

The Occupational Structure of Firms

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Abstract

Using matched employer-employee data from Brazil, we study how firms' occupational composition changes as they grow. We show that management and professional employment shares decline with within-firm growth. A broader class of occupations that we classify as overhead (occupation-by-industry cells with within-firm elasticities below one) exhibits the same pattern. Despite this within-firm decline, larger firms in the cross section employ disproportionately more overhead workers, and overhead share is positively associated with firm growth, survival, and proxies for productivity. These facts are consistent with a production function in which overhead labor is complementary to persistent firm type or organizational capital, but each unit of overhead supports more activity at larger scale, allowing firms to decrease overhead share as they grow. Consistent with this interpretation, overhead share measured at founding is more strongly associated with subsequent performance than later overhead share, while firms that increase their overhead share have worse outcomes. Exploiting a minimum-wage law that increased the relative cost of non-overhead labor, we find that exposed firms shrink and raise overhead share, but continue to move along the same within-firm scaling relationships estimated in the pre-period. Firms entering the event with higher overhead share contract less and are less likely to exit. These results are consistent with the view that the overhead share signals, rather than determines, productivity.

1 Introduction

The occupational structure of a firm provides a window into the production process. The relative shares of managers, professionals, production workers, and support staff reflect how firms organize tasks and allocate labor across functions, and these shares vary substantially across firms even within narrowly defined industries (Forsythe (2019); Handwerker et al. (2021)). Industries with greater dispersion in occupational structure also exhibit greater dispersion in productivity (Blackwood et al. (2022)). More broadly, a large literature documents substantial heterogeneity in firm productivity and performance within industries, with an important role for management and organization in shaping these differences (Bloom & Reenen (2007); Caliendo & Rossi-Hansberg (2012); Syverson (2011)). At the same time, the firm dynamics literature emphasizes that cross-sectional differences in firm size and performance reflect both within-firm adjustment and selection through growth and exit (Jovanovic (1982); Hopenhayn (1992); Sterk et al. (2021)).

In this paper, we use Brazilian matched employer-employee data from RAIS to study how occupational structure evolves as firms grow and what it reveals about firm performance. We document

a striking puzzle. Within firms, management and professional occupations scale substantially less than proportionally with employment growth: their within-firm elasticity is approximately 0.75. A broader class of detailed occupation-by-industry cells, which we classify as *overhead*, exhibits the same pattern. Yet in the cross section, this relationship reverses: larger firms employ disproportionately more overhead workers. How a firm changes as it grows is therefore not how firms of different sizes are organized.

The distinction between overhead and frontline occupations is industry-specific. In each industry, the occupations most directly tied to output scale proportionally or more than proportionally with firm growth. Production workers play this role in manufacturing, doctors and nurses in health care, and sales workers in retail. By contrast, management and many professional occupations scale less than proportionally across industries. The same occupation code can therefore be overhead in one industry and frontline in another, depending on the role it plays in production. This perspective suggests a different way to classify occupations within firms, one tied to how they scale in the production process rather than to broad skill or functional categories alone.

Why, then, do larger firms have more overhead in the cross section if overhead share falls within growing firms? Our answer is selection. Overhead share is positively associated with subsequent growth, survival, and proxies for firm productivity. Firms with higher overhead shares grow faster and survive longer, and are therefore overrepresented among large firms. The positive cross-sectional relationship between overhead and firm performance does not appear to arise because firms become more overhead-intensive as they grow. Instead, it reflects persistent differences across firms that shape both occupational structure and firm dynamics.

We develop a framework that rationalizes these facts. Within firms, the estimated occupational elasticities imply that overhead employment scales as a power function of total employment. This is consistent with a production process in which each unit of overhead labor supports more frontline workers at larger scale, so overhead share declines with within-firm growth. Across firms, we allow for persistent heterogeneity in firm type, which can be interpreted as organizational capital, intangible capability, or an organizational blueprint established early in the firm's life. To match the cross-sectional facts, overhead labor is complementary to firm type in production. Higher-type firms therefore optimally choose higher overhead shares and also become larger and more productive. The model thus generates a positive cross-sectional relationship between overhead and performance even though overhead share falls within firms as they grow. In this framework, the gap between the within-firm and cross-sectional elasticities reflects sorting on persistent firm type.

A key implication of the framework is that overhead share signals firm type but does not independently improve firm outcomes. This distinguishes our interpretation from an alternative in which overhead is directly productive and any firm could improve outcomes by adding overhead. We evaluate this distinction in three ways.

First, overhead share measured at founding is more strongly associated with subsequent growth, survival, and productivity proxies than overhead share measured later in life. The predictive power of founding overhead share also strengthens at longer horizons, consistent with overhead revealing a type that is set early in the life of the firm.

Second, firms that make large changes in overhead rank within industry have worse subsequent survival, including firms that increase their overhead share. These findings are more consistent with overhead share reflecting persistent organizational capability than with firms directly improving outcomes by adding overhead labor.

Third, we leverage a large minimum wage increase beginning in 2006, which disproportionately raised the cost of frontline labor, to examine how occupational structure responds to an exogenous cost shock. More-exposed firms shrink and their overhead share rises because frontline employment contracts. However, the underlying within-firm occupational elasticities remain unchanged from

the pre-period. Among equally exposed firms, those that entered the shock with higher overhead shares are more resilient: they shrink less and exit at lower rates. The distinction between entering the shock with a high overhead share and moving up the overhead distribution after the shock reveals that pre-existing overhead predicts resilience, but cost-induced movement up the overhead distribution does not.

Our paper contributes to three related literatures. First, it contributes to the literature on management, hierarchy, and firm organization by shifting attention from cross-sectional differences in managerial intensity, layers, and spans to the *within-firm scaling* of managerial, professional, and broader overhead labor as firms grow. Existing work shows that larger or more productive firms often appear more management-intensive, whether through better management practices (Bloom & Reenen (2007)), more developed hierarchies (Rajan & Wulf (2006); Caliendo & Rossi-Hansberg (2012); Caliendo et al. (2015)), or greater use of outside managers as firms professionalize (Akcigit et al. (2021)). We show that these cross-sectional patterns do not imply that firms become more overhead-intensive as they expand. Instead, managerial, professional, and broader overhead labor scale less than proportionally within firms. More broadly, our results suggest that mechanisms usually discussed for managerial hierarchies, such as delegation, communication, and span of control, may apply to a wider set of overhead occupations as well.

Second, it contributes to the firm dynamics literature by showing how occupational structure can be used to study persistent firm heterogeneity. Canonical models emphasize that cross-sectional outcomes reflect selection on latent firm type rather than only within-firm adjustment (Jovanovic (1982); Hopenhayn (1992); Luttmer (2007); Sterk et al. (2021)). Our contribution is to show that workforce composition provides an observable proxy for that heterogeneity. This allows us to distinguish cross-sectional patterns generated by selection from changes that occur within firms as they grow, and to connect occupational structure to the reallocation and sorting forces that shape firm growth and the size distribution (Foster et al. (2006); Bartelsman et al. (2013); Eslava et al. (2024)).

Third, it contributes to the literature on occupational structure by introducing a different way to classify occupations within firms. Rather than grouping jobs by skill, task content, wages, or broad functional categories (Acemoglu & Autor (2011); Maurin & Thesmar (2004); Davidson et al. (2017)), we classify detailed occupation-by-industry cells according to how they scale with firm growth. This yields an industry-specific distinction between frontline and overhead labor that is closely tied to the firm’s production process. In this sense, the paper offers a new way to interpret workforce composition, not just as a description of who firms employ, but as a measure of how production and coordination are organized (Blackwood et al. (2022); Harrigan et al. (2020)).

2 Data

We use the Relação Anual de Informações Sociais (RAIS), Brazil’s matched employer-employee administrative data maintained by the Ministry of Labor. RAIS is a mandatory annual census of all formal-sector employment relationships, covering every establishment that employs at least one worker under a formal labor contract. Each record represents a worker–establishment employment spell in a given year, linking worker identifiers (PIS) to establishment identifiers (CNPJ), along with occupation codes, earnings, hiring and separation dates, and worker demographics.

We primarily focus on the period from 2003-2013 to take advantage of a period of consistent occupational coding. However, for constructing measures such as firm and establishment age and worker flow measures, we use data extending as far back as 1986.

We define a firm as the set of establishments sharing a common 8-digit CNPJ root, which

identifies the parent legal entity. This aggregation links all establishments owned by the same firm, so that our unit of analysis captures the full organizational structure of each firm rather than individual plants. This is important because larger firms may locate managerial and professional employment in separate locations from production employment. Total employment N_f is the count of unique workers employed at the firm in a given year, after deduplication to one job per worker-year (retaining the highest-wage spell for workers with multiple jobs).

For our primary sample, we restrict analysis to firms with at least 20 employees. This ensures sufficient employment to reliably estimate occupational shares across groups. The resulting sample contains 451,833 distinct firms and 2,178,652 firm-years.

For within-firm analyses, we construct overlapping three-year windows (2003–2006, 2004–2007, etc). A firm is classified as a continuing firm in a given window if it has $N_f \geq 20$ and positive employment in the relevant occupation at both the initial and terminal year of the window. We also identify firm births using the first year a firm appears in RAIS, which allows us to examine how occupational structure at founding relates to subsequent growth and survival.

2.1 Summary Statistics

Table 1 presents summary statistics for the analysis sample. The median firm employs 38 workers, while the mean is 128. Production workers constitute the largest occupation group (38.6% of employment), followed by Clerical (18.7%) and Service (16.1%). Management and Professional workers together account for 16.8% of employment. Mean three-year log employment growth among continuing firms is approximately zero, with a standard deviation of 0.55 log points. The three-year survival rate is 72.4%.

3 Within-Firm Occupational Growth

We begin by characterizing how firms' occupational structure evolves as they change size. First, we describe how firms are evolving in Brazil over this time period (2003-2013). This is a period of net expansion, with average firm growth of 3.9% per year for firms in our sample. Figure 1 shows the distribution of growth, which reveals large variation in growth rates.

Table 1: Summary Statistics

Panel A: Firm-level (pooled 2003–2013)		
N firms		451,833
N firm-years		2,178,652
<i>Employment</i>		
Mean		149
Median		38
SD		1,408
p10 / p25 / p75 / p90		22 / 26 / 79 / 222
<i>Growth and survival</i>		
Mean 3-year growth ($\Delta \log N$)		0.111
SD growth		0.446
3-year survival rate		90.7%
Panel B: Occupation shares		
	Mean	SD
Management	0.081	0.109
Professional	0.119	0.214
Clerical	0.193	0.201
Production	0.372	0.351
Service	0.156	0.246
Sales	0.080	0.177
Mgmt + Prof	0.200	0.234

Notes: Sample: all firms with $N \geq 20$ employees in RAIS, 2003–2013. Growth = $\log(N_{t+3}/N_t)$. Survival = $\mathbf{1}[N_{t+3} > 0]$. Occupation shares sum to 1 within firm.

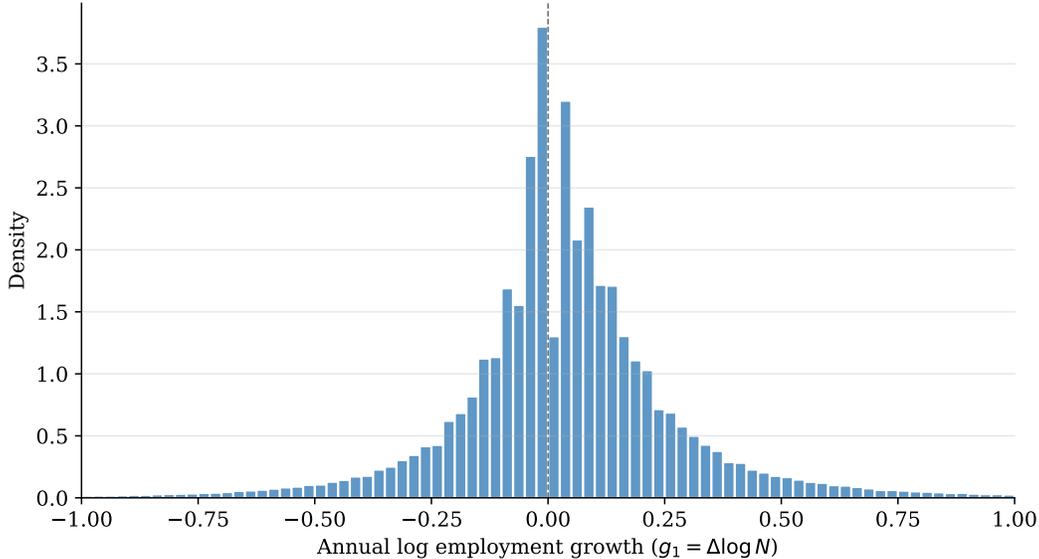


Figure 1: Distribution of annual log employment growth rates. Firms with $N \geq 20$.

In particular, the bottom quartile of firms shrink by 7% or more, while the top quartile grow by 14% or more. Thus, there is substantial year-over-year volatility. In addition, it is worth emphasizing that these events are episodic. 59% of expansion events and 71% of contraction events last only one year. This means firm growth dynamics can be thought of as primarily discrete events that last a year or two, rather than continuous expansion.

Now we want to understand how firms change occupational structure when they change size. In principle, if a firm doubled in size, they could simply double their workforce in each occupation. This may be the case if we imagine a firm that adds a new location and replicates its current workforce structure in the new location. However, there may be economies of scale in certain occupations, in which case employment scales more slowly than employment as a whole. On the opposite direction, when a firm shrinks, there are some occupations that are stickier or that it can not get rid of completely, for example due to safety regulations.

In order to formalize this idea, we measure within-firm f occupational k elasticities, which we measure by regressing the change in log occupational employment n_{fk} over a lag period on the change in log total employment N_f over the same period. In particular, we estimate the following:

$$\Delta_l \log n_{fk} = \eta_k^W \cdot \Delta_l \log N_f + \gamma_{jw} + \varepsilon_{fk} \quad (1)$$

where Δ_l denotes the l -year difference and γ_{jw} represents industry-by-window fixed effects (2-digit industry \times l -year window). The sample is restricted to continuing firms with positive employment in occupation k at both endpoints. Standard errors are clustered at the firm level. The within-firm elasticity η_k^W identifies how a given firm reallocates workers across occupations as it expands or contracts, after absorbing common industry-by-period shocks.

If firms scaled symmetrically, these elasticities should be one for all occupations. An elasticity below one means that occupation scales more slowly than firm growth as a whole, while an elasticity above one means the occupation scales more quickly. We begin by classifying occupations into six mutually exclusive functional groups: management, professional, clerical, production, service, and sales.

