Common Ownership and Employee Earnings *

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September 15, 2025

Abstract

Using administrative data in the manufacturing sector from the U.S. Census Bureau, this paper provides the first evidence on the effect of common ownership on employee earnings. Using firms' additions to the S&P 500 index as a shock to their local competitors' common ownership, we find that, after a same-industry competitor enters the S&P 500 index, the average employee earnings of S&P 500 incumbents in the same local labor market decrease. Additionally, these firms' employment increases. These findings are inconsistent with the canonical oligopsony models but our generalized model of oligopsony incorporating a recruitment intensity margin can rationalize them.

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1 Introduction

Ownership of publicly traded U.S. corporations by institutional investors rose from less than 10 percent in the 1950s to 67 percent by 2010 (Blume and Keim, 2012). This growth, coupled with a shift from actively managed funds to passively managed index funds, significantly increased common ownership of publicly traded firms (see, for example, Backus et al., 2021b; Azar and Vives, 2021).[1] This trend raises concerns that a small number of giant asset managers (especially the largest three, BlackRock, Vanguard, and State Street) could effectively control most large publicly traded firms in the near future (Coates, 2018). Increased common ownership could increase firms' employer market power, which in turn could contribute to the wage stagnation since the 1970s (Goshen and Levit, 2022, 2024; Azar and Vives, 2021; Bivens and Mishel, 2015). While this argument is theoretically plausible, how common ownership affects employee earnings in reality has not been studied empirically.

This paper uses establishment-level payroll and employment data from the U.S. Census Bureau to provide the first empirical evidence on the effects of common ownership on employee earnings. We define a local labor market as the interaction between a commuting zone (CZ) and an industry (Rinz, 2020). To measure the degree of common ownership, we combine data on institutional ownership of publicly traded firms with data on firms' employment shares in each local labor market.

Our first descriptive finding is that average common ownership in local labor markets increased significantly in the United States over the last four decades. The average common ownership in a local labor market increased from 1.7 percentage points in the 1980s to 4.4 percentage points between 2010 and 2020. Based on the modified Herfindahl-Hirschman Index (MHHI) developed in Bresnahan and Salop (1986), this implies that, in

[1] For earlier contributions that documented the secular rise of common ownership, see also Azar (2012); Fichtner et al. (2017); Azar (2017, 2020a).

the average local labor market in 2010s, local common ownership contributed a 392-point increase to employment MHHI, taking the average employment HHI across local labor markets as 1,100 points in Berger, Herkenhoff and Mongey (2022).[2] The Department of Justice (DOJ) and the Federal Trade Commission (FTC) consider market concentration increases of at least 100 points as significant, according to the 2023 Horizontal Merger Guidelines.[3] They presume such an increase is likely to substantially lessen competition or tend to substantially enhance employer market power when occurring in or creating a highly concentrated market. Among all local labor markets, 7.4% of them have MHHI delta larger than or equal to 100 points. If we restrict to local labor markets with strictly positive common ownership, the fraction is 44%. The evidence suggests that the overall level of common ownership is high enough to plausibly matter for antitrust regulation in local labor markets.

To identify the causal effect of common ownership on employee earnings, we focus on the manufacturing sector and use data from the Annual Survey of Manufactures (ASM) and the Census of Manufactures (CMF) from the U.S. Census Bureau. Focusing on manufacturing offers two large advantages. First, the product markets of manufacturers tend to be more national or international than in other industries such as services. Therefore, relative to other industries, manufacturers' product market power is less likely to be affected by increased common ownership among local industry competitors. As a result, focusing on the manufacturing sector allows us to better isolate the effects of common ownership on local labor markets from possible effects on local product markets. Second, ASM and CMF provide data on production inputs, which makes manufacturing the sector where we can estimate wage markdowns most credibly (Yeh, Macaluso and Hershbein, 2022)

[2] In a local labor market, MHHI is decomposed to employment HHI and MHHI delta. MHHI delta captures local common ownership concentration and is computed as (1-employment HHI)$\times$level of local common ownership. Taking average employment HHI to be 0.11 (1,100 points), and local common ownership to be 4.4 percentage points in 2010s, MHHI delta=10,000*(1-0.11)*4.4/100=392 points.

[3] https://www.justice.gov/atr/2023-merger-guidelines.

and enables us to separate wage effects from productivity effects of common ownership. We follow Antón, Ederer, Giné and Schmalz (2023) and Boller and Scott Morton (2020) and use a firm's addition to the S&P 500 index as a shock to the common ownership of its local competitors that already belong to the S&P 500 index (S&P 500 Incumbents). We move analysis down from the national to the local level, as in the merger analyses of Prager and Schmitt (2021) and Arnold (2021). The key idea is that a firm entering the S&P 500 index, which we refer to as a focal firm, experiences a sharp increase in institutional ownership. This, in turn, increases the overlap between its ownership and that of local S&P 500 incumbent employers. As a result, the average common ownership of S&P 500 incumbents increases after focal firms in the same local labor markets are added to the S&P 500 index. After a focal firm enters the S&P 500 index, it generates heterogeneous treatment statuses across local labor markets depending on whether the focal firm operates in a market. Based on this variation, we use a difference-in-differences (DiD) design to estimate the causal effect of common ownership on employee earnings of S&P 500 incumbents across local labor markets by contrasting outcome changes among S&P 500 incumbents in highly-affected versus in little-affected local labor markets.

In DiD analysis, we compare the changes in average employee earnings of S&P 500 incumbents' plants in local labor markets where at least one focal firm enters the S&P 500 index (treated plants) to the changes in S&P 500 incumbents' plants in local labor markets where no firm enters or exits the S&P 500 index within the estimation window (control plants). The two main identification assumptions underlying the DiD design are that (1) the employee earnings of treated plants would have evolved similarly to that of control plants in the absence of S&P 500 index addition events and (2) the post-treatment outcome changes are due to common ownership changes rather than other coincident changes.

As expected, S&P 500 index additions indeed lead to an increase in the common ownership of treated plants. Compared to control plants, the common ownership of treated plants on average increases 0.98 percentage points during a five-year window after treat-

ment. The magnitude of the estimated effect is economically meaningful and represents a 7.7% increase relative to the sample mean of treated plants one year prior to treatment. The change is broad-based, driven by both the Big Three and other shareholders, and both large and small shareholders.

S&P 500 index additions lead to lower growth of employee earnings among treated plants. The average annual earnings per full-time equivalent (FTE) worker of treated plants are 0.83% lower compared to the counterfactual during the post-treatment period. Given that the average annual earnings per FTE among treated plants is $67,260 (in 2020 dollars) one year prior to treatment, estimates suggest that an employee of treated plants with average pay earns $558 less per year, or $2,791 less in total relative to the counterfactual during the first five years after treatment. The magnitudes of the estimated effects increase over time. By the end of the fifth year after treatment, the average annual earnings per FTE worker of treated plants is 1.9% (or $1,278) lower compared to that of control plants. Our results are robust to using alternative sources of shareholder holding data (Amel-Zadeh et al., 2022) and alternative measures of common ownership (Gilje et al., 2020), as well as are robust to controlling for common board directors between S&P 500 incumbents and their local competitors (Begley et al., 2025; Herrera-Caicedo et al., 2025) and labor productivity.

A challenge in interpreting a firm's addition to the S&P 500 index as a shock to common ownership of local S&P 500 incumbents arises if the entry event influences outcomes through alternative channels. One channel could be through lowering the focal firm's cost of capital, rather than through common ownership alone. We discuss this alternative interpretation in Section 3.4.1. If a focal firm's cost of capital falls and intensifies competition for its local competitors, one would anticipate a deterioration in the performance of S&P 500 incumbents' plants. However, our results point the other way, suggesting this channel is not empirically dominant. Relatedly, the negative earnings effect could be consistent with a composition effect. Suppose new entrants strengthen and crowd out

local S&P 500 incumbents' ability to recruit high-skilled workers, forcing them to substitute towards lower-skilled, lower-wage workers but without affecting the price per skill unit. S&P 500 index entry events would then lead to lower average annual earnings per FTE worker among S&P 500 incumbents but not through reducing hourly wages that any given worker would be paid. We discuss this alternative interpretation in Section 3.4.2. Analysis of job postings data finds that S&P 500 incumbents do not reduce their demand for worker skill after S&P index entry events, evidence against this composition channel driving the negative earnings effect.

Common ownership can negatively impact employee earnings through two main channels: (i) directly via increased local employer market power of commonly-owned firms, and (ii) indirectly via increased local product market power, which reduces equilibrium output and labor demand. While we cannot completely disentangle the two channels, the product market power channel is unlikely to be the only mechanism operating for two reasons. First, the product markets of manufacturers tend to be more national or international, and focusing on the manufacturing sector helps mitigate the concern. Second, an increased local product market power would predict a decrease in employment among treated S&P 500 incumbents relative to the counterfactual after treatment, whereas our findings show the opposite.

Our results on employee earnings could be consistent with the classical monopsony model or other models of employer market power. The classical monopsony model predicts that increased common ownership would reduce total employment, while other models—for example, Jarosch, Nimczik and Sorkin (2024)—show that changes in employer market power could affect employee earnings without affecting employment levels. However, we find that employment of treated plants *increases* after S&P 500 index additions relative to the counterfactual, which is not consistent with prior models of labor market power that we are aware of. The combination of negative effects on employee earnings with positive effects on employment cannot be rationalized in a model with a

stable, upward-sloping labor supply curve. One way to rationalize this pair of findings is a channel that increases labor supply, such as the endogenous intensity of a firm's labor recruitment efforts. As employers' market power to markdown employee earnings rises, their incentive to invest in hiring increases. This mechanism appears in dynamic search models such as Rudanko (2023) and Gottfries and Jarosch (2024).

We present a model of oligopsony with common ownership and search frictions that generates predictions that, under some conditions, align with the empirical findings. The model summarized in Section 4 and presented formally in Appendix IA.2 builds on the generalized monopsony framework of Manning (2006) in which the supply of workers to a firm is a function not only of its posted wages, but also of its expenditure on recruitment (Forsythe and Weinstein, 2025). This paper extends the "generalized model of monopsony" of Manning (2006) from a one-firm setting to a multi-firm setting with strategic interaction. It predicts that higher common ownership among firms in a local labor market would lead to lower equilibrium wages per employee, but its impact on recruitment intensity is ambiguous. On the one hand, higher common ownership could lower a firm's incentive to spend on recruiting. The reason is that the firm internalizes more of its rivals' profits, and increased recruitment intensity leads to more competition, reducing the profits of the firm's competitors. We term this the "competition channel." On the other hand, a firm's incentive to recruit could increase when common ownership rises. Higher common ownership leads to lower equilibrium wages per employee, resulting in higher profits per recruited employee. The firm is incentivized to spend more resources on recruiting, and we term this the "profit-per-worker channel." The effect of common ownership on equilibrium recruitment intensity and employment is the net effect of the "profit-per-worker channel" and the "competition channel," and depends on model parameters. When the "profit-per-worker channel" dominates, the proposed model could rationalize our empirical findings.

This paper builds off two strands of literature. First, it adds to the literature on the

real effects of common ownership. The first contribution is providing the first measures of common ownership at the local firm and local labor market level, including changes over time, as previewed earlier. The second contribution is providing evidence on the causal effects of common ownership on employee earnings at the plant level. Most of the prior studies focus on the effects of common ownership on product markets (see, for example, Azar et al., 2018; Newham et al., 2018; Ruiz-Pérez, 2019; Backus et al., 2021a; Ederer and Pellegrino, forthcoming), corporate investment (Gutiérrez and Philippon, 2016, 2018), management incentives (Antón et al., 2023), and innovation (López and Vives, 2019; Anton et al., 2024). There are two theoretical papers, Goshen and Levit (2022) and Goshen and Levit (2024), that argue that common ownership has been a key driver of wage stagnation in the United States since 1980. Their main argument is that common owners push for more shareholder-friendly governance, which discourages managers from making long-term investments. As a result, firm investment declines, labor demand falls, and wages become lower relative to a counterfactual without common ownership.

In the literature, little is known about the effects of common ownership on labor market outcomes empirically. This paper starts to fill this gap. To the best of our knowledge, this is the first empirical evidence of the common ownership effects on labor markets beyond compensation for corporate executives.

The paper also relates to the literature on imperfect competition between employers in labor markets. The labor economics literature has found that firms often face upward-sloping labor supply curves, indicating the existence of employer market power (Ashenfelter et al., 2010; Manning, 2011; Staiger et al., 2010; Falch, 2010; Ransom and Sims, 2010; Matsudaira, 2013; Goolsbee and Syverson, 2023; Dube et al., 2020; Manning, 2021; Bassier et al., 2022; Sokolova and Sorensen, 2021). Some prior studies measure employer market power by employer concentration, in particular, the Herfindahl-Hirschman Index (HHI) based on either job posting share (Azar et al., 2020) or employment or payroll share (Benmelech et al., 2020; Prager and Schmitt, 2021; Rinz, 2020; Arnold, 2021; Qiu and Sojourner,

2023). The conclusion from these studies is that HHI in a labor market is negatively associated with employee earnings at the market or plant level. However, employer concentration is far from the only source of employer market power. Search friction or job differentiation can give firms wage-setting power, even in unconcentrated markets (Manning, 2021; Card et al., 2018; Azar et al., 2019). While we find new evidence that common ownership increased in recent decades, these papers show that employment concentration has not. We contribute to this literature by showing that rising connections among firms via common shareholders may have increased employer market power, reduced employee earnings, and increased employment in the U.S. over recent decades.

