Managing Employee Retention Concerns: Evidence from US Census Data*

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Abstract

Using Census microdata on 14,000 manufacturing plants, we examine how firms manage employee retention concerns in response to local wage pressure. We validate our measure of employee retention concerns by documenting that plants respond with wage increases, and do so more when the employees' human capital is higher. We document substantial use of non-wage levers in response to retention concerns. Plants shift incentives to increase the likelihood that bonuses can be paid: performance target transparency declines, as does the use of localized performance metrics for bonuses. Furthermore, promotions become more meritocratic, ensuring key employees can be promoted and retained. Lastly, decision-making authority at the plant-level increases, offering more agency to local employees. We find evidence consistent with inequity aversion constraining the response to local wage pressure, and document spillovers in

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both wage and non-wage reactions across same-firm plants.

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1. Introduction

Employee departures are disruptive. The Work Institute estimates that turnover of an employee costs firms roughly 30% of the employee's yearly salary, with aggregate voluntary turnover costs in the US exceeding $630 billion in 2019 (Work Institute, 2020). A large number of firms is currently struggling to retain employees during the Great Resignation Wave. Despite their importance, employee retention concerns are under-researched relative to the volume of research focusing on employee incentive provision (Oyer, 2004; Ittner et al., 2003; Gerakos et al., 2018; Oyer and Schaefer, 2010). Extant research on retention focuses mostly on the CEO level (Chidambaran and Prabhala, 2003; Jochem et al., 2018; Balsam and Miharjo, 2007; Cadman et al., 2021), but the individual rationality constraint's role likely differs widely for CEOs and lower-level employees. Hence, these results are unlikely to generalize. Furthermore, most studies focus on one lever that firms can pull, such as stock options (Carter and Lynch, 2004; Aldatmaz et al., 2018), whereas in practice, firms have multiple levers at their disposal.[1]

In this paper, we study firms' wage and various, previously unstudied, non-wage responses to retention concerns. Using a large, representative sample of more than 14,000 manufacturing plants from the US Census Bureau's confidential microdata, we first validate our measure of employee retention concerns: increases in local labor market wage growth. Consistent with prior literature (Campbell and Kamlani, 1997), when local wages increase, plants respond by increasing wages, albeit with pay elasticity smaller than one. Plants make those adjustments to wages in a differentiated way. When employees' human capital has less value (e.g. when employees have smaller informational advantages) retention concerns are less severe and the wage increase is dampened. Similarly, we find a weaker relation when local plant management has more

[1] An exception is Gerakos et al. (2018) who study the use of both equity grants and non-cash benefits to achieve retention objectives.

delegated Human Resources decision-making authority, allowing them to target high human capital individuals for retention rather than offering broad wage increases to all.

We then proceed to our first research question: Which non-wage levers do plants use to respond to employee retention concerns? There exist several reasons why plants may use non-wage levers rather than wage levers. First, transaction and adjustment costs may prohibit frequent re-contracting on wages (Core and Guay, 2001; Oyer, 2004; Oyer and Schaefer, 2005). Second, wage increases are to be considered virtually permanent adjustments since wages are rigid in the downward direction (Campbell and Kamlani, 1997; Eberts and Stone, 1992) and employees consider pay cuts unfair even if local labor markets would warrant them (Charness and Levine, 2002). Third, from a retention point of view, the level of compensation should matter more than its form (Ittner et al., 2003). Therefore, plants can adjust other aspects of the labor arrangements to increase the utility the employee receives. We find that plants make extensive use of non-wage levers to manage employee retention concerns. First, plants modify incentives to increase the likelihood that bonuses can be paid, thereby ensuring adequate compensation but reducing pay-for-performance sensitivity of the bonuses. They do so by reducing the transparency of performance targets and shifting away from bonus targets based on localized performance metrics. Furthermore, the meritocracy of promotion-based incentives increases, ensuring those employees with the highest human capital can be promoted and indicative of a reluctance to make a more permanent promotion commitment unless the human capital value of the employee is high. These results suggest an empirical link between the individual rationality and incentive compatibility constraints outlined in agency theory,[2] in the spirit of Oyer (2004). Furthermore, our results suggest that characteristics of performance targets have importance beyond incentive contracts; they also play a role in retention. Lastly, we find that firms increase decision-making authority of plant-level management in response to retention concerns, bringing plant employees closer to decision-making and

[2]The individual rationality constraint recognizes that an employment contract must make it advantageous for the agent to work for the principal relative to the agent's other outside options. The incentive compatibility constraint requires that under the employment contract, choosing the principal's favored action is also in the agent's best interest.

hence offering them more agency . Our ability to measure various features of the labor contract in the same plant allows us to explore how these levers may complement or substitute for wage increases to aid retention. Specifically, we find that the increase in the meritocracy of employee promotions substitutes for the use of base wage growth as a retention mechanism.

One major constraint firms face that causes adjustment costs is any perceived cross-firm inequity created by the firm's response to retention concerns. This leads to our second research question: How do inequity concerns in multi-plant firms affect the use of wage and non-wage responses to retention concerns? In social comparisons in employment contexts, inequity aversion affects how employees perceive their rewards through the lens of inequity (Adams, 1963) or relative deprivation (Martin, 1981). Adams (1963) defines inequity as existing for employees whenever their perceived job inputs and/or outcomes stand psychologically in an obverse relation to what they perceive are the job inputs and/or outcomes of other employees to which they compare themselves. Relative deprivation theory states that individuals experience deprivation when they compare the rewards they receive to the rewards received by reference groups and find that they have received less than they deserve (Levine, 1993). As Levine (1993) explains, the exact mechanisms behind these theories are different, but they both stipulate that the employees assess the value of the rewards comparatively (Gartenberg and Wulf, 2017). [3]