In Table 2, we estimate these within-firm elasticities over different time horizons. Here we see

that management and professional occupations have elasticities that are robustly less than one, while production occupations have elasticities that are robustly above 1. Clerical, service, and sales are all in the middle. This indicates that, as firms expand, management and professional employment shares shrink, while production employment in particular expands. Notably, we see these patterns are quite stable across 1 to 5 year horizons, indicating the differences in elasticities across occupational groups are not likely due to differences in recruiting lags between occupations. In Appendix C, we show these relationships are robust to a variety of alternative specifications and data cuts. The result that management and professional employment share declines as firms grow is extremely robust.¹

Table 2: Within-Firm Scaling Elasticities by Differencing Horizon

	$h = 1$	$h = 2$	$h = 3$	$h = 4$	$h = 5$
Management	0.695*** (0.002)	0.723*** (0.002)	0.743*** (0.003)	0.758*** (0.003)	0.772*** (0.003)
Professional	0.681*** (0.003)	0.727*** (0.003)	0.756*** (0.003)	0.775*** (0.004)	0.787*** (0.004)
Clerical	0.794*** (0.002)	0.838*** (0.002)	0.864*** (0.002)	0.882*** (0.003)	0.894*** (0.003)
Production	1.036*** (0.002)	1.030*** (0.002)	1.021*** (0.003)	1.015*** (0.003)	1.008*** (0.003)
Service	0.756*** (0.003)	0.778*** (0.003)	0.790*** (0.003)	0.796*** (0.004)	0.798*** (0.004)
Sales	0.836*** (0.005)	0.837*** (0.005)	0.831*** (0.006)	0.824*** (0.006)	0.827*** (0.007)
N firm-windows	1,285,344	1,028,286	824,818	660,960	520,304

Stacked panel of rolling h -year windows, 2003–2013. Continuing firms with $N \geq 20$ at both endpoints and $n_{fj} > 0$ at both endpoints. 2-digit industry \times window FE. SE clustered at firm level.

To further investigate how occupational employment responds to a change in employment, in Figure 2, we divide employment changes into five quintiles of one-year growth, relative to two-digit industry by year. We then trace out the management and professional share of employment evolves after a growth or shrinking event, relative to the stable quintile (quintile 3). The blue line shows that a large growth event is associated with a substantial decline in management and professional share of employment, which is still two-thirds of the original decline 3 years after the event. Conversely, a large shrinking event is associated with a substantial *increase* in management and professional share, which is more than three-quarters of the original decline 3 years after the event. Thus, we conclude that these compositional changes are quite persistent and are a feature of how firms change size.

¹This result is also robust across countries, with the same elasticity pattern present in the United States (Bauer & Forsythe, 2024).

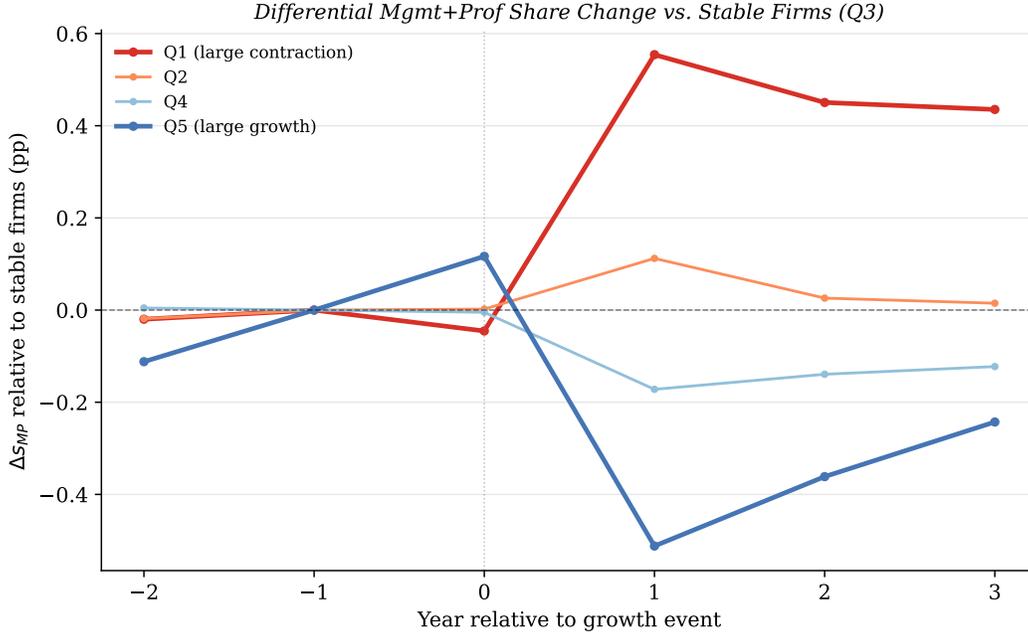


Figure 2: Differential cohort tracking: change in mgmt+prof share by growth quintile, relative to Q_3 (stable firms).

We next ask whether these relationships are industry specific. In particular, professional occupations encompass both accountants as well as doctors and teachers, who are better described as frontline employment occupations when they are employed at hospitals or schools. Thus, in Table 3, we estimate the same specification as in Table 2 for different groups of industries.

Consistent with our interpretation, occupational elasticities are specific to the industrial context. Production elasticities are above one in production industries, but below one in education and health industries. Conversely, professional employment is well below one in most industries, but in education and health it is above 1, and represents the primary frontline employment group. Thus, the elasticities do not just reflect the education or tasks of the workers, instead, it is specific to the role these workers play in the production process within the firm.

In Appendix I, we show consistent results using task-based classifications of occupations. In particular, the within-firm elasticities for non-routine cognitive occupations are similar to management and professional, while routine and non-routine manual occupations have elasticities close to one. Further, we see the same change in elasticities by industry, with elasticities for non-routine cognitive personal occupations exceeding 1 in education and health industries, while in most other industries it is much less than 1. Similarly we see manual occupations switching from above one to well-below one depending on the industry. This suggests that the elasticities have more to do with the occupation’s role in the firm’s production process rather than the workers’ skills or broad categories of tasks performed.

Whether or not an occupation has an elasticity below or above one reveals something core about the firm production function and how firms scale production. To further explore the implications for firm dynamics, we aggregate occupation by industry cells based on whether the estimated elasticities are below or above one.

We define cells at the intersection of 6-digit CBO occupation and 2-digit CNAE industry, retaining cells with at least 100 workers pooled across all firm-years. For each cell c , we estimate the

Table 3: Within-Firm Occupational Elasticities by Industry

	Production	Trade/Hosp	Services	Educ/Health
Management	0.729*** (0.003)	0.801*** (0.005)	0.756*** (0.006)	0.689*** (0.012)
Professional	0.680*** (0.004)	0.732*** (0.008)	0.817*** (0.008)	1.044*** (0.008)
Clerical	0.806*** (0.003)	0.961*** (0.004)	0.874*** (0.006)	0.954*** (0.009)
Production	1.079*** (0.002)	1.010*** (0.005)	0.895*** (0.009)	0.749*** (0.018)
Service	0.683*** (0.005)	0.859*** (0.006)	0.865*** (0.007)	0.907*** (0.012)
Sales	0.622*** (0.011)	0.944*** (0.006)	0.818*** (0.023)	0.695*** (0.043)
<i>N</i> per cell	420,888	284,490	208,537	99,450

Notes: Each cell is a separate regression within one industry group. SE in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

within-establishment scaling elasticity using three-year log-differences at the establishment level (full 14-digit CNPJ), requiring at least 30 establishment-windows per cell. We use establishment-level rather than firm-level variation because it provides finer identification of the production technology. This improves precision of our classification but does not qualitatively affect our results. We then classify a cell as “overhead” if we can reject the null hypothesis that its elasticity is at least one, the rest of the cells are labeled as “frontline” employment. See Appendix B for more details on the construction and robustness of this measure.²

3.1 What the Elasticities Imply About the Production Technology

The within-firm elasticities documented above have direct implications for the class of production functions consistent with the data. The result that overhead occupations scale with elasticity < 1 is inconsistent with standard production functions (such as CES) where factors scale proportionally within firms.³

We can make progress by characterizing the relationship between overhead (H) and total employment (N). The within-firm elasticity for overhead is not only less than one, it is approximately constant across firm sizes (See Appendix C). The power function is the unique functional form with a constant log-log slope (Appendix G.2), which implies the relationship between overhead and employment takes the form:

$$H = \kappa(\theta) \cdot N^\eta, \quad (2)$$

where $\kappa(\theta)$ is a firm-specific intercept.

The management hierarchy literature provides a micro-foundation for this relationship. As firms grow, they can increase the span of control and depth of the hierarchy, which leverages

²In Appendix H, we also show all results are similar if we focus on the management and professional share of employment at the firms. In Appendix E we show results are consistent with alternative overhead measures, including firm-based measures.

³See Appendix G.1 for more details.

managerial talent across the firm. In some models (such as Garicano (2000)), this implies managerial employment scales less than proportionally with total employment. The same logic may apply more broadly to any occupation where output per worker increases with firm size, rather than remaining approximately constant. Thus, by allowing the data to reveal which occupation-industry cells exhibit within-firm elasticities below one, we can classify occupations by their functional role in the production process without specifying the particular mechanism that generates sub-linear scaling.

The firm-specific intercept $\kappa(\theta)$ captures cross-firm differences in organizational architecture: two firms of the same size may differ in overhead intensity because they operate different production processes, maintain different hierarchical depths, or invest differently in coordination infrastructure. We leave $\kappa(\theta)$ unspecified for now but will return to it after learning more about how occupational structure varies across firms.

4 Occupational Structure Across Firms

Now that we have classified how firm occupational shares change with growth, we want to understand how that connects with the cross-sectional relationship between occupational shares and firm-size.

The cross-sectional relationship between occupation-specific employment and firm size is estimated as:

$$\log n_{fkt} = \eta_k^{CS} \cdot \log N_{ft} + \alpha_{jt} + \varepsilon_{fkt} \quad (3)$$

where n_{fkt} is employment in occupation group k at firm f in year t , N_{ft} is total firm employment, and α_{jt} represents industry-by-year fixed effects (2-digit CNAE \times year in the main specification). Standard errors are clustered at the firm level. The elasticity η_k^{CS} measures how occupation k 's employment scales with firm size in the cross-section. An elasticity below one implies that larger firms devote a smaller share of their workforce to occupation k , an elasticity above one implies the opposite.

In Table 4, in the first column we show the within-elasticities for our two groups: overhead and frontline. By construction, the within-elasticity for overhead occupations is < 1 . In column 2 we show the cross-sectional elasticity. Now we see that the roles switch: the cross-sectional overhead elasticity is approximately one while the frontline elasticity is below 1. This means that, in the cross-section, overhead share is positively correlated with size. In Appendix H we show that the finding that cross-sectional elasticities are larger than within elasticities is consistent for management and professional employment. We also show in Appendix D this elasticity gap is stronger when we examine continuing firms, that is, it is not driven by sample differences.

What can explain the relationship between occupational structure and size in the cross section? One possibility is that firms that grow and survive are systematically different from firms that do not. In Table 5, we examine how the share of overhead employment correlates with growth and survival rates across various horizons.

To interpret magnitudes, consider the interquartile range of within-industry overhead share, which spans approximately 35 percentage points. In this case, in 3 years the 75th percentile firm grows by 2% more and by 5 years it has grown over 3% more. On the survival margin, 35 pp more overhead employment is associated with a 2.5 pp higher 7-year survival rate.

In panel B, we include controls for contemporary size, to ensure these relationships are not due to firms being of different sizes. Point estimates attenuate slightly but are generally quite consistent. Further, point estimates are growing with the horizon, indicating that the relationship

Table 4: Cross-Section vs. Within-Firm Scaling: Overhead

	(1) Within	(2) Cross-sect	Gap
Overhead	0.904*** (0.002)	1.003*** (0.001)	0.099
Frontline	1.090*** (0.003)	0.963*** (0.002)	-0.127
<i>N</i>	966,990	2,142,928	

Notes: Gap = Column (2) – Column (1). 2003–2013. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Overhead Share and Firm Performance Across Horizons

	(1) Gr ₁	(2) Gr ₃	(3) Gr ₅	(4) Surv ₁	(5) Surv ₃	(6) Surv ₅	(7) Surv ₇
<i>Panel A</i>							
s^{OH}	0.024*** (0.001)	0.062*** (0.003)	0.096*** (0.004)	0.015*** (0.001)	0.044*** (0.001)	0.059*** (0.002)	0.071*** (0.003)
<i>Panel B: Controlling for log N</i>							
s^{OH}	0.021*** (0.001)	0.056*** (0.003)	0.089*** (0.004)	0.015*** (0.001)	0.044*** (0.001)	0.060*** (0.002)	0.072*** (0.003)
<i>N</i>	1,651,259	1,079,330	685,763	1,931,099	1,455,833	1,033,629	649,659

Notes: Overhead share. OLS regressions: each cell is a separate regression. Panel B adds control for log N . Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t+h$. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

between occupational structure and survival and growth is not transitory but rather increases over time. In Appendix F we show consistent growth results if we restrict to a balanced panel.

Why might overhead share be associated with survival and growth? Is a firm with larger overhead share more productive? In Table 6, we investigate a battery of measures that are correlated with firm productivity: firm AKM fixed effect $\hat{\psi}$, NPI_{EE} is the difference between inflows from other employers and outflows to other employers (scaled by firm size), and π_j is the share of all new hires that are poached from other employers. All measures are rescaled in standard deviation units for comparison. Across measures we see that higher overhead share is associated with higher firm productivity scores. This suggests that the reason firms with a higher overhead share are more likely grow and survive is because these firms are more productive, although we cannot observe productivity directly.

Table 6: Overhead Share and Firm Performance

	(1) Size	(2) Growth ₃	(3) Surv ₃	(4) AKM $\hat{\psi}$	(5) NPI _{EE}	(6) π_j
<i>Panel A</i>						
s^{OH}	-0.013*** (0.002)	0.041*** (0.002)	0.046*** (0.002)	0.001 (0.002)	0.002** (0.001)	0.059*** (0.001)
<i>Panel B: Controlling for log N</i>						
s^{OH}	—	0.037*** (0.002)	0.046*** (0.002)	0.002 (0.002)	0.002** (0.001)	0.061*** (0.001)
N	2,178,651	1,079,330	1,455,833	2,006,550	2,176,483	2,173,769

Notes: Overhead share. Each cell is a separate regression. Panel B controls for log N . Both dependent and independent variables are standardized to unit variance. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Thus, while we have found that overhead share and management/professional share decrease in firms as they grow, in the cross-section there is a strong relationship between these shares and survival and growth, driving the positive correlation between overhead share and firm size in the cross-section. But why, if these occupations are associated with survival and growth in the cross-section, do we not see these shares increasing within growing firms? We return to the overhead technology from Section 3.1 to examine how heterogeneity between firms can help explain this seeming contradiction.

4.1 A Framework for Interpreting the Cross-Sectional Patterns

The overhead technology from Section 3.1, $H = \kappa(\theta)N^\eta$, combined with two additional assumptions, rationalizes all of the cross-sectional patterns documented above and generates testable predictions.

