

Employee Equity and Workforce Outcomes in Startups: Evidence from Binding Wage Constraints*

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Abstract

How do binding wage constraints reshape ownership allocation in startups, and what are the consequences for workforce outcomes? Using population wide administrative data on Finnish startups (2006–2022), we study how mandated wage floors affect employee equity and worker mobility. We exploit staggered introductions and removals of collective bargaining agreement extensions that impose binding wage floors on previously uncovered firms, generating plausibly exogenous variation in wages and equity compensation. Extensions reduce individual employee equity stakes by 10–11%. Instrumental variables estimates show that a 10% increase in employee equity reduces one-year exit by 2.5–3% and increases internal advancement by 10–12%, with weaker effects in high-technology industries.

Keywords — Entrepreneurial finance; Ownership structure; Financial constraints; Employee ownership; Startup compensation; Corporate governance.

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1 Introduction and Background Literature

Young firms must allocate ownership while operating under severe liquidity constraints. In startups, employee equity is not merely an incentive device but an endogenous component of financing and ownership structure. When compensating workers, startups face a central trade-off: paying cash wages drains scarce internal funds but preserves ownership, while granting equity conserves liquidity but dilutes founders and reallocates control. These trade-offs become particularly salient when external wage constraints raise required cash compensation. Classic agency models emphasize equity's role in aligning incentives (Jensen and Meckling, 1976; Holmström, 1982; Manso, 2011). Yet startups differ from mature public firms in that they typically operate with limited internal liquidity and costly access to external capital (Evans and Jovanovic, 1989; Robb and Robinson, 2014; Howell, 2017). In this environment, both liquidity constraints and binding wage floors can directly shape how ownership is allocated across employees.

This paper studies two related questions. First, how do wage constraints reshape the allocation of employee equity in startups? Second, what are the consequences of employee ownership for workforce outcomes such as retention and internal mobility? While prior work has extensively studied executive equity in public firms (e.g., Aggarwal and Samwick, 1999; Ittner et al., 2003), far less is known about how young, private firms allocate equity across non-executive employees when facing binding cash compensation constraints. Moreover, existing evidence on non-executive equity compensation often relies on survey data or selected samples (Core and Guay, 2001; Oyer, 2004; Oyer and Schaefer, 2005), leaving limited causal evidence in entrepreneurial settings. At the same time, the entrepreneurial finance literature emphasizes how financing frictions shape firm behavior and organizational choices (Ewens et al., 2018; Nanda and Rhodes-Kropf, 2017), but provides limited evidence on how such constraints influence the internal allocation of employee ownership within startups.

Conceptually, consider a financially constrained startup choosing a mix of cash wages and employee equity when compensating workers. Because young firms operate with limited

internal liquidity and costly access to external capital, cash compensation draws on scarce funds, while equity grants conserve liquidity but dilute existing owners. Employee equity also affects workforce behavior by strengthening effort incentives tied to firm performance, which in turn can increase the realized value of remaining at the firm. This setting yields two central implications. First, when binding wage constraints increase required cash compensation, startups substitute away from employee equity in order to preserve liquidity. Second, variation in employee equity affects workforce outcomes by influencing both retention and promotion. Appendix A formalizes these mechanisms in a simple model in which a liquidity-constrained startup chooses between cash wages and equity subject to a binding participation constraint. The model shows that higher wage floors reduce optimal employee equity and that higher equity increases retention and promotion probabilities. These predictions directly motivate our empirical strategy.

Our empirical setting exploits exogenous variation in binding wage constraints to identify these relationships. We construct a population-level panel of equity ownership using comprehensive Finnish administrative data covering all limited liability startups that reach at least 10 employees between 2006 and 2022. The data track annual equity stakes for founders, managers, employees, and outside investors. Instrumental variables estimates indicate that when binding wage floors raise required cash compensation, startups reduce individual employee equity stakes by roughly 10–11%. Using these shocks to instrument for employee ownership, we find that a 10% increase in employee equity reduces one-year exit by approximately 2.5–3% and increases internal advancement by 10–12%, with attenuated effects in high-technology industries.

Our paper contributes to three strands of corporate finance research. First, we provide causal evidence on how startups adjust ownership allocation when binding wage floors raise required cash compensation. While the capital structure and financing literatures emphasize how financial frictions shape firm behavior ([Evans and Jovanovic, 1989](#); [Howell, 2017](#); [Nanda and Rhodes-Kropf, 2017](#)), little is known about how such constraints influence the internal

allocation of equity across employees in private firms. We show that tightening binding wage constraints systematically contracts employee ownership stakes.

Second, we contribute to research on equity compensation and incentive contracting. Prior studies document how public firms use stock-based pay to address retention, sorting, and incentive concerns (Core and Guay, 2001; Oyer, 2004; Oyer and Schaefer, 2005), but the available evidence largely focuses on executives or selected samples. We provide large-scale causal evidence at the individual level in private entrepreneurial firms, showing that employee equity materially affects retention and promotion outcomes.

Third, we link ownership structure to organizational outcomes in startups. By connecting individual equity stakes to subsequent workforce outcomes, we provide micro-level evidence on how ownership allocation shapes internal labor market behavior. In private firms, where equity is valued episodically and may deviate from fundamentals between financing events (Gornall and Strebulaev, 2020), ownership allocation involves distinctive valuation and risk-sharing considerations absent in public markets. Our findings show that binding wage constraints play a central role in shaping the allocation of employee ownership and, through that channel, influence workforce outcomes in young firms.

2 Institutional Setting, Identification, and Data

2.1 Collective Bargaining Extensions as Wage Shocks

Our identification strategy exploits staggered introductions and removals of collective bargaining agreement (CBA) extensions across Finnish industries that impose binding wage floors on previously uncovered firms. In Finland, collective bargaining agreements negotiated between unions and employer associations may be declared universally binding through a statutory extension procedure administered by public authorities. Once extended, the negotiated occupation–experience wage schedule becomes legally binding for all firms in the industry, including previously non-unionized firms.

Appendix E provides a comprehensive list of collective bargaining agreement extension and removal decisions by industry, including decision dates and implementation timing, which underlie the staggered regulatory variation exploited in our identification strategy.

Extension and removal decisions are made at the industry level and apply uniformly to all firms within the affected industry. Individual startups do not select into treatment, and the timing of extension decisions is determined by statutory coverage criteria rather than firm-level performance, compensation policies, or workforce composition. As a result, exposure to extensions is plausibly orthogonal to individual startup outcomes.

CBAs regulate wages at a granular level, specifying binding compensation floors separately by occupation and experience brackets. Unionized firms are already required to comply with these schedules. When an agreement is extended, previously non-unionized firms become subject to the same wage schedule. For financially constrained startups that previously retained wage-setting discretion, extensions therefore impose externally mandated increases in required cash compensation, tightening binding wage constraints. Because wage floors are legally binding, firms cannot comply by setting wages below the negotiated schedule.

Collective bargaining agreements contain numerous provisions beyond wages, including rules governing working hours, additional leave entitlements, and dismissal procedures. Importantly, however, a statutory extension does not automatically impose structural or organizational changes on previously uncovered firms, nor does it transform them into unionized workplaces. Instead, the extension grants employees the legal right to require that the firm comply with the terms of the negotiated agreement if their existing compensation or employment conditions fall below the contractual standard.

In practice, the component of the agreement that generates the most immediate and mechanically binding adjustment for previously uncovered startups is the occupation–experience wage schedule. Workers whose pre-extension wages fall below the negotiated floor can legally require wage adjustments. Other provisions—such as additional leave entitlements, working-hour rules, or dismissal procedures—typically apply at the firm level and do not generate

differential exposure across workers within the same firm based on their pre-extension wage position. Consequently, the primary binding channel through which extensions affect previously uncovered startups is the increase in required cash compensation for workers whose wages fall below the negotiated schedule.

The magnitude of this cash shock varies across firms and workers. Within previously uncovered firms, workers whose pre-extension wages lie further below the negotiated schedule experience larger mandated wage increases. Across firms within the same industry, the overall impact depends first on whether the firm was already covered by a collective bargaining agreement and second on how existing wages compare to the negotiated schedule. Firms that were already unionized must comply with the negotiated wage structure and therefore experience little immediate adjustment. In contrast, previously uncovered firms face increases in required cash compensation to the extent that their workers' wages fall below the negotiated occupation–experience schedule.

Removal decisions restore wage-setting discretion but do not mechanically reverse prior compensation adjustments. Equity allocations reflect multi-period contracting decisions and capitalization histories, and firms may adjust compensation gradually after wage floors are lifted. In practice, firms may rebalance between cash and equity depending on current liquidity conditions, anticipated financing needs, and existing ownership structures. As a result, removal effects need not mirror extension effects at the individual level. Empirically, removals generate variation in cash compensation constraints that complements extension-induced shocks, although the primary identifying variation for equity responses comes from binding wage increases associated with extensions.

We therefore interpret extensions as exogenous shocks that tighten cash compensation constraints and removals as shocks that relax them. For startups that rely heavily on internal funds and face costly external financing, increases in binding wage floors mechanically raise required cash outflows and tighten liquidity constraints. Constrained startups may respond by adjusting the composition of compensation and contracting employee equity allocations in

order to conserve ownership. In Section 3 we examine pre-trends, reduced-form patterns, and alternative channels to assess whether extensions affect retention and advancement directly through wage changes or indirectly through ownership adjustments.

2.2 Instrument Construction and Identification

Let $\text{PostExtension}_{kt}$ denote an indicator equal to one if industry k is subject to a binding collective bargaining extension in year t , and zero otherwise. Let $\text{NonUnion}_{i,t-1}$ denote an indicator equal to one if firm i was non-unionized in $t - 1$. We define:

$$\text{Extension}_{ikt} = \text{PostExtension}_{kt} \times \text{NonUnion}_{i,t-1}.$$

Union status is measured prior to the extension year and is predetermined with respect to the regulatory decision. This interaction isolates the regulatory discontinuity faced by firms that were not previously covered by a binding wage agreement. Unionized firms were already required to follow the negotiated occupation–experience wage schedule and therefore do not experience a discrete change at extension. Identification from extensions thus arises from differential exposure across firms within the same industry-year based on pre-existing union status.

Let PostRemoval_{kt} denote an indicator equal to one in industry-years following removal of a binding extension. We define:

$$\text{Removal}_{kt} = \text{PostRemoval}_{kt}.$$

Removals restore wage-setting discretion and relax binding wage constraints industry-wide. As such, Removals can affect both non-unionized and previously unionized firms and therefore do not require interaction with pre-existing union status.¹

¹We present results with both versions, PostRemoval_{kt} and $\text{PostRemoval}_{kt} \times \text{NonUnion}_{i,t-1}$.

Worker-level exposure. To capture heterogeneity in exposure within firms, we construct an individual-level measure of wage shortfall relative to the negotiated occupation–experience schedule. For each occupation \times experience \times industry \times year cell among unionized firms, we compute the modal annual wage bin (which closely tracks negotiated wage floors in unionized firms), denoted \tilde{w} . Because unionized firms adhere closely to negotiated schedules, the modal wage provides an empirical proxy for the binding collectively bargained compensation level.

For employees in non-unionized firms, we define:

$$\text{WageScheduleDistance}_{ijt-1} = \max \left\{ 0, \frac{\tilde{w} - w_{ijt-1}}{\tilde{w}} \right\}.$$

$\text{WageScheduleDistance}$ is constructed using pre-extension wages and therefore predetermined with respect to the regulatory shock. This measure captures the proportional shortfall of an individual’s wage relative to the negotiated schedule. We interact this measure with the extension indicator:

$$\text{Extension}_{ikt} \times \text{WageScheduleDistance}_{ijt-1}.$$

This interaction sharpens identification by generating differential exposure to binding wage floors across workers within the same firm and tenure cell. Because $\text{WageScheduleDistance}$ is constructed from pre-extension wages and varies across workers within the same firm and tenure cell, identification does not rely solely on industry-level regulatory timing but also exploits predetermined worker-level heterogeneity in exposure to binding wage floors. Any firm-level institutional changes associated with collective bargaining extensions would affect all workers within the firm symmetrically and therefore cannot mechanically produce within-firm variation aligned with pre-existing wage shortfalls. Accordingly, identification reflects the combination of regulatory variation across industries and firms with worker-level differences in mechanical wage exposure.

Taken together, the excluded instrument set consists of Extension_{ikt} , Removal_{kt} , and $\text{Extension}_{ikt} \times \text{WageScheduleDistance}_{ijt-1}$. Extension-driven variation provides the primary

source of exogenous tightening in binding wage constraints. Our estimates do not rely on symmetry between extensions and removals; rather, removals augment the instrument set and improve efficiency.