The majority of the archival, field, and survey-based literature on horizontal social comparisons concerns pay equity and is conducted at the manager level; research on pay equity at the employee level remains limited (Levine, 1993; Bloom and Michel, 2002). As notable exceptions, Kacperczyk and Balachandran (2018), using Swedish data, find that horizontal wage dispersion increases employee turnover as it is asso-

[3]The current COVID-19 pandemic which sees a substantial portion of the workforce working remotely vividly illustrates the issue. With employees spread around the country, companies trade off localizing pay scales to correspond to local labor markets with the adverse effects of inequity concerns of employees doing the same job in another remote location, particularly if that remote work becomes permanent (Bindley, 2020; Bindley and Brown, 2020; Cutter and Glazer, 2021). Survey evidence reported on in Bindley and Brown (2020) illustrates that firms struggle with this trade off, with 33 percent of firms undecided on how to handle it. The survey also reports that roughly the same number of firms choose localized pay scales versus the same pay for the same job, no matter where employees live and work.

ciated with outcomes harmful to employees such as inequity aversion, while Grabner and Martin (2021) find that horizontal pay dispersion negatively affects the effectiveness of performance-based contracts of a large US healthcare provider when employees consider the pay dispersion illegitimate. Furthermore, research is not clear about with which reference group employees compare themselves (Gartenberg and Wulf, 2017). Older work on pay equity provides support for a wage increase relative to the external labor market having less effect on perceived equity than a wage increase relative to both the external labor market and the other workers in the organization (Levine, 1993), suggesting that within-firm comparisons are important. Specifically, the constraints that multi-divisional firms face in this respect are less explored (Gartenberg and Wulf, 2017; Feichter et al., 2018). With recent large-sample empirical work in Brazil showing that 12 percent of all incoming horizontal hires are workers redeployed from other units of the firm (Chauvin and Poliquin, 2021), it is quite plausible that social comparisons to employees in other plants play an important role. Furthermore, to our knowledge, there is no research on how equity concerns affect the use of non-wage retention levers, even if recent research documents that multi-divisional firms experience such constraints (specifically) in their target setting process (Feichter et al., 2018; Merchant et al., 2018). Are non-wage levers less salient than wage-levers in the social comparison among reference groups?

Consistent with our expectation that the retention mechanisms we study, too, are not set for one plant in isolation, we find that the use of both wage and non-wage levers to manage employee retention concerns is constrained by aversion to inequity across plants of the same firm. Specifically, we find inter-plant inequity concerns constrain not only the wage reaction to local retention concerns but also non-wage levers, documenting dampened reactions to local wage growth for firms with stronger inequity constraints. Furthermore, these inequity constraints appear justified; we document that both wage and non-wage reactions to local retention concerns spill over to other plants within the same firm, more so than warranted by the retention pressure in their own local labor markets alone. Non-wage reactions appear to spill over less easily than wage reactions, possibly explaining why firms pull these additional levers as part of their retention strategy.

There are numerous advantages of the Census data to understand the use of wage and non-wage retention levers. First, the sample is a highly representative slice of the overall plant population. Our main sample includes more than 14,000 plants covering a large sample of US manufacturing activity. The sampling is randomized and stratified across industry, geography, and size, including both publicly and privately held firms. Plants are required by law to comply with Census information requests and Census personnel follow up repeatedly, inducing high response rates. The responses to these carefully-designed surveys are confidential and there are penalties for misreporting, resulting in high data quality. Second, the Census' Management Organization and Practices Survey (MOPS) queries plants about the various non-wage levers used in both 2010 and 2015, allowing us to study inter-temporal changes as local labor markets change. Coupled with the Census' Annual Survey of Manufacturers (ASM) and the Census of Manufacturers (CMF) we can observe plant wage growth and changes in the local labor market, as well as a wide range of control variables. Third, we observe multiple plants per firm, allowing us to study retention mechanisms in multi-plant firms and the related inequity concerns and spillovers of retention mechanisms.

We make several contributions to the literature. We provide evidence on the wage and (under-researched) non-wage levers employers use in response to local retention concerns using a large sample of US manufacturing plants. Our results indicate that plants do not simply increase wages to retain employees—they also shift incentives—suggesting a link between the incentive compatibility and individual rationality constraints. We find that plants reduce the transparency of performance metrics and shift away from bonus targets based on localized performance metrics to increase the likelihood that bonuses are paid. Promotion incentives become more meritocratic to better target those key employees that plants do not want to lose. Employers also go beyond monetary levers and offer increased agency to local plant management to make decisions. Our results suggests that employers use a portfolio of retention levers, and hence it is important not to study each lever in isolation, as much of the prior literature has done.

Our study also contributes to the literature by documenting intra-firm dynamics in setting employment contracts. Our results suggest the use of retention mechanisms

in multi-plant firms is not determined by one plant facing local labor market pressure in isolation. Firm-wide inequity concerns constrain the focal plant in its ability to increase wages or alter the non-wage levers of the labor contract. We report substantial spillover of the use of these levers between different plants of the same firm, beyond what is warranted by a focal plant's labor market pressure alone. These results strongly indicate that employees in other plants of the same firm are part of the reference group against which employees of the focal plant compare themselves and perceive (in)equity in their wage and non-wage treatment. Furthermore, our results indicate that non-wage levers are less salient in such social comparisons than wage levers.

2. Background and Research Questions

We explore two primary research questions related to the levers employers use to respond to employee retention concerns.