A firm is founded with type $\theta > 0$, which may reflect an exogenous productivity draw, early organizational investments, or founder characteristics. The firm employs N total workers, of whom $H = \kappa(\theta)N^\eta$ are overhead and $D = N - H$ are frontline. We assume θ is frontline-labor-augmenting, so that revenue takes the form $f(s, \theta D)$ for some function with decreasing returns, where s is a market-condition state capturing demand or other shocks realized after founding. The firm chooses N to maximize

$$\pi = f(s, \theta[N - \kappa(\theta)N^\eta]) - w_D \cdot (N - \kappa(\theta)N^\eta) - w_H \cdot \kappa(\theta)N^\eta, \quad (4)$$

where w_D and w_H are wages for frontline and overhead workers respectively, which we assume are set exogenously. Because θ raises the marginal product of frontline labor at every scale, the optimal $N^*(\theta, s)$ is increasing in both θ and s .⁴

We impose two restrictions on this environment:

1. **Type determines overhead intensity.** $\kappa'(\theta) > 0$: higher-type firms require more overhead per unit of employment. One interpretation is that more productive firms operate more complex production processes and invest in more coordination infrastructure.
2. **Type is quasi-fixed.** θ is established at founding and is costly to change thereafter. The organizational design, including the depth of the hierarchy and the breadth of coordination systems, is embedded in routines and firm-specific knowledge that cannot be easily replicated or discarded.

The framework yields several results:

Result 1: Overhead share is increasing in θ in the cross-section. The overhead share is $H/N = \kappa(\theta)N^{\eta-1}$. Higher- θ firms have higher $\kappa(\theta)$, which raises the overhead share, but also larger N , which lowers it (since $\eta - 1 < 0$). The overhead share is increasing in θ whenever

$$\frac{\kappa'(\theta)}{\kappa(\theta)} > (1 - \eta) \cdot \frac{1}{N^*} \frac{\partial N^*}{\partial \theta}. \quad (5)$$

Under this condition, overhead share is positively correlated with θ . Since revenue and optimal scale are also increasing in θ , overhead share is positively associated with firm size and productivity in the cross-section, even though overhead share declines within growing firms ($\eta < 1$). Overhead share does not cause better performance; θ does. But overhead share is an observable signal of the unobserved type.

Result 2: The cross-sectional overhead elasticity exceeds the within-firm elasticity. From the overhead technology $H = \kappa(\theta)N^\eta$, a cross-sectional regression of $\log H$ on $\log N$ that omits $\log \kappa(\theta)$ yields

$$\hat{\eta}_{CS} = \eta_W + \frac{\text{Cov}(\log \kappa(\theta), \log N)}{\text{Var}(\log N)} > \eta_W. \quad (6)$$

The inequality follows because higher- θ firms have both higher κ and larger N . For frontline employment, the bias runs in the opposite direction: high- θ firms devote a smaller share to frontline workers, so the cross-sectional elasticity for frontline employment falls below the within-firm elasticity, consistent with Table 4. Because θ is quasi-fixed at founding, the framework predicts that the positive covariance between κ and N is driven by initial organizational architecture rather than gradual within-firm reorganization. The testable predictions below are designed to evaluate this interpretation.

Testable predictions. The framework generates three predictions that distinguish it from an alternative in which overhead is independently productive (i.e., any firm could improve outcomes by increasing overhead).

1. **Birth overhead reveals type.** Because θ is fixed at founding and $\kappa(\theta)$ is increasing, overhead share at birth should predict growth and survival conditional on initial size. Under the alternative, birth structure would have no special predictive power relative to current structure.

⁴This requires $\kappa(\theta)$ to grow sufficiently slowly relative to θ , so that the revenue gain from higher productivity dominates the additional overhead cost.

2. **Changing overhead rank does not improve outcomes.** Increasing H does not change θ or $\kappa(\theta)$. A firm that hires more overhead without changing its organizational type is overstaffing relative to its coordination needs. Under the alternative, firms that increase their overhead share should perform better.
3. **Pre-existing overhead predicts resilience to shocks.** Under an adverse cost shock, high- θ firms are more resilient because θ drives productivity. Pre-existing overhead share should predict resilience, but shock-induced increases in overhead share (e.g., from differential contraction of frontline employment) should not improve outcomes. Under the alternative, any increase in overhead share should help, regardless of its source.

We test these predictions in Sections 5 and 6.

5 Persistence and Organizational Structure

The framework in Section 4.1 predicts that organizational structure at founding reflects the firm’s underlying type θ , and that this type drives the positive correlation between overhead and performance documented in Section 4. In this section we test this prediction. We show that overhead share at founding predicts firm performance over increasingly long horizons, that the founding organizational investment carries lasting information about the firm’s trajectory, and that firms that change their position in the overhead distribution do not outperform those that maintain their position.

5.1 Occupational Structure at Birth Predicts Growth and Survival

If overhead share at founding reflects the firm’s type, it should predict performance even conditional on initial size. We test this by focusing on firms we can observe overhead share from birth (first appearance in RAIS from 2003 onward) with at least 20 employees. We estimate:

$$y_{f,t+h} = \beta \cdot s_{f,t}^{OH} + \gamma \cdot \log N_{f,t} + \alpha_{j \times t} + \varepsilon_f \quad (7)$$

where $s_{f,t}^{OH}$ is the overhead share at the firm’s year of birth (t), $\log N_{f,t}$ is log employment at birth, and $\alpha_{j \times t}$ are birth-year by 2-digit industry fixed effects, which absorb variation in the composition of entering cohorts across industry and time. The dependent variables are cumulative growth (1, 3, or 5 years post birth) or a survival indicator (1, 3, 5, or 7 years post birth). Standard errors are clustered at the firm level.

Table 7 reports the results. Overhead share at founding is positively associated with both growth and survival across all horizons. Growth coefficients increase with the horizon (0.3% at one year, 0.7% at three, 1.3% at five, with size controls). A balanced panel restricted to five-year survivors confirms this increasing pattern is not driven by sample selection (Appendix Table 27). The survival estimates reveal a 10 percentage point higher overhead share at birth is associated with approximately 1 percentage point higher survival at horizons of one to seven years. All results are robust to controlling for initial firm size, which means that birth overhead carries information about future performance beyond what initial scale reveals.

Birth overhead predicts growth and survival through different channels. To assess whether birth share carries information beyond what current conditions reveal, we progressively add contemporaneous controls to the birth-share specification on a common sample (Appendix Table 25). For growth, birth overhead retains significant predictive power even in the most demanding specification: controlling simultaneously for current overhead, current size, and recent growth trajectory

Table 7: Birth Overhead Share Predicts Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
s^{OH}	0.040*** (0.008)	0.081*** (0.015)	0.154*** (0.022)	0.098*** (0.006)	0.117*** (0.008)	0.104*** (0.009)	0.086*** (0.011)
<i>Panel B: Controlling for log N</i>							
s^{OH}	0.031*** (0.008)	0.065*** (0.014)	0.133*** (0.021)	0.103*** (0.006)	0.121*** (0.008)	0.108*** (0.009)	0.093*** (0.011)
N	50,889	29,259	16,875	68,462	52,152	36,739	23,181

Notes: Overhead share. Firms at age 0 with $N \geq 20$. Panel B controls for $\log N$. Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t + h$. 2-digit industry \times birth year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

reduces the birth-share coefficient by roughly half but does not eliminate it. For survival, the picture is different: once current overhead share is included, birth share adds no independent information.

Section 4 showed that overhead share is correlated with growth and survival in the full sample. The results here show that this relationship is present from the firm's first year of operation, conditional on birth size. This is consistent with the founding organizational investment revealing information about the firm's type.

5.2 Organizational structure is persistent.

If birth overhead reflects the firm's type, the founding organizational structure should carry information about the firm's future structure beyond what current structure and recent growth reveal. We examine this in two steps.

Table 8 Panel A estimates how well current overhead share $s_{f,t}$ predicts future overhead share $s_{f,t+h}$ among continuing firms:

$$s_{f,t+h} = \beta_1 \cdot s_{f,t} + \beta_2 \cdot \Delta_h \log N_f + \beta_3 \cdot \log N_{f,t} + \alpha_{j \times t} + \varepsilon_f \quad (8)$$

where $\Delta_h \log N_f$ is employment growth over the horizon, $\log N_{f,t}$ is log employment at time t , and $\alpha_{j \times t}$ are birth-year by 2-digit industry fixed effects, which absorb variation in the composition of cohorts across industry and time. The coefficient β_1 measures the persistence of organizational structure after accounting for intervening growth and current size.

Current overhead share is a strong predictor of future share: the coefficient is 0.867 at a one-year horizon and 0.629 at five years. The coefficient on employment growth is negative throughout (-0.039 at $h = 1$, -0.027 at $h = 5$), consistent with the within-firm scaling fact documented in Section 3: firms that grow see their overhead share decline as frontline employment expands.

Panel B asks whether the initial structure carries information beyond current structure. We restrict to firms we can observe occupational structure at birth (founded 2003 or later) and add the birth-year overhead share $s_{f,\text{birth}}$ as a second predictor:

$$s_{f,t+h} = \beta_1 \cdot s_{f,t} + \beta_2 \cdot s_{f,\text{birth}} + \beta_3 \cdot \Delta_h \log N_f + \beta_4 \cdot \log N_{f,t} + \alpha_{j \times t} + \varepsilon_f \quad (9)$$

As the horizon lengthens, the coefficient on birth share *increases* (from 0.057 in year one to 0.090 in year 5) while the coefficient on current share *declines* (from 0.807 to 0.527). This is notable because

birth share is measured *further* from the prediction target than current share, yet it becomes relatively more informative. This pattern is consistent with birth structure reflecting something persistent about the firm that current structure, which has been affected by intervening growth and shocks, captures less well over time. In the context of the framework, current share reflects both $\kappa(\theta)$ and the accumulated effect of shocks s on firm scale, while birth share is a cleaner signal of $\kappa(\theta)$ because the firm has not yet been affected by post-founding shocks.

Table 8: Persistence of Overhead Structure

	$h = 1$ (1)	$h = 3$ (2)	$h = 5$ (3)
<i>Panel A: Persistence</i>			
s_t	0.867*** (0.001)	0.724*** (0.001)	0.629*** (0.002)
Growth $_h$	-0.039*** (0.001)	-0.031*** (0.001)	-0.027*** (0.001)
log N_t	0.0002** (0.0001)	0.0006** (0.0002)	0.0008** (0.0004)
N	1,651,259	1,079,330	685,763
<i>Panel B: Birth share as predictor</i>			
s_t	0.807*** (0.003)	0.636*** (0.007)	0.527*** (0.011)
s_{birth}	0.057*** (0.003)	0.083*** (0.007)	0.090*** (0.011)
Growth $_h$	-0.030*** (0.001)	-0.021*** (0.001)	-0.021*** (0.002)
log N_t	0.0011*** (0.0004)	0.0017* (0.0009)	0.0029* (0.0016)
N	184,257	96,674	47,742

Notes: Overhead share. Panel B restricts to firms founded 2003 or later. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A balanced panel restricted to five-year survivors confirms that this pattern is not driven by selective attrition (Appendix Table 26).

5.3 Does Changing Overhead Share Improve Outcomes?

The previous two sections showed that birth overhead share predicts performance and carries growing information over time. These results are consistent with overhead share revealing type, but they are also consistent with overhead share being independently productive. Firms that start with more overhead share could do better *because* of the overhead share, not because of the type it signals. To distinguish these, we ask: do firms that increase their overhead share improve their outcomes?

We begin by characterizing how much movement there is in the distribution of overhead share. We residualize each firm's overhead share on log employment and 2-digit industry \times year, assign firms to within-year quartiles of the residual, and track quartile membership over three-year horizons.

Table 9 reports the transition matrix with top line showing row percentages (transition to) and bottom line showing column percentages (transition from). The diagonal dominates: between 42% and 51% of firms remain in the same quartile, and off-diagonal movement is predominantly one step.

Table 9: Transition Matrix: Overhead Share, Three-year horizon

Quartile at t	Quartile at $t + 3$				Row	Row
	Q1 (low)	Q2	Q3	Q4 (high)	Exits	Total
Q1 (low)	46.0 <i>39.3</i>	15.2 <i>13.0</i>	4.7 <i>4.0</i>	3.3 <i>2.8</i>	30.8 <i>29.8</i>	17.5
Q2	12.4 <i>10.6</i>	42.9 <i>36.6</i>	16.0 <i>13.7</i>	4.9 <i>4.2</i>	23.8 <i>23.0</i>	17.5
Q3	4.0 <i>3.4</i>	16.0 <i>13.7</i>	41.7 <i>35.6</i>	14.7 <i>12.5</i>	23.7 <i>22.9</i>	17.5
Q4 (high)	2.9 <i>2.5</i>	5.2 <i>4.4</i>	15.9 <i>13.6</i>	50.8 <i>43.4</i>	25.2 <i>24.4</i>	17.5
Entrants	30.2 <i>44.2</i>	22.0 <i>32.3</i>	22.6 <i>33.1</i>	25.3 <i>37.0</i>		30.0
Col Total	20.5	20.5	20.5	20.5	18.1	100.0

Transition matrix for Overhead Share quartiles over a 3-year horizon. Quartiles assigned within each year after residualizing on $\log(\text{employment})$ and 2-digit industry \times year fixed effects. Each cell shows row percentage (top) and column percentage (bottom, italic). Row percentages: share of base-year firms in row quartile that transition to column quartile (or exit). Column percentages: share of forward-year firms in column quartile that originated from row quartile (or entered). Diagonal entries in bold. Row/column totals as % of all firm-year-pairs.

Next we want to examine how transitions impact survival. Among firms in each base quartile at t that survived to $t + 3$, we regress survival to $t + 5$ on the quartile they moved to, controlling for both baseline size and concurrent growth:

$$\mathbf{1}[\text{survived to } t+5]_f = \alpha + \sum_{q \neq q_0} \beta_q \cdot \mathbf{1}[Q_{f,t+3} = q] + \gamma \cdot \log N_{f,t} + \lambda \cdot \Delta_3 \log N_{f,t} + \alpha_{\text{ind}_2 \times \text{base year}} + \varepsilon_f \quad (10)$$

run separately by base quartile, with stayers as the omitted category.

For firms starting in Q2, Q3, or Q4, nearly all transitions are associated with equal or lower survival relative to stayers. With the exception of Q1, firms that increase their overhead share rank do not benefit from doing so, despite the positive cross-sectional correlation between overhead and survival documented in Section 4. And while we do see survival improvements for Q1 firms moving up to Q2, the effect attenuates and fades out by Q4.

A concern is that rank transitions proxy for size shocks: firms that move up in the overhead share distribution may be doing so because they are shrinking (losing frontline workers), and shrinking independently predicts exit. To address this directly, we control for employment growth between t and $t + k$, resulting in stronger negative results. The intuition is that some firms that moved down in overhead share rank did so because they were growing (frontline employment expanded, diluting the overhead share), and growth independently predicts survival. Removing this channel reveals a larger penalty for rank changes that are not simply a byproduct of firm expansion.