Economic mechanism and monotonicity. Extensions mechanically raise required cash wages for workers whose pre-extension compensation falls below the negotiated schedule. Because wage floors are legally binding, firms cannot comply by lowering wages below the schedule, implying a non-negative and monotonic first-stage effect on wages among exposed workers.

Equity adjustments, by contrast, are not mandated by regulation and represent endogenous firm responses to the tightening of cash constraints. When required cash outflows increase, startups may adjust the overall compensation mix and ownership allocation in order to accommodate higher wage bills while managing dilution and internal financing constraints. Because startups typically operate with limited cash buffers and costly access to external equity or debt, mandated wage increases tighten financing constraints rather than simply reduce profits. Depending on firm-specific liquidity conditions and compensation policies, this adjustment may take the form of reducing equity grants, reallocating equity across employees, or altering hiring patterns. Our identification strategy does not impose a sign restriction on the equity response but instead exploits the exogenous variation in cash compensation to trace its effect on equity ownership and employee outcomes.

Removals generate the opposite directional shock by restoring wage-setting discretion and relaxing binding constraints.

Exclusion restriction. Our identification requires that collective bargaining extensions and removals affect employee exit and promotion only through induced changes in compensation structure (instrumented wages and equity). Several institutional features support this interpretation. First, extension decisions are administered at the industry level and are triggered by statutory coverage thresholds rather than firm-level performance, workforce

composition, or compensation policies. Individual startups do not select into treatment, and the timing of extension decisions is orthogonal to firm-level outcomes.

Second, identification does not rely solely on cross-firm comparisons of treated and untreated firms. Rather, the research design combines regulatory variation across industries and firms with worker-level heterogeneity in exposure to binding wage floors. In particular, the interaction between `Extension` and `WageScheduleDistance` captures pre-existing wage shortfalls relative to the negotiated occupation–experience schedule and therefore generates worker-level heterogeneity in the magnitude of required wage adjustments. Because `WageScheduleDistance` is constructed from pre-extension wages, it is predetermined with respect to the regulatory decision.

This worker-level heterogeneity is especially useful for assessing the exclusion restriction. Extensions mechanically raise required wages only for workers whose pre-extension compensation falls below the negotiated floor, while workers already above the schedule experience little or no direct adjustment. Any firm-level institutional changes associated with extensions—such as formalization of work rules, grievance procedures, or employment protections—would apply symmetrically to workers within the same firm and therefore cannot mechanically generate variation aligned with pre-existing wage shortfalls. The interaction with `WageScheduleDistance` thus helps isolate the component of the regulatory shock tied to the mechanical application of binding wage floors, while the overall design continues to exploit regulatory variation across industries, firms, and workers.

Third, our specifications include `firm`×`tenure` fixed effects and year fixed effects. Identification thus comes from (i) differential regulatory exposure across firms within the same industry-year based on pre-existing union status, and (ii) differential worker-level exposure within firms tied to `WageScheduleDistance`. To the extent that extensions coincide with macroeconomic or industry-level demand shocks, such shocks are absorbed by time effects and do not mechanically generate within-firm heterogeneity aligned with the negotiated wage schedule.

An alternative adjustment margin is employment. Extensions could, in principle, induce firms to reduce hiring or terminate workers rather than alter compensation structure. However, generalized labor-demand responses at the firm or industry level do not mechanically generate variation aligned with WageScheduleDistance, which is constructed from predetermined worker-level wage shortfalls. Because the research design combines regulatory variation across industries and firms with worker-level heterogeneity in exposure, such responses are unlikely to account for the observed pattern of wage and equity adjustments. We therefore interpret the second-stage estimates as tracing the effect of equity variation induced by wage shocks, rather than the direct effect of wage increases on turnover. We further examine these channels in reduced-form and event-time analyses below.

Additional exclusion considerations. A remaining concern is that extension decisions may coincide with broader industry-level demand shocks that independently affect employee turnover or promotion prospects. Several features of the research design mitigate this concern. First, extension timing is governed by statutory coverage criteria tied to industry-level bargaining thresholds rather than firm performance or compensation policies. Second, our worker-level interaction between extension status and WageScheduleDistance captures predetermined differences in wage shortfalls relative to negotiated schedules. General industry shocks may affect firms broadly, but they are unlikely to mechanically generate variation aligned with these pre-existing worker-level shortfalls. Third, the results remain unchanged when we replace year fixed effects with industry \times year fixed effects.

Another potential channel is firm survival. If extensions disproportionately cause financially weak startups to exit, employee separations could reflect firm closures rather than compensation adjustments. To address this concern, we exclude firm-year observations in which the startup exits in $t + 1$ when constructing individual exit outcomes to ensure that individual exit reflects voluntary or employer-driven separation rather than firm closure. In analyzing promotion, we only include individuals who remain at the startup in $t + 1$. Finally,

extensions could alter hiring patterns or workforce composition rather than compensation design. Because our specifications include firm \times tenure fixed effects and focus on within-firm worker-level exposure, identification does not rely on cross-firm compositional differences.

First-stage implications. The institutional setting delivers sharp first-stage predictions for wages. For exposed workers in previously non-unionized firms, extensions generate discrete increases in required cash compensation. Consistent with this mechanical compliance channel, we observe strong first-stage effects on wages in the year of extension.

Equity responses reflect endogenous adjustment to the exogenous wage shock. Event-time evidence shows that equity holdings adjust contemporaneously with extensions, with no evidence of anticipatory movements in the pre-period. These dynamics are consistent with firms re-optimizing compensation and ownership allocation in response to binding wage floors rather than anticipating regulatory implementation.

Event-time validation. To assess the timing assumption underlying the instrument, we estimate event-time specifications replacing the extension indicator with leads and lags relative to the year of extension. We find no evidence of differential pre-trends in wages or equity among exposed firms and workers. Coefficients for pre-extension years are small and jointly insignificant. Wage adjustments occur sharply in the year of extension, consistent with mechanical compliance with binding wage floors, while equity responses emerge contemporaneously with the regulatory shock. These patterns support the interpretation of extensions as exogenous wage shocks rather than responses to evolving compensation trends.

2.3 Data and Sample Construction

Our dataset combines multiple administrative sources hosted by Statistics Finland.² Individual level employment and wage data are drawn from the FOLK linked employer–employee

²The data is accessed through a virtual private network (VPN) connection to a remote workspace. Transfer of data and results in and out of the workspace is strictly monitored by Statistics Finland and the workspace itself has no connection to the internet.

panel, which records annual employment relationships, wages, and occupation codes for all working-age residents. Equity ownership data are obtained from the FLOWN ownership panel, which records annual shareholdings for all shareholders of Finnish limited liability companies (osakeyhtiö, Oy), allowing us to observe the full distribution of legally registered equity ownership within each firm-year. Firm-level financial statement data are merged from the annual financial statement panel. Unionized firms are identified using the Structure of Earnings Statistics (SES). The SES covers firms subject to collective bargaining agreements, so firms appearing in the SES are classified as unionized.

We define a startup as a newly incorporated limited liability company (Oy) and exclude subsidiaries of existing firms and years in which a startup is acquired. Founding year is defined as the first year of registration in the Finnish business registry. We focus on startups founded between 2006 and 2022 that reach at least ten employees at some point in their life cycle and report complete shareholder information. The ten-employee threshold ensures that firms have non-trivial organizational structure and measurable internal mobility while excluding very small owner-managed firms. This threshold is applied based on realized firm size over the life cycle and does not depend on regulatory exposure.

Equity ownership data are available from 2006 onward. The effective estimation sample spans calendar years 2006–2021 because exit and promotion outcomes are measured between year t and $t + 1$, which limits the final sample to 2021.

The final dataset consists of 16,347 startups, 97,016 startup-year observations, and 2,060,012 individual–startup–year observations. Our main empirical analysis is conducted at the individual–startup–year level, with firm-level outcomes constructed from aggregated ownership measures.

2.4 Variables and Empirical Specification

Our primary outcomes are individual exit and promotion. Exit is an indicator equal to one if the employee exits the startup in year $t + 1$, conditional on firm survival, regardless of

destination employer. Promotion captures upward movement to a higher-ranked one-digit ISCO occupational category (or promotion to CEO for managers) in year $t + 1$, conditional on continued employment.³

The main independent variable is Shares, which denotes the raw number of shares held by individual j in firm i in year t . Because share counts are not directly comparable across firms, our specifications control for the total number of shares outstanding in firm i in year t . We use a log transformation (plus one) to accommodate skewness in the distribution of individual equity holdings. Because wages and equity are jointly determined components of compensation, we instrument for both Shares and Wage using the institutional variation described above.

We estimate the model using two-step generalized method of moments (GMM 2SLS). For binary outcomes (exit and promotion), we employ linear probability models to preserve the interpretation of coefficients under instrumental variables estimation.

The second-stage specification is:

$$Y_{ijt+1} = \beta_1 \widehat{\text{Shares}}_{ijt} + \beta_2 \widehat{\text{Wage}}_{ijt} + X_{ijt}\Gamma + \alpha_{i \times \text{Tenure}} + \delta_t + \varepsilon_{ijt}.$$

The vector X_{ijt} includes individual characteristics (education, gender, occupation status) and firm characteristics (age, revenues, venture capital ownership, and total shares outstanding). Firm \times tenure fixed effects absorb time-invariant heterogeneity across workers within firms at a given tenure level, and year fixed effects control for aggregate shocks. Standard errors are clustered at the firm \times tenure level to account for correlation in compensation and mobility decisions within firm-tenure cells.

³ISCO one-digit codes below level three are treated as equal.

3 Empirical Results

3.1 Descriptive Evidence

We first document the distribution of equity ownership within startups and the unconditional relationship between employee equity and workforce outcomes before turning to causal analysis.

Table 1 reports the evolution of ownership shares by firm age, conditioning on startups that survive to at least age ten in order to hold the set of firms fixed across ages. At founding, founders retain 71.6% of equity on average. Their ownership share declines steadily as firms mature, falling to 50.4% by age ten, consistent with dilution from financing rounds and subsequent equity allocations. Managers' equity stakes rise from 0.3% at founding to 6.1% by year ten, while rank-and-file employees hold smaller but persistent stakes, increasing from 1.0% at founding to 2.4% by age ten. Venture capital ownership increases gradually from 1.8% to 7.1% over the same horizon. Overall, ownership becomes progressively more diffuse as startups age, although founders remain the dominant shareholders. These patterns underscore that employee equity represents a non-trivial component of the ownership structure in young firms.

Table 2 presents summary statistics. The individual-level sample consists of 2,060,012 individual-year observations. The unconditional annual exit rate is 30.0%, and the promotion rate is 3.96%. Equity ownership is relatively uncommon: only 6.0% of employees ever hold equity during the sample period. High-R&D startups differ systematically from low-R&D firms in workforce composition and outcomes, with higher educational attainment, greater STEM representation, lower exit rates, and higher promotion rates. At the firm level, startups exhibit substantial heterogeneity in age, revenues, technological intensity, and ownership structure. These descriptive statistics highlight the variation necessary to study how wage constraints and ownership allocation interact with workforce dynamics.

Figure 1 presents unconditional exit and promotion rates by tenure for employees who

ever hold equity and those who never do in the focal firm. Panel A shows large differences in exit rates. In the first year of tenure, exit is 43.8% among non-equity employees compared to 14.2% among equity holders. Although exit declines modestly with tenure for both groups, the gap remains substantial throughout the tenure distribution. Panel B displays analogous differences for promotion: equity holders exhibit consistently higher promotion rates at all tenure levels. The unconditional associations are economically large, particularly early in tenure.

These descriptive patterns, however, do not establish causality. Equity may be systematically allocated to employees with higher expected productivity, stronger attachment, or superior outside options. Moreover, startups may endogenously adjust equity grants in anticipation of retention or promotion prospects. In the next subsection, we turn to regression analysis that controls for observable heterogeneity and exploits exogenous variation in binding wage constraints to identify the causal effects of employee equity on retention and internal advancement.

3.2 Individual-level results

Equity ownership, retention, and promotion

We next examine the relationship between individual equity ownership and employee outcomes using regression analysis. Tables 3 and 4 report estimates for employee exit and promotion, respectively.

Column (1) presents OLS estimates. Column (2) reports 2SLS estimates in which Shares (logged, plus one) is treated as endogenous and instrumented using Extension. Column (3) presents two-step GMM 2SLS estimates that add Removal as an additional excluded instrument for Shares. Column (4), our baseline specification, additionally treats Wage (logged) as endogenous and expands the excluded instrument set to include $\text{Extension} \times \text{WageScheduleDistance}$. Column (5) allows the effect of Shares to vary by technological intensity by including $\text{Shares} \times \text{High-R\&D}$ as an additional endogenous regressor and augmenting the

excluded instruments with $\text{Extension} \times \text{High-R\&D}$ and $\text{Removal} \times \text{High-R\&D}$. All specifications include individual- and firm-level controls, $\text{firm} \times \text{tenure}$ fixed effects, and year fixed effects.