2 Data Description

2.1 Local Labor Market Definition

We define a local labor market as the interaction between a commuting zone (CZ) (2000 version) and a four-digit NAICS industry (2017 version). A CZ is a cluster of contiguous counties that reflect the local economies where people live and work. There are 709 CZs in the U.S. Ideally, a local labor market is defined as the interaction between a commuting zone and an occupation as in Azar, Marinescu and Steinbaum (2020). However, ASM and CMF do not provide data on worker occupation. Given the constraints, we define a local labor market as the interaction between a commuting zone and an industry as in Rinz (2020). Handwerker and Dey (2023) show that, within an MSA, the correlation between the payroll-based concentration at the occupation$\times$MSA level and the one at the industry$\times$MSA level is very high.

2.2 *ASM, CMF, and LBD Data*

To measure the annual earnings per full-time equivalent (FTE) worker at the plant level, we use data in the Annual Survey of Manufacturers (ASM) and the Census of Manufacturers (CMF) from the U.S. Census Bureau. In non-Census years, the ASM provides comprehensive coverage for the manufacturing plants (two-digit NAICS codes 31-33) in the U.S. with more than 250 employees. It also maintains a randomly selected rotating panel of smaller plants. In Census years, CMF surveys the universe of all manufacturing plants in the U.S., regardless of their size. Responding to the ASM and CMF surveys is mandatory, and companies have incentives to report as accurately as possible. They would receive a nontrivial monetary penalty if they misreport. Combining these two databases allows us to construct a longitudinal panel of manufacturing plants that contain key plant-level variables such as the headcounts, production hours, payroll, value of shipments, value added, and the total factor productivity (TFP). Furthermore, the data enables us to estimate wage markdown based on the methods in the literature (Yeh et al., 2022; Hashemi et al., 2022). Our access to the data ends in 2020. We calculate the number of FTE workers as the working hours of production workers divided by 40*52 plus the headcounts of non-production workers.[4] The plant-level annual earnings per FTE worker are calculated as the total payroll divided by the number of FTE workers.

We further merge ASM and CMF data with the Longitudinal Business Database (LBD) to obtain the 2017 version six-digit NAICS industry, geographic location (zip code, time-invariant county, and state FIPS codes), and the firm to which a plant belongs. In LBD, each plant is assigned a unique longitudinal identifier in LBD (lbdnum), which stays constant even if ownership changes. Each firm is assigned a unique longitudinal identifier (lbdfid). We match a plant to a unique publicly traded firm in Compustat (Gvkey) using the crosswalk provided by the Census Bureau, and further to the firm identifier (Permco)

[4]The ASM and CMF do not report the working hours of non-production workers. We assume non-production workers work full-time.

in the Center for Research in Security Prices (CRSP).

2.3 Common Ownership of Local Firms

To measure common ownership of a firm in a local labor market (local firm), we combine data on the employment share of each firm in a local labor market with data on institutional ownership at the firm level. The employment share of a firm in a local labor market is calculated using the LBD.

Data on institutional ownership (IO) of U.S. publicly traded firms come from the Thomson Reuters 13F database (13F data) between 1980 and 1998 and from Backus, Conlon and Sinkinson (2021b) between 1999 and 2020. In the United States, all institutional investment managers with at least $100 million in assets under management must file the Securities and Exchange Commission's (SEC) Form 13F and disclose information on their securities holdings. We aggregate the data to the fund family level. In Section 3.3.1, we replace the institutional ownership data of S&P 500 firms between 2003 and 2019 with the data from Amel-Zadeh, Kasperk and Schmalz (2022).[5]

Combining 13F data with the employment share of a local firm, we measure the common ownership of a local firm in a year with a set of other local firms. We use information on both publicly traded and privately held firms when constructing the measure. Suppose there are J_m employing firms in a local labor market m. Let ω_{jm} be the employment share for firm j in m. For each shareholder s, let β_{js} be shareholder s's ownership share in j. If j is not publicly traded, then $\beta_{js} \equiv 0$. We maintain a proportional control assumption so that shareholder s's voting share is equal to its control share. We measure firm j's degree of common ownership with firm k using the "profit weight" of Backus et al.

[5]We thank the authors of Amel-Zadeh et al. (2022) for sharing the data. However, their data is currently only available for S&P 500 firms between 2003 and 2019.

(2021b),

$$\lambda_{j,k} \equiv \frac{\sum_{\forall s} \beta_{js}\beta_{ks}}{\sum_{\forall s} \beta_{js}\beta_{js}}, \tag{2.1}$$

If either firm j or k is not publicly traded or not held by any institutional investors, then $\lambda_{j,k} = 0$. The common ownership of a local firm j in market m, λ_{jm}, is calculated below. We scale the expression by $1 - \omega_{jm}$ so that $\sum_{k \neq j} \frac{\omega_{km}}{1-\omega_{jm}} = 1$. The interpretation of λ_{jm} is the average weight that firm j puts on its local labor market competitors' profits.

$$\lambda_{jm} \equiv \sum_{k \neq j} \frac{\omega_{km}}{1 - \omega_{jm}} \times \lambda_{j,k}, \tag{2.2}$$

Given that institutional ownership data are quarterly, we first calculate local firm-level common ownership in each quarter and then take the simple average across all quarters in a year to construct the annual measure. For each local labor market m, the common ownership is,

$$\lambda_m \equiv \sum_{j=1}^{J_m} \omega_j \lambda_{jm}. \tag{2.3}$$

Local labor market–level common ownership has risen each decade since 1980 in the United States. We calculate the employment-weighted average of the common ownership across local labor markets and years within a decade. Common ownership at the local labor market level has trended up over the period 1980—2020 (Figure 1). In the 1980s, local common ownership averaged .7 percentage points and increased to 4.4 percentage points between 2010 and 2020. In Section 3.3.2, we also use the common ownership measure developed in Gilje, Gormley and Levit (2020).

3 Difference-in-Differences Analysis

To examine whether and how common ownership affects employee earnings, we leverage a credibly exogenous shock to the common ownership of a firm that is already part of the S&P 500 index (S&P 500 incumbent) in a local labor market induced by its competitors' additions to the S&P 500 index and estimate the causal effects of common ownership on annual earnings per FTE worker. Section 3.1 introduces the details of the research design. Sections 3.2 and 3.3 report estimation results. Sections 3.4 and 3.5 discuss potential mechanisms.

3.1 Empirical Specification

We follow Antón et al. (2023) and Boller and Scott Morton (2020) and use the addition of a firm to the S&P 500 index (a focal firm) as a shock to the common ownership of an S&P 500 incumbent in a local labor market.[6] Boller and Scott Morton (2020) shows that a firm entering the S&P 500 index experiences a sharp increase in institutional ownership, leading to an increased overlap between the firm and its S&P 500 incumbent competitors via common owners. As a result, the average common ownership of S&P 500 incumbents in a local labor market tends to increase after focal firms enter the S&P 500 index. More importantly, a focal firm's addition to the index does not change the nature of operations and products of S&P 500 incumbents and is also unlikely to alter their visibility to institutional investors or analysts since they are already part of the S&P 500 index. Antón et al. (2023) uses this strategy to study the effect of common ownership on CEO compensation

[6]Following Boller and Scott Morton (2020), we do not extend our analysis to the S&P 500 index exits for the following reasons. If a firm exits the S&P 500 index because it goes bankrupt, is acquired, or goes private, we then do not have institutional ownership data for this firm after it exits the index. It could also affect the employment concentration in a local labor market and employee wages (Azar et al., 2020), hence contaminating the effect of common ownership. Firms could also exit the S&P 500 index and switch to the S&P 400 index or the S&P 600 index, but Boller and Scott Morton (2020) shows that index switching does not lead to a significant change in institutional ownership.

structure.[7]

To study whether and how common ownership affects employee earnings, we focus on the manufacturing sector and compare the changes in average employee earnings of S&P 500 incumbents' plants in local labor markets where at least one focal firm enters the S&P 500 index to the changes in S&P 500 incumbents' plants in local labor markets where no firm enters or exits the S&P 500 index within the estimation window. For each index addition event, the estimation window is set at five years before and after the index addition (eleven years total). Firms that enter the S&P 500 index in the same year are defined as being in the same entry cohort. Combining data on index additions with data on locations, employment, and parent firms of plants, we can measure heterogeneous treatment statuses induced by S&P 500 index additions across local labor markets.

A local labor market is defined to be treated in a cohort if it satisfies the following three conditions during the year of an index addition event: (1) there exists at least one firm employing workers in the local labor market that enters the S&P 500 index; (2) there is no firm that exits the S&P 500 index; and (3) there is at least one S&P 500 incumbent that employs workers in the local labor market. A local labor market is defined to be a control local labor market in a cohort if the following two conditions are satisfied: (1) no firm enters or exits the S&P 500 index within the estimation window; and (2) there is at least one S&P 500 incumbent that employs workers. S&P 500 incumbents' plants in treated (control) local labor markets are treated (control) plants. There are 350 S&P 500 index addition events in our sample. Out of around 8,900 local labor markets,1,100 are

[7]We show that institutional ownership of S&P 500 incumbents does not change after their industry competitors are newly added to the index. For a cohort of S&P 500 index addition events, an S&P 500 incumbent is defined to be treated if it is in the same industry (4-digit CRSP SIC code) of focal firms and no firms in the industry exit the S&P 500 index, and equal to zero if an S&P 500 incumbent is in an industry where no firms enter or exit the S&P 500 index. We further require that control S&P 500 incumbents do not experience any treatment within the estimation window. The average treatment effects are reported in Table IA.1. The results show that after a firm is added to the S&P 500 index, the average changes in the firm-level total institutional ownership and the Top1 institutional ownership of S&P 500 incumbents in the same industry are small and statistically insignificant.

treated involving 250 unique commuting zones and 80 unique industries.[8]

We use a difference-in-differences (DiD) design to estimate the treatment effects of S&P 500 index additions on average annual earnings per FTE worker of S&P 500 incumbents' plants in a local labor market. Table 1 reports the means of common ownership, annual earnings per FTE worker, and the number of FTE workers for treated and control plants one year before S&P 500 index addition events as well as the long-difference in these variables between year $t-1$ and year $t-5$ for S&P 500 index addition events in year t.

We estimate the dynamic and average treatment effects on treated of S&P 500 index additions on employee earnings. Following Cengiz, Dube, Lindner and Zipperer (2019), we first stack the observations across event cohorts and then run the regression in equation (3.1). There are at least two advantages of this specification. First, it aligns treated and control plants by event time and this is equivalent to a setting in which all the events happen at the same time rather than being staggered over time. Second, we use "clean controls" in the sense that control plants are not treated within the estimation window. Using this specification would mitigate the concerns in Goodman-Bacon (2021) on using the canonical two-way fixed effects model to estimate treatment effects in a DiD setting and is in a similar spirit to the method proposed in Callaway and SantAnna (2021).

$$y_{kit} = Treated_{ki} \times \sum_{e=-5 \& e \neq -1}^{5} \beta_e \times \mathbb{1}(t - t_k = e) + \mu_{ki} + \xi_{kj(i)t} + \gamma_{kc(i)t} + \eta_{kq(i)t} + \epsilon_{kit}, \tag{3.1}$$

where k, i, and t index a cohort, a plant of an S&P 500 incumbent, and a year, respectively. t_k is cohort k's year of index addition. y_{kit} is the natural logarithm of annual earnings per FTE worker in plant i in year t in cohort k. μ_{ki} is a set of cohort$\times$plant fixed effects.

[8]To comply with the disclosure requirements of the U.S. Census Bureau, all disclosed numbers are rounded.

$\xi_{kj(i)t}$ is a set of cohort $\times$3-digit NAICS code $\times$year fixed effects. $\gamma_{kc(i)t}$ is a set of cohort $\times$commuting zone $\times$year fixed effects. $\eta_{kq(i)t}$ aims to control for the average change in common ownership before treatment. For each plant i in cohort k, $\Delta CommonOwnership_i$ is calculated as the difference between the plant's common ownership in $t_k - 1$ and the average common ownership from $t_k - 5$ to $t_k - 2$. Within each cohort k, plants are grouped in quartiles of $\Delta CommonOwnership$. The quartile that plant i falls into is denoted as $q(i)$.

The coefficients of interest are β_e, where e indexes years of elapsed time relative to a treatment cohort's entry event. The estimated coefficients capture the dynamics of the difference in average outcomes between treated and control plants over elapsed time. The omitted category is $e = -1$, the year immediately before an index addition event. β_e is interpreted as the average relative change in an outcome between treated and control plants across all cohorts during time e, relative to time -1. If outcomes in treated and control plants are on similar trends before index addition events, then β_{-5}, β_{-4}, β_{-3}, and β_{-2} would be small in magnitude and statistically insignificant.

To estimate the average treatment effect on the treated (changes in all post-treatment elapses relative to all pre-treatment elapses), we estimate the following regression:

$$y_{kit} = \beta \times Treated_{ki} \times \mathbb{1}(t - t_k > 0) + \mu_{ki} + \xi_{kj(i)t} + \gamma_{kc(i)t} + \eta_{kq(i)t} + \epsilon_{kit}, \tag{3.2}$$

The parameter of interest is β, and it measures the average post-treatment change in annual earnings per FTE workers among treated plants relative to that in control plants.

In our sample, we require the values of measures of common ownership, earnings, employment, values of shipments, value added, and wage markdown to be non-missing, and there are around 865,000 observations in the sample.

3.2 Main Results

This section reports the estimated effects of S&P 500 index additions on common ownership and annual earnings per FTE worker of S&P 500 incumbents' plants. We start by estimating Equation 3.1 for common ownership. The trajectories of common ownership among treated and control plants are parallel before focal firms' additions to the S&P 500 index (Figure 2 and Table 2). During the post-treatment period, common ownership of treated plants increases significantly relative to control plants. The common ownership of treated plants on average increases 0.98 percentage points more on average and this is statistically significant at the 1% level. Given that the average common ownership of treated plants one year before treatment is 12.63 percentage points, the estimated average treatment effect is an economically meaningful, 7.7% increase. Focal firms' additions to the S&P 500 index evidently lead to an increase in the common ownership of local S&P 500 incumbents, consistent with the evidence in Boller and Scott Morton (2020).