As further evidence of the lasting impact of initial conditions, Appendix Table 24 shows that a firm's past size predicts its current overhead share even at ten-year lags and controlling for the

Table 10: Transition Survival

Base Q	Move to Q	Baseline		$\Delta \log N$ Control		Stayer Surv. rate
		Coef	SE	Coef	SE	
Q1	Q2	0.007***	(0.001)	0.008***	(0.001)	0.945
	Q3	0.004*	(0.002)	0.006***	(0.002)	
	Q4	0.001	(0.003)	0.004	(0.003)	
Q2	Q1	-0.011***	(0.001)	-0.012***	(0.001)	0.961
	Q3	-0.003**	(0.001)	-0.001	(0.001)	
	Q4	-0.012***	(0.002)	-0.007***	(0.002)	
Q3	Q1	-0.017***	(0.002)	-0.020***	(0.002)	0.959
	Q2	-0.004***	(0.001)	-0.006***	(0.001)	
	Q4	-0.006***	(0.001)	-0.005***	(0.001)	
Q4	Q1	-0.021***	(0.003)	-0.026***	(0.003)	0.959
	Q2	-0.005**	(0.002)	-0.010***	(0.002)	
	Q3	-0.002	(0.001)	-0.004***	(0.001)	

Notes: Coefficients show the effect on 5-year survival of being in quartile “Move to Q” at $t+3$, relative to staying in the base quartile. ***, **, * denote significance at 1%, 5%, 10%.

firm’s current size.

6 Minimum Wage Shock

The preceding sections show that overhead share is persistent, predicts firm performance, and does not appear to improve outcomes when firms increase it directly. These findings are consistent with the framework in which overhead share reflects an underlying organizational type rather than independently driving productivity. However, the variation underlying those results is observational. In this section, we leverage a large minimum wage increase in 2006, which disproportionately raised the cost of frontline labor, to provide two complementary tests. First, we test whether the within-firm occupational scaling elasticities documented in Section 3 continue to hold when firm size changes are induced by an exogenous cost shock. Second, we test the framework’s prediction that pre-existing overhead share, rather than a shock-induced increase in overhead share, predicts resilience to the shock.

6.1 Background and Identification

Brazil’s federal minimum wage increased substantially during the 2000s under President Lula’s *política de valorização do salário mínimo*. We focus on the April 2006 increase from R\$300 to R\$350, the largest single-year nominal increase during this period (16.7% nominal, approximately 12% real). The minimum wage continued to rise in subsequent years, reaching R\$510 by 2010, for a cumulative real increase of more than 80% over the decade (Engbom & Moser (2022); Luduvic et al. (2024)). Prior to 2008, these adjustments were determined annually through political negotiation rather than a formal indexation rule, making the magnitude of individual increases difficult for firms to fully anticipate. Our event study therefore captures the cumulative effects of the 2006 increase and the subsequent increases through 2013.

This episode is a useful setting for studying firm heterogeneity and reallocation. In Brazil, minimum wage increases had large effects on wages, while more muted aggregate employment

and output effects were partly offset by reallocation toward more productive firms (Engbom & Moser (2022)). More broadly, recent work shows that minimum wage hikes can operate through reallocation across firms and through industry dynamics, not only through employment changes at continuing establishments (Dustmann et al. (2022); Aaronson et al. (2018)). Our focus on occupational adjustment also relates to evidence that minimum wage policies can alter the wage and occupational structure of establishments (Forsythe (2023)).

Because the 2006 increase was nationwide, our identification compares firms based on pre-policy exposure. We define a firm as highly exposed if at least 15% of its 2005 employment earned at or below the 2006 minimum wage. We denote this by $E_i = 1$. These firms comprise 25% of the sample. Since minimum wage exposure is concentrated among lower-wage workers, and these workers are disproportionately employed in frontline occupations, the shock raised the relative cost of frontline labor.

Our main specification is:

$$Y_{it} = \alpha_i + \alpha_{st} + \alpha_{jt} + \beta \cdot E_i \cdot \text{Post}_t + \varepsilon_{it}, \quad (11)$$

with firm, state×year, and 2-digit industry×year fixed effects. As the minimum wage increase takes place on April 2006, $\text{Post}_t = \mathbf{1}[t \geq 2006]$. Y_{it} refers to log of employment $\log N$, log of wage bill $\log WB$, overhead share, log overhead share and log frontline share. We use 2003–2008 for collapsed difference-in-differences and 2003–2013 for event studies. Standard errors are clustered at the two-digit industry×state level. Since we assign exposure based on wages in 2005, these results examine the effect on continuing firms.

6.2 The Cost Shock and Occupational Response

Table 11 reports the difference-in-difference and event-study coefficients. The wage bill increases immediately, increasing 4.4% in 2006 and continuing to increase in subsequent years. Total employment in continuing firms is unchanged in 2006 but declines steadily, reaching -6.3% by 2013.

When we examine the occupational response, we see that overhead share increases beginning in 2006, but this is driven by a decline in the frontline employment level. This is consistent with our previous estimates of within-firm elasticities: when firms shrink, frontline employment absorbs most of the adjustment.⁵

⁵One may be concerned that firms are substituting formal employment for informal workers that are not recorded in RAIS. However recent evidence from Derenoncourt et al. (2025) finds that this margin of substitution is modest, particularly because the minimum wage resulted in higher wages in the informal labor market as well.

Table 11: Effect of Minimum Wage Exposure

	(1)	(2)	(3)	(4)	(5)
	log N	log WB	Overhead	log Overhead	log Direct
<i>Panel A: Collapsed Diff-in-Diff</i>					
$E_i \times \text{Post}$	-0.005 (0.005)	0.051*** (0.006)	0.005*** (0.001)	0.008 (0.006)	-0.012 (0.009)
N	790,471	790,471	790,471	779,327	740,118
<i>Panel B: Event Study (relative to 2005)</i>					
2006	0.001 (0.003)	0.044*** (0.004)	0.003** (0.001)	0.008* (0.004)	-0.007 (0.006)
2007	-0.015*** (0.004)	0.052*** (0.005)	0.004*** (0.001)	-0.003 (0.005)	-0.022*** (0.008)
2008	-0.023*** (0.005)	0.057*** (0.006)	0.008*** (0.002)	-0.001 (0.007)	-0.034*** (0.011)
N	1,319,475	1,319,475	1,319,475	1,304,302	1,241,789

Notes: Binary exposure: E_i is baseline share of sub-MW employment ≥ 0.15 . Panel A: Post is 2006 and later, sample 2003–2008. Panel B: year-by-year interactions, reference year 2005, sample 2003–2013 (truncated for table). Firm, state \times year, and industry \times year FE. SE clustered at 2-digit industry \times state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.



Figure 3: Event Study: Minimum Wage Exposure. $E_i = \mathbf{1}[b_i \geq 0.15]$. Reference year: 2005. Firm, state \times year, and industry \times year FE.

Now that we have shown that the minimum wage cost shock induces firms to shrink, we can ask whether firms shrink following the occupational elasticities we measured in Section 3. In particular, we estimate two-year within elasticities, with the pre-period measured over 2003-2005 and the post period measured from 2005-2007. We then examine whether the occupational elasticities (change in log occupational employment n_f^g regressed on the change in log total employment N_f) differs post versus pre, for high exposure firms compared to low exposure firms. Specifically, we estimate:

$$\begin{aligned} \Delta_2 \log n_f^g &= \eta \cdot \Delta_2 \log N_f \\ &+ \gamma_1 \cdot (\Delta_2 \log N_f \times \text{Post}) \\ &+ \gamma_2 \cdot (\Delta_2 \log N_f \times E_i) \\ &+ \delta \cdot (\Delta_2 \log N_f \times \text{Post} \times E_i) \\ &+ \gamma_3 \cdot (\text{Post} \times E_i) + \gamma_4 \cdot E_i + \alpha_j + \varepsilon_f \end{aligned} \tag{12}$$

where η is the baseline scaling elasticity, γ_1 captures any common time trend in the elasticity, γ_2 captures any pre-existing difference in the elasticity for exposed firms, and δ is the difference-in-differences estimate: the differential shift in the scaling elasticity for exposed firms after the shock. A null $\hat{\delta}$ means the occupational scaling relationship is unchanged by the cost shock.

Table 12 reports the results. The DiD estimate $\hat{\delta}$ is null for all occupation groups. Further, the baseline point estimates are unchanged from our main estimates in Table 4. This indicates that, at least for this cost shock, firms that are induced to change size follow the same elasticity scaling as we saw in the main estimates.

Table 12: Minimum Wage Effect on Within-Firm Elasticities

	(1) Overhead	(2) Frontline
$\Delta \log N$ (base $\hat{\eta}$)	0.906*** (0.009)	1.084*** (0.012)
$\Delta \log N \times \text{Post}$	-0.013* (0.008)	0.025 (0.020)
$\Delta \log N \times \text{Post} \times E_i$	0.020 (0.016)	-0.022 (0.027)
N	239,148	223,446

Notes: Binary exposure: E_i is baseline share of sub-MW employment ≥ 0.15 . Stacked 2-year differences: Pre (2003→2005) and Post (2005→2007). 2-digit industry \times period and state FE. SE clustered at 2-digit industry \times state. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We next ask whether pre-existing overhead share predicts how firms weather the cost shock. We measure firm overhead share in either 2003 or 2005, and the measure 3 year survival and growth. Note that for the pre-period, the 2006 endpoint is the very beginning of the post-period, this may attenuate our estimates.

We estimate this using stacked cross-sections at $t \in \{2003, 2005\}$:

$$\begin{aligned}
 y_{f,t+3} = & \beta_1 \cdot m_{f,t} + \beta_2 \cdot (m_{f,t} \times \text{Post}) + \beta_3 \cdot (m_{f,t} \times E_i) \\
 & + \beta_4 \cdot (m_{f,t} \times \text{Post} \times E_i) \\
 & + \gamma_1 \cdot E_i + \gamma_2 \cdot (\text{Post} \times E_i) + \gamma_3 \cdot \log N_{f,t} + \alpha_{jt} + \alpha_s + \varepsilon_f,
 \end{aligned} \tag{13}$$

where $m_{f,t}$ is the overhead share at baseline, $\text{Post} = \mathbf{1}[t = 2005]$, and $y_{f,t+3}$ is either three-year log employment growth or an indicator for survival to $t + 3$. The coefficient β_1 captures the baseline relationship between overhead share and outcomes; β_2 and β_3 capture any common time trend or pre-existing difference for exposed firms; and β_4 tests whether the overhead share-outcome relationship is differentially stronger for exposed firms after the shock.

Table 13 reports the results. First we notice that overhead share in the pre-period is associated with higher growth and modestly higher survival rates, this is consistent with our main specifications. Second, we see that high-exposure firms in the post period have lower growth rates (consistent with Table 11), and also have higher exit rates. However when we examine the triple difference, we see that higher baseline overhead share attenuates the negative growth and survival results. That is, even among high exposure firms, firms with a higher share of overhead have higher growth and survival rates, consistent with what we saw in the main text. This is consistent with the interpretation that overhead share reflects underlying firm characteristics that also determine resilience to adverse shocks.

Table 13: Overhead Share, MW Exposure, and Firm Outcomes

	(1)	(2)
	Growth3	Survived3
E_i	0.063** (0.029)	-0.007** (0.003)
$E_i \times \text{Post}$	-0.047*** (0.010)	-0.013*** (0.004)
Baseline Overhead	0.032*** (0.009)	0.001*** (0.000)
Baseline Overhead \times Post	0.028*** (0.009)	0.007* (0.004)
Baseline Overhead $\times E_i$	-0.027 (0.017)	-0.002** (0.001)
Baseline Overhead \times Post $\times E_i$	0.028* (0.014)	0.020*** (0.007)
N	232,484	263,028

Notes: Stacked cross-sections: base years 2003 and 2005. Post is base year 2005. E_i is baseline share of sub-MW employment ≥ 0.15 . Controls: $\log N_{f,t}$. FE: 2-digit industry, state, base year. SE clustered at 2-digit industry \times state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.3 Discussion

The minimum wage variation provides three complementary pieces of evidence.

First, the within-firm scaling elasticities are unchanged for treated firms and closely match our baseline estimates. Firms that contract because of the cost shock follow the same occupational scaling relationships as firms that change size for other reasons.

Second, treated firms become more overhead-intensive because frontline employment contracts, not because overhead employment expands. The shock therefore moves firms up the overhead distribution without changing the underlying scaling technology.

Third, this shock-induced increase in overhead share does not improve outcomes. Among equally exposed firms, those with higher pre-existing overhead shares are more likely to survive and grow. This is the distinction implied by the framework: overhead share is informative about underlying firm capability, but changing overhead share without changing firm type does not improve performance.

7 Conclusions

The occupational structure of a firm provides detailed information about how the firm produces. In this paper, we show that one particular dimension of occupational structure, the overhead share, contains meaningful information about firm growth, survival, proxies for productivity, and resilience to shocks. Using matched employer-employee data from Brazil, we document a sharp contrast between within-firm scaling and cross-sectional structure. Within firms, management, professional, and broader overhead employment scale less than proportionally with firm growth. Yet in the cross section, larger and more successful firms employ disproportionately more overhead workers.

This contrast suggests that overhead share is best understood not as a direct driver of firm performance, but as an observable marker of persistent organizational capability. Firms with higher overhead shares are more likely to grow, survive, and withstand shocks, yet firms do not typically improve outcomes by increasing overhead share as they expand. More generally, our findings highlight the importance of distinguishing between cross-sectional patterns generated by selection and the margins along which firms actually adjust internally.

The paper also proposes a novel way to classify occupations. Rather than grouping jobs only by skill or broad functional categories, we classify occupations according to how they scale with firm growth. This yields an industry-specific distinction between frontline and overhead labor that links detailed occupations to the firm's production process and, in turn, to firm dynamics.

Our evidence from the minimum wage shock reinforces this interpretation. Firms exposed to the increase shrink and become more overhead-intensive because frontline employment contracts, but the underlying within-firm scaling relationships remain unchanged. Among equally exposed firms, those that entered the shock with higher overhead shares are more resilient. This distinction between *being* high-overhead and *becoming* high-overhead provides additional evidence that overhead share reflects pre-existing firm capability rather than independently improving performance.

More broadly, the paper points to occupational structure as a useful observable proxy for otherwise hidden differences in firm type, organizational capital, or managerial capability. This perspective may be useful in other settings where the researcher observes workforce composition but not the underlying organizational technology directly. A natural direction for future work is to better understand the origins of these persistent differences in organizational structure and the extent to which they can be changed over the life cycle of the firm. More generally, understanding how firms grow requires not only studying which firms become large, but also how the internal organization of growing firms changes along the way.

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Appendix A Data

A.1 Occupation Classification

Workers are classified into six broad occupation groups based on the occupational code:

Group	Description	Emp. Share (%)
Management	Directors, senior managers	7.5
Professional	Engineers, lawyers, analysts	9.3
Clerical	Secretaries, administrative assistants	18.7
Production	Machine operators, assemblers	38.6
Service	Janitors, security guards	16.1
Sales	Salespersons, cashiers	9.7

This classification follows our earlier work using the Occupational Employment Survey in the United States Bauer & Forsythe (2024).

A.2 Firm Quality Measures

We supplement the employment data with firm-level quality measures derived from worker flows and wages in the matched data. All flow-based measures are constructed from a monthly employment panel built from RAIS spell records, which allows us to identify direct employer-to-employer (EE) transitions—cases where a worker appears at a new employer in the month immediately following separation from the previous one—and transitions mediated by nonemployment (EUE), where a gap of one or more months intervenes.