Employee exit. The OLS estimate in column (1) indicates a negative association between equity ownership and subsequent exit. Instrumenting for equity increases the magnitude of the estimate. In column (2), the 2SLS coefficient is -0.0813 ($p < 0.05$). The two-step GMM 2SLS estimate in column (3) is nearly identical at -0.0809 ($p < 0.05$), with a Kleibergen–Paap Wald F -statistic of 41.80, indicating strong instrument relevance.

Column (4) reports our baseline specification in which both Shares and Wage are treated as endogenous. The coefficient on Shares remains stable at -0.0813 ($p < 0.05$), and the Kleibergen–Paap statistic remains comfortably above conventional thresholds ($F = 29.38$). The similarity of columns (3) and (4) indicates that jointly instrumenting wages does not materially alter the estimated retention effect of equity.

Economically, the baseline estimate implies that a 10% increase in equity ownership reduces exit by approximately 0.81 percentage points. Relative to the mean exit rate of 30%, this corresponds to a 2.7% reduction in annual turnover.

Column (5) allows the equity effect to differ in high-R&D startups. The coefficient on Shares is -0.0927 ($p < 0.05$), while the interaction term $\text{Shares} \times \text{High-R\&D}$ is 0.0402 ($p < 0.05$). The implied marginal effect of equity in high-R&D firms is therefore -0.0525 , implying that the retention effect is roughly 40–45% smaller in technologically intensive industries. Instrument strength remains adequate in this specification (Kleibergen–Paap $F = 18.15$), and the Hansen J test does not reject overidentifying restrictions.

The coefficient on Wage is negative across specifications. In the baseline specification (column 4), the coefficient is -0.0564 ($p < 0.05$). Comparing magnitudes, the retention effect of a 10% increase in equity ownership (-0.0081) is economically similar to that of roughly a 14–15% increase in wages.

A complementary interpretation uses the employee ownership share specification reported in Appendix Table B1, columns (7) and (8), which measures equity as a percentage of firm ownership rather than log shares. In the GMM 2SLS specification, the coefficient on employee ownership share (%) is -0.930 , implying that a one percentage-point increase in an employee’s ownership stake reduces exit by approximately 0.93 percentage points. Relative to the mean exit rate of 30%, this corresponds to roughly a 3.1% reduction in annual turnover. Comparing the ownership-share and wage coefficients indicates that a one percentage-point increase in employee ownership is economically comparable to roughly a 14% increase in wages.

Interpreting IV estimates. The instrumental variables estimates identify the local average treatment effect of employee equity for workers whose ownership stakes respond to exogenous changes in binding cash compensation constraints induced by collective bargaining extensions and removals. In particular, the relevant compliers are employees in previously uncovered firms whose pre-extension wages fall below the negotiated occupation-experience schedule and for whom mandated wage increases tighten firm-level liquidity constraints. For these workers, firms adjust the composition of compensation (including equity allocations) in response to exogenous cash shocks. The IV coefficients therefore capture the effect of equity variation induced by binding wage constraints, rather than the average effect of equity across all employees. This interpretation aligns with the model in Appendix A, where equity is an endogenous financing margin that responds to binding wage constraints.

Employee promotion. Table 4 reports analogous results for employee promotion. The OLS estimate in column (1) indicates a positive association between equity ownership and subsequent promotion. Instrumenting for equity increases the magnitude of the estimate. In column (2), the 2SLS coefficient is 0.0642 ($p < 0.01$). The two-step GMM 2SLS estimate in column (3) is 0.0576 ($p < 0.01$), with a Kleibergen–Paap Wald F -statistic of 40.82.

Column (4), our baseline specification treating both Shares and Wage as endogenous,

yields a coefficient of 0.0597 ($p < 0.01$) on Shares, with a Kleibergen–Paap statistic of 28.74. Economically, the baseline estimate implies that a 10% increase in equity ownership raises promotion probabilities by approximately 0.60 percentage points, corresponding to roughly a 10% increase relative to the mean promotion rate.

Column (5) allows the equity effect to vary by technological intensity. The implied marginal effect of equity in high-R&D firms is 0.0516, compared to 0.0719 in lower-R&D industries, indicating a 25–30% attenuation. Instrument strength remains adequate (Kleibergen–Paap $F = 17.77$).

The coefficient on Wage becomes statistically imprecise once wages are instrumented. In the baseline specification (column 4), the coefficient is 0.0162 and not statistically significant. Comparing magnitudes, the promotion effect of a 10% increase in equity ownership (0.60 percentage points) is economically equivalent to roughly a 35–40% increase in wages.

A complementary interpretation using the employee ownership share specification in Appendix Table B2, columns (7) and (8), yields a similar level-based perspective. In the GMM 2SLS specification, the coefficient on employee ownership share (%) is 0.701, implying that a one percentage-point increase in an employee’s ownership stake raises promotion probabilities by approximately 0.70 percentage points. Relative to the mean promotion rate of 3.96%, this corresponds to roughly a 17–18% increase. Comparing coefficients on ownership share and wages indicates that a one percentage-point increase in employee ownership is economically comparable to roughly a 25–30% increase in wages.

Instrument relevance, exclusion restriction, and pre-trends

This subsection evaluates empirical support for the identifying assumptions. We assess instrument relevance using weak-instrument diagnostics, examine the exclusion restriction using reduced-form and conditional tests, and evaluate pre-trends using event-time specifications.

Instrument relevance

Instrument relevance is evaluated using the Kleibergen–Paap Wald F -statistic reported in the two-step GMM 2SLS specifications in Tables 3 and 4. For employee exit (Table 3), the Kleibergen–Paap statistic equals 41.80 in column (3), 29.38 in the baseline specification (column 4), and 18.15 in the heterogeneous specification (column 5). For promotion (Table 4), the corresponding values are 40.82, 28.74, and 17.77. These values exceed conventional weak-instrument thresholds, including in the specification with three endogenous regressors.

Table 5 reports the corresponding first-stage regressions for Shares and Wage in the baseline specification. Extension is a strong predictor of Shares (-0.114 , $p < 0.01$), and Removal also enters significantly (-0.0383 , $p < 0.05$), consistent with the interpretation that tightening cash constraints shifts compensation away from equity. For Wage, the interaction term Extension \times WageScheduleDistance is precisely estimated (-0.507 , $p < 0.01$), generating strong within-firm variation in wages tied to binding wage floors.

While extensions consistently reduce employee equity stakes, removal effects are more heterogeneous across specifications. This pattern is consistent with the dynamic nature of compensation adjustment. Extensions impose discrete, legally binding increases in required cash compensation, whereas Removals restore discretion but do not obligate firms to immediately rebalance compensation structures, particularly if prior equity allocations reflect multi-period contracting decisions or financing constraints. Importantly, our results remain stable in specifications that redefine Removal as PostRemoval \times NonUnion and in specifications that include Industry \times Year fixed effects, indicating that identification does not hinge on the precise treatment of removal shocks.

Figure 2 illustrates how the wage response to a collective bargaining extension varies with the worker’s wage shortfall relative to the negotiated schedule in $t - 1$. The figure plots the marginal effect of the extension across the distribution of WageScheduleDistance $_{t-1}$, which measures the proportional shortfall of a worker’s wage relative to the negotiated schedule. Because the administrative data do not report the negotiated wage floors directly, we proxy

the schedule using the modal annual wage bin (in €1,000 intervals) among unionized firms within the same occupation \times experience \times industry \times year cell. Unionized firms adhere closely to the negotiated wage schedule, so the modal bin provides an empirical proxy for the binding wage floor. Wage responses increase monotonically with the pre-extension shortfall: workers whose wages already meet the schedule experience little change, whereas workers further below the schedule experience progressively larger wage increases. This pattern is consistent with the institutional mechanism that extensions impose binding wage floors and therefore generate larger wage adjustments for workers whose pre-extension wages fall further below the negotiated schedule.

Exclusion Restriction

Our identification requires that extensions and removals affect employee exit and promotion only through their impact on compensation structure (instrumented equity and wages). We address the main alternative channels sequentially.

Industry-level shocks. Table 6 adds Industry \times Year fixed effects. Because an industry-level Post-Removal indicator is absorbed by Industry \times Year effects, we redefine Removal as Post-Removal \times NonUnion $_{i,t-1}$ in these specifications.⁴ Estimates for Shares remain economically and statistically similar to the baseline. Overidentification tests continue not to reject.

Firm-level labor demand responses. Table 7 examines whether extensions operate through broad employment contractions rather than compensation composition. Reduced-form effects of Extension are small, and once interacted with an indicator for ever holding equity, reduced-form effects are concentrated among equity holders. Conditioning directly on Shares within the subsample of equity holders, Extension and Removal are small and statis-

⁴In specifications with Industry \times Year fixed effects, the industry-level Post-Removal indicator is collinear. Redefining Removal as Post-Removal \times NonUnion $_{i,t-1}$ preserves within-industry-year identifying variation.

tically insignificant. This pattern suggests that the reduced-form effects are not driven by a uniform labor-demand channel, although the coefficients on Shares in these selected-sample specifications should not be interpreted as causal effects comparable to the IV estimates in Tables 3 and 4.

Direct wage channels. Because Wage is treated as endogenous in the baseline specification, direct wage channels are accounted for by instrumented wages. The stability of the equity coefficient when wages are instrumented (Tables 3 and 4, columns (3) and (4)) indicates that the estimated equity effects are not driven by uninstrumented wage changes.

Quantitative consistency of reduced-form and IV magnitudes. A complementary test evaluates whether reduced-form effects of Extension on outcomes are quantitatively accounted for by the first- and second-stage estimates in the compensation system. With two endogenous regressors, the reduced-form coefficient satisfies

$$\rho = \beta_{\text{Shares}}\pi_{\text{Shares}} + \beta_{\text{Wage}}\pi_{\text{Wage}} + \gamma,$$

where ρ is the reduced-form effect of Extension on the outcome, π_{Shares} and π_{Wage} are first-stage effects on equity and wages, β_{Shares} and β_{Wage} are second-stage coefficients, and γ captures any direct effect of Extension on the outcome conditional on instrumented compensation. Under the exclusion restriction, $\gamma = 0$.

Using Table 5 (columns 1 and 3), Extension reduces equity ownership by 0.114 log points and increases wages by 0.038 log points. Combining these with the baseline second-stage estimates (Tables 3 and 4, column (4)) yields predicted reduced-form effects of

$$(-0.0813) \times (-0.114) + (-0.0564) \times (0.038) \approx 0.00712$$

for exit and

$$(0.0597) \times (-0.114) + (0.0162) \times (0.038) \approx -0.00619$$

for promotion. These predicted values closely match the observed reduced-form coefficients (Table 6), which are 0.00720 for exit and -0.00622 for promotion. The implied residual direct effects are therefore negligible: approximately 0.00008 for exit and 0.00003 for promotion in probability units. This near-exact accounting indicates that reduced-form effects are almost entirely explained by induced changes in wages and equity, providing direct support for the exclusion restriction.

Pre-trends, timing, and dynamic effects

We examine the timing of compensation adjustments around collective bargaining extensions that impose binding wage floors using an event-study specification. Figure 3 plots the estimated coefficients for employee equity holdings around the extension year, and Appendix D reports the corresponding event-time regression results for both equity holdings and wages.

There is no evidence of anticipatory adjustment prior to the extension decision. The coefficients for $t - 5$ through $t - 2$ are small and statistically insignificant, and a joint test fails to reject that these pre-extension coefficients are jointly zero ($F(4, 28410) = 0.65$, $p = 0.629$). Following the extension, employee equity declines persistently relative to the pre-extension baseline. The timing of the decline coincides with the regulatory shock and is consistent with startups reducing employee equity allocations once binding wage floors increase required cash compensation. Consistent with mechanical compliance with wage floors, wages increase contemporaneously with the extension (Appendix Table D1).

Figure 4 complements this analysis by documenting the distribution of days between the start of a collective bargaining agreement and the subsequent extension decision. Extensions do not occur mechanically at contract initiation; instead, there is substantial dispersion in timing (mean 283 days, standard deviation 178 days), with decisions distributed broadly over the first several hundred days.

Taken together, the absence of anticipatory adjustments and the dispersed timing of extension decisions support the interpretation of collective bargaining extensions as plausibly exogenous shocks to binding wage constraints. The observed post-extension decline in employee equity is consistent with startups re-optimizing compensation and ownership allocation in response to tighter wage constraints.