Research Question 1. *Which non-wage levers do plants use to respond to employee retention concerns?*

While pay elasticity is below one, firms have many non-wage levers at their disposal to respond to employee retention concerns. Transaction and adjustment costs may prohibit re-contracting frequently on wages (Core and Guay, 2001; Oyer, 2004; Oyer and Schaefer, 2005), potentially leading firms to use alternate mechanisms that have lower adjustment costs. Additionally, the permanence of pulling a non-wage lever may be lower in that employees will strongly object to lowering wages, even if the labor market would support that. Furthermore, from a retention perspective, the level of compensation rather than the form should matter to the employee (Ittner et al., 2003). Firms may be able to adjust other contractual features to both reduce the riskiness of the incentives offered as well as the level of effort necessary to achieve a bonus payout. This could de facto ensure an increase in the utility employees derive from those incentives without having to offer increased base wages.[4] Existing studies have

[4]This is in contrast to existing intuition that the use of variable pay is mostly for incentive purposes and not for attracting and retaining employees (Gerakos et al., 2018).

focused on the non-wage levers of stock options, target difficulty or the provision of benefits. Carter and Lynch (2004) find that stock option repricing of under-water options reduces employee turnover. Aldatmaz et al. (2018) find that large, broad-based employee stock option grants reduce employee turnover. In their field study, Merchant et al. (2018) document widespread target adjustment to ensure employees earn their bonus, given that salaries were set below market levels at their case firm. Gerakos et al. (2018) study how the provision of benefits and the breadth of employee eligibility for incentive plans and equity grants is used to achieve various compensation objectives, including a retention objective.[5]

The MOPS data allow us to explore previously unstudied non-wage responses to retention concerns. We study the transparency of performance targets, the use of localized versus more high-level performance targets, the meritocracy of promotion incentives, and the amount of delegated decision-making authority given to local management. Transparency of performance targets is one of the most important contract design choices in multi-divisional firms but has received limited attention in the academic literature (Feichter et al., 2018; Matějka, 2018). We predict that when local retention concerns increase, performance targets become less transparent to allow the plant to pay bonuses even if performance targets are not achieved. We also predict that the likelihood that bonuses are set on localized performance metrics will decrease for two reasons. First, pushing less for individualized performance will give the plant more leeway to pay out bonuses. Second, the use of more aggregate performance metrics lumps employees of different performance levels into a single category, thereby reducing morale and animosity concerns (Murphy and Cleveland, 1991), which may play a more important role during times of pressure in the local labor market. There is

[5]Other studies have looked at the use of stock options and target setting as retention tools for executives and managers (Oyer and Schaefer, 2005; Merchant and Manzoni, 1989; Indjejikian et al., 2014). For example, based on the premise that targets are easier to adjust than incentive weights as circumstances change, Matějka and Ray (2017) find that targets are set to be easier to achieve for companies more concerned about managerial retention. Casas-Arce et al. (2020) find that during a recession, when executive retention concerns are low, CFOs are compensated with reduced incentive strength, increased relative incentive weight on financial performance measures and increased difficulty of financial performance targets, all consistent with the use of these incentive plan features to reduce bonus payments when few outside employment opportunities exist.

tension in both performance target predictions; if employees perceive any pay inequality to be fairly justified by easily observable performance differences, then such pay differences would not generate psychological costs (Larkin et al., 2021). Additionally, transparency in criteria and standards for evaluation may facilitate fair and equitable employment decisions (Castilla, 2015). In such a case, the plant may want to set individual performance metrics and make them very transparent, to allow increasing pay to high human capital employees which are a retention priority.

Rather than use short-term wage increases, firms can also respond to retention concerns with longer-term promotion incentives (Davis, 2015). While prior management literature has documented that promotions are negatively related with turnover (Benson et al., 2004), we are not aware of any studies that hone in on how the meritocracy of those promotions is related to employee retention. Because promotions are a long-term commitment, we predict that when wage pressure in the local labor market increases, promotion opportunities will become more meritocratic, to ensure that high performing employees can still be retained. There is tension on this prediction, as making promotions less meritocratic may provide the plant with the opportunity to promote more people as retention concerns arise.

As a last non-wage lever, we study delegating more decision-making authority in order to reduce turnover, as advocated by practitioner publications (Payscale, 2020). The management literature documents that high-involvement work practices, of which giving employees discretionary decision-making authority is one aspect, are associated with lower quit rates (Batt and Colvin, 2011). Hence, we predict that headquarters delegates more decision-making authority to local plant management to alleviate retention concerns, as doing so will bring local employees a step closer in the hierarchy to where decisions are being made, making it more likely that they are able to be involved and heard in decision-making. Again, there is tension on this prediction as it is not clear that offering local plant management more discretionary decision-making authority will translate to the local employees feeling more empowered too, and it is possible that local plant managers simply ignore the voice of local employees in decision-making.

Research Question 2. *How does inequity aversion in multi-plant firms affect the use of wage and non-wage responses to retention concerns?*

The majority of the archival, field and survey-based literature on horizontal social comparisons concerns pay (in)equity and is conducted at the manager level. For example, using both an archival Execucomp sample and a survey sample, Bloom and Michel (2002) find that managers care more about relative pay (compared to relevant others) than absolute pay, and find that minimizing the pay differential within the firm increases manager satisfaction and reduces their impetus to leave.[6] Research on inequity aversion related to horizontal pay dispersion at employee level is more limited (Bloom and Michel, 2002).[7] As notable exceptions, Kacperczyk and Balachandran (2018), using Swedish data, find that horizontal wage dispersion increases employee turnover as it is associated with outcomes harmful to employees such as inequity aversion. Grund and Westergaard-Nielsen (2008) document that the effect of dispersion in wage growth within firms on value added per employee is negative in the majority of Danish firms because of fairness concerns, and that this effect is stronger for white collar than for blue collar employees. It is not clear if the results from these more egalitarian Scandinavian countries generalize to the US setting. Using US Census data, Silva (2021) documents wage convergence in multi-unit firms where workers in low-wage industries collect higher-than-industry wages when the firm is also present in high-wage industries, and speculates (but does not test) that this is caused by fairness and equity concerns.[8] We are particularly interested in understanding inequity concerns stemming

[6]Using longitudinal survey data collected by compensation consultant Hewitt Associates between 1986 and 1999, Gartenberg and Wulf (2017) find that horizontal pay comparisons mute pay-performance sensitivity for managers. Duchin et al. (2017) find that industry-wide pay increases are a determinant of management pay increases, and within conglomerates, management pay increases in one division will spill over to other divisions even if those divisions are in different industries. One mechanism they highlight is internal benchmarking of managerial pay.

