management levels, women who become managers are more likely to have been internally promoted and less likely to have been hired externally with prior management experience. This pattern is consistent with women's lower mobility limiting their access to the external managerial labor market.

4.4 Sorting into Make-or-Buy Firms

If internal promotion is relatively more important for women's access to management, and if women sort differentially into make-versus-buy firms, then firm sorting could generate—or attenuate—the gender management gap. To quantify how much of the gap sorting can explain, Table 9 presents a simple accounting decomposition. Panel A reports management rates by gender and firm type: men are managers at a rate of 9.8% at make firms and 12.3% at buy firms, while women's rates are 9.6% and 13.1%, respectively. Panel B shows that women are slightly more likely to work at make firms (48.8% versus 46.7% for men).

Panel C decomposes the total gender management gap into a within-firm-type component and a sorting component. The within component accounts for 130% of the gap—within both make and buy firms, women have slightly lower management rates. The sorting component works in the *opposite* direction (−30%), because women are overrepresented at make firms, which have lower overall management rates. Sorting across make-versus-buy firms does not explain the gender management gap. Rather, the fact that women disproportionately sort into make firms partially *offsets* what would otherwise be a larger gap: if women sorted into make and buy firms at the same rate as men, their management rate would be lower.

4.5 The Make-or-Buy Margin and the Gender Gap

The preceding analysis shows that sorting across firm types cannot explain the gender management gap, but the make-or-buy distinction still matters *within* firms. At buy firms, the gender difference in the internal channel is large—women who become managers at buy firms are overwhelmingly internal promotees rather than external hires. At make firms, where internal promotion rates are high for everyone, the gender gap in the channel of appointment nearly disappears. In other words, make firms equalize the route to management; buy firms do not.

Table 8 examines the promotion rate itself. Among full-time non-managers, women are 0.2 percentage points more likely to be promoted to manager in any given year. But the Female × Make interaction is −0.4 percentage points ($p < 0.01$): the female promotion advantage is smaller at make firms. This is not because make firms discriminate—rather, make firms have higher baseline promotion rates for everyone, compressing gender differences. At buy firms, promotion is rarer and more selective, and the gender gap in who gets promoted is larger.

Appendix Table A8 examines the promotion gap in more detail. In an OLS specification with year, industry, and occupation fixed effects, women are 0.3 percentage points less likely to be promoted in a given year (column 1). With firm-by-occupation-by-entry-cohort fixed effects—which compare men and women who entered the same firm, occupation, and cohort—the gap shrinks to 0.1 percentage points and is no longer statistically significant (column 2), suggesting that much of the overall promotion gap reflects sorting across firms and occupations rather than differential treatment within them.

5 Conclusion

This paper presents new evidence on how firms fill managerial positions—and why it matters. Using matched employer-employee administrative data covering the universe of Norwegian private-sector workers, we measure whether each new manager was promoted from within the firm or hired from outside, and we show that this make-or-buy margin is a persistent dimension of firm behavior.

We document three sets of findings. First, firms differ sharply and persistently in their internal promotion rates. Market conditions explain a large share of the variation in promotion strategy, but firm fixed effects contribute meaningful incremental explanatory power, and most of the variation remains unexplained by standard observables. These patterns parallel recent evidence on wage-setting strategies (Caldwell et al., 2026), suggesting that firms' human resource practices are a first-order but poorly understood source of heterogeneity in the labor market. Firms that pay higher wage premia are more likely to promote from within, consistent with rent-sharing and internal labor markets being complements.

Second, internally promoted managers earn less than externally hired managers at the time of appointment, but subsequent wage growth is steeper for internal promotees. The within-worker premium is modest, suggesting that much of the cross-sectional manager premium reflects selection rather than a causal return to the role.

Third, the structure of internal labor markets has consequences for gender inequality. Women are less mobile across employers than men, making them more reliant on internal promotion to reach management. Within the same firm and year, women are 3.1 percentage points less likely to hold a managerial position than observably similar men. Among those who do reach management, women arrive disproportionately through the internal channel. Sorting across make-versus-buy firms does not explain this gap—if anything, women's overrepresentation at make firms partially offsets what would otherwise be a larger management deficit. But the make-or-buy margin matters within firms: the gender gap in the channel of appointment nearly disappears at make firms. These patterns suggest that firms with strong internal labor markets partially offset the barriers women face in accessing management.

These findings have implications for both research and policy. For research, they suggest that firm-level human resource practices—how firms fill positions, not just how they set pay—are an important and underexplored dimension of labor market inequality. For policy, they suggest that interventions aimed at increasing transparency in promotion processes, such as internal job posting requirements, may help narrow gender gaps in management access.

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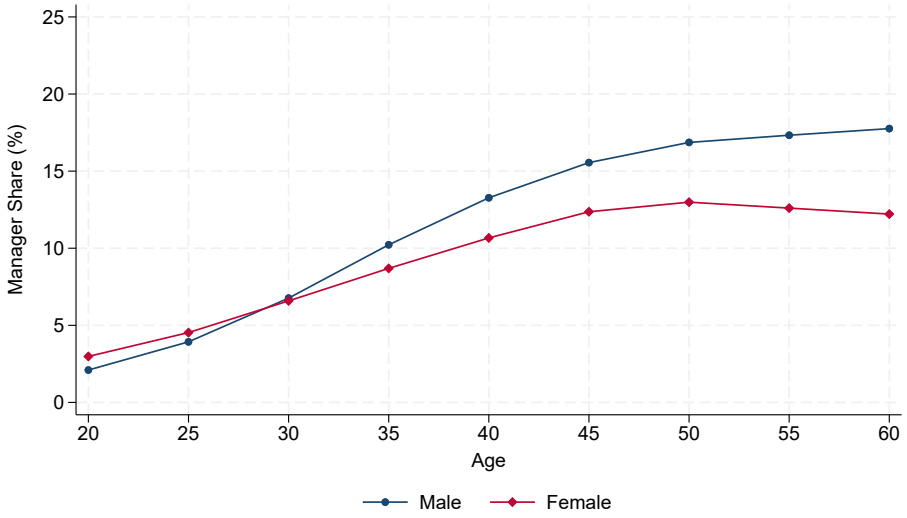
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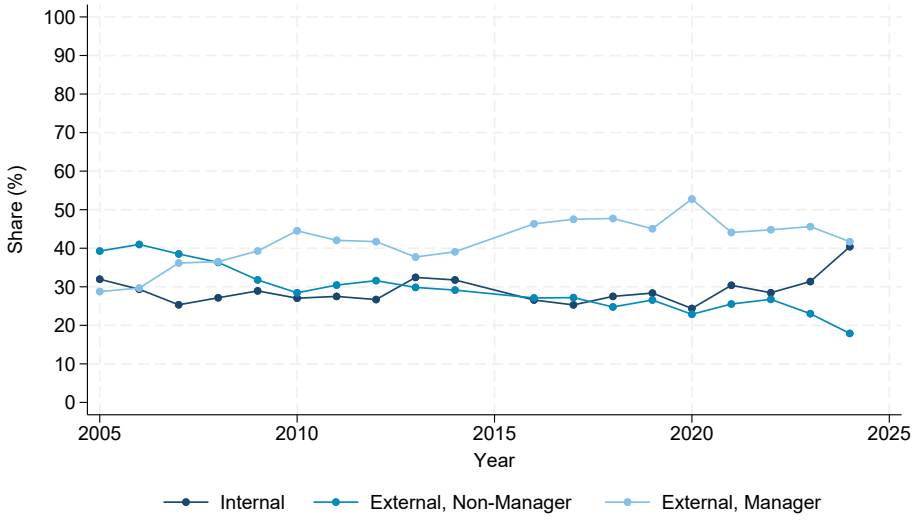
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Figure 1: Manager Share by Age and Gender