3.3 Ownership Concentration and Firm Dynamics (Descriptive Evidence)

To complement the individual-level results, we briefly examine whether changes in overall ownership concentration correlate with broader organizational outcomes. These analyses are descriptive and are intended to situate employee-level equity allocation within the firm’s aggregate ownership structure rather than to provide causal estimates.

From a corporate finance perspective, ownership concentration may influence governance, monitoring, and the allocation of initiative within startups (e.g., [Shleifer and Vishny \(1986\)](#); [Burkart et al. \(1997\)](#)).

Ownership concentration and internal outcomes. Table 8 reports firm-level regressions relating ownership concentration, measured by the Herfindahl-Hirschman Index (HHI) of equity stakes, to workforce turnover, promotion rates, and organizational policies. The first seven columns include firm and year fixed effects, so the estimation arises from within-firm changes in concentration over time.

Columns (1) and (2) relate concentration to exit rates. Higher concentration is associated with lower exit among both rank-and-file employees and managers, with economically larger associations for managers. Columns (3) and (4) report promotion outcomes. Greater concentration is associated with lower promotion rates for rank-and-file employees, while the manager promotion association is modest and less precisely estimated.⁵

⁵We use the first digit of the 2010 International Standard Classification of Occupations (ISCO) to distinguish managers from rank-and-file employees. Non-founder employees with an ISCO code beginning with

Columns (5) through (7) relate concentration to broader organizational outcomes. Higher concentration is associated with lower subsequent growth and lower advertising expenditures, both forward-looking measures of expansion and market investment, and with a lower manager-to-employee ratio. Overall, within-firm increases in concentration are correlated with greater internal stability but lower growth-oriented activity and leaner managerial structures.⁶

Column (8) of Table 8 examines whether ownership concentration is associated with startups' hiring of workers displaced during the deep Nokia contraction in the early smart-phone era, focusing on the 2006–2010 period when labor reallocation was most pronounced. This specification includes industry fixed effects rather than firm and year fixed effects and therefore reflects cross-firm differences in ownership concentration within industries. More concentrated ownership structures are associated with a lower share of employees drawn from Nokia, consistent with more diffuse ownership being correlated with greater responsiveness to externally available high-skill labor. Because these estimates are descriptive, they should be interpreted as suggestive patterns rather than causal effects.

Taken together, the descriptive firm-level evidence suggests that the aggregate distribution of ownership within startups is correlated with organizational stability, growth-oriented activity, and responsiveness to external labor supply. While these patterns are not causally identified, they are consistent with the broader interpretation that ownership allocation in young firms matters not only for individual retention and advancement but also for firm-level dynamics.

¹ (“Managers”) are flagged as managers and any other non-founder employees are flagged as rank-and-file.

⁶Since HHI is bounded on $[0, 1]$, we interpret coefficients using economically plausible changes in concentration. As examples, a 0.10 increase in HHI corresponds to roughly a 0.13 percentage point decline in rank-and-file exit, a 0.53 percentage point decline in manager exit, and a 1.3 percentage point reduction in subsequent firm growth (Table 8).

3.4 Robustness: Alternative Equity Measures

Tables B1 and B2 in the Appendix examine whether the results are sensitive to the functional form or scaling of the equity variable. In addition to $\ln(\text{Shares} + 1)$, we consider: (i) shares winsorized at the 1st and 99th percentiles, (ii) an indicator for holding any equity in year t , and (iii) an indicator for ever holding equity during the sample period. All specifications retain Firm \times Tenure and Year fixed effects and cluster standard errors at the Firm \times Tenure level. In the two-step GMM 2SLS specifications, both equity and log wages are instrumented using Extension, Removal, and Extension \times WageScheduleDistance.

Exit. The negative effect of equity on subsequent exit remains economically and statistically similar across all alternative measures. Winsorizing shares leaves coefficient magnitudes and significance largely unchanged, indicating that the baseline results are not driven by extreme observations. Using a binary indicator for equity ownership yields larger absolute coefficients, consistent with a discrete retention effect associated with participating in equity. The “ever equity” specification produces comparable estimates, indicating that the findings are not sensitive to whether equity is measured contemporaneously or over a longer horizon. Across specifications, Kleibergen–Paap statistics remain comfortably above conventional thresholds and Hansen J tests do not reject, confirming instrument strength and validity under alternative definitions of equity.

Promotion. The positive relationship between equity and next-year promotion is likewise robust. Winsorized shares yield estimates nearly identical to the baseline specification. Indicator-based specifications again produce economically larger coefficients, consistent with a meaningful promotion effect associated with holding equity. Instrument relevance remains strong in all cases, and overidentification tests provide no evidence against the maintained exclusion restriction.

Taken together, Tables B1 and B2 show that the core findings—equity reduces exit and

increases promotion—are robust to alternative definitions and scalings of employee ownership. The results are stable across continuous, share-based, and indicator-based measures of equity and are not driven by outliers in the distribution of shares.

3.5 Robustness: Growth-oriented startups

To examine whether the baseline results are driven by startups with limited growth ambitions, Appendix Table C1 repeats the main specifications using a subsample of startups with explicit growth orientations.⁷

The growth-oriented subsample contains 1,494,502 individual-year observations in the exit regressions and 1,493,203 observations in the promotion regressions, corresponding to approximately 73% and 72% of the samples used in the baseline GMM 2SLS specifications reported in column (4) of Tables 3 and 4. The estimated effects of employee equity remain very similar to those in the main analysis. In the exit regressions, the GMM 2SLS coefficient on equity ownership equals -0.0921 (s.e. 0.0465), compared with -0.0813 in Table 3. In the promotion regressions, the corresponding GMM 2SLS estimate equals 0.0524 (s.e. 0.0194), compared with 0.0597 in Table 4. Thus, both the magnitude and statistical significance of the estimates remain economically comparable when the analysis is restricted to startups with explicit growth ambitions.

⁷A startup is classified as growth-oriented if it has applied for and received a government growth grant from either Business Finland or Finnvera at any point during its life cycle. These public programs target firms with growth and internationalization ambitions and span a wide range of stages from early ventures to scaling firms. Importantly, the earliest-stage grants are intentionally only weakly selective and impose no ex-post performance requirements related to firm growth or performance, making grant receipt a suitable proxy for ex-ante growth intent rather than realized success. For example, Business Finland’s Innovation Voucher program provides small grants to early-stage firms to initiate innovation activities or develop growth-oriented capabilities. Additional information is available at <https://www.businessfinland.fi/en/services/funding/funding-services/research-and-development-funding/innovation-voucher/>. The grant system is largely staged, so that startups typically apply first for smaller exploratory grants and only subsequently become eligible for larger growth and internationalization programs.

4 Discussion

This paper provides population-level evidence on how binding wage constraints reshape the allocation of employee ownership in startups and on the consequences of employee equity for workforce outcomes. Exploiting staggered collective bargaining extensions and removals as exogenous variation in mandated wage floors, we identify the causal effect of employee equity on retention and promotion.

At the individual level, employee equity has economically meaningful effects on both retention and advancement. In our baseline specification, a 10% increase in equity ownership reduces annual exit by approximately 0.8–0.9 percentage points (a 2.5–3% decline relative to the mean exit rate) and increases promotion probabilities by 0.6–0.7 percentage points (corresponding to about a 10–12% increase relative to the mean promotion rate). Benchmarking against instrumented wages indicates that the retention effect of a 10% increase in equity is comparable to that of roughly a 14–15% wage increase, while the promotion effect corresponds to an even larger wage adjustment. These magnitudes indicate that employee equity is not a marginal component of compensation but a quantitatively important component of startup compensation structures.

The dynamic evidence reinforces the interpretation that startups adjust compensation structures when externally imposed wage floors increase required cash compensation. We find no anticipatory adjustments prior to binding wage extensions and observe persistent post-extension declines in employee equity holdings among exposed firms. These patterns are consistent with startups re-optimizing the mix of cash and equity compensation when mandated wage increases raise required cash outflows. The dispersed timing of extension decisions further supports interpreting the instrument as plausibly exogenous variation in wage constraints rather than as a response to firm-level performance or strategic timing.

The effects of equity are heterogeneous across technological environments. Both retention and promotion effects are attenuated in high-R&D industries, where outside labor market opportunities are stronger and employee mobility is higher. In such settings, equity appears

to play a weaker role in shaping workforce outcomes.

Beyond individual outcomes, the distribution of ownership within firms correlates systematically with broader organizational dynamics. Firms with more concentrated ownership structures exhibit lower turnover, particularly among managers, lower rank-and-file promotion rates, reduced growth, lower advertising expenditures, and weaker absorption of displaced high-skill labor during the Nokia contraction. While these firm-level patterns are descriptive rather than causal, they are consistent with a governance trade-off in which concentrated ownership is associated with greater internal stability and control but potentially reduced organizational dynamism and experimentation.

Taken together, the evidence highlights a dual role of employee equity in startups. At the individual level, equity affects retention and within-firm career progression. At the firm level, the allocation of ownership is associated with broader patterns of growth, investment, and talent allocation. Binding wage constraints therefore reshape not only the level of employee equity but also the internal distribution of ownership within the firm, with implications for organizational structure and workforce dynamics.

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Figures

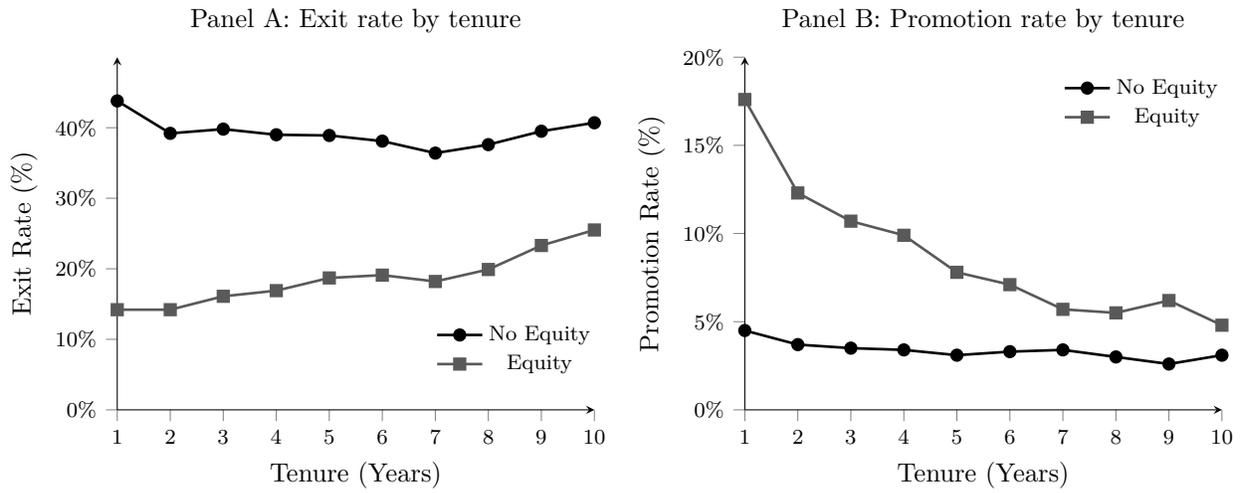
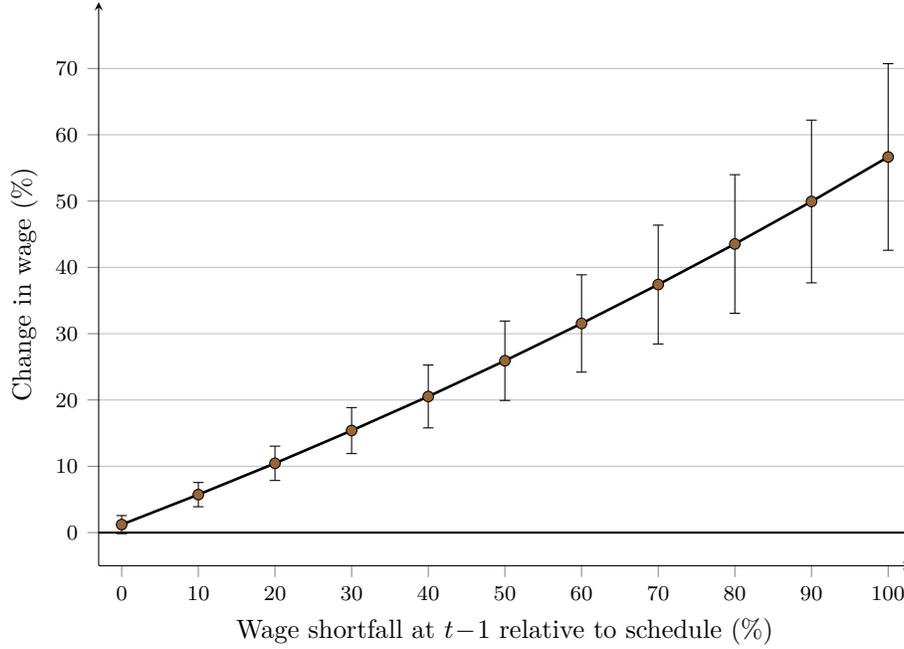