We next estimate the effects on annual earnings per FTE worker of local S&P 500 incumbents' plants using Equation 3.1. The estimated coefficients during the pre-treatment period are close to zero and statistically insignificant, adding credibility to the maintained parallel trends assumption post-treatment (Figure 3 and Table 3: Column 2). The trajectories of annual earnings per FTE worker between treated and control plants only start to diverge after treatment. The average annual earnings per FTE worker of treated local S&P 500 incumbents decrease 0.83% relative to control plants after focal firms enter the S&P 500 index, statistically significant at the 10% level. Given that the average annual earnings per FTE worker of treated plants one year before treatment is $67,260 (in 2020 dollars), the estimate suggests that an average employee of treated plants earns $558 less per year, or $2,791 in total relative to the counterfactual during the first five years after treatment.

Turning to the dynamic treatment effect in Figure 3, we find that the estimated effects

on employee earnings during the first two years after treatment are smaller and statistically insignificant. But the estimated effect becomes stronger since the third year and the magnitude of the estimated effect increases over elapsed time. By the fifth year after treatment, the magnitude of the estimated negative effect increases to 1.9%, suggesting that the average annual earnings per FTE worker of treated plants is $1,277 lower compared to the one of control plants. Overall, a 7.7% increase in common ownership (Table 2: Column (1)) leads to 0.83% lower employee earnings during the five-year window after treatment (Table 3: Column 1).

We report additional results on alternative measures of employee earnings in Table IA.2, and the patterns are similar to the baseline results. The results show that both annual earnings per employee and annual earnings per production hour of production workers in treated plants tend to decrease after the S&P 500 index addition events relative to the counterfactual, especially since the third year after treatment.

3.3 Robustness

In this section, we conduct several robustness tests to address potential concerns about the main results.

3.3.1 Alternative Data on Ownership

Our results may be specific to the source of institutional ownership data. To explore the robustness to this measurement issue, we supplement the 13F data with the shareholder holding data from Amel-Zadeh et al. (2022). The main advantage of the data is that it contains the share holdings of both institutional and individual investors, but the authors currently only make the data available for S&P 500 firms between 2003 and 2019. In the robustness test, we replace the 13F ownership data of S&P 500 firms between 2003 and 2019 with the shareholder holding data from Amel-Zadeh et al. (2022), and re-

estimate the Equation 3.1. The estimates for common ownership and employee earnings (columns (1) and (2) of Table IA.3) are robust to using this alternative data source.

3.3.2 Alternative Measures of Common Ownership

Our results could be specific to the common ownership measure used. To explore this concern, we use the common ownership measure of Gilje, Gormley and Levit (2020) (GGL). Compared to the common ownership measure in Equation 2.1, GGL's measure accounts for investors' attention to firms in their portfolios and captures the extent to which common ownership affects managers' incentives to internalize externalities. For each shareholder s, let β_{js} be shareholder s's ownership share in firm j and let γ_{js} be firm j's weight in institutional owner s's portfolio. For any two firms j and k, their degree of common ownership based on the GGL measure is $GGL_{j,k} = \sum_s \beta_{js}\gamma_{js}\beta_{ks}$. If either firm j or k is not publicly traded or not held by any institutional investors, then $GGL_{j,k} = 0$. Then, common ownership of firm j in the local labor market m based on the GGL measure is:

$$GGL_{jm} = \sum_{k \neq j} \frac{\omega_{km}}{1 - \omega_{jm}} \times GGL_{j,k}. \tag{3.3}$$

We calculate the local GGL measure and re-estimate Equation 3.1. Estimates for common ownership and employee earnings using this alternative measure of common ownership (columns (3) and (4) of Table IA.3) are similar to the baseline.

3.3.3 Robustness Checks for Table 3

In this section, we report several robustness tests for the results in Table 3. In columns (1)—(2), we show that our results are robust to controlling for common board directors between firms. Recent studies, Begley, Haslag and Weagley (2025) and Herrera-Caicedo,

Jeffers and Prager (2025), show that common leadership between firms, including common board directors, facilitates labor market collusion. Therefore, one concern is that common leadership could be an omitted variable and could drive the empirical findings. We address this concern in this section. We use data from BoardEx and calculate a dummy variable indicating whether two firms share at least one common director. For each local S&P 500 incumbent in a year, we calculate the fraction of local competitors that it shares at least one common director as a proxy for the extent to which it is connected to local competitors via common board directors. We conduct two sets of tests. In the first test, we only keep S&P 500 incumbents that never share board directors with local competitors within the estimation window and re-estimate Equation 3.2. The result is reported in column (1) of Table IA.4 and our result is robust. In the second test, we control for the extent to which an S&P 500 employer is connected to local competitors via common board directors when estimating Equation 3.2. We report the results in column (2) of Table IA.4 and the results are robust. Overall, the estimates suggest that common board directors between firms are unlikely to drive our results.

Another potential omitted variable is plant-level labor productivity. We use value added per FTE worker as a proxy for labor productivity and control for it when estimating Equation 3.2. We report the result in column (3) of Table IA.4, and our baseline result is robust. Furthermore, in column (4), we do not include the Cohort×CO Trend Quartile× fixed effects and our result is robust.

3.3.4 The increase in common ownership is not driven mainly by small shareholders

A potential concern about the results in Table 2 is that they could be driven mainly by shareholders that have very small stakes in the companies, and, therefore, would have no incentive or power to meaningfully engage with the management to affect their behavior. This would challenge the plausibility of the mechanism. To check whether this is the case,

we analyzed what types of institutional investors drive the increase in common ownership after S&P 500 index additions. First, we examine the effects on common ownership of the three largest index fund managers—BlackRock, Inc., State Street Corporation, and the Vanguard Group—known as the "Big Three" versus the effects on common ownership of other institutional investors. The pair-wise common ownership between any two firms j and k decomposes into common ownership of the Big Three and common ownership of others. Specifically,

$$\lambda_{j,k} = \underbrace{\frac{\sum_{s \in BigThree} \beta_{js}\beta_{ks}}{\sum_{\forall s} \beta_{js}\beta_{js}}}_{\text{Big Three Common Ownership}} + \underbrace{\frac{\sum_{s \notin BigThree} \beta_{js}\beta_{ks}}{\sum_{\forall s} \beta_{js}\beta_{js}}}_{\text{Non-Big Three Common Ownership}}, \tag{3.4}$$

We calculate Big Three and Non-Big Three common ownerships of local firms as in Equation 2.2 and estimate effects on each. Both Big Three and Non-Big Three common ownership of treated local S&P 500 incumbents increase after S&P 500 index entry events (columns (1) and (2) of Table IA.5).

Next, we examine whether only investors that hold small stakes in a firm drive the increase in common ownership. We build measures of common ownership among institutional investors that hold at least 3% of shares in a firm and common ownership among other institutional investors. We decompose the pair-wise common ownership between any two firms j and k into the sum of the common ownership by these two types of institutional investors,

$$\lambda_{j,k} = \underbrace{\frac{\sum_{s \in Holding_Share \geq 3\%} \beta_{js}\beta_{ks}}{\sum_{\forall s} \beta_{js}\beta_{js}}}_{\text{Common Ownership of Large Holders}} + \underbrace{\frac{\sum_{s \in Holding_Share < 3\%} \beta_{js}\beta_{ks}}{\sum_{\forall s} \beta_{js}\beta_{js}}}_{\text{Common Ownership of Small Holders}}, \tag{3.5}$$

After calculating the common ownership of investors with large and small holding shares in a local firm as in Equation 2.2, we estimate the effects on each. Common ownership of investors with both large and small holding shares in treated local firms increases

after S&P 500 index entry events (columns (3) and (4) of Table IA.5). The results in Table IA.5 mitigate the concern that the effect on common ownership is only driven by investors with little control motives.

3.4 Potential Mechanisms

Results in Section 3.2 show that after a firm is added to the S&P 500 index, S&P 500 incumbents' plants in the same local labor market are more connected to local competitors via common ownership and employee earnings decline relative to employee earnings in S&P 500 incumbents' plants in control local labor markets, where no firms enter or exit the S&P 500 index. However, attributing the dampened earnings growth associated with local competitors' S&P 500 entry to the effect of increased common ownership could be misleading, given that entry could be associated with other changes besides the rise in common ownership. In this section, we consider potential alternative channels that could explain our empirical findings based on the literature, theory, and additional analysis.

3.4.1 Focal Firms Become Stronger Via Lower Cost of Capital

A focal firm entering the S&P 500 index could get a lower cost of equity (Baran and King, 2012), making it tougher for S&P 500 incumbents to compete in the same local labor market. Consistent with this concern, after a firm is added to the S&P 500 index, earnings per FTE worker and the number of FTE workers of the focal firm both tend to increase (Appendix IA.1). If this competition effect is large enough, then the performance of treated local S&P 500 incumbents' plants could deteriorate after index entry events, and employee earnings would decline as a consequence.

We argue that this channel alone is unlikely to explain the observed results. First, Boller and Scott Morton (2020) shows that stock returns of S&P 500 incumbents increase instead of decrease after an industry competitor is added to the S&P 500 index. Second,

to provide direct evidence on the competition channel, we examine the effects of S&P 500 index entry on the performance of S&P 500 incumbents' plants in our sample. We use four measures, the natural logarithm of revenue, the natural logarithm of value added, total factor productivity (TFP), and the natural logarithm of value added per FTE worker to proxy plant performance. Table 4 reports the results. The results show that both the natural logarithm of revenue and the natural logarithm of value added of treated plants tend to increase after focal firms are added to the S&P 500 index. The estimated effects on TFP and the natural logarithm of value added per FTE worker are positive but are not statistically significant. Overall, treated plants in our sample do not appear to perform worse relative to the counterfactual after focal firms are added to the S&P 500 index.

3.4.2 Is Negative Earnings Effect Due to Composition Effect?

Theoretically, the negative effect observed on employee earnings could be due to a shift in the skill composition of workers employed by S&P 500 incumbents, rather than by a decline in wages holding composition fixed. Suppose S&P 500 index entrants become stronger and reduce local S&P 500 incumbents' ability to recruit high-skilled workers, leading incumbents to substitute towards lower-skilled workers. Then, S&P 500 index entry events would lower average annual earnings per FTE worker among incumbents but not wages per effective skill unit.

To examine whether this channel drives our results, we use data on skill requirements in local firms' job postings to proxy firms' skill demand in new hires. The data from Lightcast (formerly, Burning Glass Technologies) are available between 2010 and 2020. For each job posting, Lightcast provides detailed information, including the date of the posting, skill requirements, the employer's name, industry, and geographic location. Following Hershbein and Kahn (2018), we focus on the following skill requirements: college education, at least three years of experience, cognitive skills, and computer-related skills.

For each job posting, we create a composite skill index by summing across dummies indicating whether each of these four skills is required and the index ranges between zero and four. We match each firm in Lightcast to Gvkey in Compustat using the crosswalk in Babina, Fedyk, He and Hodson (forthcoming). For each year, we aggregate data to the local firm (Gvkey×commuting zone×4-digit NAICS code) level and compute the average skill index across jobs postings in a local firm.

Due to the short panel of Lightcast data, we choose the estimation window to be three years before and after the event year (seven years in total). Table 5 reports results. We do not observe a significant decrease in the skill composite index of treated local firms after S&P 500 index additions relative to the counterfactual. The estimated coefficient is positive (0.0533) but is not statistically significant. These estimates suggest that the negative earnings effects are unlikely to be driven by S&P 500 incumbents' demand for lower-skilled new hires after treatment.

3.4.3 Increased Product Market Power

Even if the negative earnings effect is indeed attributed to increased common ownership, the impact could occur by multiple potential channels. Increased common ownership could lead to increased employer market power but other mechanisms could also be at play. For example, a local S&P 500 incumbent's product market power could increase because of increased common ownership, which in turn impacts firms' product market decisions and profits (Azar et al., 2018; Antón et al., 2023; Ederer and Pellegrino, forthcoming). Although our focus on the manufacturing sector helps us alleviate the concern, we cannot completely rule this channel out.

In turn, increased product market power will impact labor market outcomes, and predicted effects are ambiguous from a theoretical perspective. In a canonical Cournot model, increased product market power leads to lower output and labor demand. Conse-

quently, employee wages and employment fall, assuming an upward-sloping labor supply curve. However, some theories predict increases in employee wages and are not consistent with the observed negative earnings effect.[9]

Overall, the estimated negative earnings effect could be consistent with a canonical Cournot or (differentiated product) Bertrand model of product market competition. However, if this model explains the result, then the employment of treated plants would decrease after treatment relative to the counterfactual, whereas we find a positive effect on employment, as we will discuss in Subsection 3.4.5. The positive observed employment effect goes against a classical Cournot or Bertrand product market power interpretation of the results. Given a fixed, upward-sloping labor supply curve, no theory of product markets alone will predict the observed coupling of negative earnings and positive employment effects.