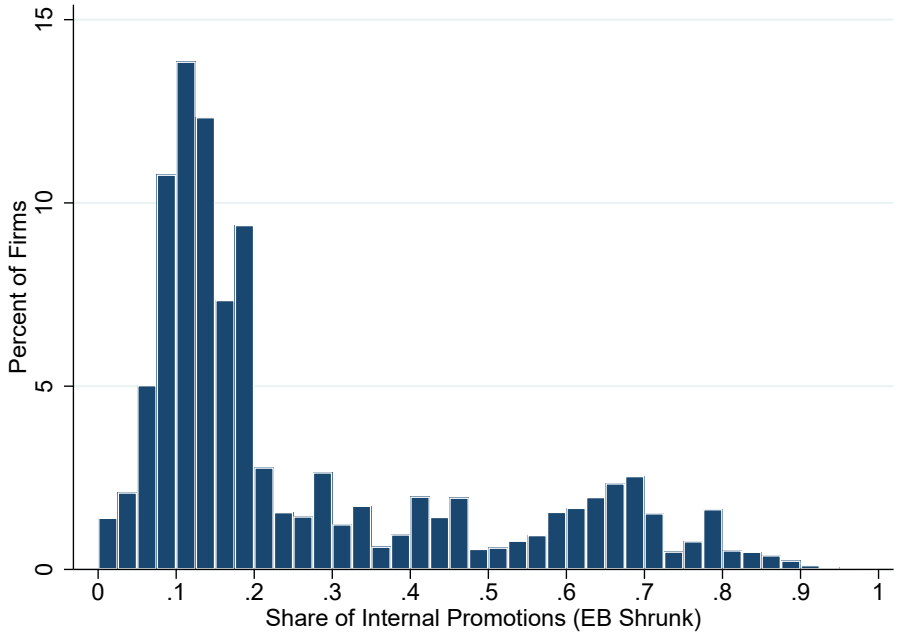
Notes: Share of full-time workers (average monthly hours ≥ 30) holding a managerial position, by five-year age bin. The male line shows raw means. The female line shows the male mean plus the coefficient on a female indicator from a regression of managerial status on gender, controlling for industry fixed effects and a college indicator, estimated separately within each age bin. Bars show 95% confidence intervals on the female line.

Figure 2: Manager Source Trends Over Time



Notes: Each bar shows the share of new managerial appointments by source in a given year. We define a new managerial appointment as a worker classified as a manager (ISCO major group 1) in year t who was not a continuing manager at the same firm in $t-1$. Internal promotions are workers who held a non-managerial role at the same firm in the prior year. External hires are workers who were not employed at the firm in the prior year. Among external hires we separately identify whether a hire had prior managerial experience. We use data from 2016–2023.

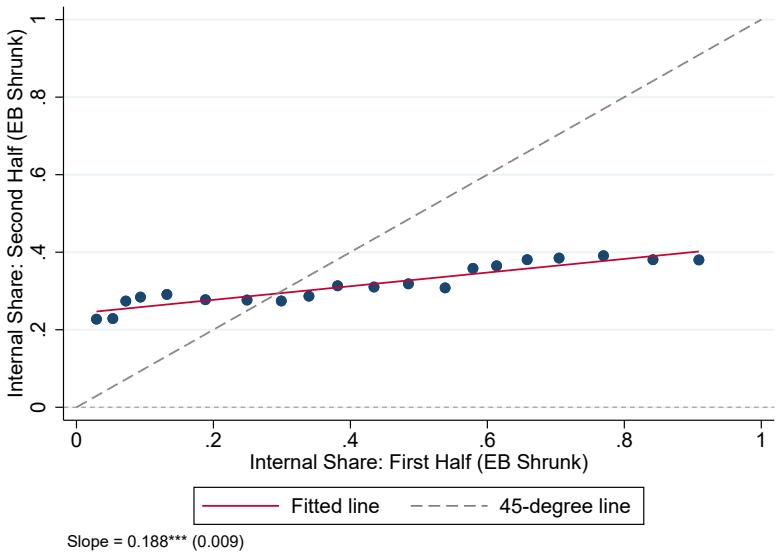
Figure 3: Distribution of Firm-Level Internal Promotion Rates



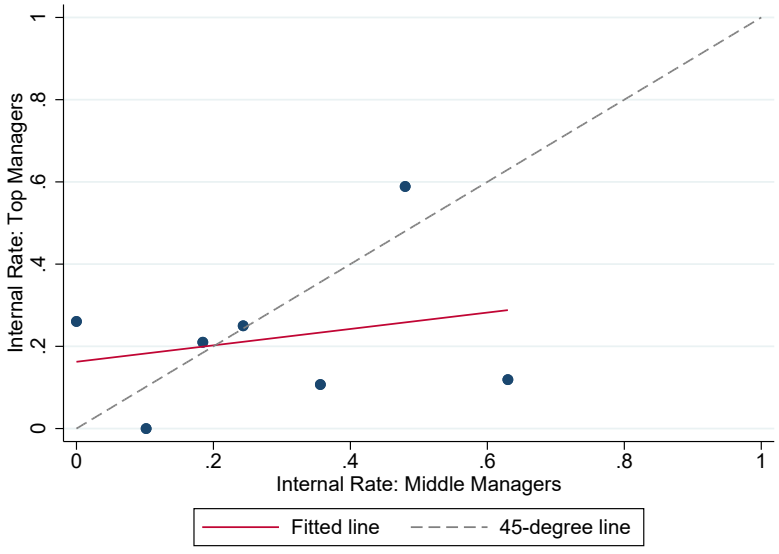
Notes: The histogram shows the distribution of the empirical Bayes-adjusted firm-level internal promotion rate. We shrink each firm's raw rate toward the hire-weighted mean of its two-digit NACE industry, with shrinkage proportional to the imprecision of the firm estimate (so firms with fewer hires move more toward the mean). The sample includes only firms with at least three new managerial appointments.