Figure 1: Exit and Promotion Rates by Tenure and Equity Ownership

Figure 2: Marginal Wage Response to Collective Bargaining Extension

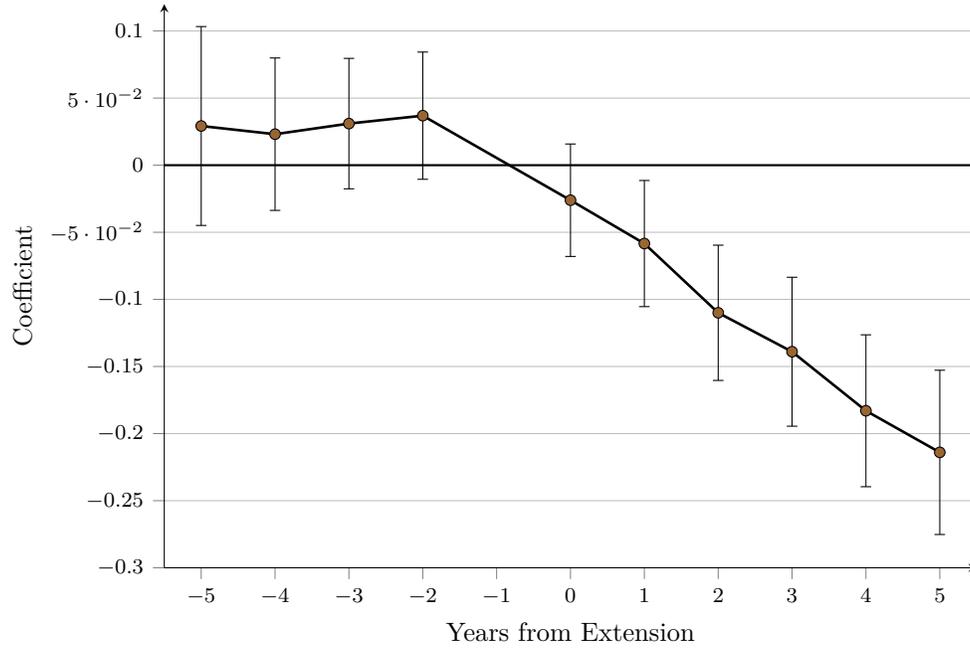


Wage shortfall(%)	0	10	20	30	40	50	60	70	80	90	100
Coefficient	0.01*	0.06***	0.10***	0.14***	0.19***	0.23***	0.27***	0.32***	0.36***	0.41***	0.45***
Wage change (%)	1.2	5.7	10.5	15.4	20.5	25.9	31.5	37.4	43.5	49.9	56.6

Notes: This figure plots the marginal wage response to a collective bargaining extension as a function of the worker’s wage shortfall at $t - 1$ relative to the negotiated wage schedule. A wage shortfall of 10 on the horizontal axis corresponds to a worker being 10% below the wage schedule at $t - 1$, prior to the extension. The plotted line and error bars are shown in percentage terms, obtained from the underlying log-point marginal effects as $100 \times (\exp(\beta) - 1)$. The table reports both the underlying coefficient estimates and the corresponding implied percentage wage changes. The marginal effects are computed from a regression of log wages on the extension indicator, Wage-Schedule Distance, and their interaction. The specification includes Firm \times Tenure and year fixed effects and the same individual- and firm-level controls as in the main specifications. Standard errors are clustered at the Firm \times Tenure level, and error bars denote 95% confidence intervals.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 3: Event Study Coefficients: Employee Shares Around Extension



	$t-5$	$t-4$	$t-3$	$t-2$	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Coef.	0.0292	0.0231	0.0310	0.0369	-0.0261	-0.0584**	-0.110***	-0.139***	-0.183***	-0.214***
S.E.	(0.0378)	(0.0290)	(0.0248)	(0.0242)	(0.0214)	(0.0240)	(0.0257)	(0.0283)	(0.0289)	(0.0312)

Notes: This figure plots coefficients from an event-time regression of shares on indicators for years relative to the extension decision interacted with an indicator for the firm being non-unionized at $t - 1$. The omitted baseline period is $t - 1$. The coefficients therefore trace the evolution of equity holdings for firms exposed to the extension relative to the year immediately preceding the decision. Error bars denote 95% confidence intervals. The regression includes Firm \times Tenure and year fixed effects, as well as the same individual- and firm-level controls as in the main specifications. Standard errors are clustered at the Firm \times Tenure level. A joint test of the pre-extension coefficients ($t - 5$ through $t - 2$) fails to reject the null that they are jointly zero ($F(4, 28410) = 0.65$, $p = 0.629$).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

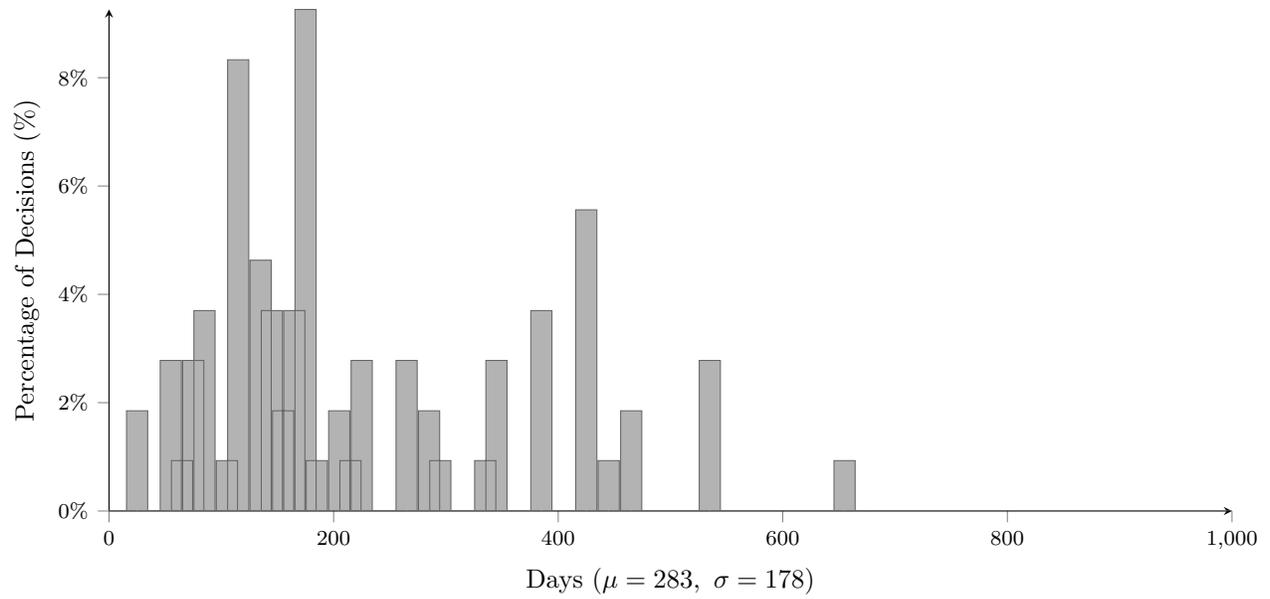


Figure 4: Percentage histogram of days between collective bargaining agreement start date (Voimaantulo / Ikraftträdelse) and extension decision (0–1000 days in 10-day bins), excluding gaps over 1000 days (2.8% of observations). Mean number of days between start of collective bargaining agreement and extension decision is 283 days and the standard deviation 178 days.

Tables

Table 1: Equity ownership shares by firm age and group

Firm age (years)	Founders	Managers	Rank & File	VC	Other
0	71.6%	0.3%	1.0%	1.8%	25.4%
1	71.2%	1.0%	1.9%	2.3%	24.1%
2	68.2%	1.6%	2.6%	2.9%	25.4%
3	65.9%	2.2%	2.9%	3.5%	26.2%
4	63.3%	3.3%	2.8%	4.2%	27.5%
5	60.5%	4.1%	2.7%	4.8%	29.1%
6	58.1%	4.6%	2.6%	5.4%	30.6%
7	56.1%	5.1%	2.5%	5.9%	32.1%
8	54.2%	5.7%	2.2%	6.5%	33.2%
9	52.1%	6.0%	2.1%	6.9%	34.7%
10	50.4%	6.1%	2.4%	7.1%	35.9%

Notes: This table reports mean equity ownership shares by firm age (0–10) for startups that survive to at least age ten. Conditioning on survival to age ten keeps the set of firms fixed across ages and mitigates compositional changes from selective exit. Founder status is defined from ownership and governance records rather than employment. Founders are shareholders who are either CEOs or board members within the first year since founding and may therefore fall outside the individual-level employment panel. Managers are employees with ISCO occupation code 1 (Managers), excluding founders. Rank-and-file employees are non-founders and non-managers. “Other” aggregates all remaining shareholders (e.g., angels, acquirers, advisors, and other residual owners).

Table 2: Descriptive Statistics

	All		Low R&D		High R&D	
	Mean	SD	Mean	SD	Mean	SD
Panel A: Individual-level variables						
<i>Exit</i> _{<i>t</i>+1}	0.300	0.458	0.326	0.469	0.257	0.437
<i>Promotion</i> _{<i>t</i>+1}	0.0396	0.195	0.0338	0.181	0.0495	0.217
Shares (logged, +1)	0.261	1.246	0.249	1.161	0.283	1.378
1(Equity ever)	0.0601	0.238	0.0587	0.235	0.0624	0.242
Wage (logged, +1)	10.44	0.620	10.32	0.616	10.63	0.579
1(Rank & File)	0.930	0.255	0.935	0.246	0.920	0.271
1(Female)	0.329	0.470	0.381	0.486	0.239	0.427
1(University degree)	0.232	0.422	0.170	0.376	0.338	0.473
1(STEM degree)	0.380	0.485	0.282	0.450	0.546	0.498
Individual-year observations	2,060,012		1,297,522		762,490	
Panel B: Firm-level variables						
1(High-R&D)	0.316	0.465	0	0	1	0
Firm age (years)	4.672	3.662	4.656	3.664	4.706	3.659
Firm revenues (logged, +1)	14.03	2.083	13.98	1.810	14.15	2.573
VC shares (logged, +1)	0.495	2.037	0.250	1.416	1.024	2.896
Other shares (logged, +1)	5.567	2.950	5.245	2.552	6.264	3.570
Firm-year observations	97,016		66,403		30,613	

Notes: Panel A reports descriptive statistics for the individual-level sample used in the main analysis. Panel B reports firm-level statistics. High R&D is an indicator for startups operating in industries with above-median R&D intensity. All share measures, individual wages, and firm revenues are logged.

Table 3: Effect of share ownership on exit

DV: $Exit_{t+1}$	(1)	(2)	(3)	(4)	(5)
	OLS	2SLS	GMM2S	GMM2S	GMM2S
<i>Panel A: Main results</i>					
Shares	-0.0140*** (0.000337)	-0.0813** (0.0387)	-0.0809** (0.0383)	-0.0813** (0.0393)	-0.0927** (0.0445)
Wage	-0.0544*** (0.00120)	-0.0552*** (0.00128)	-0.0552*** (0.00128)	-0.0564** (0.0237)	-0.0533** (0.0236)
Shares \times High-R&D					0.0402** (0.0194)
Constant	3.142*** (1.017)				
Firm \times Tenure FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Identification</i>					
Instrumented variables		1)Shares	1)Shares	1)Shares 2)Wage	1)Shares 2)Wage 3)Shares \times High-R&D
Instruments		1)Extension	1)Extension 2)Removal	1)Extension 2)Removal 3)Extension \times Wage-Schedule Distance	1)Extension 2)Removal 3)Extension \times Wage-Schedule Distance 4)Extension \times High-R&D 5)Removal \times High-R&D
Observations	2,060,012	2,045,775	2,045,775	2,045,775	2,045,775
R-squared	0.253	0.235	0.235	0.235	0.238
K-P Wald F		78.82	41.80	29.38	18.15
Hansen J			0.00412	0.00453	1.412
Hansen p-value			0.949	0.946	0.494

Extension = Post-Extension (industry-level) \times Non-unionized at $t - 1$ (firm-level).

Removal = Post-Removal (industry-level).

Wage-Schedule Distance = proportional shortfall of the individual wage in $t - 1$ relative to the modal annual wage bin (computed in €1,000 intervals) among unionized firms within the occupation \times experience \times industry \times year cell. Formally, Wage-Schedule Distance = $(\tilde{w} - w)/\tilde{w}$ if $w < \tilde{w}$ and 0 otherwise, where \tilde{w} denotes the modal union wage bin.