3.4.4 Increased Employer Market Power

One possible explanation of the negative earnings effect is that increased common ownership increases employer market power. There are two leading models of employer market power in the literature, both of which predict negative wage effects but they differ in their predictions regarding employment effects. First, the classical monopsony model (Robinson, 1933) combines employer market power with an internal pay equity constraint. Under these conditions, a monopsonistic employer maximizes profits by pay-

[9] If workers bargain with firms on wages and employment as in Abowd and Lemieux (1993), the predicted effect on employee wages is positive but the predicted effect on employment remains negative because a decrease in employment leads to increased revenue per employee, resulting in higher wages per employee. Or, increased product market power could lead to higher employee wages and higher employment if it increases output, for example, through increasing advertising expenditure (Chandra and Weinberg (2018); Telser (1964); Hamilton (2009)). For this to happen, the positive effect of advertising expenditure on output has to be so large as to overcome the negative effect on output from higher prices. This case is also inconsistent with the observed negative effect of common ownership on wages. However, a similar logic can be applied to the case of labor market power: firms could increase their recruiting intensity in response to common ownership because their markdowns are higher. In that case, as we will show in Section IA.2 , the prediction would be lower wages and higher employment.

ing workers less than the perfectly-competitive market wage (their marginal product) and employs fewer workers than they would in a competitive equilibrium. If the common ownership effect operates along the lines of monopsonistic competition, then the negative earnings effect would be accompanied by lower employment in treated plants relative to the counterfactual after S&P 500 index additions. A second leading model argues that increases in employer market power could reduce employee wages without suppressing the employment level. For example, Jarosch et al. (2024) builds a model based on the structure of a canonical search and bargain model but allows a finite number of firms. As a result, a worker can re-encounter past employers when searching for a job. A firm is not a competitor of itself in the future, that is, workers' outside options do not include future vacancies of the firm. Therefore, workers' outside options are worse when bargaining with employers when the distribution of employment is more concentrated, resulting in lower wages. But the model does not predict underemployment. Different models of employer market power that both predict negative employee earnings effects differ in their predictions for employment levels. Therefore, we next estimate the effects on employment of treated plants to understand whether these existing employer market power models can explain the results, or if a new model is needed.

3.4.5 Effects on Employment

In this subsection, we examine the effects of S&P 500 index entries on the employment of S&P 500 incumbents' plants. This test helps illuminate potential mechanisms. We estimate Equation 3.2 by replacing the dependent variable with the natural logarithm of the number of FTE workers. We report the results in Table 6. The result shows that the number of FTE workers increases after focal firms are added to the S&P 500 index. The dynamic treatment effects are reported in Figure 4. Trajectories of the number of FTE workers between treated and control plants are parallel before treatment and only

start to diverge after index addition events. During the post-treatment period, treated plants' number of FTE workers increases by 2.13% relative to the counterfactual. Given that the average number of FTE workers of treated plants one year before treatment is 393, our estimates imply that S&P 500 index additions lead the number of FTE workers of treated plants to increase by eight relative to the counterfactual. Although this result is inconsistent with the evidence in Arnold (2021) and Marinescu, Ouss and Pape (2021), it is consistent with the evidence in Brown and Medoff (1989), which finds that acquisitions in Michigan resulted in increased employment. More recently, Prager and Schmitt (2021) also reports that hospital nursing & pharmacy employment grew faster in commuting zones that experienced a large increase in merger-induced concentration.[10]

As mentioned above, the estimated effect on employment does not seem to be consistent with the product market power channel nor with two leading employer market power models in the literature. As Section 4 discusses and Appendix IA.2 shows, the estimated effects on employee earnings and employment are consistent with an employer market power model that incorporates a costly recruitment-intensity margin for firms as in Manning (2006).

We report additional results on alternative measures related to employment and production hours in Table IA.7. The results show that the headcount of all workers and production hours in treated plants all increase after the S&P 500 index addition events relative to the counterfactual.

3.5 Further Evidence on Employer Market Power

In this subsection, we examine the effect of the S&P 500 index addition on the wage markdown of treated plants and provide evidence that further strengthens the interpretation that employer market power plays a role in explaining the slower growth of em-

[10]The interpretation of results in Prager and Schmitt (2021) should be under the caveat that there is evidence of differential pre-trends in nursing & pharmacy employment between treated and control hospitals.

ployee earnings after treated plants experience a positive shock to common ownership. The results are consistent with some role for employer market power, but this is not meant to rule out other channels, such as changes in product market power, as potential mechanisms. Estimates in Section 3.2 should be interpreted as the overall effects of common ownership on employee earnings through all possible mechanisms.

We next discuss the estimates of wage markdown at the plant level using ASM and CMF data. Our estimation approach follows Yeh, Macaluso and Hershbein (2022) with modifications suggested by Hashemi, Kirov and Traina (2022), which proposes a method to estimate wage markdown based on revenue directly. Consider a monopsonistic firm's profit maximization problem where the firm chooses the labor input L to maximize profits:

$$\max_{L} R(L) - w(L)L. \tag{3.6}$$

The first-order condition with respect to labor input is:

$$R'(L) = w(L) + w'(L)L = \underbrace{(1 + \frac{w'(L)L}{w(L)})}_{\nu} w(L). \tag{3.7}$$

where ν measures the firm's power to markdown wages relative to the marginal product of labor. We can further express ν as:

$$\nu = \frac{R'(L)}{w(L)} = \frac{R'(L)\frac{L}{R(L)}}{w(L)\frac{L}{R(L)}} = \frac{\theta_{R,L}}{\alpha_L} \tag{3.8}$$

where $\theta_{R,L}$ is the elasticity of revenue with respect to labor input and α_L is the share of labor cost in revenue.

Once we estimate $\theta_{R,L}$ at the plant level, then we can estimate ν as data on labor cost and revenue are readily available. To estimate $\theta_{R,L}$, we use the proxy variable approach

in Ackerberg, Caves and Frazer (2015). Given that we only observe the revenue instead of the output in ASM and CMF, we estimate the plant-level revenue-production function. This approach avoids the critiques in Bond, Hashemi, Kaplan and Zoch (2021), and the estimate would be robust even when firms have product market power. We model a plant's natural logarithm of revenue as a function of labor, capital, materials, and energy:

$$r_{it} = \underbrace{f(l_{it}, k_{it}, m_{it}, e_{it}; \beta) + \omega_{it}}_{\phi_{it}} + \epsilon_{it}$$

where i and t index plant and year, respectively. r_{it} is the natural logarithm of revenue. l_{it} is the natural logarithm of the number of FTE workers. k_{it} is the natural logarithm of real capital stock, m_{it} is the natural logarithm of real materials cost, and e_{it} is the natural logarithm of real energy cost. ω_{it} is plant-level productivity. ω_{it} can be observed by the plant, but cannot be observed by econometricians. ϵ_{it} is the error term that cannot be observed by either the plant or the econometricians. We denote $f(l_{it}, k_{it}, m_{it}, e_{it}; \beta) + \omega_{it}$ as ϕ_{it}. Following Yeh, Macaluso and Hershbein (2022), we assume $f(l_{it}, k_{it}, m_{it}, e_{it}; \beta)$ is translog, that is,

$$\begin{aligned} f(l_{it}, k_{it}, m_{it}, e_{it}; \beta) = {} & \beta_K k_{it} + \beta_L l_{it} + \beta_M m_{it} + \beta_E e_{it} \\ & + \beta_{KL} k_{it} l_{it} + \beta_{KM} k_{it} m_{it} + \beta_{KE} k_{it} e_{it} \\ & + \beta_{LM} l_{it} m_{it} + \beta_{LE} l_{it} e_{it} + \beta_{ME} m_{it} e_{it} \\ & + \beta_{KK} k_{it}^2 + \beta_{LL} l_{it}^2 + \beta_{MM} m_{it}^2 + \beta_{EE} e_{it}^2 \end{aligned}$$

Estimation proceeds in three steps.[11]

- Step 1: approximate ϕ_i with a third-order polynomial in l_{it}, k_{it}, m_{it}, and e_{it} and

[11] We thank Yeh et al. (2022) for sharing the code for production function estimations publicly at https://www.openicpsr.org/openicpsr/project/162581/version/V1/view.

denote it as $\hat{\phi_{it}}$

- Step 2: For a given vector of $\tilde{\beta}$, calculate $\omega_{it} = \hat{\phi_{it}} - f(l_{it}, k_{it}, m_{it}, e_{it}; \tilde{\beta})$ and project it onto a third-order polynomial in ω_{it-1}. The residual is the estimated productivity shocks, denoted as $\xi_{it}(\tilde{\beta})$
- Step 3: estimate the production function parameters β by minimizing the sum of squared moment conditions using nonlinear GMM

To estimate β in Step 3, we follow Yeh et al. (2022) and assume that a firm chooses capital one period ahead. Therefore, k_{it} is orthogonal to $\xi_{it}(\beta)$. Furthermore, plants cannot observe future productivity shocks, so input decisions on labor, materials, and energy in the last period are orthogonal to $\xi_{it}(\beta)$. We define Z_{it} as a Z-dimension vector below:

$$\begin{aligned}\mathbf{Z}_{it} = \big(&k_{it},\ l_{it-1},\ m_{it-1},\ e_{it-1},\\ &k_{it}l_{it-1},\ k_{it}m_{it-1},\ k_{it}e_{it-1},\\ &l_{it-1}m_{it-1},\ l_{it-1}e_{it-1},\ m_{it-1}e_{it-1},\\ &k_{it}^2,\ l_{it-1}^2,\ m_{it-1}^2,\ e_{it-1}^2\big)'\end{aligned}$$

Therefore, the moment conditions are:

$$E[\xi_{it}(\beta)\mathbf{Z_{it}}] = \mathbf{0_{Z\times 1}}$$

Empirically, we minimize the following GMM objective function to estimate β given N plants and T years:

$$\sum_{m=1}^{Z}(\sum_{i=i}^{N}\sum_{t=1}^{T}\xi_{it}(\beta)z_{it}^{m})^2$$

where z_{it}^m is an element of Z_{it}. Following Yeh et al. (2022), we estimate production function parameters for each 3-digit NAICS code. Once we obtain the estimated $\hat{\beta}$, wage markdown is constructed as $\nu_{it} = \frac{(\frac{\partial f(l_{it},k_{it},m_{it},e_{it};\beta)}{l_{it}})}{\alpha_{it}}$, where α_{it} is the ratio of labor cost to revenue in plant i in year t.

Table 7 and Figure 5 report the estimated effects of the S&P 500 index addition on the wage markdown of local S&P 500 incumbents' plants. The results show that wage markdown increases 2% in treated plants relative to the counterfactual after treatment, suggesting that increased employer market power plays a role in explaining the slower growth of employee earnings.

4 Discussion

We find that an increase in common ownership of S&P 500 incumbents in a local labor market leads to lower employee earnings but higher total employment relative to the counterfactual. These results are not consistent with a canonical Cournot model of product market competition nor the theoretical predictions from Robinson (1933) and Jarosch et al. (2024). The findings could be consistent with a model of oligopsony with common ownership that incorporates a costly recruitment-intensity margin for firms as in Manning (2006). Appendix IA.2 presents such a model formally. This section discusses the intuitions and provides further empirical evidence to test its predictions.

In this model of oligopsony, a firm is connected to its competitors via common ownership, and the firm partially internalizes its competitors' profits in its objective function. Each firm chooses wages and recruiting intensity to maximize its objective function. When a firm increases its wages, its market share increases. However, some of the increased market share comes at the expense of its competitors' profits. As a result, when a firm's common ownership with its competitors is higher, the marginal cost of increasing

wages is higher, resulting in lower equilibrium wages *ceteris paribus*.

However, the prediction on how common ownership affects a firm's recruitment intensity is ambiguous ex-ante. On the one hand, an increase in a firm's recruitment intensity increases its market share, but some of the increased market share comes at the expense of its competitors' profits. Given that the firm partially internalizes its competitors' profits, higher common ownership would reduce the firm's incentive to increase recruitment intensity *ceteris paribus*. We term this the "competition channel." On the other hand, higher common ownership can increase a firm's incentive to increase recruitment intensity. The reason is that higher common ownership leads to lower wages in equilibrium, and then each additional worker that the firm hires is more profitable. We term this the "profit-per-worker channel." The effect of common ownership on recruitment and employment is the net effect of "profit-per-worker channel" and the "competition channel." When the "profit-per-worker channel" dominates, the proposed model could rationalize our empirical findings.

One key assumption in the model is that a firm partially internalizes its competitors' profits in its objective function. This assumption can be microfounded either (i) as the outcome of a probabilistic voting model in which two potential managers compete to attract shareholder votes, and this leads firms to maximize a weighted average of shareholder utilities (Azar, 2012, 2017), or (ii) as the outcome of an election with an incumbent manager that can potentially be replaced by the shareholders and therefore internalizes their objectives at least partially (Azar, 2020b; Azar and Ribeiro, 2022). Moreover, previous studies also show that common ownership could affect firm strategies through affecting top management incentives. For example, Antón et al. (2023) proposes a model that embeds the managerial incentive contract design problem with moral hazard in a strategic product market competition model with common owners and shows that common ownership reduces product market competition through lowering the pay-for-performance sensitivities in executives' compensation schemes, which results in higher costs and prod-

uct prices. Empirically, the authors use the empirical design and show that the pay-for-performance sensitivities of S&P 500 incumbents' executives decrease after a competitor in the same industry enters the S&P 500 index.

5 Conclusion

This paper contributes to the literature on employer market power by measuring common ownership at the local firm and local labor market level and providing the first empirical evidence on the effects of common ownership on labor outcomes at the plant level in the manufacturing sector. We explore natural experiments generated when S&P 500 incumbents have a local competitor added to the S&P 500 index and use a difference-in-differences design to estimate causal effects. Our results suggest that the average annual earnings per full-time equivalent (FTE) worker among treated local S&P 500 incumbents' plants are lower compared to the counterfactual after their local competitors enter the S&P 500 index. S&P 500 index additions also lead to an increase in the employment of treated plants. We show that, while this is inconsistent with existing models of employer market power, it *can* be rationalized through a model of oligopsony with common ownership that incorporates an endogenous recruitment intensity.