[7]While Larkin et al. (2021) in their theoretical paper predict that pay dispersion will lead to increased turnover, the empirical paper by Bloom (1999) they cite to support this prediction relates to vertical pay dispersion, which is a more prevalent topic of research. For an accounting study on vertical pay dispersion, refer to Rouen (2020).

[8]Grabner and Martin (2021) find that horizontal pay dispersion negatively affects the effectiveness of performance-based contracts of a large US healthcare provider when employees consider the pay dispersion illegitimate. Chen and Sandino (2012) find that higher wages relative to employees working for other similar organizations in the region lead to lower theft. Card et al. (2012) show in a field experiment that when pay is disclosed, more university employees report increased intention to leave.

from within-firm, cross-plant comparisons, as both the management (Gartenberg and Wulf, 2017) and accounting literatures (Feichter et al., 2018) do not explore these constraints facing multi-divisional firms. We predict that inequity aversion in multi-plant firms reduces the use of wage increases as a local retention mechanism, as employees in plants in other locations may perceive any wage differential with the focal plant as inequitable. There is tension in this prediction, as recent survey evidence shows that a proportion of firms chooses to have the same pay for the same job, no matter the location (Bindley, 2020), presumably also because of inequity concerns.

Experimental research has also studied the effects of inequity aversion on other management accounting aspects of the firm, such as managerial reporting, budgeting, incentives, and management control (Matuszewski, 2010; Evans III et al., 2001; Fisher et al., 2019). Recently, survey and field-based research has considered the role of inequity aversion in the target setting process (Feichter et al., 2018; Merchant et al., 2018). Merchant et al. (2018) document in a field study that extensive efforts are performed to ensure cross-entity equity in target setting for different business units. Feichter et al. (2018) find that there is big cross-sectional heterogeneity in terms of the flexibility headquarters exercise in adjusting performance target difficulty in multi-divisional firms. About half of their survey respondents indicate such flexibility is not exercised because of business group managers' lack of fairness perceptions and alleging of favoritism, whereas the other half of the firms do differentiate target difficulty across divisions. The corporate finance literature on investment demonstrates the constraining effect of inequity aversion as conglomerates are pressed on a more even distribution of resources when investing in assets (Duchin et al., 2017). We expect that the retention mechanisms we study, too, are not set for one plant in isolation and thus predict inequity aversion in multi-plant firms also reduces the use of non-wage levers as retention mechanisms. The MOPS data are particularly suited to research this prediction as we observe the use of these non-wage retention levers in multiple plants per firm at two points in time.

Since we will document that inequity concerns in multi-plant firms indeed constrain the use of both wage and non-wage levers by a plant when it responds to retention concerns in the local labor market, we additionally explore if these inequity aversion

considerations are warranted. We do so by considering spillovers in the use of these retention levers to other plants within the same firm, beyond the retention pressures those other plants experience in their own local labor markets. Prior research has found that internal firm networks create other types of spillover effects. Duchin et al. (2017) document spillovers in managerial pay. Giroud and Mueller (2019) find that local housing market shocks of a focal plant affect employment in plants of the same firm in other regions, even in the case of non-tradeable industries.[9] If such positive spillover also exists for employee wages and other non-wage retention levers, this indicates that other plants deviate from retention practices that would be optimal for their local labor markets only because of wage rate increases in the local labor market of the focal plant. As a result, this will limit how much the focal plant can or will be allowed to use the various retention mechanisms to manage its own retention problems. Furthermore, since to our knowledge no research exists on the salience of a particular lever in forming inequity concerns, we further explore the differential strength of these spillovers to other plants.

3. Data and Research Design

We use data from three confidential data sets collected by the US Census Bureau on the economic activity in the manufacturing sector. We use the Census of Manufactures (CMF) and the Annual Survey of Manufacturers (ASM) data to measure plant-level characteristics and wage changes at the Metropolitan Statistical Area (MSA) and plant. We also use the Management and Organizational Practices Survey (MOPS) to measure the non-wage retention levers used at the plant.

3.1. CMF and ASM data

In years ending in "2" or "7", Census conducts a full Census of Manufactures (CMF) and sends surveys to about 168,000 establishments representing the entire US manufacturing industry, publicly and privately held, other than very small single-plant

[9] Giroud and Mueller (2015) find that financially constrained firms withdraw money from other plants to fund investment opportunities in the focal plant.

companies with fewer than 20 employees. Plants are required to provide operational data including sales, employees, payroll, and capital expenditures. In other years, Census surveys a subset of these manufacturing plants on an annual basis in the Annual Survey of Manufactures (ASM). Two years after each CMF, Census selects a stratified sample of about 51,000 establishments (33,000 of which are plants from multi-establishment firms while 18,000 are larger single-establishment firms) who receive this survey each year for five years. Questions in the ASM are almost identical to those in the CMF.[10] This stratified sample is designed to cover each industry, geographic area and employment level adequately. For both the CMF and the ASM, plants are required to respond to the surveys by law. Furthermore, Census personnel persistently follows up on non-responders to minimize selection bias, resulting in a response rate between 70 and 80 percent in all years.