Notes: All specifications include individual-level controls (occupation status, education, field of study, gender), firm-level controls (firm age, firm revenues, shares owned by VC, shares owned by others), Firm \times Tenure fixed effects, and year fixed effects. All share measures, individual wages and firm revenues are logged. Standard errors in parentheses, clustered at the Firm \times Tenure level.

Table 4: Effect of share ownership on promotion

DV: $Promotion_{t+1}$	(1)	(2)	(3)	(4)	(5)
	OLS	2SLS	GMM2S	GMM2S	GMM2S
<i>Panel A: Main results</i>					
Shares	0.0145*** (0.000299)	0.0642*** (0.0191)	0.0576*** (0.0180)	0.0597*** (0.0186)	0.0719*** (0.0186)
Wage	0.00877*** (0.000586)	0.00932*** (0.000632)	0.00929*** (0.000627)	0.0162 (0.0111)	0.0147 (0.0112)
Shares \times High-R&D					-0.0203** (0.0102)
Constant	-0.0323* (0.0187)				
Firm \times Tenure FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Identification</i>					
Instrumented variables		1)Shares	1)Shares	1)Shares 2)Wage	1)Shares 2)Wage 3)Shares \times High-R&D
Instruments		1)Extension	1)Extension 2)Removal	1)Extension 2)Removal 3)Extension \times Wage-Schedule Distance	1)Extension 2)Removal 3)Extension \times Wage-Schedule Distance 4)Extension \times High-R&D 5)Removal \times High-R&D
Observations	2,088,098	2,073,626	2,073,626	2,073,626	2,073,626
R-squared	0.009	-0.036	-0.025	-0.028	-0.033
K-P Wald F		77.19	40.82	28.74	17.77
Hansen J			1.245	1.318	1.786
Hansen p-value			0.265	0.251	0.410

Extension = Post-Extension (industry-level) \times Non-unionized at $t - 1$ (firm-level).

Removal = Post-Removal (industry-level).

Wage-Schedule Distance = proportional shortfall of the individual wage in $t - 1$ relative to the modal annual wage bin (computed in €1,000 intervals) among unionized firms within the occupation \times experience \times industry \times year cell. Formally, Wage-Schedule Distance = $(\tilde{w} - w)/\tilde{w}$ if $w < \tilde{w}$ and 0 otherwise, where \tilde{w} denotes the modal union wage bin.

Notes: All specifications include individual-level controls (occupation status, education, field of study, gender), firm-level controls (firm age, firm revenues, shares owned by VC, shares owned by others), Firm \times Tenure fixed effects, and year fixed effects. All share measures, individual wages and firm revenues are logged. Standard errors in parentheses, clustered at the Firm \times Tenure level.

Table 5: First-stage regressions

DV:	(1) Shares	(2) Shares	(3) Wage	(4) Wage
Extension	−0.114*** (0.0128)	−0.0914*** (0.0124)	0.0381*** (0.00705)	0.0339*** (0.00805)
Removal	−0.0383** (0.0173)	−0.0501*** (0.0140)	−0.00374 (0.00812)	0.0116 (0.0110)
Extension × High-R&D		−0.0762*** (0.0291)		0.0137 (0.0140)
Removal × High-R&D		0.0158 (0.0318)		−0.0273* (0.0146)
Extension × Wage-Schedule Distance	0.0189 (0.0395)	0.0233 (0.0394)	−0.507*** (0.0257)	−0.508*** (0.0257)
Constant	3.803*** (0.501)	3.809*** (0.501)	9.873*** (0.733)	9.877*** (0.735)
Firm×Tenure FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,060,012	2,060,012	2,060,012	2,060,012
R-squared	0.608	0.608	0.513	0.513

Extension = Post-Extension (industry-level) × Non-unionized at $t - 1$ (firm-level).

Removal = Post-Removal (industry-level).

Wage-Schedule Distance = proportional shortfall of the individual wage in $t - 1$ relative to the modal annual wage bin (computed in €1,000 intervals) among unionized firms within the occupation × experience × industry × year cell. Formally, Wage-Schedule Distance = $(\tilde{w} - w)/\tilde{w}$ if $w < \tilde{w}$ and 0 otherwise, where \tilde{w} denotes the modal union wage bin.

Notes: The table reports the first-stage regressions for the endogenous variables (shares and wage) corresponding to the baseline IV specification (columns (1) and (3)) and the heterogeneous IV specification that additionally includes interactions with High-R&D (columns (2) and (4)). The instrument Extension × Wage-Schedule Distance induces differential wage adjustments across workers within firm–tenure cells following collective bargaining extensions; in the second stage, it therefore isolates the extension-induced component of wages. All specifications include individual-level controls (occupation status, education, field of study, gender), firm-level controls (firm age, firm revenues, shares owned by VC, shares owned by others), Firm×Tenure fixed effects, and year fixed effects. All share measures, individual wages and firm revenues are logged. Robust standard errors in parentheses are clustered at the Firm×Tenure level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: GMM2S robustness checks for exit and promotion

DV:	(1) <i>Exit</i> _{t+1} GMM2S	(2) <i>Exit</i> _{t+1} GMM2S	(3) <i>Exit</i> _{t+1} GMM2S	(4) <i>Promo</i> _{t+1} GMM2S	(5) <i>Promo</i> _{t+1} GMM2S	(6) <i>Promo</i> _{t+1} GMM2S
<i>Panel A: Robustness</i>						
Shares	-0.0814* (0.0488)	-0.0835** (0.0371)	-0.0897** (0.0418)	0.0618*** (0.0230)	0.0607*** (0.0155)	0.0712*** (0.0241)
Wage	-0.0564** (0.0267)	-0.0566** (0.0238)	-0.0691*** (0.0249)	0.0166 (0.0136)	0.0164 (0.0111)	0.0215* (0.0117)
Firm×Tenure FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes		Yes	Yes	
Industry×Year FE			Yes			Yes
SE clustering	Firm	Firm×Tenure	Firm×Tenure	Firm	Firm×Tenure	Firm×Tenure
<i>Panel B: Identification</i>						
Instrumented variables	1)Shares 2)Wage	1)Shares 2)Wage	1)Shares 2)Wage	1)Shares 2)Wage	1)Shares 2)Wage	1)Shares 2)Wage
Instruments	1)Extension 2)Removal 3)Extension× WSD	1)Extension 2)Removal [†] 3)Extension× WSD	1)Extension 2)Removal [†] 3)Extension× WSD	1)Extension 2)Removal 3)Extension× WSD	1)Extension 2)Removal [†] 3)Extension× WSD	1)Extension 2)Removal [†] 3)Extension× WSD
Observations	2,045,775	2,045,775	2,045,639	2,073,626	2,073,626	2,073,508
R-squared	0.235	0.234	-0.023	-0.032	-0.030	-0.052
Wald F	11.70	41.32	15.64	11.44	41.22	16.58
Hansen J	0.00227	0.0155	0.430	0.628	0.262	1.880
Hansen p-value	0.962	0.901	0.512	0.428	0.609	0.170

Extension = Post-Extension (industry-level) × Non-unionized at $t - 1$ (firm-level).

Removal = Post-Removal (industry-level).

Removal[†] = Post-Removal (industry-level) × Non-unionized at $t - 1$ (firm-level).

Wage-Schedule Distance (WSD) = proportional shortfall of the individual wage in $t - 1$ relative to the modal annual wage bin (computed in €1,000 intervals) among unionized firms within the occupation × experience × industry × year cell. Formally, $WSD = (\tilde{w} - w)/\tilde{w}$ if $w < \tilde{w}$ and 0 otherwise, where \tilde{w} denotes the modal union wage bin.

Notes: This table reports GMM2S robustness checks for the exit and promotion specifications. Columns (1) and (4) replicate the baseline GMM2S specification (column (4) in Tables 3 and 4) with standard errors clustered at the firm level. Columns (2) and (5) redefine the removal instrument as Removal[†] = Post-Removal × Non-unionized at $t - 1$, so that both collective bargaining shocks are identified from within-industry firm-level variation. Columns (3) and (6) additionally include Industry×Year fixed effects alongside Firm×Tenure fixed effects; identification is preserved because Removal[†] varies within industry-year cells. Standard errors in columns (2), (3), (5), and (6) are clustered at the Firm×Tenure level.

All specifications include the same individual- and firm-level controls as in the main tables. All continuous share measures, individual wages and firm revenues are logged.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Exclusion restriction test

DV:	(1)	(2)	(3)	(4)	(5)	(6)
	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$
1(Equity ever)		-0.110*** (0.00197)			0.0989*** (0.00177)	
Extension	0.00720 (0.00440)	0.00459 (0.00441)	-0.00157 (0.00942)	-0.00622*** (0.00205)	-0.00328 (0.00200)	0.00667 (0.0126)
1(Equity ever)×Extension		-0.0200*** (0.00266)			0.00541** (0.00261)	
Removal	0.00287 (0.00651)	0.00171 (0.00651)	-0.00499 (0.0116)	0.00147 (0.00360)	0.00319 (0.00344)	-0.00212 (0.0141)
1(Equity ever)×Removal		-0.000539 (0.00441)			-0.0129*** (0.00433)	
Shares			0.00448*** (0.000591)			0.00761*** (0.000722)
Constant	2.556** (1.051)	2.636** (1.045)	1.183*** (0.0690)	0.141*** (0.0185)	0.0377** (0.0175)	0.539*** (0.111)
Observations	2,060,012	2,060,012	123,724	2,088,098	2,088,098	124,849
R-squared	0.249	0.250	0.279	0.004	0.011	0.017

Extension = Post-Extension (industry-level) × Non-unionized at $t - 1$ (firm-level).

Removal = Post-Removal (industry-level).

Notes: Columns (1)–(3) report reduced-form regressions for exit and columns (4)–(6) for promotion. Column (1) and column (4) estimate the average reduced-form effects of extensions and removals. Columns (2) and (5) interact collective bargaining shocks with an indicator for ever holding equity in the focal employer, testing whether the effects of extensions and removals are concentrated among equity holders. Columns (3) and (6) restrict the sample to individuals who ever held equity in the focal employer and include the log number of shares held (Shares) as a regressor, testing whether the reduced-form effects operate through variation in equity intensity among equity holders. All specifications include individual-level controls (occupation status, education, field of study, gender), firm-level controls (firm age, firm revenues, shares owned by VC, shares owned by others), Firm×Tenure fixed effects, and year fixed effects. Robust standard errors in parentheses are clustered at the Firm×Tenure level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8: Ownership concentration (HHI) and firm-level dynamics

DV (t+1):	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	R&F Exit	Manager Exit	R&F Promotion	Manager Promotion	Growth	Advertising	Manager Ratio	Ex-Nokia Share
HHI	-0.0126*** (0.00479)	-0.0529*** (0.00770)	-0.0138*** (0.00294)	0.0125* (0.00667)	-0.131*** (0.0328)	-0.236*** (0.0707)	-0.00865*** (0.00271)	-0.00266*** (0.000905)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Industry FE	No	No	No	No	No	No	No	Yes
Observations	105,894	82,212	105,894	82,212	92,478	71,748	109,881	13,431
R-squared	0.514	0.540	0.238	0.173	0.475	0.675	0.590	0.053

Notes: Entries report coefficients on **HHI**. Columns (1)–(7) report firm-level regressions with firm and year fixed effects. Column (8) reports the association between ownership concentration and the share of ex-Nokia employees during the 2006–2010 period, a major labor reallocation episode in Finland. This measure is intended to capture startups’ responsiveness to externally available high-skill labor. Column (8) includes industry fixed effects at the 2-digit TOL08 level instead of firm and year fixed effects. Robust standard errors clustered at the firm level are reported in parentheses. All regressions include controls for founder equity share, manager equity share, venture capital ownership, employee education (university and STEM degrees), ratio of women to all employees, firm age, and log firm revenues.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix A: A Simple Model of Wage Constraints and Employee Equity

Setup. Two dates $t \in \{1, 2\}$. A risk-neutral founder hires one risk-neutral employee at $t = 1$ and chooses a cash wage $w \geq 0$ and equity share $s \in [0, 1]$ (the founder keeps $1 - s$). If the employee remains with the firm at $t = 2$, output is

$$Y = \theta e,$$

where $\theta > 0$ and $e \geq 0$ denotes employee effort. Effort is costly: the employee incurs cost $c(e)$ with $c'(e) > 0$ and $c''(e) > 0$.

The employee has an outside option U^o at $t = 2$. The startup has internal liquid funds $C > 0$ for payroll, and regulation may impose a binding wage floor \bar{w} .