The policy implications of anticompetitive effects of common ownership in labor markets are complex. Legal scholars have mostly analyzed the antitrust implications of horizontal shareholding in product markets (Elhauge, 2015; Baker, 2015; Posner et al., 2017; Rock and Rubinfeld, 2020; Posner, 2021), as well as labor market power (Marinescu and Hovenkamp, 2019; Krueger and Posner, 2018; Naidu and Posner, 2021). Evaluating the competitive effects of common ownership in labor markets will require a combination of insights from these two literatures. A potential approach is tackling the issue directly by breaking up large common owners or analyzing and regulating securities transactions with labor market implications, as the FTC and DOJ currently do for mergers. However,

it is important to take into account that there are substantial trade-offs from a social point of view, as low-cost index funds provide substantial cost savings for retail investors compared to more expensive actively managed funds.

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Main Figures and Tables

Figure 1
Common Ownership in Local Labor Markets: 1980–2020

This figure reports the average local labor market common ownership in each of the last four decades. Local labor market common ownership in a year is the employment-weighted local firm-level common ownership. In each decade, we calculate employment-weighted average local labor market common ownership across local labor markets.

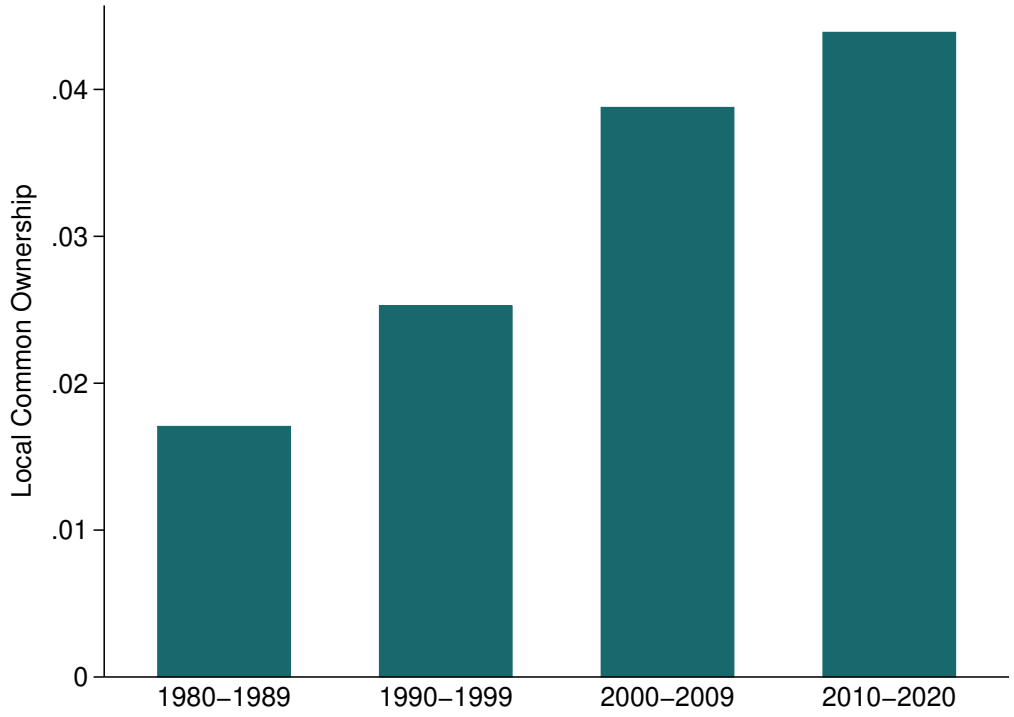


Figure 2
Effect of S&P 500 Index Additions on Common Ownership

This figure reports the estimates of Equation 3.1 for common ownership. The bars around point estimates represent 95% confidence intervals, and they are based on standard errors clustered at the local labor market level.

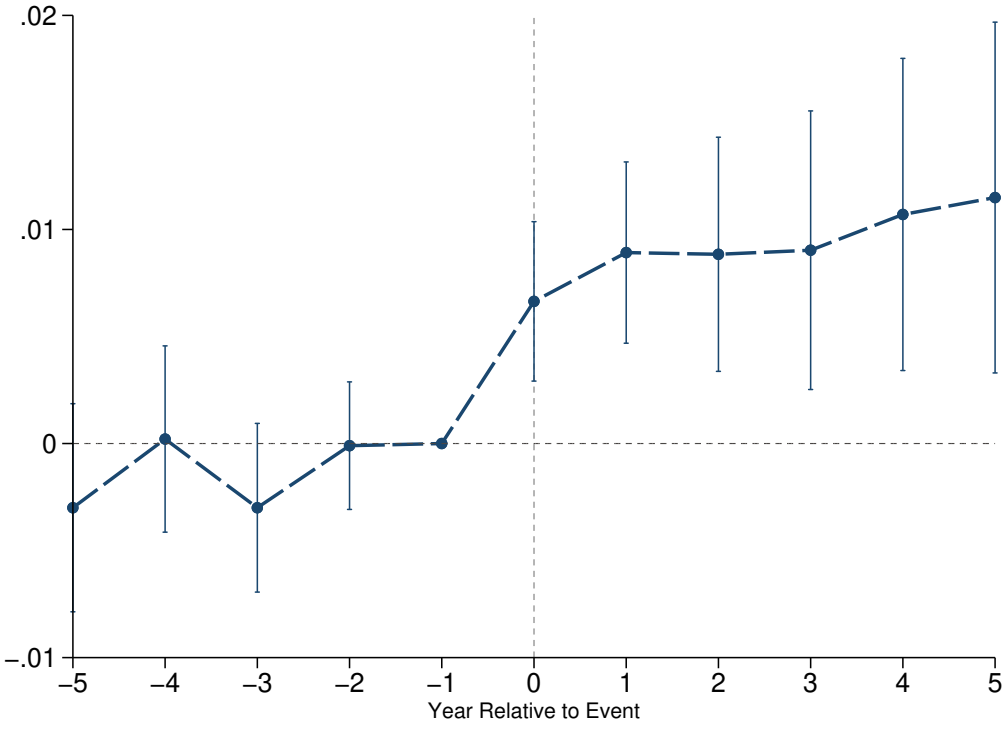


Figure 3
Effect of S&P 500 Index Additions on Employee Earnings

This figure reports the estimates of Equation 3.1 for the natural logarithm of average annual earnings per full-time equivalent (FTE) worker. The bars around point estimates represent 95% confidence intervals, and they are based on standard errors clustered at the local labor market level.

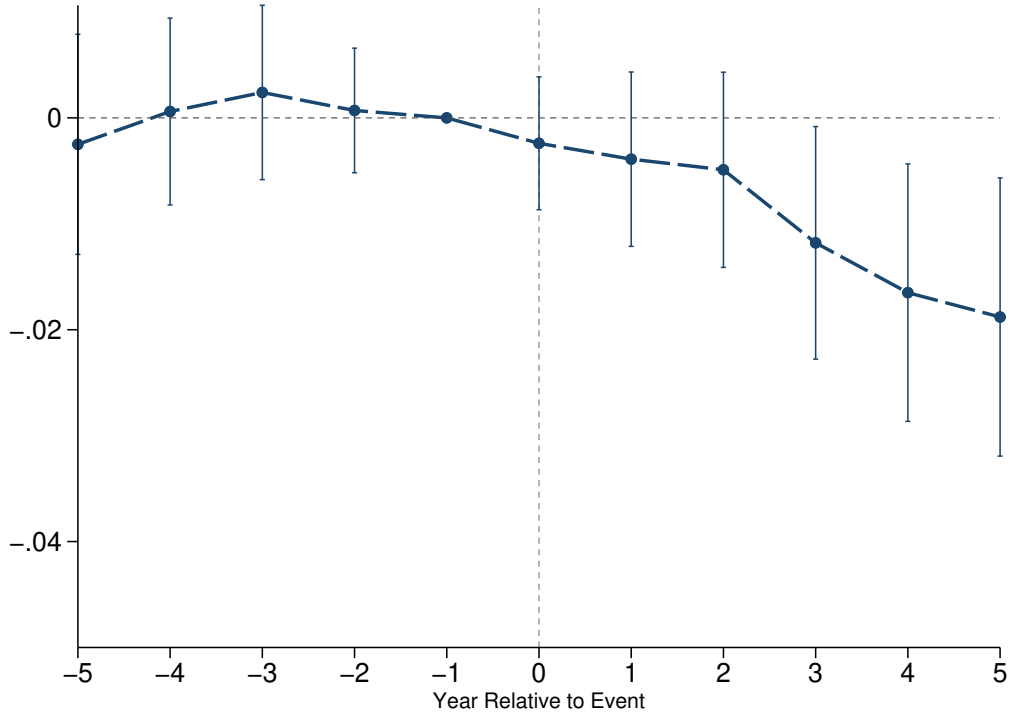


Figure 4
Effect of S&P 500 Index Additions on the Number of FTE Workers

This figure reports the estimates of Equation 3.1 for the natural logarithm of the number of full-time equivalent (FTE) worker. The bars around point estimates represent 95% confidence intervals, and they are based on standard errors clustered at the local labor market level.

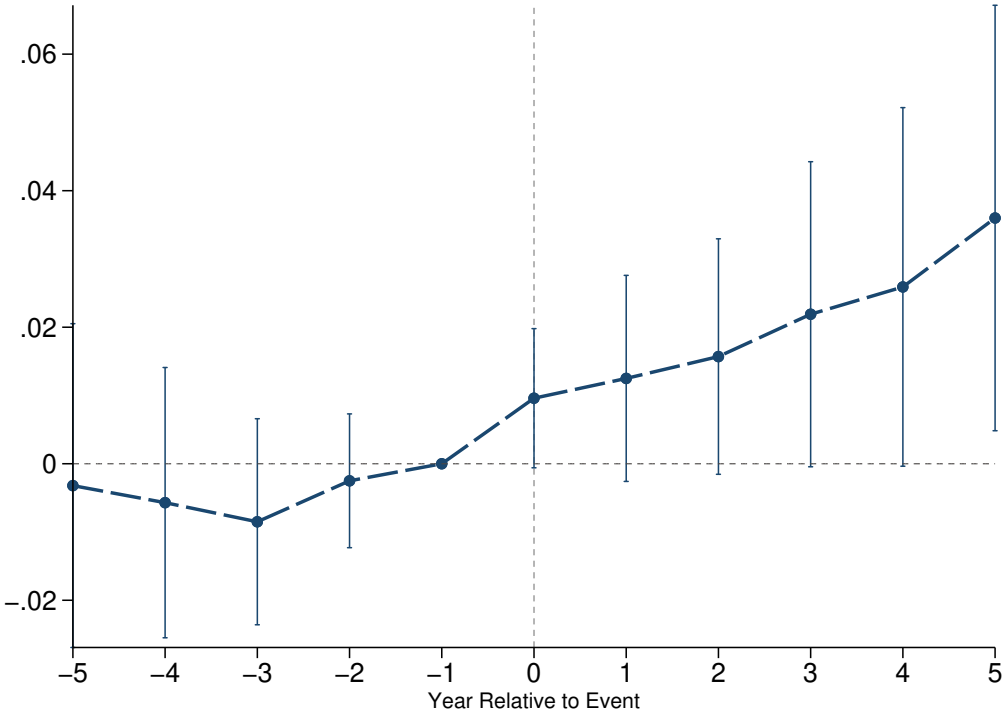


Figure 5
Effect of S&P 500 Index Additions on Wage Markdown

This figure reports the estimates of Equation 3.1 for the natural logarithm of wage markwodn. The bars around point estimates represent 95% confidence intervals, and they are based on standard errors clustered at the local labor market level.

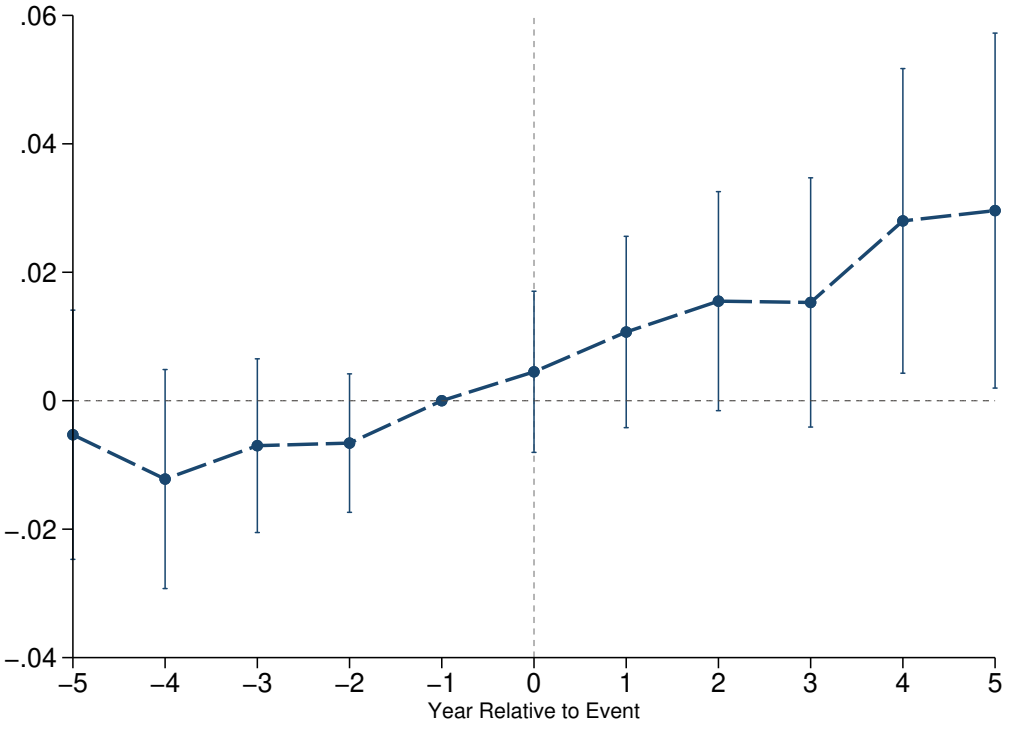


Table 1
Summary Statistics

This table reports the summary statistics of the levels of main outcome variables for treated and control plants one year before S&P 500 index addition events and the long-difference in these variables between year $t-1$ and year $t-5$ for S&P 500 index addition events in year t. The annual earnings per full-time equivalent (FTE) worker are in 2020 dollars. The number of FTE workers in a plant in a year is equal to the working hours of production workers divided by 40×52 plus the headcount of non-production workers. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Treated	Control	p-value of (1)-(2)
	(1)	(2)	(3)
Common Ownership	0.1263	0.0728	<0.01
Annual Earnings per FTE Worker ($000)	67.26	58.9	<0.01
Number of FTE Workers	393.1	349.7	0.1357
ΔCommon Ownership	0.0061	0.0035	0.2419
ΔLog(Annual Earnings per FTE Worker)	0.0298	0.0238	0.2663
ΔLog(Number of FTE Workers)	-0.0242	-0.0224	0.8732