3.2. MOPS data

The third data set we use is the Census Management and Organizational Practices Survey (MOPS), sent in 2010 and 2015 to the ASM plants. MOPS provides unparalleled detail for a large and broad sample of plants, including detailed questions on management practices, decision-making authority, organizational hierarchy and background information, which allows us to measure all non-wage retention levers. Research has started to make use of these high quality data recently (Bloom et al., 2019a; Bai et al., 2021; Brynjolfsson and McElheran, 2016).[11] We employ a difference-in-difference research design, so our measures of changes in non-wage retention levers come from comparing the 2010 and 2015 responses.

[10]For a copy of the 2015 ASM survey instrument see `https://www2.census.gov/programs-surveys/asm/technical-documentation/questionnaire/2015/ma-10000-15-final-11-3-15.pdf`. The 2010 ASM and 2012 CMF forms are virtually identical.

[11]See `https://www2.census.gov/programs-surveys/mops/technical-documentation/questionnaires/ma-10002_15_final_3-2-16.pdf` for a copy of the 2015 MOPS survey instrument. While the Census disclosure processes constrain our ability to report detailed data validity checks in this paper, we refer the reader to the extensive detail on validity reported in Bloom et al. (2019b), Buffington et al. (2017) and Buffington et al. (2018).

3.3. Sample and variable construction

For admission in our sample we require valid responses to the 2010 and 2015 ASM and MOPS, along with the firm's presence in the 2012 CMF. Our sample consists of 14,000 plants representing 7,100 distinct firms.[12] The MOPS asks questions about delegated decision-making authority for plants that are not co-located with corporate headquarters. When we explore these non-wage retention levers, we rely on this subset consisting of 5,100 plants and 2,000 firms. Because Census employs a stratified sample methodology, certain observations are oversampled relative to the general population of plants to ensure good sampling coverage across industries, geographies, and plant sizes.[13] Thus, if we use the raw sample and weighted each plant equally, our sample distribution would likely differ from the population as a whole. To correct for this problem, in all of our regression estimates we weigh observations by the sampling weights Census uses to tabulate population estimates.

3.4. Key empirical constructs

3.4.1. Wage rate growth and local wage pressure

For each plant in our sample, we use ASM data to calculate the wage rate growth from 2010 to 2015 ($GrowthWageRate_p$, where p denotes the focal plant) as salaries and wages scaled by total employee count of plant p in 2015 minus salaries and wages scaled by total employee count of plant p in 2010, all divided by salaries and wages scaled by total employee count of plant p in 2010. Reported in Table 1, Panel A, the wage rate for the average plant in our sample increased by 12.6% over the sample window. We then aggregate wage rate growth to the MSA level to measure local wage pressure ($GrowthWageRate_{m-p}$ where m denotes MSA). Specifically, excluding the focal plant, we calculate growth from 2010 to 2015 in the weighted average (weighted by census sampling weights) of plant salaries and wages scaled by the plant's total employees. This wage pressure measure equates to the growth in pay for the average manufacturing worker in the same geographic area, and offers us a measure of retention

[12] To comply with Census disclosure requirements, all counts are rounded.

[13] For technical details of the sampling process, please refer to `https://www.census.gov/programs-surveys/asm/technical-documentation/methodology.html`.

concerns.[14] A limited number of remote plants do not fall into a defined MSA; thus for each state we group all plants not within MSA boundaries and designate those plants in a state-specific "rural" MSA. By excluding the focal plant, we ensure that the measure of wage rate pressure captures the labor market conditions outside of the firm and that the local measure and the focal plant measure are not mechanically related. Thus, the wage pressure measure will differ very slightly from one plant to the next as each focal plant is removed from the calculation. Our underlying assumption is that wage rate pressure is determined exogenously. We acknowledge this assumption is strong; for especially large plants, reverse causality may be at play (i.e. changes in a focal plant may affect wages at other local plants). However, given the average manufacturing plant in the US is relatively small at roughly 40 employees, we believe that aside from a handful of mega-factories, the primary causal direction is the local labor market affecting the focal plant's retention concerns and not the other way around.

Insert Table 1 about here.

3.4.2. Non-wage retention levers

We measure two characteristics of performance targets used in bonus plans. Target transparency ($TargetTransparency_p$) is measured by responses to question 8 of the MOPS (who was aware of production targets at this establishment): 1="All managers and most production workers", 0.667="Most managers and most production workers", 0.333="Most managers and some production workers", 0="Only senior managers". The use of localized performance targets for non-managers ($LocalizedMetrics_p$) is measured based on question 9 of the MOPS. If respondents check own or team performance on the question "what were non-managers' performance bonuses usually based on at this establishment", $LocalizedMetrics_p$ equals one.

The measurement of meritocracy of employee promotions ($StaffPromotions_p$) is

[14] Our MSA-level measure captures the weighted average wage rate in both 2010 and 2015. We use the full 2010 and 2015 ASM to calculate these measures, as the 2010 and 2015 samples are each individually representative of the MSA. If we included only plants present in both years' surveys, it would skew the sample towards larger plants. Additionally, if a new plant opens in the MSA with higher wages than the incumbent plants, we want our measure to capture the effect of those newer, high-paying jobs which may lure workers away from the focal plant.

based on responses to question 13 of the MOPS (the primary way non-managers were promoted at the establishment): 1="Promotions were based solely on performance and ability", 0.667="Promotions were based partly on performance and ability and partly on other factors (for example, tenure or family connections)", 0.333="Promotions were based mainly on factors other than performance and abillity", 0="Non-managers are normally not promoted".