AKM firm effects. We estimate two-way fixed-effect wage decompositions following Abowd et al. (1999). The model regresses log real wages on worker fixed effects, establishment fixed effects, and year indicators, estimated on the connected set of workers and establishments separately for two non-overlapping five-year windows (2003–2007 and 2008–2012). We extract establishment-level firm effects $\hat{\psi}_j$ and aggregate to the firm level as an employment-weighted average across establishments. AKM firm effects are available for 93% of the sample.

Net Poaching Index (NPI). The NPI measures the net balance of direct EE worker flows, constructed in rolling three-year windows:

$$\text{NPI}_f = \frac{\text{EE}_{in} - \text{EE}_{out}}{\bar{N}_f}$$

where EE_{in} and EE_{out} count monthly EE transitions into and out of the firm over the window, and \bar{N}_f is average firm employment. By restricting to direct EE moves, the index captures a revealed-preference signal: workers voluntarily leaving one employer for another without an intervening spell of nonemployment. NPI is available for 96% of the sample.

Poaching share. While NPI captures the net balance of flows, poaching share measures the composition of inflows:

$$\text{Poach}_f = \frac{\text{EE}_{in}}{\text{EE}_{in} + \text{EUE}_{in}}$$

where EUE_{in} counts workers hired after a nonemployment spell. A high poaching share indicates the firm fills positions primarily by attracting workers directly from competitors rather than from the unemployment pool.

A.3 Industry Classification

Establishments are classified by industry using the CNAE (Classificação Nacional de Atividades Econômicas). In our main specifications, we use 2-digit CNAE sections interacted with time period indicators as fixed effects.

A.4 Summary Statistics

Table 14: Summary Statistics: Management and Overhead Shares

	Mgmt+Prof share	Overhead share (M10)
Panel A: Unconditional distribution		
Mean	0.200	0.563
SD	0.234	0.303
p10	0.000	0.133
p25	0.043	0.300
p50	0.103	0.580
p75	0.250	0.838
p90	0.598	0.967
IQR	0.207	0.538
p90 – p10	0.598	0.833
N	2,178,652	2,178,652
Panel B: Within industry \times year		
Mean cell SD	0.171	0.207
Median cell SD	0.158	0.209
Mean cell IQR	0.196	0.279
Median cell IQR	0.157	0.279
N cells	624	624
Panel C: Residualized (within industry \times year)		
SD	0.165	0.240
IQR	0.138	0.324
p10	-0.138	-0.312
p90	0.188	0.283

Notes: Sample: all firms with $N \geq 20$ employees in RAIS, 2003–2013. Mgmt+Prof share = $(N_{\text{mgmt}} + N_{\text{prof}})/N$. Overhead share (M10) = share of employment in occupations classified as coordinative using establishment-level CI test ($\hat{\eta}$ upper 95% CI < 1, mesh E, floor 100). Panel B reports the average and median of within-cell SD and IQR across 2-digit CNAE \times year cells (minimum 30 observations per cell). Panel C reports moments of the residualized variable after subtracting cell means.

Appendix B Construction of the Overhead Measure

The main text uses an overhead share measure that classifies each occupation \times industry cell as either overhead or frontline based on estimated within-firm elasticities. This section describes the construction in detail and compares it with other measures of occupational structure used in the paper.

B.1 Estimation of Cell-Level Elasticities

For each 6-digit CBO occupation \times 2-digit CNAE industry cell, we estimate the within-establishment elasticity of cell-specific employment with respect to total establishment employment at a 3-year horizon:

$$\Delta_3 \log n_{ej} = \eta_j \cdot \Delta_3 \log N_e + \gamma_w + \varepsilon_{ej}$$

where e indexes establishments, j indexes occupation \times industry cells, and γ_w absorbs 3-year window fixed effects. We restrict to establishments with at least 100 employees and cells with at least 10 observations and 10 distinct establishments, weighting by average employment between t and $t + 3$.

B.2 Classification Rule

A cell j is classified as **overhead** if we can reject the null that the elasticity is at least one at the 95% confidence level:

$$\hat{\eta}_j + 1.96 \cdot \text{SE}(\hat{\eta}_j) < 1$$

All remaining cells are classified as **frontline**. This is a conservative classification: a cell is only labeled overhead if there is statistically significant evidence that the occupation scales less than proportionally with establishment growth.

The following table shows the share of employment classified as overhead by broad occupation group. Management occupations are predominantly overhead across industries (78% of cells), while production occupations are split roughly evenly. The classification is industry-specific: the same occupation code can be overhead in one industry and frontline in another.

Table 15: Overhead Classification by Occupation Group

Occupation group	Cells	Overhead	% Overhead
Management	2,708	2,106	77.8%
Professional	3,801	2,538	66.8%
Clerical	1,968	1,298	66.0%
Production	3,456	1,788	51.7%
Service	982	573	58.4%
Sales	152	64	42.1%
Total	13,067	8,367	64.0%

Notes: Each cell is an occupation (6-digit CBO) \times industry (2-digit CNAE) pair. A cell is classified as overhead if the upper 95% CI of its establishment-level employment elasticity is below 1. Occupation groups follow the 6-group CBO aggregation.

B.3 Examples

The following table illustrates this industry specificity. Office assistants and clerks are classified as overhead in some industries (where they perform coordination functions) and frontline in others (where they are part of the core production process).

Occupation	Industry	$\hat{\eta}$		Class
Office assistant	Business svcs	0.773	[0.74, 0.80]	Overhead
Office assistant	Health/social	0.971	[0.92, 1.02]	Frontline
General clerk	Public admin.	0.702	[0.67, 0.74]	Overhead
General clerk	Chemicals	0.942	[0.86, 1.03]	Frontline
Archivist	Construction	0.699	[0.67, 0.72]	Overhead
Archivist	Motor veh. trade	0.922	[0.83, 1.01]	Frontline
Receptionist	Business svcs	0.683	[0.65, 0.72]	Overhead
Receptionist	Motor veh. trade	0.944	[0.86, 1.03]	Frontline

Figure 4 shows the employment-weighted distribution of estimated cell-level elasticities. Most mass lies between 0.4 and 1.2, with the overhead classification capturing the left tail.

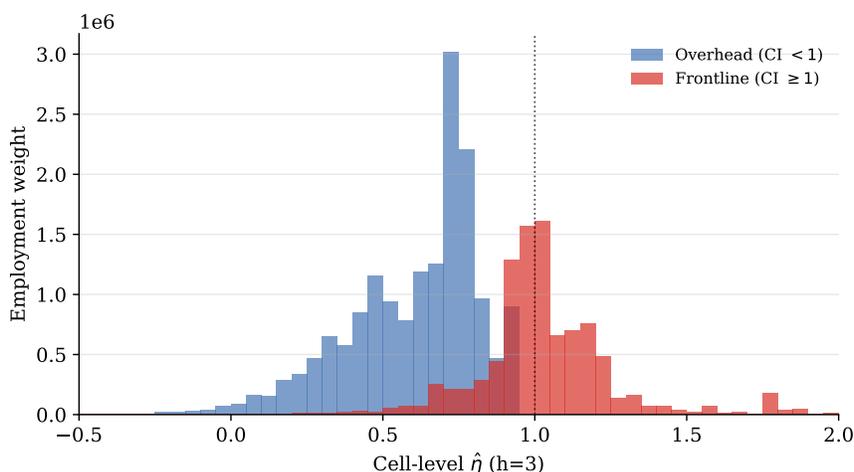


Figure 4: Distribution of cell-level elasticities ($\hat{\eta}_j$), employment-weighted.

B.4 Firm-Level Overhead Share

For each firm-year, we compute the overhead share as:

$$s_f^{OH} = \frac{\sum_{j \in \text{overhead}} n_{fj}}{N_f}$$

the fraction of total firm employment in cells classified as overhead. This is the primary measure used throughout the paper.

Figure 5 shows the mean overhead share by broad industry. Production-goods sectors have overhead shares around 50–55%, while professional services are somewhat higher.

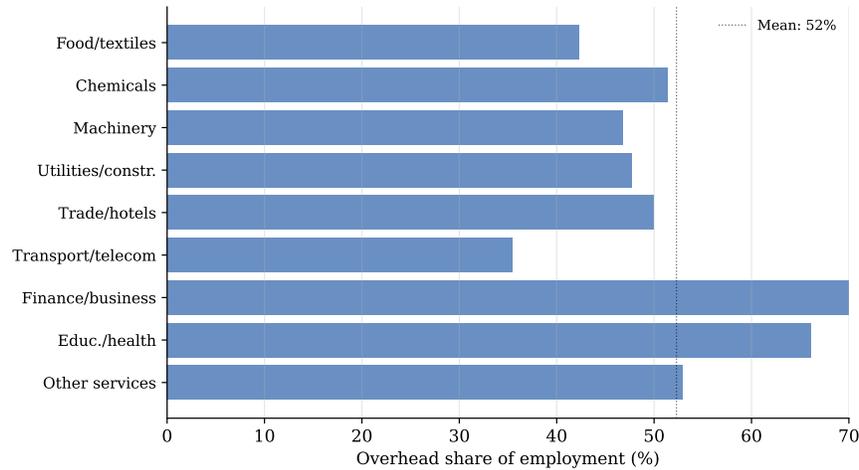


Figure 5: Mean overhead share by broad industry group.

B.5 Relationship to Management + Professional Share

A natural alternative is s^{MP} , the combined management and professional employment share. Figure 6 compares the two measures across industries. While correlated, the overhead measure is substantially broader: it captures non-managerial coordination roles (e.g., HR clerks, accountants, IT support) that scale sublinearly with firm growth but are not classified as management or professional occupations.

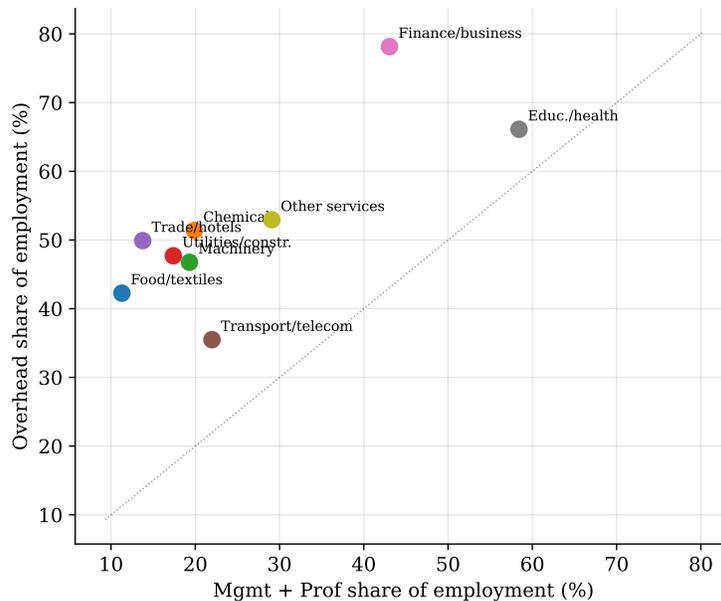


Figure 6: Overhead share vs. Mgmt+Prof share, by industry.

B.6 Other Measures in the Horse Race

The horse race table (Appendix E) compares three summary measures of occupational structure:

- s^{MP} (**Mgmt+Prof share**): The combined share of management and professional employment. Simple, transparent, and available in most administrative datasets. Does not account for the industry-specific nature of occupational roles.
- s^{OH} (**Overhead share**): Our primary measure, constructed as described above. Broader than s^{MP} and industry-specific, but requires estimation of cell-level elasticities.
- **Distance to industry mean**: For each firm, the Euclidean distance between its occupation-group share vector and the mean vector for its 5-digit industry \times year cell:

$$d_f = \sqrt{\sum_{k=1}^6 (s_{fk} - \bar{s}_{jk})^2}$$

This captures overall compositional distinctiveness without distinguishing the direction of deviation. A firm with an unusually high management share and a firm with an unusually high production share both have high distance.

B.7 Robustness to Classification Threshold

The following table shows how the composition of overhead employment changes under alternative classification thresholds. As the threshold becomes more restrictive (requiring stronger evidence of $\eta < 1$), fewer cells are classified as overhead, but the core set—management-heavy cells with low elasticities—remains stable.

Cutoff	% Cells	% Emp	Composition of overhead bin (%)					
			Mgmt	Prof	Cler	Prod	Serv	Sales
CI < 1.0	66.2	63.1	14	25	26	16	18	2
CI < 0.9	58.7	52.8	16	26	28	15	15	1
CI < 0.8	50.0	38.1	16	24	30	14	16	1
CI < 0.7	40.7	22.9	21	33	15	15	16	1
CI < 0.5	22.5	8.1	19	38	16	15	11	0

Appendix C Within-Firm Elasticities

Table 16: Within-Firm Scaling Elasticities

	(1) Pooled	(2) 20–49	(3) 50–149	(4) 150–499	(5) 500+
Management	0.743*** (0.003)	0.707*** (0.004)	0.753*** (0.004)	0.797*** (0.006)	0.827*** (0.009)
Professional	0.756*** (0.003)	0.743*** (0.005)	0.753*** (0.005)	0.790*** (0.007)	0.833*** (0.013)
Clerical	0.864*** (0.002)	0.865*** (0.003)	0.877*** (0.004)	0.872*** (0.006)	0.882*** (0.008)
Production	1.021*** (0.003)	1.008*** (0.003)	1.028*** (0.004)	1.031*** (0.007)	0.992*** (0.012)
Service	0.790*** (0.003)	0.770*** (0.005)	0.797*** (0.005)	0.819*** (0.008)	0.843*** (0.014)
Sales	0.831*** (0.006)	0.835*** (0.006)	0.848*** (0.009)	0.839*** (0.017)	0.792*** (0.029)
N firm-windows	824,818	397,606	246,738	121,276	59,198
N unique firms	191,968	134,152	73,382	30,644	12,058

Notes: Each row is a separate regression: $\Delta_3 \log n_{fj} = \eta \cdot \Delta_3 \log N_f + \alpha_{\text{ind} \times \text{window}} + \varepsilon_f$. Stacked panel of rolling 3-year windows, 2003–2013. Continuing firms with $N \geq 20$ at baseline and $n_{fj} > 0$ at both endpoints. 2-digit CNAE \times window FE. SE clustered at firm level in parentheses. Cols (2)–(5) split by baseline firm size. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A: Growing vs. shrinking

Table 17: Stability of η : Interaction Tests

	Mgmt	Prof	Cler	Prod	Serv	Sales
$\hat{\eta}$ (base)	0.774*** (0.004)	0.766*** (0.005)	0.884*** (0.003)	1.016*** (0.004)	0.815*** (0.005)	0.829*** (0.008)
$\hat{\delta}$ (\times Shrinking)	-0.076*** (0.007)	-0.024** (0.010)	-0.049*** (0.006)	0.011 (0.007)	-0.062*** (0.009)	0.007 (0.017)
N	824,818					

Panel B: Time period

	Mgmt	Prof	Cler	Prod	Serv	Sales
$\hat{\eta}$ (base: 03–06)	0.743*** (0.004)	0.770*** (0.006)	0.864*** (0.004)	1.014*** (0.004)	0.786*** (0.006)	0.833*** (0.009)
$\hat{\delta}_1$ (\times 06–09)	-0.003 (0.005)	-0.020*** (0.007)	0.003 (0.005)	0.012** (0.005)	-0.004 (0.007)	-0.011 (0.012)
$\hat{\delta}_2$ (\times 09–13)	0.003 (0.006)	-0.020** (0.008)	-0.002 (0.005)	0.008 (0.006)	0.019** (0.008)	0.009 (0.013)
N	824,818					