Figure 4: Firm Component of Managerial Source

Panel A: Split-Sample Persistence

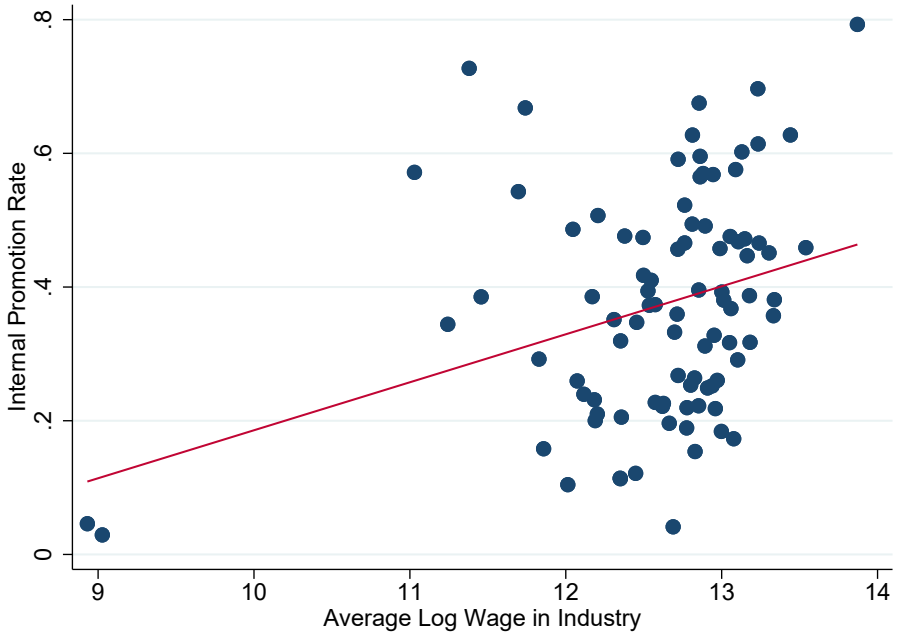


Panel B: Relationship Between Source of Middle and Upper Level Managers



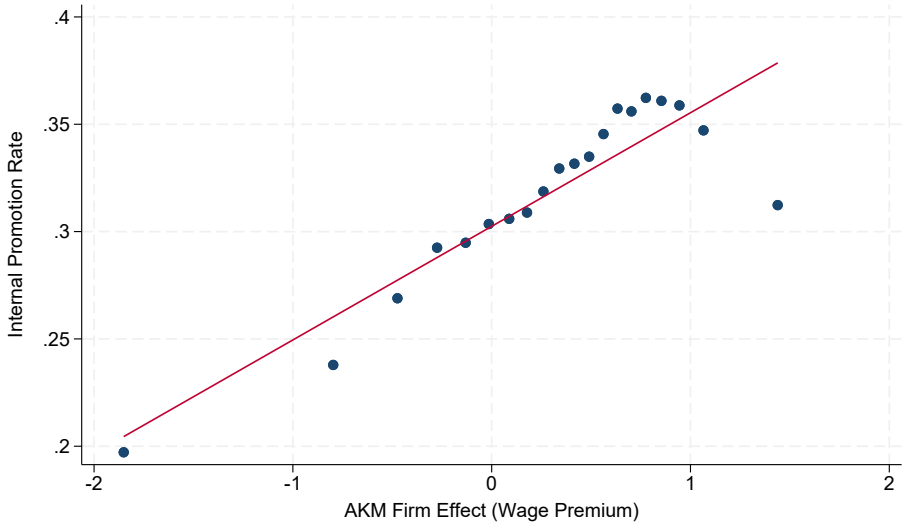
Notes: Panel A: each point represents a bin of firms. The horizontal axis is the firm-level internal promotion rate in the first half of the sample (2016–2019) and the vertical axis is the rate in the second half (2020–2023). The sample includes only firms with at least two new managerial appointments in each half. The 45-degree line is shown for reference. Panel B: each point represents a bin of firms. The horizontal axis is the firm-level internal promotion rate for middle managers (ISCO 12–14) and the vertical axis is the rate for top managers (ISCO 11). The sample includes only firms with at least two managerial hires at each level. The dashed line is the 45-degree line; the solid line is the linear fit.

Figure 5: Internal Promotion Rate and Average Wage by Industry



Notes: Each point represents a two-digit NACE industry. The horizontal axis is the average log wage in the industry and the vertical axis is the average internal promotion rate. Higher-wage industries promote internally at higher rates.

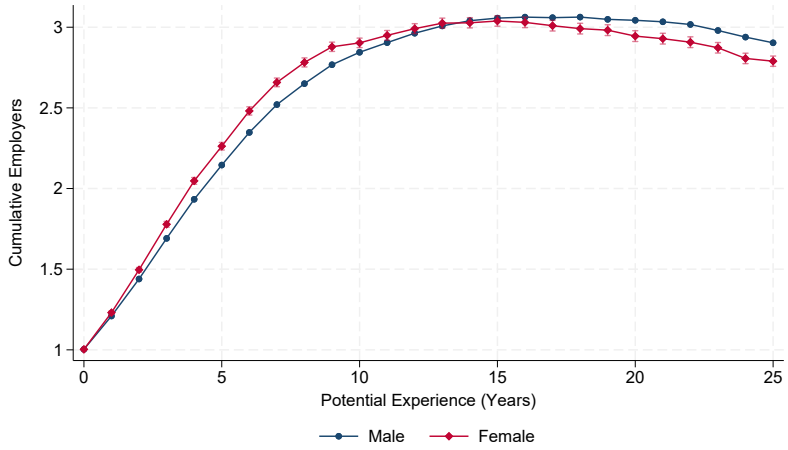
Figure 6: Internal Promotion Rate and AKM Firm Wage Premium



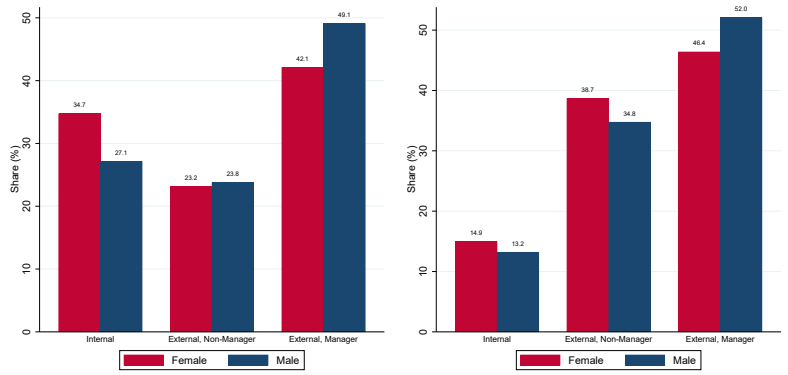
Notes: Binned scatter of the empirical Bayes-adjusted firm-level internal promotion rate against the AKM firm fixed effect (wage premium). Firms that pay higher wages conditional on worker quality promote more internally.

Figure 7: Gender Differences in Mobility and Manager Source

(a) Cumulative Employers by Gender



(b) Manager Source by Level and Gender



Notes: Panel A shows cumulative distinct employers by years of potential experience. The solid line plots the male mean. The dashed line plots the female level, computed as the male mean plus the coefficient on a female indicator from a regression that controls for industry and education within each experience year. Bands are 95% confidence intervals. The sample is restricted to full-time workers (average hours ≥ 30). Panel B shows the share of new managerial appointments by source (internal promotion, external hire without prior management experience, external hire with prior management experience), separately for men and women, for middle managers (left) and top managers (right).

Table 1: Summary Statistics

	(1) All Workers	(2) Managers	(3) Death Sample
Female	0.475	0.448	0.531
Age	40.5	46.3	42.0
	[13.9]	[11.8]	[14.3]
Manager	0.101		0.045
Top Manager	0.027	0.286	0.001
College Degree	0.364	0.488	0.504
Tenure	4.5	5.8	4.5
	[4.3]	[4.8]	[4.3]
Log Wage	12.175	12.593	12.500
	[1.382]	[1.395]	[1.277]
Internally Promoted		0.466	
Person-Years	3,199,275	323,400	29,599
People	231,379	64,089	10,239

Notes: Column 1 includes all private-sector worker-years. Column 2 includes only workers holding a managerial position (ISCO 1). Column 3 covers manager death events that we use in the vacancy analysis. Standard deviations in parentheses. The sample period is 2016–2023.