Table 2
Effects of S&P 500 Index Additions on Common Ownership

This table reports the estimates of Equation 3.1 and Equation 3.2 for common ownership. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. $Year(+\tau)$ ($Year(-\tau)$) is a dummy variable equal to 1 for the τth year after (before) an S&P 500 index addition event. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Common Ownership	Common Ownership
	(1)	(2)
Treated×Post	0.00977***	
	[0.00226]	
Treated×Year(-5)		-0.00300
		[0.00248]
Treated×Year(-4)		0.00021
		[0.00222]
Treated×Year(-3)		-0.00300
		[0.00201]
Treated×Year(-2)		-0.00010
		[0.00152]
Treated×Year(0)		0.00664***
		[0.00190]
Treated×Year(+1)		0.00892***
		[0.00216]
Treated×Year(+2)		0.00884***
		[0.00279]
Treated×Year(+3)		0.00903***
		[0.00332]
Treated×Year(+4)		0.01070***
		[0.00372]
Treated×Year(+5)		0.01149***
		[0.00418]
Cohort×Plant FEs	✓	✓
Cohort×NAICS3× FEs	✓	✓
Cohort×CZ× FEs	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓
Adjusted R^2	0.7695	0.7695
N	865,000	865,000

Table 3
Effects of S&P 500 Index Additions on Employee Earnings

This table reports the estimates of Equation 3.1 and Equation 3.2 for annual earnings per full-time equivalent (FTE) worker. The number of FTE workers in a plant in a year is equal to the working hours of production workers divided by 40×52 plus the headcount of non-production workers. The plant-level annual earnings per FTE worker are calculated as the total payroll divided by the number of FTE workers. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. $Year(+\tau)$ ($Year(-\tau)$) is a dummy variable equal to 1 for the τth year after (before) an S&P 500 index addition event. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Annual Earnings per FTE Worker)	Log(Annual Earnings per FTE Worker)
	(1)	(2)
Treated×Post	-0.0083*	
	[0.0045]	
Treated×Year(-5)		-0.0025
		[0.0053]
Treated×Year(-4)		0.0006
		[0.0045]
Treated×Year(-3)		0.0024
		[0.0042]
Treated×Year(-2)		0.0007
		[0.0030]
Treated×Year(0)		-0.0024
		[0.0032]
Treated×Year(+1)		-0.0039
		[0.0042]
Treated×Year(+2)		-0.0049
		[0.0047]
Treated×Year(+3)		-0.0118**
		[0.0056]
Treated×Year(+4)		-0.0165***
		[0.0062]
Treated×Year(+5)		-0.0188***
		[0.0067]
Cohort×Plant FEs	✓	✓
Cohort×NAICS3× FEs	✓	✓
Cohort×CZ× FEs	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓
Adjusted R^2	0.829	0.829
N	865,000	865,000

Table 4
Effects of S&P 500 Index Additions on Plant Performance

This table reports the estimates of Equation 3.1 and Equation 3.2 for plant performance. The dependent variable in columns (1) and (2) is the natural logarithm of revenue. The dependent variable in columns (3) and (4) is the natural logarithm of value added. The dependent variable in columns (5) and (6) is the total factor productivity (TFP). The dependent variable in columns (7) and (8) is the natural logarithm of value added per full-time equivalent (FTE) worker. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's average common ownership from $t-5$ to $t-2$ and the common ownership in $t-1$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. $Year(+\tau)$ ($Year(-\tau)$) is a dummy variable equal to 1 for the τth year after (before) an S&P 500 index addition event. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Revenue)	Log(Revenue)	Log(Value Added)	Log(Value Added)	TFP	TFP	Log(Value Added per FTE Worker)	Log(Value Added per FTE worker)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated×Post	0.0274**		0.0311*		0.0061		0.0097	
	[0.0124]		[0.0161]		[0.0078]		[0.0121]	
Treated×Year(-5)		-0.0054		0.0044		0.0106		0.0023
		[0.0142]		[0.0202]		[0.0112]		[0.0171]
Treated×Year(-4)		-0.0164		-0.0158		0.0055		-0.0173
		[0.0120]		[0.0175]		[0.0096]		[0.0154]
Treated×Year(-3)		-0.0142		-0.0107		0.0024		-0.0098
		[0.0091]		[0.0139]		[0.0078]		[0.0127]
Treated×Year(-2)		-0.0120*		-0.0109		-0.0001		-0.0107
		[0.0066]		[0.0115]		[0.0058]		[0.0106]
Treated×Year(0)		0.0066		0.0140		0.0057		0.0011
		[0.0075]		[0.0125]		[0.0062]		[0.0112]
Treated×Year(+1)		0.0179*		0.0194		0.0083		0.0040
		[0.0096]		[0.0152]		[0.0072]		[0.0134]
Treated×Year(+2)		0.0153		0.0282		0.0183**		0.0074
		[0.0120]		[0.0175]		[0.0089]		[0.0152]
Treated×Year(+3)		0.0183		0.0219		0.0086		-0.0037
		[0.0140]		[0.0201]		[0.0096]		[0.0163]
Treated×Year(+4)		0.0324*		0.0390		0.0101		0.0067
		[0.0170]		[0.0241]		[0.0114]		[0.0200]
Treated×Year(+5)		0.0381*		0.0415		0.0013		0.0022
		[0.0198]		[0.0269]		[0.0130]		[0.0223]
Cohort×Plant FEs	✓	✓	✓	✓	✓	✓	✓	✓
Cohort×NAICS3× FEs	✓	✓	✓	✓	✓	✓	✓	✓
Cohort×CZ× FEs	✓	✓	✓	✓	✓	✓	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.9383	0.9383	0.8743	0.8743	0.836	0.836	0.745	0.745
N	865,000	865,000	865,000	865,000	865,000	865,000	865,000	865,000

Table 5
Effects of S&P 500 Index Additions on Skill Demand

This table reports the estimates of Equation 3.1 and Equation 3.2 for skill demand in job postings. For each job posting, we create a composite index by summing across dummies indicating whether each of four skills (college education, at least three years of experience, cognitive skills, and computer-related skills) is required, and the index ranges between zero and four. For each year, we compute the average composite index across job postings in a plant. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. $Year(+\tau)$ ($Year(-\tau)$) is a dummy variable equal to 1 for the τth year after (before) an S&P 500 index addition event. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Skill Demand Index	Skill Demand Index
	(1)	(2)
Treated×Post	0.0533	
	[0.1224]	
Treated×Year(-5)		-0.1271
		[0.1864]
Treated×Year(-4)		-0.0868
		[0.1931]
Treated×Year(-3)		0.0326
		[0.1802]
Treated×Year(-2)		0.0035
		[0.1191]
Treated×Year(0)		-0.0040
		[0.1029]
Treated×Year(+1)		0.0325
		[0.1501]
Treated×Year(+2)		0.2001
		[0.1597]
Treated×Year(+3)		0.0724
		[0.1856]
Treated×Year(+4)		0.0934
		[0.2500]
Treated×Year(+5)		0.0541
		[0.2295]
Cohort×Plant FEs	✓	✓
Cohort×NAICS3× FEs	✓	✓
Cohort×CZ× FEs	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓
Adjusted R^2	0.7317	0.7315
N	20,500	20,500

Table 6
Effects of S&P 500 Index Additions on the Number of FTE Workers

This table reports the estimates of Equation 3.1 and Equation 3.2 for the number of full-time equivalent (FTE) workers. The dependent variable is the natural logarithm of FTE workers. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. $Year(+\tau)$ ($Year(-\tau)$) is a dummy variable equal to 1 for the τth year after (before) an S&P 500 index addition event. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Number of FTE worker)	Log(Number of FTE worker)
	(1)	(2)
Treated×Post	0.0213**	
	[0.0105]	
Treated×Year(-5)		-0.0032
		[0.0121]
Treated×Year(-4)		-0.0057
		[0.0101]
Treated×Year(-3)		-0.0085
		[0.0077]
Treated×Year(-2)		-0.0025
		[0.0050]
Treated×Year(0)		0.0096*
		[0.0052]
Treated×Year(+1)		0.0125
		[0.0077]
Treated×Year(+2)		0.0157*
		[0.0088]
Treated×Year(+3)		0.0219*
		[0.0114]
Treated×Year(+4)		0.0259*
		[0.0134]
Treated×Year(+5)		0.0360**
		[0.0159]
Cohort×Plant FEs	✓	✓
Cohort×NAICS3× FEs	✓	✓
Cohort×CZ× FEs	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓
Adjusted R^2	0.9517	0.9517
N	865,000	865,000

Table 7
Effects of S&P 500 Index Additions on Wage Markdown

This table reports the estimates of Equation 3.1 and Equation 3.2 for wage markdown. The dependent variable is the natural logarithm of wage markdown. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. $Year(+\tau)$ ($Year(-\tau)$) is a dummy variable equal to 1 for the τth year after (before) an S&P 500 index addition event. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Wage Markdown)	Log(Wage Markdown)
Treated×Post	0.0203**	
	[0.0081]	
Treated×Year(-5)		-0.0053
		[0.0099]
Treated×Year(-4)		-0.0122
		[0.0087]
Treated×Year(-3)		-0.0070
		[0.0069]
Treated×Year(-2)		-0.0066
		[0.0055]
Treated×Year(0)		0.0045
		[0.0064]
Treated×Year(+1)		0.0107
		[0.0076]
Treated×Year(+2)		0.0155*
		[0.0087]
Treated×Year(+3)		0.0153
		[0.0099]
Treated×Year(+4)		0.0280**
		[0.0121]
Treated×Year(+5)		0.0296**
		[0.0141]
Cohort×Plant FEs	✓	✓
Cohort×NAICS3× FEs	✓	✓
Cohort×CZ× FEs	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓
Adjusted R^2	0.8342	0.8342
N	865,000	865,000

APPENDIX FOR "COMMON OWNERSHIP AND WAGES"

IA.1 Effects on Plants of Local Focal Firms

In this section, we examine what happens to employee earnings and employment in plants of focal firms that are added to the S&P 500 index (treated plants). The potential set of control plants includes those whose parent firms are publicly traded but are not S&P 500 incumbents within the estimation window.

To estimate the effects, we perform a difference-in-differences analysis. In addition to including event×plant, event×CZ×year, event×NAICS3×year fixed effects, we further include event×decile of annual earnings per FTE worker×decile of the number of FTE workers×year fixed effects. For events in year t, the deciles of annual earnings per FTE worker and deciles of the number of FTE workers are measured in year $t-1$. By including these fixed effects, we essentially compare treated and control plants in the same decile of employee earnings and employment one year before treatment. We report the results in Table IA.6. The result in column (1) shows that the annual earnings per full-time equivalent (FTE) worker in plants of the focal firms increase 1.31% after entering the S&P 500 index and the estimate is statistically significant at the 5% level. Column (2) shows that the number of FTE workers of the focal firms' plants increases 1.38% after entering the S&P 500 index, but the estimate is not statistically significant at the conventional level.

IA.2 Oligopsony with Common Ownership and Endogenous Recruitment Intensity

In this section, we develop a theoretical model that can rationalize our empirical findings. Specifically, we extend the classical model of oligopsony in two directions: (i) it has differentiated jobs and wage competition, as in Bhaskar et al. (2002), and (ii) it incorporates a recruitment-intensity margin as in Manning (2006). With these additional features,

our model shows that a higher common ownership in a labor market could lead to lower wages and a higher total employment in equilibrium.[12]

Let's consider a labor market with J firms offering differentiated jobs. The market is an oligopsony and firms compete in wages. There is a continuum of workers of mass 1. Worker-i's utility from working at firm j is,

$$u_{ij} = \alpha \log(w_j) + \epsilon_{ij}, \tag{IA.1}$$

where w_j is the wage of firm j's jobs, and ϵ_{ij} is a worker-firm match-specific shock. We assume that the match-specific shocks are independent and identically distributed, with a Type I extreme value distribution. A higher α expresses a relatively more significant role for wages and a more minor role for non-wage job attributes between firms in governing worker utility, making jobs at different firms closer substitutes. This reduces firms' differentiation in jobs and market power as employers. α is a key parameter that determines the impact of common ownership on total employment

Firms engage in informative advertising of their job openings. We model informative recruiting expenditures similarly to the model of informative product advertising in Butters (1977) and Hamilton (2009). A worker observes the job posting of firm j with probability ϕ_j. Among all the job postings that the worker observes, she chooses the one that offers the highest utility. It is possible that the worker observes zero job postings. Therefore, there can be frictional unemployment for this reason, even there is no outside option in the model.[13] Firm j chooses its recruitment intensity ϕ_j given a cost function $a(\phi_j) = -\theta \log(1 - \phi_j)$. Recruitment cost is zero when $\phi_j = 0$, and approaches to infinity as ϕ_j is close to one. $a(\phi_j)$ is convex, so that there is an increasing marginal cost

[12] An important difference between our setup and that of Bhaskar et al. (2002) is that they model differentiated jobs and workers using a Hotelling (1929) linear city model, while we use a multinomial logit random utility model for the labor supply specification.