Panel C: AKM ψ quartile

	Mgmt	Prof	Cler	Prod	Serv	Sales
$\hat{\eta}$ (base: Q1)	0.728*** (0.005)	0.747*** (0.006)	0.855*** (0.004)	1.016*** (0.005)	0.791*** (0.007)	0.831*** (0.010)
$\hat{\delta}_2$ (\times Q2)	0.023*** (0.007)	0.006 (0.009)	0.012* (0.006)	0.011 (0.007)	0.006 (0.009)	0.009 (0.014)
$\hat{\delta}_3$ (\times Q3)	0.023*** (0.007)	0.011 (0.009)	0.014** (0.006)	0.008 (0.007)	0.000 (0.009)	0.009 (0.014)
$\hat{\delta}_4$ (\times Q4)	0.007 (0.007)	0.019** (0.009)	-0.001 (0.006)	0.009 (0.007)	-0.011 (0.010)	-0.020 (0.016)
N	788,873					

Notes: Each panel adds an interaction to the base within-firm specification. Panel A: growing vs. shrinking ($\hat{\delta} \approx 0$ means symmetric scaling). Panel B: windows grouped into three periods (2003–06, 2006–09, 2009–13). Panel C: AKM firm effect quartiles assigned at baseline. 2003–2013. 2-digit industry \times window FE throughout. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix D Cross-Sectional Elasticities

Panel A: Mgmt + Prof

Table 18: Cross-Sectional Elasticity by Firm Group

	(1) New births	(2) New to sample	(3) Cont: Growers	(4) Cont: Shrinkers	(5) Cont: Stable	(6) Exiters	(7) Pooled
$\hat{\eta}$	0.873*** (0.005)	0.892*** (0.003)	0.968*** (0.003)	0.958*** (0.003)	0.981*** (0.004)	0.880*** (0.006)	0.945*** (0.002)
N	60,136	308,216	415,172	239,217	121,463	80,275	1,224,479
Share	4.9%	25.2%	33.9%	19.5%	9.9%	6.6%	100.0%

Panel B: Overhead

	(1) New births	(2) New to sample	(3) Cont: Growers	(4) Cont: Shrinkers	(5) Cont: Stable	(6) Exiters	(7) Pooled
$\hat{\eta}$	0.976*** (0.004)	0.970*** (0.002)	1.007*** (0.002)	0.980*** (0.002)	1.000*** (0.002)	0.977*** (0.004)	1.002*** (0.001)
N	72,127	365,843	451,548	258,599	133,677	90,756	1,372,550
Share	5.3%	26.7%	32.9%	18.8%	9.7%	6.6%	100.0%

Notes: Cross-sectional regressions estimated within each firm group. 2-digit industry \times year FE. 2003–2013. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A: Mgmt + Prof

Table 19: Cross-Sectional Elasticity by Firm Group and Size Bin

	(1) New births	(2) New to sample	(3) Cont: Growers	(4) Cont: Shrinkers	(5) Cont: Stable	(6) Exiters	(7) Pooled
20-49	0.658*** (0.016)	0.699*** (0.008)	0.840*** (0.009)	0.834*** (0.015)	0.822*** (0.015)	0.729*** (0.016)	0.783*** (0.005)
50-149	0.882*** (0.030)	0.933*** (0.015)	1.004*** (0.012)	0.949*** (0.013)	1.041*** (0.021)	0.851*** (0.024)	0.976*** (0.008)
150-499	1.116*** (0.060)	1.028*** (0.021)	1.015*** (0.015)	1.020*** (0.020)	1.031*** (0.026)	0.997*** (0.051)	1.026*** (0.012)
500+	1.065*** (0.051)	1.030*** (0.016)	1.032*** (0.012)	1.028*** (0.017)	1.003*** (0.020)	0.977*** (0.055)	1.024*** (0.011)

Panel B: Overhead

	(1) New births	(2) New to sample	(3) Cont: Growers	(4) Cont: Shrinkers	(5) Cont: Stable	(6) Exiters	(7) Pooled
20-49	0.891*** (0.013)	0.844*** (0.006)	0.986*** (0.006)	0.949*** (0.011)	0.958*** (0.010)	0.909*** (0.013)	0.963*** (0.004)
50-149	0.959*** (0.026)	1.000*** (0.011)	1.033*** (0.008)	1.003*** (0.010)	1.036*** (0.014)	0.964*** (0.020)	1.025*** (0.006)
150-499	1.093*** (0.053)	0.969*** (0.015)	0.977*** (0.009)	0.988*** (0.014)	0.972*** (0.017)	1.023*** (0.037)	0.989*** (0.008)
500+	1.001*** (0.038)	1.013*** (0.009)	1.006*** (0.007)	0.963*** (0.011)	0.998*** (0.009)	1.011*** (0.029)	0.996*** (0.006)

Notes: Cross-sectional elasticity estimated within each baseline size bin. SE in parentheses, clustered at firm level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A: Mgmt + Prof

Table 20: Cross-Sectional Elasticity by Firm Group and Age

	(1) New births	(2) New to sample	(3) Cont: Growers	(4) Cont: Shrinkers	(5) Cont: Stable	(6) Exiters	(7) Pooled
Age 0-2	0.873*** (0.005)	0.761*** (0.007)	0.860*** (0.010)	0.911*** (0.012)	0.894*** (0.020)	0.821*** (0.014)	0.840*** (0.004)
Age 3-7	—	0.803*** (0.006)	0.878*** (0.006)	0.876*** (0.008)	0.903*** (0.010)	0.800*** (0.011)	0.851*** (0.004)
Age 8+	—	0.863*** (0.005)	0.940*** (0.004)	0.929*** (0.006)	0.940*** (0.006)	0.889*** (0.010)	0.921*** (0.003)

Panel B: Overhead

	(1) New births	(2) New to sample	(3) Cont: Growers	(4) Cont: Shrinkers	(5) Cont: Stable	(6) Exiters	(7) Pooled
Age 0-2	0.976*** (0.004)	0.919*** (0.006)	0.980*** (0.006)	0.963*** (0.009)	0.968*** (0.013)	0.937*** (0.011)	0.963*** (0.003)
Age 3-7	—	0.939*** (0.005)	0.986*** (0.004)	0.953*** (0.006)	0.977*** (0.007)	0.921*** (0.008)	0.969*** (0.003)
Age 8+	—	0.959*** (0.004)	1.001*** (0.003)	0.966*** (0.004)	0.987*** (0.004)	0.997*** (0.006)	0.990*** (0.002)

Notes: Cross-sectional elasticity estimated within each age group. New births are age 0 by definition (Col 1 only populated for age 0–2). SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix E Performance and Firm Quality

Table 21: Occupation Shares and Firm Performance

	(1) Size	(2) Growth ₃	(3) Surv ₃	(4) AKM $\hat{\psi}$	(5) NPI _{EE}	(6) π_j
Management	-0.016*** (0.002)	0.023*** (0.001)	0.003*** (0.001)	0.004*** (0.001)	0.010*** (0.002)	0.057*** (0.001)
Professional	0.051*** (0.003)	0.041*** (0.002)	0.031*** (0.002)	0.015*** (0.002)	0.018*** (0.004)	0.180*** (0.002)
Clerical	-0.018*** (0.002)	0.020*** (0.002)	0.015*** (0.001)	-0.004** (0.002)	0.008*** (0.001)	0.034*** (0.001)
Production	-0.013*** (0.002)	-0.047*** (0.002)	-0.052*** (0.002)	-0.002 (0.002)	-0.021*** (0.002)	-0.129*** (0.001)
Service	0.043*** (0.002)	-0.014*** (0.002)	0.007*** (0.002)	0.008*** (0.002)	-0.001 (0.001)	-0.038*** (0.001)
Sales	-0.040*** (0.001)	-0.012*** (0.002)	0.008*** (0.002)	-0.019*** (0.002)	-0.008*** (0.002)	-0.032*** (0.001)
<i>N</i>	2,178,651	1,079,330	1,455,833	2,006,550	2,176,483	2,173,769

Notes: Standardized bivariate regressions: each cell is a separate regression. Both y and share standardized to unit variance, so coefficients are in SD units. 2-digit CNAE \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 22: Summary Measures of Organizational Structure and Firm Performance

	(1) Size	(2) Growth ₃	(3) Surv ₃	(4) AKM $\hat{\psi}$	(5) NPI _{EE}	(6) π_j
<i>Panel A: Bivariate</i>						
s^{MP} (Mgmt+Prof)	0.023*** (0.002)	0.050*** (0.002)	0.025*** (0.002)	0.014*** (0.002)	0.022*** (0.003)	0.179*** (0.001)
Overhead share (M1)	-0.069*** (0.002)	0.021*** (0.002)	0.037*** (0.001)	0.004** (0.002)	-0.003* (0.002)	0.056*** (0.001)
Overhead share (M5, firm CI)	-0.038*** (0.002)	0.040*** (0.002)	0.039*** (0.002)	0.009*** (0.002)	0.002 (0.002)	0.071*** (0.001)
Overhead share (M10, estab CI)	-0.013*** (0.002)	0.041*** (0.002)	0.046*** (0.002)	0.001 (0.002)	0.002** (0.001)	0.059*** (0.001)
Overhead continuous	-0.078*** (0.002)	0.031*** (0.002)	0.031*** (0.001)	0.003* (0.002)	0.003 (0.002)	0.063*** (0.001)
Distance to ind. mean	-0.140*** (0.002)	0.026*** (0.002)	-0.046*** (0.001)	-0.014*** (0.002)	0.001 (0.001)	-0.037*** (0.001)
<i>Panel B: Controlling for log N</i>						
s^{MP} (Mgmt+Prof)	—	0.054*** (0.002)	0.024*** (0.002)	0.013*** (0.002)	0.021*** (0.003)	0.175*** (0.001)
Overhead share (M1)	—	0.006*** (0.002)	0.041*** (0.001)	0.008*** (0.002)	-0.002 (0.002)	0.067*** (0.001)
Overhead share (M5, firm CI)	—	0.031*** (0.002)	0.041*** (0.002)	0.012*** (0.002)	0.003 (0.002)	0.077*** (0.001)
Overhead share (M10, estab CI)	—	0.037*** (0.002)	0.046*** (0.002)	0.002 (0.002)	0.002** (0.001)	0.061*** (0.001)
Overhead continuous	—	0.014*** (0.002)	0.035*** (0.001)	0.008*** (0.002)	0.004** (0.002)	0.076*** (0.001)
Distance to ind. mean	—	-0.000 (0.002)	-0.039*** (0.001)	-0.006*** (0.002)	0.003** (0.001)	-0.016*** (0.001)
<i>N</i>	2,178,651	1,079,330	1,455,833	2,006,550	2,176,483	2,173,769

Notes: Standardized bivariate regressions: each cell is a separate regression. Panel A: bivariate. Panel B: controlling for log N (Col 1 excluded). Both y and m standardized to unit variance. 2-digit CNAE \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 23: Organizational Structure and Performance: Controlling for Other Measure

	(1)	(2)	(3)	(4)	(5)	(6)
	Size	Growth ₃	Surv ₃	AKM $\hat{\psi}$	NPI _{EE}	π_j
<i>Panel A: s^{OH} controlling for s^{MP}</i>						
	-0.014*** (0.002)	0.040*** (0.002)	0.045*** (0.002)	0.001 (0.002)	0.001 (0.001)	0.053*** (0.001)
<i>Panel B: s^{OH} controlling for s^{MP} and $\log N$</i>						
	—	0.036*** (0.002)	0.045*** (0.002)	0.002 (0.002)	0.001 (0.001)	0.055*** (0.001)
<i>Panel C: s^{MP} controlling for s^{OH}</i>						
	0.024*** (0.002)	0.049*** (0.002)	0.023*** (0.002)	0.014*** (0.002)	0.022*** (0.003)	0.176*** (0.001)
<i>Panel D: s^{MP} controlling for s^{OH} and $\log N$</i>						
	—	0.053*** (0.002)	0.022*** (0.002)	0.013*** (0.002)	0.021*** (0.003)	0.173*** (0.001)
<i>N</i>	2,178,651	1,079,330	1,455,833	2,006,550	2,176,483	2,173,769

Notes: Each cell is a separate regression of a standardized outcome on the focal measure, controlling for the other measure (and $\log N$ in Panels B and D). Both y and regressors standardized to unit variance. 2-digit CNAE \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix F Persistence and Dynamics

Panel A: Mgmt+Prof and Balance

Table 24: Organizational Inertia: Lagged Size and Current Structure

	$s = 1$	$s = 3$	$s = 5$	$s = 7$	$s = 10$
Mgmt+Prof	0.012*** (0.001)	0.008*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.007*** (0.001)
Balance	-0.012*** (0.001)	-0.008*** (0.001)	-0.006*** (0.001)	-0.006*** (0.001)	-0.007*** (0.001)
N	2,130,243	2,271,860	2,391,855	2,485,995	2,574,649

Panel B: Overhead and Frontline

	$s = 1$	$s = 3$	$s = 5$	$s = 7$	$s = 10$
Overhead	0.023*** (0.001)	0.018*** (0.001)	0.018*** (0.001)	0.017*** (0.001)	0.016*** (0.001)
Frontline	-0.023*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.017*** (0.001)	-0.016*** (0.001)
N	2,130,243	2,271,860	2,391,855	2,485,995	2,574,649

Notes: Each column is a separate regression at lag s : $(m_{it}/n_{it}) = \alpha + \beta(s) \log n_{i,t-s} + \gamma \log n_{it} + \delta_{jt} + \varepsilon_{it}$. Reported coefficient is $\hat{\beta}(s)$ on lagged log size, controlling for current log size. δ_{jt} : 2-digit CNAE \times year FE. Lagged size drawn from raw annual files for $t - s < 2003$. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 25: Successive Controls: Birth Composition and Firm Outcomes

Spec	Employment Growth			Survival		
	$h=1$	$h=3$	$h=5$	$h=1$	$h=3$	$h=5$
Birth share	0.029*** (0.005)	0.090*** (0.015)	0.138*** (0.030)	0.005* (0.003)	0.014 (0.009)	0.029* (0.016)
+ $\log N_t$	0.030*** (0.005)	0.090*** (0.015)	0.132*** (0.030)	0.004 (0.003)	0.013 (0.009)	0.028* (0.016)
+ s_t (current)	0.003 (0.007)	0.047** (0.019)	0.069* (0.037)	0.001 (0.003)	0.000 (0.011)	0.007 (0.020)
+ $\log N_t + s_t$	0.010 (0.007)	0.057*** (0.019)	0.073** (0.037)	-0.001 (0.003)	-0.005 (0.011)	0.002 (0.020)
+ $\log N_t + \Delta_3 \log N$	0.031*** (0.005)	0.092*** (0.015)	0.133*** (0.030)	0.002 (0.003)	0.008 (0.009)	0.023 (0.016)
All controls	0.012* (0.007)	0.061*** (0.019)	0.076** (0.037)	-0.005 (0.003)	-0.013 (0.011)	-0.009 (0.020)
+ $\log N_t + s_{\text{birth}} \times \text{age}$	0.036*** (0.013)	0.111*** (0.039)	0.224** (0.087)	0.005 (0.007)	0.014 (0.023)	-0.015 (0.048)
$\beta_{\text{birth} \times \text{age}}$	-0.001 (0.002)	-0.005 (0.009)	-0.026 (0.024)	-0.000 (0.001)	-0.000 (0.005)	0.012 (0.013)
N	66,212	29,927	10,738	76,455	42,253	18,058

Notes: Each column reports the coefficient on birth-year overhead share (s_{birth}^{OH}) from a firm-level regression. All specifications include 2-digit industry \times birth-year fixed effects. ***, **, * denote significance at 1%, 5%, 10%.