Table 2: Gender Differences in Cumulative Employers

	All Workers					Full-Time Only
	(1)	(2)	(3)	(4)	(5)	(6)
Female	0.000678	0.0306**	0.000306	-0.0129	-0.0172	0.00191
	(0.0192)	(0.0123)	(0.0128)	(0.0123)	(0.0120)	(0.0141)
Experience		0.131***	0.126***	0.119***	0.126***	0.0942***
		(0.00187)	(0.00182)	(0.00182)	(0.00177)	(0.00180)
Avg. Weekly Hours					-0.00153***	
					(0.0000293)	
Observations	2,971,591	2,971,591	2,971,336	2,774,037	2,774,037	2,442,353
Adjusted R-squared	-0.000	0.287	0.305	0.318	0.322	0.339

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variable is the cumulative number of distinct employers a worker has held since the start of the panel. Column 1 shows the raw gender gap. Columns 2–5 progressively add experience (and experience squared), year fixed effects, industry fixed effects, education fixed effects, and average weekly hours. Column 6 restricts the sample to full-time workers (contracted hours ≥ 30/week). Standard errors (in parentheses) are two-way clustered by worker and firm. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: The Manager Wage Premium

	(1) OLS	(2) Within-Firm	(3) Within-Firm
Manager	0.148***		0.208***
	(0.016)		(0.014)
Female	-0.334***	-0.269***	-0.263***
	(0.008)	(0.006)	(0.006)
Controls	✓	✓	✓
Year FE	✓	✓	✓
Industry FE	✓		
Firm FE		✓	✓
Observations	2534213	2508701	2506690
Adjusted R-squared	0.435	0.529	0.531

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Dependent variable: log monthly wage (NOK). Sample restricted to full-time workers (average monthly hours ≥ 30). Column 1 estimates the manager premium and gender gap by OLS with year and industry fixed effects. Column 2 adds firm fixed effects without controlling for managerial status, so the female coefficient captures the total within-firm gender wage gap. Column 3 adds the manager indicator: the change in the female coefficient between Columns 2 and 3 measures how much of the within-firm gender gap is attributable to differential presence in managerial positions. Column 4 adds person fixed effects, identifying the manager premium from workers who transition into or out of management within the same firm. Controls include a quadratic in age, tenure, a college indicator, and log hours. The female coefficient is absorbed by person fixed effects in Column 4. Standard errors (in parentheses) are two-way clustered at the person and firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Decomposition of the Within-Firm Gender Management Gap

	(1) Raw	(2) Market	(3) Human Cap	(4) Firm FE
Female	-0.0009	-0.0233***	-0.0254***	-0.0309***
	(0.0031)	(0.0027)	(0.0024)	(0.0016)
Observations	2743836	2743468	2579070	2551571
Adjusted R^2	0.000	0.076	0.101	0.301
Age + Tenure			✓	✓
Year FE		✓	✓	✓
Industry FE		✓	✓	

Dep var: manager (=1). Full-time workers (contracted hours $\geq$ 30/week). Col (1): raw gap. Col (2): year + industry FE.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variable is a manager indicator (= 1 if the worker holds a managerial position). Each column adds progressively richer controls to a regression of the manager indicator on a female indicator. Column 1 is raw OLS. Column 2 adds year and industry fixed effects. Column 3 adds age, age squared, and tenure. Column 4 replaces industry fixed effects with firm fixed effects. Column 5 uses firm $\times$ year fixed effects, so the coefficient represents the within-firm-year gender gap in management. Standard errors (in parentheses) are two-way clustered at the person and firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Variance Decomposition of Internal Promotion Rate

	(1) Market Only	(2) Firm Only	(3) Market+Firm
Observations	1605989	1475670	1474956
Adjusted R-squared	0.328	0.184	0.404
Number of FE	1	1	2

Column (1): Industry x Year FE. Column (2): Firm FE. Column (3): Both.

Notes: Each column reports the R^2 from a regression of the firm-year internal promotion rate on the indicated set of fixed effects. Column 1 includes region-by-industry-by-year fixed effects. Column 2 includes firm fixed effects only. Column 3 includes both. The increase in R^2 from column 1 to column 3 measures how much persistent firm-level differences, beyond market conditions, explain the variation in internal promotion rates.

Table 6: Firm Characteristics and Internal Promotion Rate

	(1)
	Internal Rate (EB Shrunk)
Number of Hires (log)	0.026***
	(0.006)
Average Wage	0.047***
	(0.007)
Industry FE	✓
Region FE	✓
Observations	1624
Number of clusters	1624
Adjusted R-squared	0.226

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variable is the firm-level internal promotion rate, defined as the share of new managerial appointments that are internal promotions, pooling data from 2016–2023. The sample includes only firms with at least three new managerial appointments. Standard errors (in parentheses) are robust to heteroskedasticity. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: External Market Thickness and Internal Promotion

	(1) Baseline	(2) With Controls
Market Manager Supply (log)	0.008*	-0.006
	(0.004)	(0.004)
college	-0.001	-0.007
	(0.014)	(0.016)
Firm Size (log)		0.112***
		(0.014)
Firm Age		0.018***
		(0.001)
Observations	39380	39380
Number of clusters	6566	6566
Adjusted R-squared	0.329	0.362

Year and industry FEs absorbed. Two-way clustering on person and firm.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variable is an indicator for whether a new managerial appointment is an internal promotion. The key independent variable is the log number of managers in the local labor market, defined as region by one-digit occupation group by year. Column 1 includes year fixed effects. Column 2 adds firm-level controls. Standard errors (in parentheses) are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8: Gender Promotion Gap by Firm Type

	(1)	(2)	(3)	(4)
	(1)	(2)	(3)	(4)
Female	0.002**	0.003***	0.003***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.000)
Make Firm		0.001	0.002**	
		(0.001)	(0.001)	
Female × Make		-0.004***	-0.003**	
		(0.001)	(0.001)	
Observations	1402359	1049974	1049996	1392913
Adjusted R-squared	0.155	0.041	0.024	0.178
Mincer Controls	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Industry FE	✓	✓		

Sample: full-time non-managers (hours ≥ 30) at firms with ≥ 5 hires. Outcome: promoted next year. Firm FE in col 4.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variable is an indicator for promotion to manager next year. Sample: full-time non-managers (contracted hours ≥ 30/week) at firms with ≥ 5 managerial hires. Firm FE absorbed in column 4. Standard errors (in parentheses) are robust to heteroskedasticity. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9: Accounting Decomposition of the Gender Management Gap

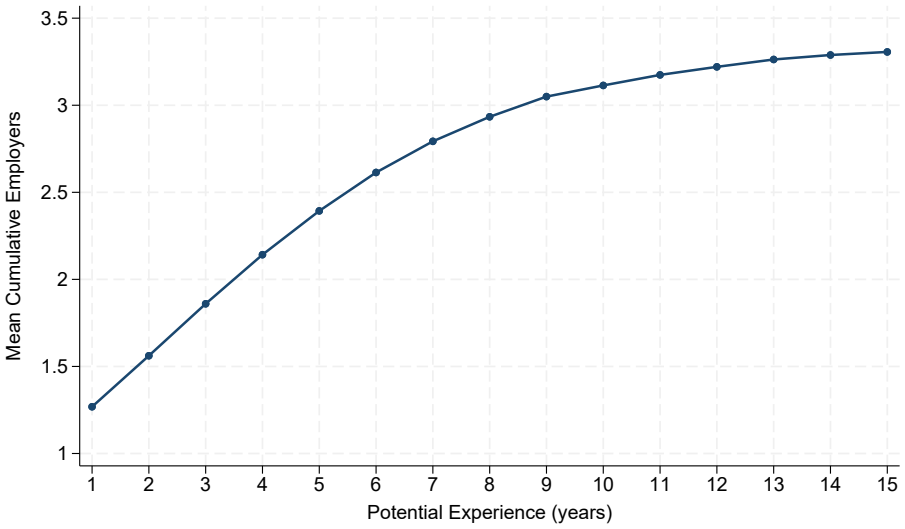
	Make Firms	Buy Firms
Panel A: Management Rates		
Men	0.0983	0.1225
Women	0.0960	0.1306
Panel B: Share of Workers		
Men	0.4665	0.5335
Women	0.4880	0.5120
Panel C: Decomposition		
	Gap	Share
Total gap (Male − Female)	-0.0025	100%
Within firm type	-0.0032	130.2%
Sorting across firm types	0.0007	-30.2%

Notes: Panel A reports the share of workers holding a managerial position, by gender and firm type. Panel B reports the share of each gender's person-years spent at make versus buy firms. Panel C decomposes the total gender management gap into a within-firm-type component (management rate gaps within make and buy firms, weighted by men's firm-type distribution) and a sorting component (differential sorting across firm types, weighted by women's management rates). The two components sum to the total gap. Sample: 5% random draw from the full population of private-sector workers aged 22–55. Make firms are defined as those with above-median internal promotion rates among firms with at least three new managerial appointments.