Employee effort. Given compensation (w, s) , the employee chooses effort to maximize

$$U = w + s\theta e - c(e).$$

The optimal effort level satisfies

$$c'(e^*) = s\theta.$$

Hence effort increases with employee equity:

$$\frac{\partial e^*}{\partial s} > 0.$$

Participation and wage constraints. The employee accepts the job if expected compensation exceeds the outside option:

$$w + s\theta \geq U^o.$$

Cash feasibility and regulation impose

$$\bar{w} \leq w \leq C.$$

Since the founder prefers not to overpay, the participation constraint binds:

$$w + s\theta = U^o \quad \Rightarrow \quad w = U^o - s\theta.$$

Founder's problem. The founder chooses (w, s) to maximize

$$\Pi = (1 - s)\theta e^* - w \quad \text{s.t.} \quad w + s\theta = U^o, \quad \bar{w} \leq w \leq C.$$

Prediction 1 (Wage constraints reduce equity). If the wage floor binds ($w = \bar{w}$), the participation constraint implies

$$s^* = \frac{U^o - \bar{w}}{\theta}, \quad \frac{ds^*}{d\bar{w}} = -\frac{1}{\theta} < 0.$$

Thus exogenous increases in required cash wages reduce optimal employee equity.

Retention. Our retention mechanism is intentionally parsimonious and operates through incentives: because equity and wages trade off in the initial contract, higher equity need not mechanically raise total compensation. Instead, equity increases retention by strengthening effort incentives and thereby increasing the realized value of remaining at the firm. This differs from mechanisms in

which equity retention effects arise because the value of equity comoves with outside opportunities. At $t = 2$ the employee decides whether to remain with the firm or accept the outside option. The employee stays if

$$w + s\theta e^* \geq U^o.$$

Promotion. Suppose internal advancement depends positively on effort:

$$Pr(\text{promotion}) = p(e), \quad p'(e) > 0.$$

Since equity increases effort, higher equity increases promotion probabilities.

Prediction 2 (Equity and workforce outcomes). Higher employee equity increases effort and therefore improves workforce outcomes through the incentive channel. Because higher effort raises the employee's continuation value inside the firm, stronger incentive provision can increase retention and promotion probabilities.

Outside labor market opportunities. If outside opportunities improve (higher U^o), retention becomes harder to sustain because the outside option increases relative to the value of remaining with the firm.

Mapping to the empirical design. Collective bargaining extensions correspond to exogenous increases in \bar{w} for previously uncovered firms. The model predicts that tighter wage constraints reduce employee equity allocations and that stronger equity incentives increase effort and improve workforce outcomes such as retention and internal advancement. These predictions motivate the instrumental-variables design used in the main text.

Appendix B: Alternative equity measures

Table B1: Alternative equity measures and employee exit

DV:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$	$Exit_{t+1}$
	OLS	GMM2S	OLS	GMM2S	OLS	GMM2S	OLS	GMM2S
Shares (winsorized 1%/99%)	-0.0174*** (0.0004)	-0.0829** (0.0399)						
1(Equity)			-0.101*** (0.0020)	-0.340** (0.163)				
1(Equity ever)					-0.115*** (0.0018)	-0.262** (0.125)		
Employee ownership share (%)							-0.192*** (0.0044)	-0.930** (0.470)
Wage	-0.0545*** (0.0012)	-0.0536** (0.0233)	-0.0547*** (0.0012)	-0.0461** (0.0227)	-0.0541*** (0.0012)	-0.0434* (0.0224)	-0.0558*** (0.0012)	-0.0712*** (0.0272)
Firm×Tenure FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Identification</i>								
Instrumented variables		1)Equity 2)Wage		1)Equity 2)Wage		1)Equity 2)Wage		1)Equity 2)Wage
Instruments		1)Extension 2)Re- moval 3)Extension× WSD		1)Extension 2)Re- moval 3)Extension× WSD		1)Extension 2)Re- moval 3)Extension× WSD		1)Extension 2)Re- moval 3)Extension× WSD
Observations	2,060,012	2,045,775	2,060,012	2,045,775	2,060,012	2,045,775	2,060,012	2,045,775
R-squared	0.253	0.240	0.253	0.247	0.254	0.251	0.253	0.236
Wald F		34.62		56.90		93.71		12.01
Hansen p-value		0.982		0.933		0.971		0.738

Notes: Columns (1) and (2) use shares winsorized at the 1st and 99th percentiles. Columns (3) and (4) replace shares with an equity ownership dummy. Columns (5) and (6) use an indicator for whether the employee ever held equity. Columns (7) and (8) measure employee ownership as the share of firm equity held by the employee (employee shares divided by total shares). GMM2S specifications instrument both the equity measure and wages using Extension, Removal, and Extension×WSD. Standard errors are clustered at the Firm×Tenure level.

*** p<0.01, ** p<0.05, * p<0.1.

Table B2: Alternative equity measures and promotion

DV:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$	$Promo_{t+1}$
	OLS	GMM2S	OLS	GMM2S	OLS	GMM2S	OLS	GMM2S
Shares (winsorized 1%/99%)	0.0181*** (0.0003)	0.0592*** (0.0183)						
1(Equity)			0.104*** (0.0017)	0.246*** (0.0744)				
1(Equity ever)					0.0997*** (0.0015)	0.187*** (0.0569)		
Employee ownership share (%)							0.174*** (0.0034)	0.701*** (0.226)
Wage	0.00877*** (0.0006)	0.0140 (0.0107)	0.00894*** (0.0006)	0.00865 (0.0103)	0.00834*** (0.0006)	0.00669 (0.0101)	0.00986*** (0.0006)	0.0275** (0.0134)
Firm×Tenure FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Identification</i>								
Instrumented variables		1)Equity 2)Wage		1)Equity 2)Wage		1)Equity 2)Wage		1)Equity 2)Wage
Instruments		1)Extension 2)Re- moval 3)Extension× WSD		1)Extension 2)Re- moval 3)Extension× WSD		1)Extension 2)Re- moval 3)Extension× WSD		1)Extension 2)Re- moval 3)Extension× WSD
Observations	2,057,923	2,043,730	2,057,923	2,043,730	2,057,923	2,043,730	2,057,923	2,043,730
R-squared	0.009	-0.014	0.010	-0.000	0.011	0.006	0.009	-0.032
Wald F		34.55		56.88		93.71		12.00
Hansen p-value		0.493		0.592		0.491		0.849

Notes: Columns (1) and (2) use shares winsorized at the 1st and 99th percentiles. Columns (3) and (4) replace shares with an equity ownership dummy. Columns (5) and (6) use an indicator for whether the employee ever held equity. Columns (7) and (8) measure employee ownership as the share of firm equity held by the employee (employee shares divided by total shares). GMM2S specifications instrument both the equity measure and wages using Extension, Removal, and Extension×WSD. Standard errors are clustered at the Firm×Tenure level.

*** p<0.01, ** p<0.05, * p<0.1.

Appendix C: Growth-oriented startups

Table C1: Effect of share ownership on exit and promotion: Growth-oriented startups

DV:	(1)	(2)	(3)	(4)
	$Exit_{t+1}$	$Exit_{t+1}$	$Promotion_{t+1}$	$Promotion_{t+1}$
	OLS	GMM2S	OLS	GMM2S
<i>Panel A: Growth-oriented startup subsample</i>				
Shares	-0.0140*** (0.000376)	-0.0921** (0.0465)	0.0138*** (0.000345)	0.0524*** (0.0194)
Wage	-0.0568*** (0.00143)	-0.0264 (0.0278)	0.00907*** (0.000720)	0.0312** (0.0128)
Constant	4.754*** (1.137)		-0.0404* (0.0243)	
Firm×Tenure FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>Panel B: Identification</i>				
Instrumented variables		1)Shares 2)Wage		1)Shares 2)Wage
Instruments		1)Extension 2)Removal 3)Extension× Wage-Schedule Distance		1)Extension 2)Removal 3)Extension× Wage-Schedule Distance
Observations	1,503,163	1,494,502	1,501,845	1,493,203
R-squared	0.257	0.231	0.009	-0.021
Firm×Tenure units	67,501	58,840	67,461	58,819
K-P Wald F		24.73		24.69
Hansen J		0.0507		0.221
Hansen p-value		0.822		0.638

Extension = Post-Extension (industry-level) × Non-unionized at $t - 1$ (firm-level).

Removal = Post-Removal (industry-level).

Wage-Schedule Distance = proportional shortfall of the individual wage in $t - 1$ relative to the modal annual wage bin (computed in €1,000 intervals) among unionized firms within the occupation × experience × industry × year cell. Formally, Wage-Schedule Distance = $(\tilde{w} - w)/\tilde{w}$ if $w < \tilde{w}$ and 0 otherwise, where \tilde{w} denotes the modal union wage bin.

Notes: The sample is restricted to startups with ex-ante growth intent. All specifications include individual-level controls (occupation status, education, field of study, gender), firm-level controls (firm age, firm revenues, shares owned by VC, shares owned by others), Firm×Tenure fixed effects, and year fixed effects. All share measures, individual wages and firm revenues are logged. Standard errors in parentheses, clustered at the Firm × Tenure level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix D: Event study validation

Table D1: Employee equity and wages around CBA extensions

	Shares	Wage
<i>Pre-extension</i>		
$t - 5$	0.029 (0.038)	-0.054** (0.024)
$t - 4$	0.023 (0.029)	-0.038 (0.035)
$t - 3$	0.031 (0.025)	-0.027 (0.017)
$t - 2$	0.037 (0.024)	-0.032* (0.018)
$t - 1$	Omitted category	
<i>Post-extension</i>		
t	-0.026 (0.021)	0.028** (0.011)
$t + 1$	-0.058** (0.024)	0.019* (0.011)
$t + 2$	-0.110*** (0.026)	0.053*** (0.012)
$t + 3$	-0.139*** (0.028)	0.046*** (0.013)
$t + 4$	-0.183*** (0.029)	0.049*** (0.015)
$t + 5$	-0.214*** (0.031)	0.034** (0.015)
<i>Pre-period joint test ($t - 5$ to $t - 2$)</i>		
F-statistic	0.65	1.54
p-value	0.629	0.188
Observations	446,347	446,347
R-squared	0.666	0.530
Firm×Tenure FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes

Notes: This table reports coefficients from event-time regressions around the introduction of collective bargaining agreement extensions. The omitted category is the year immediately preceding the extension ($t - 1$). Coefficients therefore represent differences relative to the year immediately before the regulatory change. Regressions include the same individual- and firm-level controls as in the baseline specification, as well as Firm×Tenure and year fixed effects. Standard errors clustered at the Firm×Tenure level are reported in parentheses. The bottom rows report a joint test that the pre-extension coefficients ($t - 5$ through $t - 2$) are jointly equal to zero.

Appendix E: List of collective bargaining extensions and extension removals

Table E1: List of Collective Agreement Extension Decisions by Industry

TOL02	Industry	Decision	CBA date	Extension date	Days between
24140	Manufacture of other organic basic chemicals	14/2008	15.6.2007	11.9.2008	454
24420	Manufacture of pharmaceutical preparations	14/2008	15.6.2007	11.9.2008	454
92610	Operation of sports arenas and stadiums	37/2008	1.10.2007	18.12.2008	444
40120	Transmission of electricity	3/2009	21.10.2007	29.1.2009	466
40131	Distribution of electricity	3/2009	21.10.2007	29.1.2009	466
45230	Construction of motorways, roads, airfields and sports facilities	11/2010	19.4.2010	14.10.2010	178
55100	Hotels	13/2010 & 14/2010	1.4.2010 & 1.4.2010	11.11.2010 & 11.11.2010	224 / 224
55301	Restaurants	13/2010 & 14/2010	1.4.2010 & 1.4.2010	11.11.2010 & 11.11.2010	224 / 224
92720	Other recreational activities n.e.c.	13/2010 & 14/2010	1.4.2010 & 1.4.2010	11.11.2010 & 11.11.2010	224 / 224
45211	General construction of buildings	26/2011	1.4.2010	8.12.2011	617
92312	Theatre and concert activities	5/2011	21.11.2007	13.1.2011	1149
74600	Investigation and security activities	5/2012	1.3.2011	9.2.2012	345
63401	Forwarding and freighting	7/2012 & 25/2012	1.1.2011 & 1.4.2012	22.3.2012 & 7.6.2012	446 / 67
64120	Courier activities other than national post activities	7/2012	1.1.2011	22.3.2012	446