[13] It would be possible to add an outside option to our model, corresponding to out of the labor force, but it is not essential to the point we want to make.

of increasing recruitment intensity.[14] Manning (2006) provides evidence supporting this assumption. If there were no recruiting costs ($\theta = 0$), all firms would advertise job postings to all workers and there would be no frictional unemployment. As recruiting cost increases, employer competition would weaken and the employment rate could fall as a consequece.

We will focus on finding symmetric equilibria. For this purpose, it is useful to calculate the probability that firm j faces k rivals for a given worker who is informed about its job posting, when each of its symmetric rival sets its recruitment intensity to ϕ_{-j}. When there are $J-1$ rival firms, such a probability is given by the binomial distribution:

$$p(k; \phi_{-j}, J-1) = \binom{J-1}{k} \phi_{-j}^{k} (1-\phi_{-j})^{J-1-k}. \tag{IA.2}$$

For a given set of chosen wages and recruitment intensities by firm j and each of its rival, $\{w_j, w_{-j}, \phi_j, \phi_{-j}\}$, the employment share of firm j among all potential workers in the labor market (including the unemployed) is given by

$$s_j(w_j, w_{-j}, \phi_j, \phi_{-j}) = \phi_j \sum_{k=0}^{J-1} p(k; \phi_{-j}, J-1) s_j^{(k)}(w_j; w_{-j}), \tag{IA.3}$$

where

$$s_j^{(k)}(w_j; w_{-j}) = \frac{\exp(\alpha \log(w_j))}{\exp\left[\alpha \log(w_j)\right] + k \exp\left[\alpha \log(w_{-j})\right]}$$

is the market share of firm j among the workers that are informed about the job postings of firm j and its k rivals.

The intuition of Equation IA.3 is the following. When firm j sets its recruitment intensity to be ϕ_j, a measure of workers of that size are informed about its job posting. Among these ϕ_j workers, $p(k; \phi_{-j}, J-1)$ of them also observe the job postings of firm j's k rivals.

[14] Forsythe and Weinstein (2025) shows that firm-level recruiting expenditures are indeed associated with increased hiring by the firm.

Among the workers that observe k rivals' job postings, firm j's market share is given by the multinomial logit market share $s_j^{(k)}(w_j; w_{-j})$.

The employment share of a firm j's rival among all potential workers in the labor market is given by

$$s_{-j}(w_j, w_{-j}, \phi_j, \phi_{-j}) = \phi_{-j} \sum_{k=0}^{J-2} p(k; \phi_{-j}, J-2) \left[\phi_j s_{-j}^{(k+1)} + \frac{1-\phi_j}{k+1} \right], \tag{IA.4}$$

where

$$s_{-j}^{(k)}(w_j, w_{-j}) = \frac{\exp(\alpha \log(w_{-j}))}{\exp\left[\alpha \log(w_j)\right] + k \exp\left[\alpha \log(w_{-j})\right]}$$

is the market share of firm $-j$ among the workers that are informed about the job postings of firm j and firm $-j$'s k rivals. There are two terms in the bracket in Equation IA.4 and the interpretation is the following. With a probability of ϕ_j, a worker that is informed about the job postings of firm $-j$ and its k rivals could also observe firm j's job posting. In this case, firm $-j$'s market share is given by $s_{-j}^{(k)}(w_j, w_{-j})$; with a probability of $1-\phi_j$, a worker that is informed about the job postings of firm $-j$ and its k rivals does not observe firm j's job posting. In this case, firm $-j$'s market share is simply $1/(k+1)$.

For a given set of chosen wages and recruitment intensities by firm j and each of its rival, $\{w_j, w_{-j}, \phi_j, \phi_{-j}\}$, the profit of firm j is given by

$$\pi_j(w_j, w_{-j}, \phi_j, \phi_{-j}) = (A - w_j) s_j(w_j, w_{-j}, \phi_j, \phi_{-j}) - a(\phi_j), \tag{IA.5}$$

where A is the additional revenue for firm j from hiring another worker, which we assume is symmetric across firms.

When there is common ownership in the labor market, that is, firms are connected via common owners, firm j would partially internalize the profits of its rivals. We incorporate this idea into our model by assuming that firm j chooses its wages, w_j, and recruitment

intenstiy, ϕ_j, to maximize its profit plus a weight λ times the profits of its rivals in the labor market, taking the choices of $\{w_{-j}, \phi_{-j}\}$ by its rivals as given:

$$\max_{w_j,\phi_j} \left(A - w_j\right) s_j(w_j, w_{-j}, \phi_j, \phi_{-j}) - a(\phi_j) + \lambda \cdot (J-1) \left[\left(A - w_{-j}\right) s_{-j}(w_j, w_{-j}, \phi_j, \phi_{-j}) - a(\phi_{-j})\right]. \tag{IA.6}$$

The first-order condition for firm j with respect to its wage is,

$$-s_j + (A - w_j)\frac{\partial s_j}{\partial w_j} + \lambda \cdot \left[(J-1)\left(A - w_{-j}\right)\frac{\partial s_{-j}}{\partial w_j}\right] = 0, \tag{IA.7}$$

where the market share slopes with respect to firm j's wage are

$$\frac{\partial s_j}{\partial w_j} = \frac{\alpha}{w_j}\phi_j \sum_{k=0}^{J-1} p(k; \phi_{-j}, J-1) s_j^{(k)}(1 - s_j^{(k)}) \tag{IA.8}$$

$$\frac{\partial s_{-j}}{\partial w_j} = -\frac{\alpha}{w_j}\phi_{-j}\phi_j \sum_{k=0}^{J-2} p(k; \phi_{-j}, J-2) s_{-j}^{(k+1)} s_j^{(k+1)}. \tag{IA.9}$$

Intuitively, an increase in its wages by one dollar has two opposing effects on firm j's profits. On one hand, it reduces its profits per worker by one dollar, and this reduces overall profits by its market share s_j. This is captured in the first term of Equation IA.7. On the other hand, increasing wages would increase firm j's market share by $\frac{\partial s_j}{\partial w_j}$, and this increases its profits because the margin $A - w_j$ is applied to more workers. This is captured in the second term of Equation IA.7. With common ownership, firm j internalizes the fact that some of this increase in its market share comes at the expense of its rivals, whose profits firm j internalizes at a rate λ. This is what drives the third term of equation Equation IA.7. This last term, *ceteris paribus*, implies that an increase in common ownership reduces firm j's incentive to increase wages.

The first-order condition for firm j with respect to its own recruiting effort is,

$$(A - w_j)\frac{\partial s_j}{\partial \phi_j} - \theta/(1-\phi_j) + \lambda \cdot \left[(J-1)\left(A - w_{-j}\right)\frac{\partial s_{-j}}{\partial \phi_j}\right] = 0, \tag{IA.10}$$

where the market share slopes with respect to firm j's recruitment intensity are

$$\frac{\partial s_j}{\partial \phi_j} = s_j/\phi_j \tag{IA.11}$$

$$\frac{\partial s_{-j}}{\partial \phi_j} = \phi_{-j}\sum_{k=0}^{J-2} p(k;\phi_{-j}, J-2)\left[s_{-j}^{(k+1)} - \frac{1}{k+1}\right]. \tag{IA.12}$$

The intuition is as follows. Increasing its recruitment intensity has opposing effects on firm j's profits. An increase in its recruitment intensity would increase firm j's market share by $\frac{\partial s_j}{\partial \phi_j}$, and this increases profits because the margin $A - w_j$ is applied to more workers. This is captured in the first term of Equation IA.10. But increasing recruitment intensity is costly and the marginal cost is reflected in the second term of Equation IA.10.

Common ownership makes firm j internalize the fact that, when it increases recruitment intensity, some of its increase in market share comes at the expense of its rivals. As in the first-order condition for wages (Equation IA.7), firm j internalizes its rivals' profits at a rate λ. This is captured by the third term of Equation IA.10. *Ceteris paribus*, this would imply that higher common ownership would reduce firm j's incentive to increase recruitment intensity. However, if common ownership drives down wages in equilibrium, then it increases the first term of Equation IA.10, implying that each additional worker that firm j hires is more profitable. This would increase firm j's incentive to increase its recruitment intensity. These two conflicting economic forces are the reason why, as we will see in the numerical simulations, the effect of common ownership on employment could be positive or negative, depending on the parameters.

We solve the model numerically by finding the solution to the two non-linear equations obtained by imposing symmetry, that is, setting $w_j = w_{-j} = w$ and $\phi_j = \phi_{-j} = \phi$ in the first-order conditions.

$$\begin{cases} (A-w)\left\{\frac{\partial s_j}{\partial w_j} + \lambda(J-1)\frac{\partial s_{-j}}{\partial w_j}\right\} = (1-(1-\phi)^J)/J \\ (A-w)\left\{\frac{\partial s_j}{\partial \phi_j} + \lambda(J-1)\frac{\partial s_{-j}}{\partial \phi_j}\right\} = \theta/(1-\phi) \end{cases}, \tag{IA.13}$$

where all the market share slopes are evaluated at the symmetric wage and recruitment intensity values ($w_j = w_{-j} = w$ and $\phi_j = \phi_{-j} = \phi$):

$$\begin{array}{l} \frac{\partial s_j}{\partial w_j} = \frac{\alpha}{w}\phi\sum_{k=0}^{J-1} p(k;\phi,J-1)\frac{k}{(k+1)^2} \\ \frac{\partial s_{-j}}{\partial w_j} = -\frac{\alpha}{w}\phi^2\sum_{k=0}^{J-2} p(k;\phi,J-2)\frac{1}{(k+2)^2} \\ \frac{\partial s_j}{\partial \phi_j} = \frac{1-(1-\phi)^J}{\phi J} \\ \frac{\partial s_{-j}}{\partial \phi_j} = \phi\sum_{k=0}^{J-2} p(k;\phi,J-2)\left[\frac{1}{k+2} - \frac{1}{k+1}\right] \end{array}. \tag{IA.14}$$

In equilibrium, the total employment in a labor market is equal to $1-(1-\phi)^J$. Therefore, the effect of common ownership on recruitment intensity and total employment would be qualitatively the same.

We set the number of firm J to be 20 and marginal product of labor A to be 1 (as a normalization) when solving the model. We report the results in Figure IA.1. In the left panel, we examine how the impacts of common ownership on wages, recruitment intensity, and employment vary with the wage sensitivity parameter α. In this panel, we set the cost of recruitment intensity θ=0.3. In the right panel, we examine how the impacts of common ownership on wages, recruitment intensity, and employment vary with θ that governs recruiting cost. In this panel, we set the wage sensitivity parameter α=3.

As can be seen in Figure IA.1, an increase in common ownership always reduces equilibrium wages but its impact on recruitment intensity or total employment depends on α or θ. In this example, common ownership generates an increase in employment when

the wage sensitivity parameter α or the cost of recruitment intensity parameter θ is relatively high, and common ownership generates a decrease in employment when α or θ is relatively low.

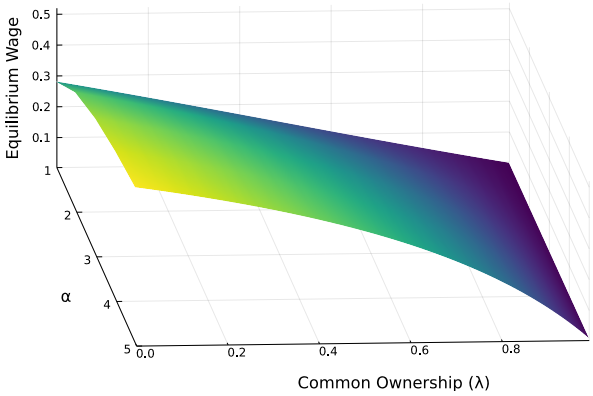
As we discussed earlier, the intuition for the ambiguous effect of common ownership on employment is the following. A higher common ownership implies that a firm would internalize more the effect of an increased recruitment intensity on its rivals' profits, because some of the extra recruited workers could have otherwise been employed by firms that share common owners. This effect implies that a higher common ownership would tend to reduce equilibrium recruitment intensity. However, a higher common ownership also reduces equilibrium wages, increasing the profits per worker that the firms receive. These higher profits per job *increase* a firm's incentive to recruit more workers in equilibrium, at least when these workers are more likely to be recruited from the unemployed. When the later "profit-per-worker" effect dominates, the net effect of common ownership on equilibrium employment could be positive.

The positive effect of common ownership on employment is more likely to happen when equilibrium employment is lower without common ownership, because then recruited workers are more likely not coming from rival firms. A higher wage-sensitivity parameter α implies that firms are closer substitutes, resulting in higher equilibrium wages. In this model, higher wages imply that profits per worker are lower, and a firm has less incentive to spend resources on advertising their job openings. As a result, equilibrium employment would be *lower* when there is no common ownership. Similarly, when the recruitment cost parameter θ is higher, a firm has less incentive to spend on recruitment, leading to *lower* equilibrium employment when common ownership is zero. Therefore, when α or θ is higher, higher common ownership could increase a firm's incentive to spend resources on recruitment because newly recruited workers more likely come from the unemployed, and it comes less at the expense of its rival firms.