A Appendix Tables and Figures

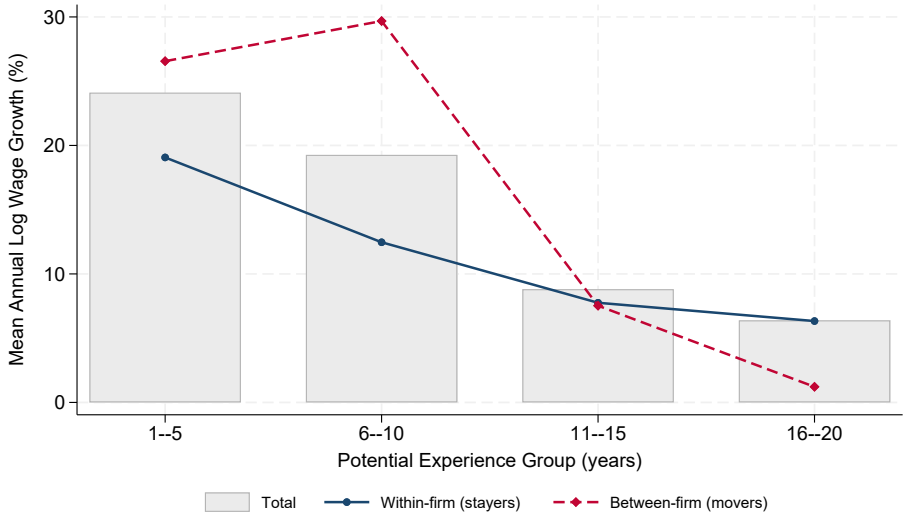
A.1 Appendix Figures

Figure A1: Mean Cumulative Employers by Experience



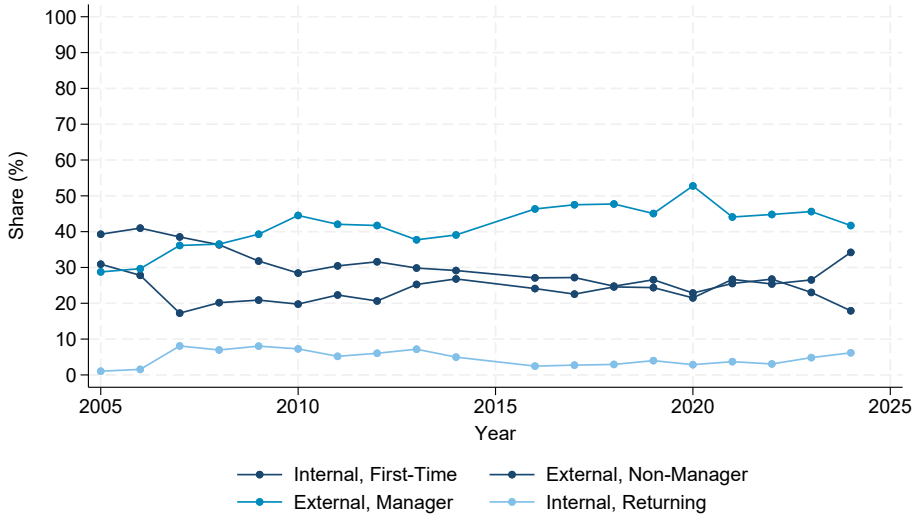
Notes: Mean number of distinct employers held to date by years of potential experience, adjusted for education (residualized on a college indicator and re-centered at the grand mean). Experience is defined as age minus 18. The sample includes all private-sector workers with positive wages, aged 18–64.

Figure A2: Wage Growth Decomposition



Notes: Decomposition of log wage growth into within-firm (stayer) and between-firm (mover) components by experience group, following Topel and Ward (1992).

Figure A3: Manager Source Trends (Detailed)



Notes: Detailed breakdown of new managerial appointment sources by year, distinguishing senior managers (ISCO 11–12) from middle managers (ISCO 13–14).

A.2 Appendix Tables

Table A1: Career Mobility by Experience

Experience (years)	N (pers.-yrs.)	Job Change Rate (%)	Mean Employers	Mean Tenure
1–5	297,720	40.5	1.86	1.97
6–10	332,989	33.3	2.91	2.55
11–15	356,195	23.8	3.25	3.33
16–20	360,513	19.3	3.29	4.07
21+	1578042	12.5	2.78	5.90

Notes: Job change rate = fraction of person-years with employer change. Employer count censored at pa

Notes: Job-change rates and cumulative employer counts by potential experience bin, following Topel and Ward (1992).

Table A2: Wage Growth Decomposition

	All		Stayers		Movers	
Experience (years)	$\Delta \log w$	N	$\Delta \log w$	N	$\Delta \log w$	N
1–5	0.2412	240,810	0.1907	146,455	0.2656	83,882
6–10	0.1927	286,765	0.1247	192,846	0.2968	81,178
11–15	0.0882	316,273	0.0776	239,247	0.0753	63,939
16–20	0.0639	325,885	0.0633	259,856	0.0122	53,211
All	0.0597	2529100	0.0555	2092161	0.0799	436,939

Notes: Stayers = same employer as prior year. Movers = employer change. $\Delta \log w$ = annual change in

Notes: Decomposition of log wage changes into within-firm (stayer) and between-firm (mover) components by experience bin, following Topel and Ward (1992).

Table A3: R^2 Progression: Explaining Firm Internal Promotion Rates

	Dep. var: Internal promotion rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Avg log wage				0.022**		
				(0.009)		
Avg tenure				0.113***		
				(0.007)		
Avg age				-0.002*		
				(0.001)		
Female share				-0.015		
				(0.033)		
Log firm size				0.060***		
				(0.020)		
Observations	879	866	866	861	654	654
Adjusted R^2	0.000	0.132	0.340	0.741	0.241	0.392
Firm characteristics	None	None	None	Yes	None	None
Industry FE	No	Yes	Yes	Yes	Absorbed	Absorbed
Year FE	No	No	Yes	Yes	No	Yes
Firm FE	No	No	No	No	Yes	Yes

Unit of observation: firm-year. Firms with ≥ 3 manager hires.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Each column reports the adjusted R^2 from a regression of the firm-year internal promotion rate on progressively richer controls. Column 1: no controls (constant only). Column 2: one-digit industry fixed effects. Column 3: industry and year fixed effects. Column 4: industry, year, and firm characteristics (average wage, average tenure, average age, female share, log employment). Columns 5–6: firm fixed effects (with and without year fixed effects). The sample includes firms with at least three new managerial appointments. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Internal Promotion Rate by Firm Size

Firm Size	Internal Rate	Firm-Years
10-49	0.364	107,791
50-99	0.388	24,053
100-249	0.429	20,887
250-499	0.495	9,880
500-999	0.529	6,540
1000+	0.562	6,123

Sample: established firms (observed since 2015). Firm-years with ≥ 1 new manager.

Notes: Mean internal promotion rate by firm size category. The sample includes established firms (observed since at least 2015) with at least one new managerial appointment in the given year.

Table A5: Deaths by Firm Size

Firm size	**N firms**	**N with death**	**% with death**	**N death events**
1–9	150792	8528	5.7	10721
10–49	2569	1503	58.5	5423
50–249	562	377	67.1	5091
250+	81	42	51.9	2188
Total	154004	10450	6.8	23423

Notes: Distribution of exogenous death events across firm size classes. See Table B.1 for sample construction.