Plants report the extent to which local management can make decisions without headquarters review on six dimensions including human resources (hiring, and deciding large pay raises), marketing (new product introductions, advertising, and pricing), and capital expenditures. We scale these responses 0-1 (0="Only at headquarters", 0.5="Both at this establishment and at headquarters", and 1="Only at this establishment" for questions 18-22; 0-1 based on the capital expenditures approval threshold in question 23 with 1 indicating authority to purchase $1 million or more without approval). In addition to using responses to each dimension of delegation, we also average responses across these dimensions to derive an overall plant specific measure of delegation ($Delegation_p$). $DelegationNoHR_p$ averages only the survey answers on the marketing and capital expenditures questions.

3.4.3. Inequity aversion in multi-plant firms

We measure inequity aversion using two different variables reflecting likely travel of information on retention levers from one plant to another within the firmj, making differing conditions more salient and the other plant more likely to be used as a reference group. Our first variable is an indicator of whether the firm has interplant transfers of goods ($InterplantXfers_f$). We use this measure for three reasons. First, if firms transfer goods between plants, employees from each likely coordinate closely. These established communication channels likely facilitate exchanging information about wages and work conditions, making any differing employment conditions more salient. Second, Kacperczyk and Balachandran (2018) and Adams (1963) argue that employees rely on other employees in their "reference group" to evaluate the (in)equity of their own pay. Forms of proximity, such as social and geographic proximity, determine which employees will be in such reference group (Kacperczyk and Balachandran,

2018). When employees work together across multiple plants, this will increase their proximity and the likelihood that they include employees from other plants in their reference groups. Lastly, Shaw et al. (2002) find that pay dispersion inhibits cooperation, which is presumably more important with interplant transfers, and hence will be more constraining.Our second variable is the firm's employee dispersion ($EmpDispersion_f$), as measured by the inverse of the Herfindahl index of employees across plants in the firm. This measure reflects the impact that active internal labor markets will have on the exchange of information on the use of wage and non-wage levers. For example, firms may run labor rotation programs or operate internal labor markets where employees are moved to different plant locations in the same firm (Giroud and Mueller, 2019), making any inequities in labor conditions very salient. In a recent study in 32,000 Brazilian firms with ca. 119,000 establishments, Chauvin and Poliquin (2021) show that 12 percent of all incoming horizontal hires are workers redeployed from other units of the firm.

3.5. Research Design

Our research design regresses the shifts in retention levers on changes in local wage pressure, our measure of retention concerns. We estimate models of the following form:

$$RetentionLeverChange_p = \alpha GrowthWageRate_{m-p} + \beta Controls_{p,f,m} + \gamma_i + \varepsilon \qquad (1)$$

whereby m indicates MSA, f indicates firm, p indicates plant and i indicates industry. The richness of the Census data allows us to include a battery of control variables and fixed effects, ruling out a whole host of alternative explanations. In nearly all specifications we include industry fixed effects for the plant's 4-digit NAICS classification to control for industry-wide confounds such as the available technology. To control for different underlying economics aside from industry we include the 2010 levels of total value of shipments from the plant (logged), and the cost of materials, capital expenditures (controlling for automation), and salaries and wages, each scaled by total value of shipments. We also include the growth in these four measures from 2010 to

2015 (excluding salaries and wages when we use plant wage rate response as a dependent or explanatory variable). To control for firm size, we include firm-wide plant and employee counts (each logged). Because a unionized workforce may restrict changes management may make in employment contracts, we control for the extent of unionization of the workforce at the plant. Changes in the workforce likely necessitate changes in the overall compensation contract, so we separately control for changes in the portion of the staff and management with bachelor's degrees. Additionally, because data availability and use has been shown to affect how plants are managed (Brynjolfsson and McElheran, 2016), we control for changes in the availability of data for decision-making. We also control for changes in plant ownership, as these have been shown to result in changes in management practices (Bai et al., 2021).

In addition to these plant- and firm-level variables and industry fixed effects, we also control for non-wage changes in the local economy using two approaches. Our first approach is to control for growth in average production in peer plants by including $GrowthValShip_{m-p}$, constructed analogously to $GrowthWageRate_{m-p}$. Alternatively, we control for unspecified local economic changes (e.g. cities versus rural areas developing differently) using MSA fixed effects. Because $GrowthWageRate_{m-p}$ is a MSA-level variable, we cannot include it in conjunction with MSA fixed effects.[15] However, we can include MSA fixed effects in specifications where we interact local wage pressure with another variable, provided we drop the main effect.

4. Results and Discussion

All results that use confidential Census data need to go through a review process by Census personnel prior to being disclosed to ensure that no individual plant or firm responses can be inferred. To minimize risk of possible disclosure, we minimize nonessential data tabulated such as the coefficients on control variables and highly

[15] Strictly speaking, $GrowthWageRate_{m-p}$ and $GrowthValShip_{m-p}$ are not collinear with MSA fixed effects because of the small variation induced within an MSA by excluding the focal plant. However, because the focal plant typically represents a small portion of the MSA's economic activity, in practice these variables are nearly collinear with MSA fixed effects. Hence, whenever we employ MSA fixed effects we drop these variables from the estimation.

detailed descriptive statistics.

4.1. Validation of Retention Concerns Measure

We start by validating our measure of local retention concerns, the growth in the wage rate in the MSA (minus the focal plant) in Table 2, by showing that plants respond to such local wage growth in ways that are to be expected. Consistent with prior work (Campbell and Kamlani, 1997), column (1) shows that local retention concerns are highly correlated (0.896) with the growth in wage rate at the focal plant.[16] In Column (2), we allow the regression to have a constant, which suggests over the sample period in the absence of local wage pressure, wage rates increased an average of 10.7%. However local wage pressure still has a positive and significant effect on focal plant wage growth (12.3% of the increase in the average local wage rate carries over to the focal plant). Results are similar if we add industry fixed effects (columns (3) and (4)) and our battery of control variables (column (4)). Among the many control variables in column (4), note specifically the changes in management and staff education level, precluding that growth in wages at the plant is driven by changes in the skill-level of the workforce, and growth in capital expenditures, precluding that growth in wages at the plant is driven by increased automation.