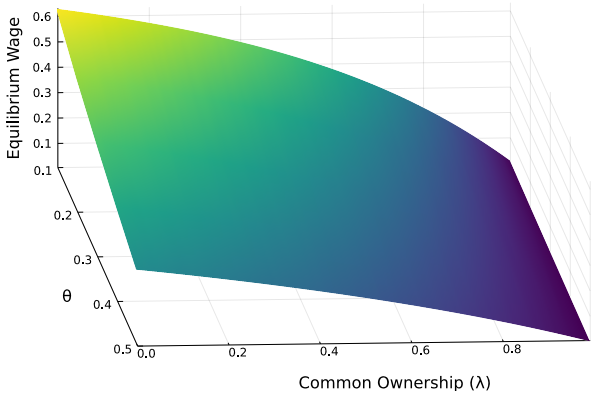
Internet Appendix Figures and Tables

Figure IA.1
Theoretical Effect of Common Ownership on Wages, Recruitment Intensity, and Employment

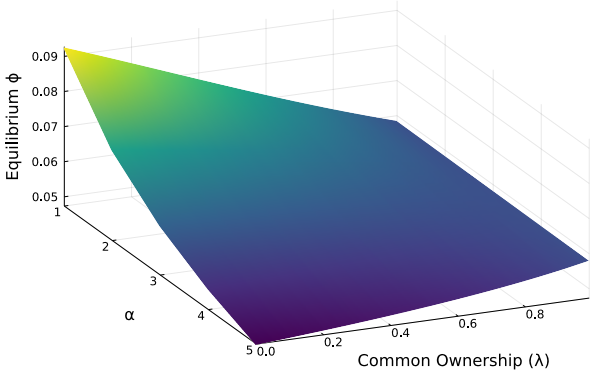
This figure shows the solution to the model for the following parameter values: number of firms $J = 20$, marginal product of labor $A = 1$ (as a normalization), cost of recruitment intensity parameter $\theta = 0.3$ (in the varying α case), and wage sensitivity parameter $\alpha = 3$ (in the varying θ case). The common ownership parameter λ ranges from 0 to 1.



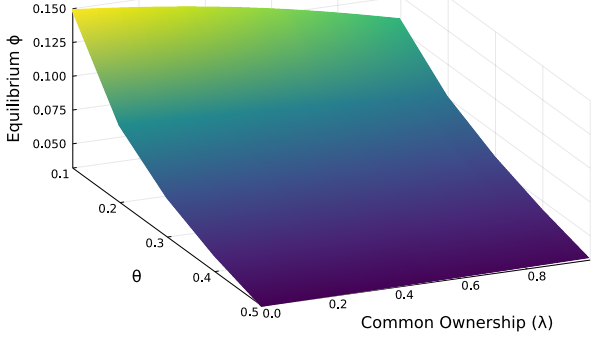
(a) Equilibrium Wage (Varying α)



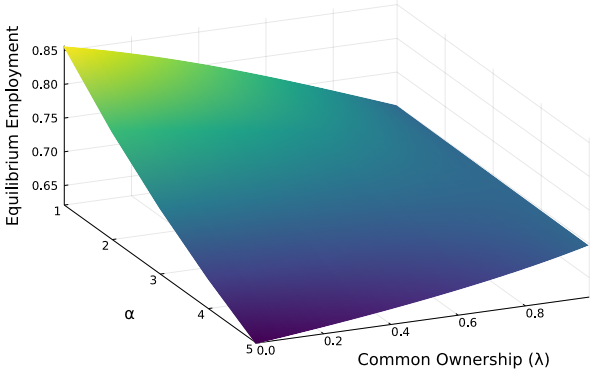
(b) Equilibrium Wage (Varying θ)



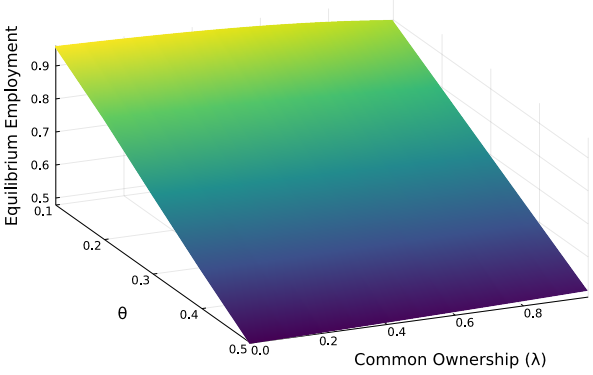
(c) Equilibrium Recruitment Intensity ϕ (Varying α)



(d) Equilibrium Recruitment Intensity ϕ (Varying θ)



(e) Equilibrium Employment (Varying α)



(f) Equilibrium Employment (Varying θ)

Table IA.1
Effect of S&P 500 Index Additions on Total and Top 1 Institutional Ownership of S&P 500 Incumbents

This table reports the estimated effects of S&P 500 index additions on the total and top 1 institutional ownership of S&P 500 incumbents in the same industry (4-digit CRSP SIC code) of firms that enter the index (focal firms). Columns (1) and (2) report the results for the total institutional ownership (*Total IO*) and the top 1 institutional ownership (*Top 1 IO*), respectively. For a cohort of S&P 500 index addition events, *Treated* is a dummy variable equal to one if an S&P 500 incumbent is in the same industry of focal firms and no firms in the industry exit the S&P 500 index within the estimation window, and equal to zero if an S&P 500 incumbent is in an industry where no firms enter or exit the S&P 500 index within the estimation window. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. Standard errors are clustered at the 4-digit CRSP SIC level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Total IO	Top 1 IO
	(1)	(2)
Treated×Post	0.0022	0.0028
	[0.0051]	[0.0018]
Event×Firm FEs	✓	✓
Event×Year FEs	✓	✓
Adjusted R^2	0.852	0.710
N	44,325	44,325

Table IA.2
Additional Results on Employee Earnings

This table reports additional results on employee earnings based on Equation 3.1 and Equation 3.2. In columns (1) and (2), the dependent variable is the natural logarithm of annual earnings per employee. In columns (3) and (4), the dependent variable is the natural logarithm of annual earnings per production hour of production wworkers. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Annual Earnings per Employee)	Log(Annual Earnings per Employee)	Log(Annual Earnings per Production Hour)	Log(Annual Earnings per Production Hour)
	(1)	(2)	(3)	(4)
Treated×Post	-0.0061		-0.0077	
	[0.0042]		[0.0051]	
Treated×Year(-5)		0.0005		-0.0044
		[0.0049]		[0.0062]
Treated×Year(-4)		-0.0009		-0.0003
		[0.0043]		[0.0056]
Treated×Year(-3)		0.0028		0.0005
		[0.0039]		[0.0051]
Treated×Year(-2)		-0.0022		-0.0023
		[0.0029]		[0.0038]
Treated×Year(0)		-0.0030		-0.0026
		[0.0030]		[0.0038]
Treated×Year(+1)		0.0002		-0.0032
		[0.0040]		[0.0049]
Treated×Year(+2)		-0.0034		-0.0040
		[0.0046]		[0.0057]
Treated×Year(+3)		-0.0106*		-0.0145**
		[0.0054]		[0.0067]
Treated×Year(+4)		-0.0151**		-0.0175**
		[0.0060]		[0.0071]
Treated×Year(+5)		-0.0148**		-0.0245***
		[0.0067]		[0.0080]
Cohort×Plant FEs	✓	✓	✓	✓
Cohort×NAICS3× FEs	✓	✓	✓	✓
Cohort×CZ× FEs	✓	✓	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓	✓	✓
N	865,000	865,000	865,000	865,000

Table IA.3
Robustness to Alternative Data Source and Common Ownership Measure

This table reports robustness results using an alternative data source on shareholder holding and an alternative measure of common ownership based on Equation 3.2. Columns (1) and (2) report the estimated effects on common ownership and annual earnings per FTE worker by supplementing 13F data with shareholder holding data from Amel-Zadeh et al. (2022). Columns (3) and (4) report the estimated effects on common ownership and annual earnings per FTE worker using the common ownership measure in Gilje et al. (2020). For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Use Amel-Zadeh et al. (2022) Data		GGL Measure	
	Common Ownership	Log(Annual Earnings per FTE Worker)	Common Ownership	Log(Annual Earnings per FTE Worker)
	(1)	(2)	(3)	(4)
Treated×Post	0.01425***	-0.0081*	0.00543**	-0.0085*
	[0.00227]	[0.0045]	[0.00269]	[0.0045]
Cohort×Plant FEs	✓	✓	✓	✓
Cohort×NAICS3× FEs	✓	✓	✓	✓
Cohort×CZ× FEs	✓	✓	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓	✓	✓
Adjusted R^2	0.77	0.829	0.6978	0.829
N	865,000	865,000	865,000	865,000

Table IA.4
Robustness Checks for Table 3

This table reports results of robustness tests based on Equation 3.2. In column (1), we focus on the subsample where local S&P 500 incumbents that never share common board directors with local competitors within the estimation window. In column (2), we control for the fraction of local competitors that an S&P 500 incumbents is connected via common board directors in a local labor market (*Common Director Fraction*). In column (3), we control for labor productivity, proxied by plant-level value added per FTE worker. In column (4), we do not include the Cohort×CO Change Quartile× fixed effects. For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	No Common Directors	Control for Common Directors	Control for Labor Productivity	Alternative FEs
	(1)	(2)	(3)	(4)
Treated×Post	-0.0128*	-0.0117*	-0.0088**	-0.0086*
	[0.0072]	[0.0070]	[0.0044]	[0.0045]
Common Director Fraction		0.0291		
		[0.0263]		
Log(Value Added per FTE)			0.0561***	
			[0.0018]	
Cohort×Plant FEs	✓	✓	✓	✓
Cohort×NAICS3× FEs	✓	✓	✓	✓
Cohort×CZ× FEs	✓	✓	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓	✓	
Adjusted R^2	0.832	0.8316	0.835	0.829
N	28,000	28,700	865,000	865,000

Table IA.5
Effects of S&P 500 Index Additions on Common Ownership by Types of Shareholders

This table reports the estimates of Equation 3.2 for common ownership by the types of shareholders. In column (1), the dependent variable is common ownership of the "Big Three" institutional investors (Blackrock, Vanguard, and State Street) (*Common Ownership Big Three*). In column (2), the dependent variable is common ownership of non-"Big Three" institutional investors (*Common Ownership Non-Big Three*). In column (3), the dependent variable is common ownership of the institutional investors that hold larger shares of a firm ($\geq$3%) (*Common Ownership Larger Holding*). In column (4), the dependent variable is common ownership of the institutional investors that hold smaller shares of a firm (<3%) (*Common Ownership Smaller Holding*). For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Common Ownership Big Three	Common Ownership Not Big Three	Common Ownership Larger Holding	Common Ownership Smaller Holding
	(1)	(2)	(3)	(4)
Treated×Post	0.00502***	0.00429**	0.00539***	0.00408**
	[0.00094]	[0.00186]	[0.00126]	[0.00172]
Cohort×Plant FEs	✓	✓	✓	✓
Cohort×NAICS3× FEs	✓	✓	✓	✓
Cohort×CZ× FEs	✓	✓	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓	✓	✓
Adjusted R^2	0.8123	0.7386	0.7138	0.7333
N	865,000	865,000	865,000	865,000

Table IA.6
Effects of S&P 500 Index Additions on Plants of Focal Firms

This table reports the estimated effects of S&P 500 index additions on plants of firms that are added to the index (focal firms). The dependent variables in columns (1) and (2) are the natural logarithm of annual earnings per full-time equivalent (FTE) worker and the natural logarithm of the number of FTE workers, respectively. The number of FTE workers in a plant in a year is equal to the working hours of production workers divided by 40×52 plus the headcount of non-production workers. *Treated* is a dummy variable equal to one if a plant is part of a firm that is added to the S&P 500 index, and equal to zero otherwise. The potential set of control plants includes those whose parent firms are publicly traded but are not S&P 500 incumbents within the estimation window. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. We further include Event×Decile of Annual Earnings per FTE worker×Decile of the number of FTE workers×Year (Event×Decile of Earnings×Decile of FTE×Year) fixed effects. For events in year t, the deciles of annual earnings per FTE worker and deciles of the number of FTE workers are measured in year $t-1$. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Annual Earnings per FTE Worker)	Log(Number of FTE Workers)
	(1)	(2)
Treated×Post	0.0131**	0.0138
	[0.0059]	[0.0135]
Event×Plant FEs	✓	✓
Event×CZ×Year FEs	✓	✓
Event×NAICS3×Year FEs	✓	✓
Event×Decile of Earnings×Decile of FTE×Year FEs	✓	✓
Adjusted R^2	0.8641	0.9256
N	2,321,000	2,321,000

Table IA.7
Additional Results on Employment and Production Hours

This table reports additional results on employment and production hours based on Equation 3.2. In column (1), the dependent variable is the natural logarithm of employment. In column (2), the dependent variable is the natural logarithm of production hours. For the cohort in year t, For the cohort in year t, *CO Change Quartile* is a quartile of the difference between a plant's common ownership in $t-1$ and the average common ownership from $t-5$ to $t-2$. *Treated* is a dummy variable equal to one if a local S&P 500 incumbent's plant is treated in a cohort of S&P 500 index addition events, and equal to zero otherwise. The definitions of treated and control plants are in Section 3.1. *Post* is a dummy variable equal to one for the years after S&P 500 index additions events (including the event years), and zero otherwise. Standard errors are clustered at the local labor market level. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	Log(Employment)	Log(Production Hours)
	(1)	(2)
Treated×Post	0.0202**	0.0315**
	[0.0103]	[0.0130]
Cohort×Plant FEs	✓	✓
Cohort×NAICS3× FEs	✓	✓
Cohort×CZ× FEs	✓	✓
Cohort×CO Change Quartile× FEs	✓	✓
Adjusted R^2	0.9568	0.9369
N	865,000	865,000