Table A6: New Manager Appointments by Firm Size

	New managers over sample period						
Firm size	**0**	**1**	**2–5**	**6–10**	**11–50**	**51+**	**Total**
1–9	130521	17406	2760	79	26	0	150792
10–49	804	434	726	246	344	15	2569
50–249	66	36	114	74	145	127	562
250+	11	1	10	3	25	31	81
Total	131402	17877	3610	402	540	173	154004

Notes: Distribution of new managerial appointments across firm size classes.

Table A7: Among New Managers, Women Are More Likely to Come From Within

	(1)	(2)	(3)
	(1)	(2)	(3)
Female	0.042***	0.032***	0.031***
	(0.004)	(0.003)	(0.003)
Age		0.000	0.000
		(0.000)	(0.000)
Tenure		0.116***	0.117***
		(0.003)	(0.003)
Log Wage		0.031***	0.031***
		(0.002)	(0.002)
Log Firm Size			0.007**
			(0.003)
Firm Age			-0.002***
			(0.001)
Observations	80302	76394	76394
Adjusted R-squared	0.298	0.670	0.671
Year FE	✓	✓	✓
Industry FE	✓	✓	✓

Sample: new managers. Outcome: internal promotion (=1). Col (3) adds firm size and age to test whether female gap refl

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Internal promotion rate by detailed hiring source, separately for men and women.

Table A8: Gender Promotion Gap

	(1) OLS	(2) Firm-Occ-Entry FE
female	-0.003***	-0.001
	(0.000)	(0.001)
age	0.000***	
	(0.000)	
Year FE	✓	
Industry FE	✓	
Occupation FE	✓	
Firm-Occ-Entry FE		✓
Observations	529778	277638
Number of clusters	111685	
Adjusted R-squared	0.051	

All FE absorbed by reghdfe

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variable is an indicator for promotion to manager. Column 1 includes year, industry, and occupation fixed effects. Column 2 includes firm-by-occupation-by-entry-cohort fixed effects. All FE absorbed by `reghdfe`. Standard errors (in parentheses) are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

B Data Sources and Construction

This appendix describes our data sources, the construction of the worker panel, and the definitions of the key variables. All data were accessed under a confidential research agreement with Statistics Norway (SSB) and are available to researchers under a standard microdata application.[4]

Our core analysis uses two linked administrative employer-employee registers that together span 2000–2023. For the period 2015–2023, employment and wages are recorded monthly in the a-ordningen register. For 2000–2014, we use the ALTLTO register family, which provides an annual November snapshot constructed by linking the State Labour Register to annual wage filings. We supplement both registers with annual records on firm characteristics and leadership roles, month-precision death records, sickness benefit histories, and firm accounts. The combination covers essentially the entire Norwegian formal-sector workforce throughout.

B.1 Employment and Wages

A-ordningen, 2015–2023. From January 2015, all Norwegian employers are required to file a monthly electronic payroll report (the *a-melding*) with the Tax Administration, NAV, and SSB. The a-ordningen register collates these reports into a person-by-employer-by-month panel. For each employment relationship, the register records occupation according to the STYRK-08 standard (an eight-category major group code, of which major group 1 identifies managers), agreed weekly hours, position percentage, and four components of monthly compensation: base salary, cash wages, overtime pay, and bonus. On the employer side, each record carries the enterprise's NACE industry code, organizational form, and institutional sector. Because the a-melding is an administrative filing rather than a survey, coverage of the formal sector is essentially complete. We retain active employment relationships with positive wages and restrict to workers aged 16–74.

ALTLTO register, 2000–2014. Before the introduction of a-ordningen, SSB compiled the ALTLTO register family by matching employment spells from the State Labour Register (Aa-registeret, administered by NAV) to annual wage and tax-deduction statements submitted by employers (LTO filings). The matching produces three distinct populations. First, *matched* employment spells are those for which both an Aa-register employment record and a corresponding LTO wage record could be linked; these account for the large majority of formal-sector workers and carry a complete profile of workplace, hours, occupation,

[4] Applications are submitted through SSB's microdata portal at `microdata.no`.

and annual wages. Second, a smaller share of employment spells are present in the Aa-register but lack a matched LTO record — these workers have employment and occupation information but no wage observation. Third, a residual group of wage records has no corresponding Aa-register employment spell and is not used in the analysis because occupation and establishment information are unavailable. Our analysis rests primarily on the matched population; the Aa-only spells are retained for employment analyses where wages are not required.

For all included employment spells, the ALTLTO register produces an annual November snapshot with records of workplace municipality, agreed hours, establishment industry code, and occupation according to STYRK-98/03. Wages, where available, are recorded as annual total cash pay from the primary employer. Critically, ALTLTO and a-ordningen use the same SSB firm identifier system, so firms can be tracked continuously across the two registers. We verify this empirically: the large majority of ALTLTO firms in 2014 appear in a-ordningen the following year, consistent with the register transition being administrative rather than reflecting real entry and exit.

Occupation codes and the 2014–2015 series break. The two registers use different occupation code standards: ALTLTO uses STYRK-98/03 while a-ordningen uses STYRK-08. In both standards, major group 1 encompasses all managerial occupations (corresponding to ISCO major group 1 in both ISCO-88 and ISCO-08), so our manager indicator is directly comparable across the full 2000–2023 period. The finer occupation sub-groups are not directly comparable, however, as the 2008 revision reorganized several managerial subcategories. We consequently treat the register boundary as a hard break for any variable that relies on year-over-year occupation comparisons — including lagged occupation, lagged manager status, and the managerial appointment classification — setting these to missing for observations in 2015 whose prior-year record came from ALTO. Wages and firm identifiers are handled differently: annual wages are directly comparable because both registers measure total cash pay from the primary employer, and firm identifiers are consistent because both registers use the same numbering system.

B.2 Firm and Enterprise Records

Firm characteristics come from the Bedrifts- og foretaksregisteret (BOF), SSB's annual business register, which combines the Central Coordinating Register maintained by the Brønnøysund Register Centre with SSB's own employment counts. We use three components of this register.

The enterprise table provides one record per firm per year with information on primary NACE industry, organizational form (publicly or privately held limited company, sole proprietorship, partnership, and related forms), institutional sector, employee count, and operating status. It also records each firm's previous organization number when the firm has undergone a legal reorganization, which we use to trace firms through name changes and restructurings that would otherwise appear as entry and exit. The establishment table records the crosswalk between business establishments and their parent enterprises, and flags when an establishment changes ownership — a signal we use to detect acquisitions (Section B.9).

The roles register records formal person-to-enterprise linkages from the Central Coordinating Register. Each record identifies a person's organizational role — including chief executive officer (*daglig leder*), board chair (*styrets leder*), vice chair, and board members — with the start and, where applicable, end date of the appointment. We use these records to supplement the occupation-based manager classification: any person formally registered as chief executive or board chair at a firm is coded as a manager in that firm-year regardless of the occupation code in their employment record. The role taxonomy was updated around 2004–2005 when SSB transitioned to the current four-character BRREG role codes; our classification maps both vintages to common categories.

B.3 Demographics and Deaths

Death timing comes from SSB's fixed demographics file, a cross-sectional register of permanent personal characteristics. The key variable records the year and month of death (for those alive, the field is zero). This month-precision timing is essential for our instrumental variables design: the only other death source, the annual population register, records status as of January 1 each year, implying up to twelve months of uncertainty around the true death date. The fixed demographics file also provides birth year, gender, country of birth, and immigrant category. We cross-validate death dates between the two sources.