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Continued on next page

Table E1 – continued from previous page

TOL02	Industry	Decision	CBA date	Extension date	Days between
61103	Domestic coastal water transport	10/2012	1.3.2011	22.3.2012	387
61200	Inland water transport	10/2012	1.3.2011	22.3.2012	387
25130	Manufacture of other rubber products	14/2012	1.12.2011	10.5.2012	161
74872	Debt collecting activities	23/2012	1.11.2011	7.6.2012	219
92620	Other sporting activities	24/2012	1.12.2011	7.6.2012	188
26400	Manufacture of bricks, tiles and construction products, in baked clay	26/2012	1.1.2012	7.6.2012	158
26610	Manufacture of concrete products for construction purposes	26/2012	1.1.2012	7.6.2012	158
63120	Storage and warehousing	39/2012	1.4.2012	18.10.2012	200
63221	Harbours	39/2012	1.4.2012	18.10.2012	200
92130	Motion picture projection	40/2012	1.11.2011	18.10.2012	352
70320	Management of real estate on a fee or contract basis	41/2012	1.1.2012	18.10.2012	291
63110	Cargo handling	42/2012 & 43/2012	1.2.2012 & 1.5.2012	18.10.2012 & 18.10.2012	260 / 170
40301	Separate production and distribution of district heating and cooling	48/2012	1.1.2012	20.12.2012	354
85324	Sheltered work and rehabilitation	49/2012	1.2.2012	20.12.2012	323
15890	Manufacture of other food products n.e.c.	46/2013	1.12.2011	12.12.2013	741
19100	Tanning and dressing of leather	30/2013	1.12.2011	18.6.2013	565
19300	Manufacture of footwear	30/2013	1.12.2011	18.6.2013	565
20100	Sawmilling and planing of wood; impregnation of wood	14/2013	1.1.2012	28.2.2013	424
20201	Manufacture of plywood and laminboard	14/2013	1.1.2012	28.2.2013	424
21120	Manufacture of paper and paperboard	10/2013	1.1.2012	28.2.2013	424

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TOL02	Industry	Decision	CBA date	Extension date	Days between
22140	Publishing of sound recordings	23/2013	1.1.2012	11.4.2013	466
36220	Manufacture of jewellery and related articles n.e.c.	30/2013	1.12.2011	18.6.2013	565
36620	Manufacture of brooms and brushes	30/2013	1.12.2011	18.6.2013	565
45220	Erection of roof covering and frames	27/2013	1.1.2012	18.6.2013	534
50102	Retail sale of motor vehicles	2/2013	1.1.2012	28.2.2013	424
51511	Wholesale of liquid fuels	28/2013	1.10.2012	18.6.2013	261
60241	Freight transport by road	28/2013 & 36/2013	1.10.2012 & 1.4.2012	18.6.2013 & 17.10.2013	261 / 564
62200	Non-scheduled air transport	8/2013	1.3.2012	28.2.2013	364
63301	Activities of travel agencies and tour operators	33/2013	1.4.2012	18.6.2013	443
64202	Other telecommunications	3/2013 & 18/2013 & 19/2013	1.1.2012 & 1.1.2012 & 1.12.2011	28.2.2013 & 11.4.2013 & 11.4.2013	424 / 466 / 497
72220	Other software consultancy and supply	18/2013 & 19/2013	1.1.2012 & 1.12.2011	11.4.2013 & 11.4.2013	466 / 497
80410	Driving school activities	9/2013	1.4.2012	28.2.2013	333
80422	In-service training centres	35/2013	1.1.2012	18.6.2013	534
92110	Motion picture and video production	23/2013	1.1.2012	11.4.2013	466
92520	Museums activities and preservation of historical sites and buildings	22/2013	1.4.2012	11.4.2013	375
92710	Gambling and betting activities	39/2013	1.1.2012	17.10.2013	655
74201	Town and city planning	12/2014	1.12.2013	15.9.2014	288
74203	Architectural activities	12/2014	1.12.2013	15.9.2014	288
74700	Industrial cleaning	3/2014	1.1.2014	27.2.2014	57
92340	Other entertainment activities n.e.c.	4/2014	1.11.2013	27.2.2014	118

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TOL02	Industry	Decision	CBA date	Extension date	Days between
20309	Manufacture of builders' carpentry and joinery n.e.c.	15/2015	1.10.2014	7.9.2015	341
20510	Manufacture of other products of wood	15/2015	1.10.2014	7.9.2015	341
22130	Publishing of journals and periodicals	19/2015	1.2.2014	7.9.2015	584
22220	Printing n.e.c.	19/2015	1.2.2014	7.9.2015	584
33102	Manufacture of dentures	17/2015	1.4.2012	7.9.2015	1255
45330	Heating, plumbing and ventilation	12/2015	1.2.2012	1.6.2015	1216
61102	Sea freight transport	8/2015	1.11.2013	1.6.2015	578
62100	Scheduled air transport	14/2015	1.11.2013	1.6.2015	578
15510	Manufacture of dairy products	6/2017	1.2.2017	20.6.2017	139
43300	Building completion and finishing	9/2017	1.3.2017	20.6.2017	111
45310	Electrical installation	8/2017	1.3.2017	20.6.2017	111
85144	Other social work activities without accommodation n.e.c.	5/2017	1.1.2017	20.6.2017	170
85329	Other social work activities without accommodation	5/2017	1.1.2017	20.6.2017	170
11200	Manufacture of wines from grape	4/2018	1.2.2018	21.6.2018	140
12510	Manufacture of other rubber products	3/2018	1.1.2018	21.6.2018	171
14120	Manufacture of workwear	2/2018	1.1.2018	21.6.2018	171
14200	Manufacture of articles of fur	2/2018	1.1.2018	21.6.2018	171
20200	Manufacture of pesticides and other agrochemical products	1/2018	1.1.2018	21.6.2018	171
20300	Manufacture of paints, varnishes and similar coatings	1/2018	1.1.2018	21.6.2018	171
21110	Manufacture of pulp	7/2018	1.3.2018	21.6.2018	112

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TOL02	Industry	Decision	CBA date	Extension date	Days between
22150	Other publishing activities	6/2018	1.2.2018	21.6.2018	140
24130	Manufacture of other inorganic basic chemicals	5/2018	1.2.2018	21.6.2018	140
24660	Manufacture of other chemical products n.e.c.	5/2018	1.2.2018	21.6.2018	140
25240	Manufacture of metal structures and parts of structures	8/2018	1.3.2018	21.6.2018	112
27410	Manufacture of electric lighting equipment	9/2018	1.3.2018	21.6.2018	112
28110	Manufacture of engines and turbines	8/2018	1.3.2018	21.6.2018	112
32200	Manufacture of musical instruments	10/2018	1.4.2018	21.6.2018	81
40200	Manufacture of gas; distribution of gaseous fuels	11/2018	1.4.2018	21.6.2018	81
45320	Insulation work activities	12/2018	1.5.2018	21.6.2018	51
52486	Retail sale via mail order houses or via Internet	13/2018	1.5.2018	21.6.2018	51
60100	Radio broadcasting	14/2018	1.6.2018	21.6.2018	20
74810	Photographic activities	15/2018	1.6.2018	21.6.2018	20
10300	Processing and preserving of fruit and vegetables	2/2019	1.1.2019	20.6.2019	170
17720	Manufacture of knitted and crocheted pullovers	3/2019	1.2.2019	20.6.2019	139
18220	Reproduction of video recording	3/2019	1.2.2019	20.6.2019	139
25110	Manufacture of metal structures and parts of structures	4/2019	1.3.2019	20.6.2019	111
50202	Sea and coastal freight water transport	5/2019	1.3.2019	20.6.2019	111
91310	Activities of religious organisations	6/2019	1.4.2019	20.6.2019	80

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TOL02	Industry	Decision	CBA date	Extension date	Days between
93010	Washing and dry-cleaning of textile and fur products	7/2019	1.4.2019	20.6.2019	80
26120	Manufacture of loaded electronic boards	2/2020	1.1.2020	18.6.2020	169
45442	Glazing	3/2020	1.2.2020	18.6.2020	138
74140	Business and management consultancy activities	4/2020	1.3.2020	18.6.2020	109
85111	General secondary education	5/2020	1.4.2020	18.6.2020	78
85129	Other general secondary education	5/2020	1.4.2020	18.6.2020	78
85319	Other social work activities without accommodation n.e.c.	6/2020	1.4.2020	18.6.2020	78
26120	Manufacture of loaded electronic boards	1/2021	1.1.2021	17.6.2021	167
26220	Manufacture of computers and peripheral equipment	2/2021	1.2.2021	17.6.2021	136
80300	Higher education	3/2021	1.1.2021	17.6.2021	167

Table E2: List of Collective Agreement Extension Removal Decisions by Industry

TOL02	Industry	Decision	CBA date	Removal date	Days between
15890	Manufacture of other food products n.e.c.	11/2006	1.5.2003	31.8.2006	1218
85130	Dental practice activities	7/2007	1.3.2005	3.5.2007	793
22130	Publishing of newspapers	26/2012	1.1.2012	7.6.2012	158
22220	Printing n.e.c.	26/2012	1.1.2012	7.6.2012	158
45129	Sale of other motor vehicles	42/2012	1.2.2012	18.10.2012	260
45230	Construction of motorways, roads, airfields and sports facilities	31/2012	1.3.2012	13.9.2012	196
50201	Sea and coastal passenger water transport	7/2012	1.1.2011	22.3.2012	446
52720	Repair of electrical household goods	7/2012	1.1.2011	22.3.2012	446
72500	Maintenance and repair of office, accounting and computing machinery	7/2012	1.1.2011	22.3.2012	446
52720	Repair of electrical household goods	27/2013	1.1.2013	18.6.2013	168
52740	Repair of furniture and home furnishings	27/2013	1.1.2013	18.6.2013	168
74121	Engineering activities and related technical consultancy	28/2013	1.1.2013	18.6.2013	168
74301	Translation and interpretation activities	29/2013	1.2.2013	18.6.2013	137
74879	Other business activities n.e.c.	29/2013	1.2.2013	18.6.2013	137
85142	Special needs education	31/2013	1.3.2013	18.6.2013	109
74140	Business and management consultancy activities	1/2014	1.10.2012	27.2.2014	514
45310	Electrical installation	10/2015	1.3.2015	9.9.2015	192
50201	Sea and coastal passenger water transport	8/2015	1.1.2015	1.6.2015	151
52720	Repair of electrical household goods	9/2015	1.2.2015	1.6.2015	120
72500	Maintenance and repair of office, accounting and computing machinery	9/2015	1.2.2015	1.6.2015	120
20200	Manufacture of pesticides and other agrochemical products	4/2017	1.1.2017	20.6.2017	170
75130	Regulation of and contribution to more efficient operation of businesses	3/2017	1.2.2017	20.6.2017	139
26100	Manufacture of electronic components	2/2018	1.1.2018	21.6.2018	171
26200	Manufacture of computers and peripheral equipment	2/2018	1.1.2018	21.6.2018	171
35120	Transmission of electricity	3/2018	1.2.2018	21.6.2018	140
50201	Sea and coastal passenger water transport	4/2018	1.3.2018	21.6.2018	112
52720	Repair of electrical household goods	5/2018	1.3.2018	21.6.2018	112
64120	Courier activities other than national post activities	6/2018	1.4.2018	21.6.2018	81
72500	Maintenance and repair of office, accounting and computing machinery	7/2018	1.5.2018	21.6.2018	51
74860	Other business activities n.e.c.	8/2018	1.5.2018	21.6.2018	51
40119	Production of electricity	1/2019	1.1.2019	20.6.2019	170

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TOL02	Industry	Decision	CBA date	Removal date	Days between
60242	Other passenger land transport n.e.c.	2/2019	1.2.2019	20.6.2019	139
22130	Publishing of newspapers	1/2020	1.1.2020	18.6.2020	169
22220	Printing n.e.c.	1/2020	1.1.2020	18.6.2020	169
60100	Radio broadcasting	2/2020	1.2.2020	18.6.2020	138
64120	Courier activities other than national post activities	3/2020	1.3.2020	18.6.2020	109
74301	Translation and interpretation activities	4/2020	1.3.2020	18.6.2020	109
74402	Advertising agencies	5/2020	1.4.2020	18.6.2020	78
92312	Theatre and concert activities	6/2020	1.4.2020	18.6.2020	78
61102	Sea freight transport	1/2021	1.1.2021	17.6.2021	167
74301	Translation and interpretation activities	2/2021	1.2.2021	17.6.2021	136
80220	Security systems service activities	3/2021	1.3.2021	17.6.2021	108
80429	Other adult education n.e.c.	4/2021	1.3.2021	17.6.2021	108
85111	General secondary education	5/2021	1.4.2021	17.6.2021	77
85142	Special needs education	5/2021	1.4.2021	17.6.2021	77
85319	Other social work activities without accommodation n.e.c.	6/2021	1.4.2021	17.6.2021	77
91110	Activities of business and employers membership organisations	7/2021	1.5.2021	17.6.2021	47
91339	Activities of other membership organisations n.e.c.	8/2021	1.5.2021	17.6.2021	47
92620	Other sporting activities	9/2021	1.6.2021	17.6.2021	16