To further validate our measure, we regress growth in capital expenditures (along with fixed effects and controls) at the focal plant, controlling for industry fixed effects and our control variables (column 5). The positive and significant coefficient demonstrates that the focal plants substitute capital for labor in response to an increase in the price of labor, in line with the result in Silva (2021) that increased labor costs in internal capital markets of multi-divisional firms lead to automation in production.

Insert Table 2 about here.

As our last validation strategy, we show that plants' response to local wage growth is differentiated in that they respond less strongly with wage increases when the employees that are subject to retention concerns have lower human capital for the firm.

[16] We estimate the regression for column (1) without an intercept term. As a result, R^2 is not bound by [0,1]. The negative R^2 term indicates that forcing the model through the origin fits the data worse than a horizontal line at the average of the dependent variable.

Employee turnover is a major source of "organizational forgetting" (David and Brachet, 2011). Ittner et al. (2003) argue that retention concerns are stronger when employees can take important information and know-how away from the firm when they leave. Formal internal information quality reduces the human capital value of employees in that it can substitute for tacit knowledge that employees possess. In Table 3 (panel A, column 1), we interact the growth in wage rate in the MSA (minus the focal plant) with the amount of data available for decision-making at the plant. The negative interaction effect in column (1) shows that the growth in wage rate in response to local retention concerns is less strong when the plant has a lot of information available. In column (2), we interact wage pressure with indicators of who chooses the type of data collected at the plant. We find that when management—either local or at headquarters—chooses the type of data to collect, the effect of local wage pressure is dampened, whereas when production workers choose, the effect of local wage pressure is amplified. We interpret these findings to indicate if employees are not collecting substantial information to do their job and information resides in management instead, retention concerns are less pressing and hence the plant does not need to respond as strongly to increases in the prevailing local wage rate.[17]

Insert Table 3 about here.

The cross-sectional results in Panel B of Table 3 show that headquarters delegating more decision-making authority to managers at the focal plant allows for highly selective and targeted retention efforts rather than offering broad, across-the-board wage increases, as reflected by plant wages reacting less strongly to increases in the prevailing local wage rate. This validation is consistent with the notion that local management may be able to better identify key high human capital retention candidates. Column (1) documents a negative interaction between the composite delegation index and the change in wage rate. Column (2) separates out each dimension of delegated authority. We find that the delegation result in column (1) is driven by authority over Human Re-

[17] In Table 3 we also control for the interaction between our measure of local wage pressure and employee dispersion to ensure our results on these plant-level characteristics are not driven by firm-level inequity aversion which we will discuss in Table 4.

sources decisions (hiring and large wage increases). Even though plant management has the authority to increase wages, they choose not to do so on average, but instead likely target raises to key employees that represent a flight risk. Other aspects of delegated authority do not load significantly.

4.2. Results on Research Questions

We start with studying the first part of our second research question and find in Table 4 that inequity aversion affects the wage elasticity of the focal plant to local wage growth. In column (1), the coefficient on $GrowthWageRatge_{m-p}$ is positive, indicating that for firms with employees concentrated to a single plant, local wage pressure has a strong positive influence on plant wages. However, the negative interaction term indicates that as the company's employees become disperse across multiple plants in different labor markets, the effect of local wage pressure on the focal plant's wages is dampened. In column (2) we include MSA fixed effects and thus drop the main effect, but we continue to find a negative and significant interaction term. We find similar results in columns (3) and (4) using an indicator for interplant transfers occurring within the firm instead of the employee dispersion measure, and both interaction terms are negative when simultaneously included in column (5). These results support our predictions on exposure to multiple labor markets and close collaboration with reference group employees at other plants serving as an inhibitor for the company to respond aggressively to changes in the prevailing local wage rate. Note that our results control for union representation, as Freeman (1980) finds that unions reduce wage dispersion between establishments within the same industry and within establishments.

Insert Table 4 about here.

We also conduct spillover analyses, exploring how much increasing wages in other plants around the company will affect wages at the focal plant. Specifically, we calculate $\overline{GrowthWageRate_f}$, the weighted (by employee count) average growth of $GrowthWageRatge_{m-p}$ experienced by company plants across the country and then subtract off changes in the local wage rate. This difference represents how much wages are increasing elsewhere in the company over and above changes in the local wage rate. We interpret a positive

significant coefficient as evidence supporting the idea that increased wages elsewhere in the company prompt the focal plant to make adjustments, likely out of inequity concerns.

Table 5 shows that the restraint focal plants show in increasing wages because of inequity concerns is indeed warranted in that there are spillovers of wage growth. Specifically, in column (1) we find that for each dollar of wage rate growth in other company plants over and above local wage rate growth is associated with wage rate growth at the focal plant, the focal plant will increase wages by 26 cents. Furthermore, in column (2), we find that the interaction effect of this spillover with interplant transfers is positive, which is evidence that when there are stronger inequity concerns around wage increases at different plants around the firm, the spillover of wage increases is larger. Our finding may help explain why Schoar (2002) finds evidence that diversified conglomerate firms pay higher wages on average than similar stand-alone plants.

Insert Table 5 about here.

Next, we move to research question 1, studying non-wage retention levers. Table 6, panel A, reports results on the characteristics of performance targets used in bonus plans. These results control for equity concerns through including the interactions with employee dispersion and interplant transfers, industry fixed effects, and MSA fixed effects (in each second and third column). Our results show that an increase in local retention concerns decreases target transparency (column (1)) and the usage of localized performance metrics (column (4)). These results are consistent with these changes in performance targets giving leeway to pay out bonuses, thereby meeting reservation utility of employees without having to increase base wages by as much, while reducing pay-for-performance sensitivity in the bonuses.