B.4 Sickness Benefits

Norwegian employers are obligated to pay full salary during the first 16 calendar days of any sickness spell; NAV takes over from day 17 onward. Annual NAV sickness benefit payments are recorded in SSB's income and tax register. A positive benefit payment indicates that a worker had at least one sickness episode exceeding two weeks in that year. We use this variable to implement the health filter in our exogenous death sample (Section B.10), following Jäger and Heining (2024). The income register is available from 2006; for the small number of deaths early in our sample where the full five-year lookback cannot be constructed,

we flag affected observations and verify robustness to their exclusion.

B.5 Education

Completed educational attainment comes from the National Education Database (NUDB), maintained by SSB. The NUDB register records the highest completed degree for every resident of Norway as of October 1 each year, coded to the six-digit NUS2000 classification. The first digit of the NUS2000 code identifies the education level (0–8), which we map to six analytical categories:

NUS first digit	Norwegian name	Our code	Label
0–2	Grunnskole	1	Primary / lower secondary
3–4	Videregående	2	Upper secondary
5	Fagskole	3	Post-secondary vocational
6	Universitet/høgskole lavere grad	4	Bachelor / short university
7	Universitet/høgskole høyere grad	5	Master or equivalent
8	Forskerutdanning	6	PhD

We define a binary *college* indicator equal to one for levels 4–6 (bachelor's degree or higher). We also retain the full six-digit NUS code for analyses that condition on detailed field of study.

Cleaning. Because educational attainment is a stock variable recorded annually, occasional coding errors can introduce apparent decreases in education level. We apply three sequential cleaning steps within person. First, a *despiking* filter removes locally anomalous values: if a person's education level in year t is strictly higher (or strictly lower) than in both years $t-1$ and $t+1$, the year-t value is set to missing. Second, remaining missing values are forward-filled using the last observed non-missing education level. Third, a *monotonicity* constraint replaces each observation with the running maximum of the person's education level up to that year, ensuring that completed education is weakly increasing over the career. The resulting panel covers the period 2000–2023.

B.6 Firm Accounts

Annual firm-level accounts are drawn from SSB's accounting register (REGN_FORE), which is constructed primarily from tax returns and direct filings with the Brønnøysund Register

Centre. Coverage extends to most private-sector enterprises and is available through 2022. We use these records to construct firm-level productivity measures — log revenue per worker, log value added per worker (revenue net of materials costs), operating profit margin, and return on assets — and to build the shift-share demand instruments described in Section B.11. All financial variables are in nominal NOK; since all regressions include year fixed effects, we do not deflate.

B.7 Panel Construction

From monthly records to an annual worker panel. For the a-ordningen period, we collapse the monthly employment records to an annual observation by selecting each worker's "main job" for the calendar year: the employer at which the worker was employed for the greatest number of months, with ties broken by presence in November and then by managerial status. We then take employment status, occupation, industry, region, and management tier from the November record of the main job, and measure annual wages as the sum of monthly cash wages across all months at that employer. November is the SSB standard reference month for annual labor market statistics, and it aligns naturally with the ALTO register, which is itself a November snapshot. For the ALTLTO period, a worker who appears at multiple employers in a year is assigned to the firm accounting for the greatest total working time, and wages are taken directly from the annual pay figure recorded for that employment spell.

All nominal wage measures are available in the panel alongside CPI-deflated real counterparts. Deflation uses the Norwegian consumer price index (annual, base year 2015=100) from SSB StatBank Table 08184. Real wages are expressed in 2015 NOK and are our preferred measure in wage level regressions; nominal wages are used where noted. All firm-level financial variables from the accounting register (Section B.6) are left in nominal NOK because firm-level regressions include year fixed effects.

Stacking the two registers. We append the ALTLTO annual panel (2000–2014) to the a-ordningen annual panel (2015–2023) to form a unified, unbalanced person-year panel spanning 2000–2023. Workers enter when they turn 16 and exit when they turn 75, die, or emigrate. Firm identifiers are directly comparable because both registers use the same SSB numbering system. For the ALTLTO years, matched employment spells take priority when a worker appears in both the matched and Aa-only populations; wages are observed for the matched majority and missing for the remainder. Wage regressions for the ALTLTO period are restricted to workers with matched wage records.

Tenure, lags, and the register break. Within-firm tenure is a running count of consecutive years at the same employer, resetting to one on any firm change, any gap year, or at the 2014–2015 register boundary. Lag variables for wages, log wages, manager status, occupation, and industry are computed within person-firm spells and set to missing at the 2014–2015 boundary because the year-over-year changes are not interpretable across the occupation coding change. The same-firm indicator — whether the worker remained at the same employer as the prior year — is retained at the boundary because firm identifiers are consistent.

Education merge. We merge the cleaned NUDB education panel (Section B.5) onto the worker panel by person identifier and year. The merge is a left join: workers without a match in the education register retain all other variables and have education set to missing. Education is available for the large majority of the workforce; the unmatched cases are predominantly recent immigrants whose foreign qualifications have not yet been registered in NUDB.

B.8 Manager Classification

We define a worker as a **manager** in year t if her four-digit occupation group falls in major group 1 of either STYRK-08 or STYRK-98/03 (corresponding to ISCO major group 1, "Managers"), or if she is formally registered as chief executive or board chair in the roles register. We further distinguish two management tiers: senior managers (STYRK-08 sub-groups 11 and 12, or formal chief executive and board chair registrations) and middle managers (sub-groups 13 and 14).

A worker is recorded as entering a **new managerial role** at firm j in year t if she is a manager in year t but was not a continuing manager at the same firm in year $t-1$. This definition allows a worker to become a "new" manager at a firm where she previously worked in a non-managerial capacity, or after a gap in panel coverage, while correctly treating career managers with unbroken tenure at the same firm as non-events. We classify each new appointment into three mutually exclusive categories:

- **Internal promotion**: the worker held a non-managerial role at firm j in year $t-1$.
- **External hire from non-management**: the worker joined from outside firm j and had not held a managerial role in any prior year visible in the panel.
- **External hire with prior management experience**: the worker joined from outside firm j and had been a manager in at least one prior panel year.

All classification variables are set to missing at the 2014–2015 register boundary, so the occupation coding change does not generate spurious internal or external appointment events. A worker who appears as a manager in both 2014 and 2015 at the same firm is treated as a new manager in 2015, with source determined by whether she was at that firm in 2014 in a non-managerial role.

B.9 Merger Detection

Mergers and acquisitions create apparent labor market mobility that could contaminate our manager-source classification: a worker whose employer changes through a transaction should not be coded as an external hire. We identify M&A events and exclude affected transitions using three complementary signals.

The primary signal is a worker flow test. For each consecutive pair of months, we count the number of workers transitioning from a given firm to each potential destination firm. When this count exceeds 50 percent of the origin firm's prior-month workforce (subject to a minimum of five workers), we flag the transition as a potential merger corridor. This approach provides monthly precision and is more reliable than legal filings because it is grounded directly in employment data. The second signal uses the business register: we flag firm-years in which a firm is recorded as deleted or in which an establishment changes its parent enterprise, either of which may reflect a transaction. The third, confirmatory signal draws on the shareholder register to identify years in which a firm issued new shares in connection with a merger or reduced capital in connection with a demerger.

We combine the three signals into a firm-month merger flag and, for transitions falling within a detected merger corridor, set the managerial source classification to missing.

B.10 Identifying Exogenous Deaths

Our instrumental variables strategy uses the sudden deaths of incumbent workers as exogenous supply shocks to positions within firms, following the approach of Jäger and Heining (2024). The validity of this design requires that deaths be unanticipated by the firm and co-workers. Bennedsen et al. (2020) and Pérez-González (2006) demonstrate that the deaths of top executives create discontinuous changes in firm outcomes, consistent with sudden loss rather than planned succession. In our setting, we apply four restrictions to isolate deaths that plausibly satisfy this condition.