Table 26: Persistence Decomposition: Full vs. Balanced Panel

	$h=1$ Full	$h=1$ Bal.	$h=3$ Full	$h=3$ Bal.	$h=5$ Full
<i>Panel A: Current composition only</i>					
β_{s_t} (current)	0.867*** (0.001)	0.858*** (0.001)	0.724*** (0.001)	0.715*** (0.002)	0.629*** (0.002)
β_{growth}	-0.039*** (0.001)	-0.043*** (0.001)	-0.031*** (0.001)	-0.033*** (0.001)	-0.027*** (0.001)
$\beta_{\log N}$	0.0002** (0.0001)	0.0001 (0.0001)	0.0006** (0.0002)	0.0002 (0.0003)	0.0008** (0.0004)
N	1,651,259	657,788	1,079,330	655,083	685,763
<i>Panel B: Adding birth composition</i>					
β_{s_t} (current)	0.807*** (0.003)	0.787*** (0.006)	0.636*** (0.007)	0.616*** (0.010)	0.527*** (0.011)
$\beta_{s_{\text{birth}}}$	0.057*** (0.003)	0.061*** (0.006)	0.083*** (0.007)	0.086*** (0.010)	0.090*** (0.011)
β_{growth}	-0.030*** (0.001)	-0.028*** (0.003)	-0.021*** (0.001)	-0.024*** (0.002)	-0.021*** (0.002)
$\beta_{\log N}$	0.0011*** (0.0004)	0.0018** (0.0008)	0.0017* (0.0009)	0.0014 (0.0014)	0.0029* (0.0016)
N	184,257	45,473	96,674	45,382	47,742

Notes: Dependent variable: overhead share at $t+h$. Panel A regresses s_{t+h} on current share s_t , employment growth, and $\log N$. Panel B adds birth-year share s_{birth} . “Bal.” restricts to the 5-year balanced panel (firms observed at both t and $t+5$). 2-digit industry \times year FE. ***, **, * denote significance at 1%, 5%, 10%.

Table 27: Birth Composition Predicts Firm Outcomes: Full vs. Balanced Panel

	Full Sample						Balanced 5-yr Panel			
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Gr ₁	Gr ₃	Surv ₁	Surv ₃
β_{birth}	0.031*** (0.008)	0.065*** (0.014)	0.133*** (0.021)	0.103*** (0.006)	0.121*** (0.008)	0.108*** (0.009)	0.004 (0.014)	0.070*** (0.019)	0.037*** (0.008)	0.037*** (0.008)
N	50,889	29,259	16,875	68,462	52,152	36,739	15,682	15,716	16,875	16,875
R^2	0.075	0.107	0.129	0.085	0.074	0.061	0.099	0.134	0.056	0.079

Notes: Each cell reports the coefficient on birth-year overhead share (s_{birth}^{OH}) from a firm-level regression with 2-digit industry \times birth-year FE and $\log N_t$ control. The balanced 5-yr panel restricts to firms observed at both t and $t+5$. ***, **, * denote significance at 1%, 5%, 10%.

Appendix G Derivations

G.1 Homotheticity and the Within-Firm Elasticity

We prove that any homothetic production function implies a within-firm overhead elasticity of exactly one.

Fix a firm type θ . If $F(H, D; \theta)$ is homothetic in (H, D) , then conditional cost minimization implies

$$\frac{H}{D} = \psi\left(\frac{w_H}{w_D}, \theta\right),$$

independent of output. Hence, if θ and relative input prices are fixed within a firm, $\eta_W = 1$.

For homothetic $F(\cdot, \cdot; \theta)$, the conditional cost function factors as output times a unit cost index:

$$C(y, w_H, w_D; \theta) = y \cdot c(w_H, w_D; \theta).$$

By Shephard's lemma, conditional factor demands are

$$H(y, w_H, w_D; \theta) = \frac{\partial C}{\partial w_H} = y \cdot \frac{\partial c}{\partial w_H}, \quad D(y, w_H, w_D; \theta) = \frac{\partial C}{\partial w_D} = y \cdot \frac{\partial c}{\partial w_D}.$$

Therefore

$$\frac{H}{D} = \frac{\partial c / \partial w_H}{\partial c / \partial w_D},$$

which depends on (w_H, w_D, θ) but not on output y . Both inputs scale proportionally with output, so $d \ln H / d \ln y = 1$. Since total employment $N = H + D$ with H/D fixed, $d \ln H / d \ln N = 1$.

This result covers Cobb-Douglas ($Y = H^\alpha D^{1-\alpha}$), CES ($Y = [\alpha H^\rho + (1 - \alpha) D^\rho]^{1/\rho}$), and any production function that can be written as $Y = G(f(H, D))$ where f is homogeneous of degree one.

Note that the proposition does not say H/D is the same across firms. Different firm types θ can have different input ratios, generating cross-sectional variation in overhead shares. The claim is narrower: *within* a firm (where θ and input prices are fixed), H/D does not vary with scale, and therefore $\eta_W = 1$.

Factor-augmenting heterogeneity as a special case. The general result above allows θ to shift the input ratio across firms. Factor augmentation, $Y = F(\theta H, D)$, is one mechanism through which this occurs: the effective price of overhead becomes w_H/θ , so higher- θ firms use relatively more overhead. This generates $\eta_{CS} \neq 1$ in the cross-section. But within any given firm, θ is fixed, so the effective price ratio does not change with scale, and $\eta_W = 1$ still holds. Factor augmentation therefore explains why $\eta_{CS} \neq \eta_W$ but cannot explain why $\eta_W < 1$.⁶

G.2 Derivation of the Power Function from Constant η

We show that, if the within-firm elasticity is exactly constant in firm size for a given firm type, then the implied reduced-form overhead requirement is a power function.

⁶We treat H and D as headcounts throughout. The theorem also requires the maintained assumption that within-category labor quality does not change systematically with firm scale, or equivalently that the production function is written in efficiency units and headcounts are proportional to those units. If, for example, managers become systematically higher quality as firms grow, a homothetic technology over efficiency units could generate changing headcount ratios even with $\eta_W = 1$ in efficiency units.

Write the overhead requirement as $H = g(N, \theta)$, where θ indexes firm-specific organizational characteristics. The within-firm elasticity, holding θ fixed, is

$$\eta_W(N) = \frac{\partial \log g}{\partial \log N}.$$

The data show η_W is approximately constant across firm sizes: the management elasticity ranges from 0.71 to 0.83 over a 25-fold range of firm sizes (Table 16)).

Imposing $\eta_W(N) = \eta$ for all N :

$$\begin{aligned} \frac{d \log g}{d \log N} &= \eta \\ \Rightarrow \log g &= \eta \cdot \log N + c(\theta) \\ \Rightarrow g(N, \theta) &= \exp(c(\theta)) \cdot N^\eta = \kappa(\theta) \cdot N^\eta \end{aligned} \tag{14}$$

where $\kappa(\theta) = \exp(c(\theta))$ is an integration constant that may differ across firms. The power function is the unique solution to this ordinary differential equation.

Appendix H Alternative Measure: Mgmt+Prof

The main text presents results using the overhead/frontline classification. Here we show the corresponding results using the management + professional share (s^{MP}).

Cross-Section vs. Within

Table 28: Cross-Section vs. Within-Firm Scaling: Mgmt+Prof vs. Balance

	(1) Within	(2) Cross-sect	Gap
Mgmt + Prof	0.817*** (0.002)	0.947*** (0.002)	0.130
Balance	1.023*** (0.001)	1.000*** (0.001)	-0.023
N	936,738	1,926,867	

Notes: Management + Professional (occ groups 1+2) vs. Balance (occ groups 3–6). Gap = Column (2) – Column (1). 2003–2013. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Performance Across Horizons

Performance and Firm Quality

Table 29: Mgmt+Prof Share and Firm Performance Across Horizons

	(1) Gr ₁	(2) Gr ₃	(3) Gr ₅	(4) Surv ₁	(5) Surv ₃	(6) Surv ₅	(7) Surv ₇
<i>Panel A</i>							
s^{MP}	0.038*** (0.001)	0.094*** (0.004)	0.146*** (0.007)	0.008*** (0.001)	0.031*** (0.002)	0.049*** (0.003)	0.061*** (0.005)
<i>Panel B: Controlling for log N</i>							
s^{MP}	0.042*** (0.002)	0.101*** (0.004)	0.155*** (0.007)	0.008*** (0.001)	0.030*** (0.002)	0.046*** (0.003)	0.058*** (0.005)
N	1,651,259	1,079,330	685,763	1,931,099	1,455,833	1,033,629	649,659

Notes: Mgmt+Prof share. OLS regressions: each cell is a separate regression. Panel B adds control for log N . Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t+h$. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 30: Mgmt+Prof Share and Firm Performance

	(1) Size	(2) Growth ₃	(3) Surv ₃	(4) AKM $\hat{\psi}$	(5) NPI _{EE}	(6) π_j
<i>Panel A</i>						
s^{MP}	0.023*** (0.002)	0.050*** (0.002)	0.025*** (0.002)	0.014*** (0.002)	0.022*** (0.003)	0.179*** (0.001)
<i>Panel B: Controlling for log N</i>						
s^{MP}	—	0.054*** (0.002)	0.024*** (0.002)	0.013*** (0.002)	0.021*** (0.003)	0.175*** (0.001)
N	2,178,651	1,079,330	1,455,833	2,006,550	2,176,483	2,173,769

Notes: Mgmt+Prof share. Each cell is a separate regression. Panel B controls for log N . Both dependent and independent variables are standardized to unit variance. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Birth Prediction

Table 31: Birth Mgmt+Prof Share Predicts Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
s^{MP}	0.041*** (0.013)	0.043* (0.024)	0.076** (0.037)	0.070*** (0.010)	0.062*** (0.012)	0.075*** (0.015)	0.072*** (0.017)
<i>Panel B: Controlling for log N</i>							
s^{MP}	0.046*** (0.012)	0.055** (0.024)	0.092*** (0.036)	0.065*** (0.009)	0.058*** (0.012)	0.071*** (0.015)	0.069*** (0.017)
N	50,889	29,259	16,875	68,462	52,152	36,739	23,181

Notes: Mgmt+Prof share. Firms at age 0 with $N \geq 20$. Panel B controls for $\log N$. Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t+h$. 2-digit industry \times birth year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Persistence

Table 32: Persistence of Mgmt+Prof Structure

	$h = 1$ (1)	$h = 3$ (2)	$h = 5$ (3)
<i>Panel A: Persistence</i>			
s_t	0.892*** (0.001)	0.775*** (0.002)	0.695*** (0.003)
Growth $_h$	-0.019*** (0.000)	-0.013*** (0.000)	-0.010*** (0.000)
$\log N_t$	0.0003*** (0.0001)	0.0009*** (0.0001)	0.0015*** (0.0002)
N	1,651,259	1,079,330	685,763
<i>Panel B: Birth share as predictor</i>			
s_t	0.826*** (0.004)	0.665*** (0.010)	0.565*** (0.016)
s_{birth}	0.050*** (0.004)	0.076*** (0.009)	0.083*** (0.015)
Growth $_h$	-0.018*** (0.001)	-0.013*** (0.001)	-0.010*** (0.001)
$\log N_t$	-0.0007*** (0.0002)	-0.0015** (0.0006)	-0.0027** (0.0011)
N	184,257	96,674	47,742

Notes: Mgmt+Prof share. Panel B restricts to firms founded 2003 or later. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

MW: Effect on Occupational Composition

Table 33: Event Study Coefficients: Binary Exposure — Mgmt+Prof ($D_i \times \mathbf{1}[t = t']$)

	(1) log N	(2) log WB	(3) s^{MP}	(4) Balance
2003	-0.004 (0.005)	0.012** (0.006)	0.004*** (0.001)	-0.004*** (0.001)
2004	-0.007* (0.004)	-0.003 (0.004)	0.003** (0.001)	-0.003** (0.001)
2005	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
2006	0.001 (0.003)	0.044*** (0.004)	0.001 (0.001)	-0.001 (0.001)
2007	-0.015*** (0.004)	0.052*** (0.005)	0.001 (0.001)	-0.001 (0.001)
2008	-0.023*** (0.005)	0.057*** (0.006)	0.002** (0.001)	-0.002** (0.001)
2009	-0.030*** (0.007)	0.071*** (0.007)	0.003** (0.001)	-0.003** (0.001)
2010	-0.030*** (0.007)	0.087*** (0.008)	0.003** (0.001)	-0.003** (0.001)
2011	-0.049*** (0.009)	0.072*** (0.010)	0.003** (0.001)	-0.003** (0.001)
2012	-0.059*** (0.011)	0.079*** (0.012)	0.002 (0.002)	-0.002 (0.002)
2013	-0.063*** (0.012)	0.084*** (0.013)	0.001 (0.002)	-0.001 (0.002)
N	1,319,475	1,319,475	1,319,475	1,319,475

Notes: Binary exposure: $D_i = \mathbf{1}[b_i \geq 0.15]$. s^{MP} = management + professional employment share. Balance = $1 - s^{MP}$. Reference year: 2005. Firm, state×year, and industry×year FE. SE clustered at ind×state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

MW: Within-Firm Elasticity Shift

Table 34: Within-Firm Elasticity Shift:
Binary Exposure (Mgmt+Prof/Balance)

	(1) Mgmt+Prof	(2) Balance
$\Delta \log N$ (base $\hat{\eta}$)	0.786*** (0.011)	1.031*** (0.004)
$\Delta \log N \times \text{Post}$	0.029** (0.013)	-0.009 (0.006)
$\Delta \log N \times \text{Post} \times E_i$	0.005 (0.022)	-0.001 (0.009)
N	208,591	242,771

Notes: Binary exposure: E_i is baseline share of sub-MW employment ≥ 0.15 . Mgmt+Prof = occ groups 1+2; Balance = occ groups 3-6. Stacked 2-year differences: Pre (2003→2005) and Post (2005→2007). 2-digit industry \times period and state FE. SE clustered at 2-digit industry \times state. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

MW: Performance \times Exposure

Table 35: Mgmt+Prof Share, MW Exposure, and Firm Outcomes

	(1) Growth3	(2) Survived3
E_i	0.051* (0.027)	-0.009*** (0.003)
$E_i \times \text{Post}$	-0.030*** (0.006)	-0.004 (0.003)
Baseline Overhead	0.086*** (0.015)	0.001* (0.000)
Baseline Overhead \times Post	0.023* (0.012)	0.018*** (0.007)
Baseline Overhead $\times E_i$	-0.021 (0.025)	-0.001 (0.001)
Baseline Overhead \times Post $\times E_i$	-0.010 (0.017)	0.014** (0.007)
N	232,484	263,028

Notes: Stacked cross-sections: base years 2003 and 2005. Post is base year 2005. E_i is baseline share of sub-MW employment ≥ 0.15 . Controls: $\log N_{f,t}$. FE: 2-digit industry, state, base year. SE clustered at 2-digit industry \times state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix I Alternative Classification: Task Groups

As a complementary classification, we assign each worker to one of five task groups following Lewandowski et al. (2020). The mapping proceeds from CBO-2002 occupation codes to ISCO-88 via a structural correspondence, and then to task content scores derived from O*NET. Each occupation is assigned to the task dimension in which it is most intensive:

Task Group	Description	Examples
NRCA	Non-routine cognitive analytical	Research, engineering, data analysis
NRCP	Non-routine cognitive personal	Management, teaching, negotiation
RC	Routine cognitive	Bookkeeping, record-keeping, filing
RM	Routine manual	Machine operation, assembly
NRM	Non-routine manual	Construction, cleaning, driving

We use the NRCA (non-routine cognitive analytical) share as the task-based analog of overhead share, and show that the main results replicate under this alternative classification.