1. *Age below 65 at the time of death.* We exclude workers who die at or after age 65 because deaths near retirement age are anticipated. Firms plan succession for managers

approaching retirement, and co-workers adjust their own career investments accordingly. The age-65 threshold is standard in this literature (Jäger and Heining, 2024).

2. *Active employment at the firm.* We require the worker to appear in the employment panel in at least one month of the death year or the year prior, identified with the same employer. This ensures we are measuring the impact of the sudden loss of an active contributor rather than a lagged administrative recording.

3. *No recent sickness benefits.* Workers who received NAV sickness benefits — paid for illness spells exceeding 16 days — in any of the five years preceding death are excluded. A multi-week illness is visible to the employer and co-workers and may trigger anticipatory adjustments in staffing and career plans. This is the Norwegian analogue of the six-week sick-pay filter applied by Jäger and Heining (2024) in Germany; in their data, this restriction removes approximately 42 percent of deaths. We expect a similar rate in Norway given the comparable structure of the sickness insurance system.

4. *At most one exogenous death per firm per year.* We exclude firm-years with multiple qualifying deaths. Two or more deaths at the same firm in the same year raise the possibility of a shared cause — a workplace accident, an outbreak, or financial distress — which would be endogenous to the firm's situation.

Table B.1 documents how each restriction affects the sample. Starting from 575,516 deaths recorded in SSB's fixed demographics file during the sample period, the active employment requirement is the most restrictive filter, reducing the sample to 50,961 deaths that can be matched to an employment record. The age restriction removes a further 24,993 deaths at age 65 or above. The sickness benefit filter is not yet applied in the current version because the INNT income register has not been received; we anticipate this will remove roughly 40 percent of remaining deaths, consistent with rates reported in Jäger and Heining (2024) for Germany. Finally, the single-death-per-firm-year restriction drops 9,397 deaths, leaving a final sample of 16,571 exogenous deaths, of which 1,859 are manager deaths and 14,712 are non-manager deaths.

Monthly event-time panel. For each exogenous death event, we construct an event-time panel spanning twelve months before and twelve months after the death month, where event time is measured in months relative to the death calendar month. The panel retains all workers employed at the deceased's firm during any month in the event window, not only the deceased. We classify each worker-month observation as belonging to one of three groups: the deceased worker (observed in pre-death months only), *survivors* (workers present at the

Table B.1: Construction of the Exogenous Death Sample

	Dropped	Remaining	% Retained
Deaths in administrative records		575,516	
Matched to employment panel	524,555	50,961	8.9%
Age below 65 at death	24,993	25,968	51.0%
No sickness benefits in prior 5 years	*INNT register not yet received — filter not applied*		
Single death per firm-year	9,432	16,536	63.7%
Final sample by type			
Manager deaths		1,855	
Non-manager deaths		14,681	

Notes: Each row applies an additional restriction to the sample from the previous row. Deaths enter the administrative records if they appear in SSB's fixed demographics file with a non-missing death year-month. *Matched to employment panel* requires the deceased to appear in the monthly employment register in the death year or the prior year. *Age below 65* excludes near-retirement deaths, where succession is anticipated by the firm. *No sickness benefits* drops workers who received NAV-paid sickness benefits — paid for illness spells exceeding 16 consecutive days — in any of the five years before death, following Jäger and Heining (2024). *Single death per firm-year* excludes firm-years with multiple qualifying deaths, ruling out workplace accidents and other shared causes.

firm in at least one pre-death month who are not the deceased), and new arrivals (workers first appearing at the firm after the death). The survivor classification is constructed by identifying all distinct (worker, death event) pairs observed at the firm in the pre-period, then joining this lookup to the full panel. This approach avoids computing window functions over the entire event panel and is memory-efficient even for large samples. The resulting dataset is the basis for the event study analysis of how firms fill managerial vacancies after an unexpected death.

B.11 Instruments for the Make-or-Buy Decision

We use four classes of instruments to address the endogeneity of the firm's promotion versus hiring choice.

Bench depth. The internal cost of filling a managerial vacancy depends on the depth of the available candidate pool. We measure bench depth separately by management tier. For senior management vacancies (STYRK-08 sub-groups 11–12), the bench is the count of middle managers (sub-groups 13–14) at the firm in the year prior to the vacancy. For middle management vacancies, the bench is the count of non-managerial workers at the firm with at

least three years of continuous tenure. Firms with deeper benches face lower marginal costs of internal promotion and should, conditional on a vacancy, be more likely to promote from within.

External market conditions. We define a local managerial labor market as the intersection of region (first two digits of the work municipality code) and one-digit occupation group (STYRK-08 major group, derived as the occupation code divided by 100). For each market cell and year, we compute the stock of managers — the count of workers classified as managers in the a-ordningen employment panel — and three manager mobility rates. A manager is classified as a mover if she works at a different firm than in the prior year (requiring consecutive annual observations). The own-cell mobility rate is the mover count divided by the manager stock in the firm's (region $\times$ occupation group $\times$ year) cell. The cross-industry mobility rate uses movers and stocks from all industries within the same region and year, excluding the firm's own cell. The other-region mobility rate similarly uses all regions within the same industry and year. The latter two rates provide excluded instruments in overidentification tests. Cells with fewer than five managers are excluded to avoid noise from thin markets.

We also construct three additional market-level supply measures for the death vacancy analysis. The count of *other deaths in the market* captures the number of exogenous deaths (from Section B.10) in the same market cell, excluding the focal death, which proxies for the unexpected release of workers from other firms. The count of *near-retirements* is the number of managers aged 62–66 in the market cell, measuring anticipated future supply. The count of *firm exits* is the number of firms present in the market cell in year $t-1$ that are absent in year t. All three measures are leave-one-out where applicable: the focal firm's own events are excluded from the market-level count.

Firm wage position. Firms that pay above the local managerial wage rate should find it easier to attract external candidates. We measure each firm's wage position as the ratio of its mean managerial wage to the mean managerial wage in its local labor market (region $\times$ one-digit occupation group $\times$ year). We also compute the firm's percentile rank within the market-year wage distribution. Both measures are constructed from the pre-vacancy year to avoid mechanical dependence on hiring outcomes.

Demand shifters. We construct a Bartik shift-share instrument (Bartik, 1991) to capture exogenous variation in the demand for managerial labor. National log revenue growth rates are computed by two-digit NACE industry and year from the accounting register (Sec-

tion B.6), then weighted by each firm's pre-period industry employment shares. The resulting index captures demand variation driven by national industry trends, which are plausibly exogenous to any individual firm's staffing decisions.

B.12 Wage Decomposition

We decompose log wages following Abowd et al. (1999):

$$\ln w_{it} = \alpha_i + \psi_{j(i,t)} + \beta_1 \, \text{age}_{it} + \beta_2 \, \text{age}_{it}^2 + \gamma_t + \varepsilon_{it}, \tag{B.1}$$

where α_i is a worker fixed effect capturing portable individual characteristics, ψ_j is a firm fixed effect capturing the wage premium the firm pays above what its workers could earn elsewhere, age and age-squared proxy for accumulated experience, and γ_t are year fixed effects. We normalize firm effects to mean zero and cluster standard errors at the firm level. Identification of firm effects requires workers who change employers; we report the fraction of the log wage variance attributable to worker effects, firm effects, and their covariance — the last of which measures assortative matching between high-ability workers and high-premium firms. We use estimated firm wage premiums both as a measure of firm quality and as an instrument for external hiring.