Within-Firm Elasticities

Table 36: Within-Firm Scaling Elasticities (Task Groups)

	(1) Pooled	(2) 20–49	(3) 50–149	(4) 150–499	(5) 500+
NRCA	0.708*** (0.003)	0.676*** (0.005)	0.716*** (0.005)	0.774*** (0.007)	0.771*** (0.011)
NRCP	0.652*** (0.004)	0.627*** (0.005)	0.647*** (0.005)	0.684*** (0.008)	0.770*** (0.015)
RC	0.878*** (0.002)	0.886*** (0.003)	0.884*** (0.004)	0.879*** (0.006)	0.889*** (0.008)
RM	0.947*** (0.003)	0.940*** (0.004)	0.955*** (0.004)	0.966*** (0.007)	0.931*** (0.013)
NRM	0.941*** (0.003)	0.911*** (0.004)	0.942*** (0.004)	0.977*** (0.007)	0.990*** (0.012)
N firm-windows	541,454	205,042	171,712	107,253	57,447
N unique firms	124,845	73,208	52,612	27,190	11,724

Notes: Task group robustness. Each row is a separate regression: $\Delta_3 \log n_{fj} = \eta \cdot \Delta_3 \log N_f + \alpha_{\text{ind} \times \text{window}} + \varepsilon_f$. Stacked panel of rolling 3-year windows, 2003–2013. Continuing firms with $N \geq 20$ at baseline and $n_{fj} > 0$ at both endpoints. 2-digit industry \times window FE. SE clustered at firm level in parentheses. Cols (2)–(5) split by baseline firm size. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 37: Scaling Elasticities by Task Group \times Industry

	Agri	Food	Chem	Mach	Util	Trade	Trans	Fin	Educ	Other
NRCA	0.54*** (0.02)	0.65*** (0.01)	0.72*** (0.01)	0.72*** (0.01)	0.62*** (0.01)	0.70*** (0.01)	0.73*** (0.01)	0.75*** (0.01)	0.90*** (0.01)	0.78*** (0.02)
NRCP	0.52*** (0.02)	0.56*** (0.01)	0.53*** (0.01)	0.54*** (0.01)	0.37*** (0.01)	0.71*** (0.01)	0.62*** (0.01)	0.70*** (0.01)	1.02*** (0.01)	0.78*** (0.02)
RC	0.69*** (0.01)	0.84*** (0.01)	0.88*** (0.01)	0.88*** (0.01)	0.70*** (0.01)	0.96*** (0.00)	0.93*** (0.01)	0.90*** (0.01)	0.96*** (0.01)	0.91*** (0.01)
RM	0.88*** (0.02)	1.07*** (0.01)	1.04*** (0.01)	1.04*** (0.01)	0.87*** (0.01)	0.98*** (0.01)	0.99*** (0.01)	0.85*** (0.01)	0.65*** (0.02)	0.77*** (0.02)
NRM	1.05*** (0.01)	0.80*** (0.01)	0.85*** (0.01)	0.86*** (0.02)	1.10*** (0.00)	0.92*** (0.01)	0.90*** (0.01)	0.93*** (0.01)	0.94*** (0.01)	0.94*** (0.01)
<i>N</i> per cell	35,968	98,776	129,702	39,144	61,245	295,436	64,293	156,501	98,319	56,917

Notes: Task group robustness. Each cell is a separate regression within one 2-digit industry industry. Specification identical to Table 36 Col (1). SE in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Cross-Section vs. Within

Panel A: Five task groups

Table 38: Five-Column Elasticity Comparison (Task Groups)

	(1) Within	(2) Firm FE	(3) XS changers	(4) XS WF	(5) XS pooled	Atten.
NRCA	0.708*** (0.003)	0.694*** (0.003)	0.755*** (0.003)	0.762*** (0.003)	0.737*** (0.003)	0.029
NRCP	0.652*** (0.004)	0.639*** (0.003)	0.727*** (0.003)	0.731*** (0.003)	0.712*** (0.002)	0.060
RC	0.878*** (0.002)	0.874*** (0.002)	0.945*** (0.002)	0.946*** (0.002)	0.937*** (0.002)	0.059
RM	0.947*** (0.003)	0.933*** (0.003)	0.829*** (0.003)	0.828*** (0.003)	0.822*** (0.002)	-0.125
NRM	0.941*** (0.003)	0.921*** (0.003)	0.870*** (0.003)	0.872*** (0.003)	0.864*** (0.003)	-0.078
<i>N</i>	541,454	1,151,055	747,249	941,260	1,151,054	

Panel B: NRCA vs. Complement

	(1) Within	(2) Firm FE	(3) XS changers	(4) XS WF	(5) XS pooled	Atten.
NRCA	0.708*** (0.003)	0.694*** (0.003)	0.755*** (0.003)	0.762*** (0.003)	0.737*** (0.003)	0.029
Complement	1.008*** (0.001)	1.007*** (0.000)	0.999*** (0.000)	0.998*** (0.000)	0.998*** (0.000)	-0.010
<i>N</i>	541,454	1,151,055	747,249	941,260	1,151,054	

Notes: Task group robustness. Col (1): within-firm $\Delta \log N_{fjt}$ on $\Delta \log N_{ft}$. Col (2): panel with firm FE. Col (3): cross-sectional, restricted to firm-changers. Col (4): cross-sectional, restricted to within-firm sample. Col (5): cross-sectional, pooled. Attenuation = Col (5) – Col (1). 2003–2013. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Birth Prediction

Table 39: Birth Structure Predicts Outcomes (Task Groups)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
NRCA share	0.095*** (0.021)	0.160*** (0.041)	0.246*** (0.064)	0.132*** (0.015)	0.125*** (0.020)	0.089*** (0.024)	0.102*** (0.029)
<i>Panel B: Controlling for log N</i>							
NRCA share	0.117*** (0.021)	0.198*** (0.040)	0.288*** (0.062)	0.113*** (0.015)	0.110*** (0.020)	0.076*** (0.024)	0.092*** (0.029)
<i>N</i>	50,889	29,259	16,875	68,462	52,152	36,739	23,181

Notes: Task group robustness (NRCA share). Firms at age 0 with $N \geq 20$. Panel B controls for $\log N$. Gr_{*h*}: *h*-year log employment growth (survivors only). Surv_{*h*}: indicator for firm observed in RAIS at $t + h$. 2-digit industry \times birth year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix J Establishment-Level Robustness

The main text uses firm-level analysis (aggregating across all establishments of the same firm). Here we show that the key results hold at the establishment level.

Cross-Section vs. Within

Table 40: Cross-Section vs. Within-Establishment Scaling

	(1) Within	(2) Cross-sect	Gap
Mgmt + Prof	0.799*** (0.003)	0.923*** (0.002)	0.124
Balance	1.022*** (0.001)	0.997*** (0.001)	-0.025
<i>N</i>	795,647	2,270,795	

Notes: Establishment-level analysis. Unit of observation: establishment ($N \geq 20$ employees per establishment). Gap = Column (2) – Column (1). 2003–2013. SE in parentheses, clustered at establishment level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Performance and Quality

Table 41: Summary Measures and Establishment Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Size	Growth ₃	Surv ₃	AKM $\hat{\psi}$	NPI _{EE}	PageRank	π_j
<i>Panel A: Bivariate</i>							
Mgmt+Prof (estab)	0.021*** (0.002)	0.040*** (0.002)	0.016*** (0.001)	0.012*** (0.002)	0.045*** (0.001)	0.034*** (0.005)	0.178*** (0.001)
Mgmt+Prof (firm)	0.015*** (0.002)	0.034*** (0.002)	0.015*** (0.001)	0.007*** (0.002)	0.052*** (0.001)	0.028*** (0.005)	0.180*** (0.001)
Distance to ind. mean	-0.102*** (0.001)	0.029*** (0.002)	-0.060*** (0.001)	-0.014*** (0.001)	-0.010*** (0.001)	-0.005*** (0.002)	-0.020*** (0.001)
<i>Panel B: Controlling for log N</i>							
Mgmt+Prof (estab)	—	0.045*** (0.002)	0.013*** (0.001)	0.010*** (0.002)	0.045*** (0.001)	0.030*** (0.005)	0.175*** (0.001)
Mgmt+Prof (firm)	—	0.037*** (0.002)	0.013*** (0.001)	0.006*** (0.002)	0.052*** (0.001)	0.026*** (0.005)	0.177*** (0.001)
Distance to ind. mean	—	0.008*** (0.002)	-0.045*** (0.001)	-0.006*** (0.001)	-0.007*** (0.001)	0.030*** (0.003)	-0.006*** (0.001)
<i>N</i>	2,571,152	922,226	1,696,107	2,242,787	2,568,639	2,167,387	2,564,304

Notes: Establishment-level robustness check. Unit of observation: establishment (14-digit CNPJ). $N \geq 20$ employees per establishment. Occupation shares (including Management + Professional) are computed within each establishment, not aggregated to the firm level. SE in parentheses, clustered at establishment level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standardized bivariate regressions. Mgmt+Prof (estab) = management + professional share computed within the individual establishment (14-digit CNPJ). Mgmt+Prof (firm) = management + professional share computed at the firm level (8-digit CNPJ root, aggregating across all establishments of the firm) and merged back to each establishment. No coord share or LASSO scores at establishment level. 2-digit CNAE \times year FE.

Appendix K Small-Firm Robustness ($N \geq 5$)

The main analysis restricts to firms with $N \geq 20$ employees. Here we show the key results are robust to including firms down to $N \geq 5$, however point estimates are attenuated.

Cross-Section vs. Within

Table 42: Cross-Section vs. Within-Firm Scaling: Overhead

	(1) Within	(2) Cross-sect	Gap
Overhead	0.917*** (0.001)	0.938*** (0.001)	0.021
Frontline	1.024*** (0.001)	0.923*** (0.001)	-0.101
N	3,061,661	8,436,325	

Notes: Gap = Column (2) – Column (1). 2003–2013. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Performance Across Horizons

Table 43: Overhead Share and Firm Performance Across Horizons

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
s^{OH}	0.015*** (0.000)	0.034*** (0.001)	0.049*** (0.002)	0.012*** (0.000)	0.025*** (0.001)	0.030*** (0.001)	0.034*** (0.001)
<i>Panel B: Controlling for log N</i>							
s^{OH}	0.008*** (0.000)	0.021*** (0.001)	0.034*** (0.002)	0.013*** (0.000)	0.028*** (0.001)	0.034*** (0.001)	0.038*** (0.001)
N	6,740,880	4,425,868	2,808,374	7,963,518	6,010,643	4,267,867	2,701,469

Notes: Overhead share. OLS regressions: each cell is a separate regression. Panel B adds control for $\log N$. Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t + h$. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Birth Prediction

Table 44: Birth Overhead Share Predicts Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
s^{OH}	0.017*** (0.003)	0.031*** (0.005)	0.060*** (0.007)	0.059*** (0.002)	0.077*** (0.003)	0.070*** (0.003)	0.059*** (0.004)
<i>Panel B: Controlling for log N</i>							
s^{OH}	-0.002 (0.003)	0.005 (0.005)	0.033*** (0.007)	0.074*** (0.002)	0.089*** (0.003)	0.079*** (0.003)	0.066*** (0.004)
N	351,853	211,513	123,111	477,056	363,482	254,938	160,884

Notes: Overhead share. Firms at age 0 with $N \geq 5$. Panel B controls for $\log N$. Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t + h$. 2-digit industry \times birth year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix L Employment-Weighted Robustness

The main specifications are unweighted. Here we show the key results using employment-weighted regressions.

Cross-Section vs. Within

Table 45: Cross-Section vs. Within-Firm Scaling: Overhead

	(1) Within	(2) Cross-sect	Gap
Overhead	0.902*** (0.020)	1.001*** (0.005)	0.099
Frontline	1.243*** (0.066)	0.953*** (0.019)	-0.290
<i>N</i>	966,990	2,142,928	

Notes: Gap = Column (2) – Column (1). 2003–2013. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Performance Across Horizons

Table 46: Overhead Share and Firm Performance Across Horizons

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
s^{OH}	0.107*** (0.034)	0.249** (0.107)	0.368** (0.166)	0.009*** (0.002)	0.022*** (0.007)	0.033*** (0.012)	0.045*** (0.016)
<i>Panel B: Controlling for log N</i>							
s^{OH}	0.105*** (0.033)	0.245** (0.103)	0.362** (0.157)	0.009*** (0.002)	0.022*** (0.006)	0.033*** (0.011)	0.043*** (0.015)
N	1,651,259	1,079,330	685,763	1,931,099	1,455,833	1,033,629	649,659

Notes: Overhead share. OLS regressions: each cell is a separate regression. Panel B adds control for log N . Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t + h$. 2-digit industry \times year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Birth Prediction

Table 47: Birth Overhead Share Predicts Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr ₁	Gr ₃	Gr ₅	Surv ₁	Surv ₃	Surv ₅	Surv ₇
<i>Panel A</i>							
s^{OH}	0.090*** (0.023)	0.091 (0.062)	0.185 (0.127)	0.090*** (0.012)	0.078*** (0.019)	0.037 (0.029)	0.077*** (0.030)
<i>Panel B: Controlling for log N</i>							
s^{OH}	0.079*** (0.024)	0.081 (0.063)	0.024 (0.144)	0.095*** (0.011)	0.079*** (0.017)	0.043* (0.026)	0.084*** (0.028)
N	50,889	29,259	16,875	68,462	52,152	36,739	23,181

Notes: Overhead share. Firms at age 0 with $N \geq 20$. Panel B controls for $\log N$. Gr _{h} : h -year log employment growth (survivors only). Surv _{h} : indicator for firm observed in RAIS at $t + h$. 2-digit industry \times birth year FE. SE in parentheses, clustered at firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.