Insert Table 6 about here.

The effects of local retention concerns on the change of the characteristics of the performance targets used in bonuses are all dampened when inequity concerns are stronger. Columns (2) and (5) show this for the measure of employee dispersion, with the interaction effect of employee dispersion and increased local retention concerns

having the opposite and significant sign of the main effect of increased local retention concerns. Columns (3) and (6) show the same with the measure of interplant transfers. Our results suggest that inequity concerns not only constrain wage rate changes when employees compare their treatment by their employer with how employees are treated at other company plants, but also constrain how performance targets are used in bonus plans.

Table 6, panel B, shows the restraint focal plants show in altering performance target characteristics because of inequity concerns is indeed warranted in that there are spillovers of these performance target practices. We find evidence that when other plants around the country experience an increase in the wage rate over and above the focal plant's local wage conditions, the focal plant's target transparency and localized metrics decrease, though only the localized metrics result is statistically significant. We interpret this result that wage pressure in other plants prompts those plants to change their target practices, and those changes in target practices spill over to the focal plant. Comparing economic magnitudes, we see the spillover for wage increases is stronger than for non-wage increases; a one standard deviation in $\overline{GrowthWageRate_f} - GrowthWageRate_{m-p}$ is associated with a 0.060 standard deviation in $GrowthWageRate_p$ (Table 5, column (1)), whereas it is associated with only 0.010 standard deviations in $\Delta TargetTransparency_p$ and 0.037 standard deviations in $\Delta LocalizedMetrics_p$ (Table 6, Panel B, columns (1) and (3)). Thus, because non-wage levers have smaller spillovers, it may make sense for firms to pull these levers as opposed to wage levers. Partitioning the effect by companies that have interplant transfers, we find negative results on target salience and localized bonuses for plants from firms with interplant transfers. These cross-sectional results suggest that spillovers of these non-wage retention levers is greater in firms with higher interplant cooperation and communication, consistent with our findings in Panel B.

Table 7, Panel A, studies the meritocracy of promotions as another non-wage retention lever. These results control for inequity concerns through including the interactions with employee dispersion and interplant transfers, industry fixed effects, and MSA fixed effects in the second and third columns for each result. We find that retention concerns because of local wage growth increase the meritocracy of employee

promotions at the plant. Again, inequity concerns dampen the ability of the firm to respond by changing this non-wage retention lever, as measured by the interaction effect with employee dispersion or with interplant transfers. In untabulated results, we find that the speed of terminations upon observing low performance is not changing significantly, consistent with terminations not being an appropriate lever to pull in times of retention concerns. A number of potential reasons may explain why plants use promotions more selectively: awarding a one-time bonus does not entail the long-term commitment associated with promoting an employee, in hierarchies it is typically infeasible to promote a large portion of employees, and promoting high-performers rather than merely increasing their pay may allow for diminishing pay dispersion among the lower performing employees as an employee in a higher rank is less likely to be used as a reference point.

Insert Table 7 about here.

Table 7, panel B, shows the restraint focal plants show in altering the meritocracy of promotions because of inequity concerns is indeed warranted as there is a spillover on the contractual features related to these promotion incentives. The effect of the difference between the weighted average growth wage rate at the firm (weighted by number employees at firm) and the local growth wage rate (minus the focal plant) on the focal plant's meritocracy of employee promotions is positive. Furthermore, the interplant transfers exacerbate this effect on the meritocracy of employee promotions.

Firms can adjust the amount of discretionary decision-making authority they give to the local plant management in response to local retention concerns. Results are reported in Table 8, and include industry fixed effects (in the first columns), firm fixed effects (in the second columns) or both (in the third columns). We remind the reader that we need to use a smaller sample here, as delegation is only measured in the subsample of firms with multiple plants. As a result, employees are more dispersed in this sample than in the full sample. In columns (1) through (3) we find that local wage growth (minus focal plant) increases delegation of decision making to local plant management in general. This is consistent with bringing decision-making authority closer to the local employees in order for the increased agency thus afforded to entice them to

remain with the plant. In columns (4) through (6), we find the same result on delegation of marketing and capital expenditure decision authority only, excluding the delegation of HR decisions.[18]

Insert Table 8 about here.

A key contribution of our study involves being able to explore how the same sample of plants responding to the same local wage pressure utilize different levers to address retention concerns. By standardizing the magnitudes, we can ascertain which levers are pulled more aggressively. At the sample mean of employee dispersion, we rescale comparable specifications of wage response (Table 4, Column (1)), target transparency (Table 6, Panel A, Column (1)), localized metrics (Table 6, Panel A, Column (4)) and promotion meritocracy (Table 7, Panel A, Column (1) to determine the effect of one standard deviation in $GrowthWageRate_{m-p}$ on standard deviations of the dependent variables. We find that firms adjust wages and targets with relatively similar magnitudes (0.032 and -0.038 respectively) whereas the effects for localized metrics and meritocracy of performance metrics (-0.013 and 0.021 respectively) are weaker.[19] While the intensity with which plants adjust wages and targets is relatively similar, comparing standardized coefficients from Table 5, column (1) and Table 6, Panel B, column (1), we see wage changes spill over to other company plants at roughly six times the intensity of spillovers in target transparency. We speculate that wage responses spill over more easily because of their higher saliency as a point of social comparison, given employee focus on pay inequity, whereas employees may have both less visibility on and lower interest in comparing target transparency at plants.

[18] An alternative interpretation of our results is that offering more decision-making authority to local plant management may enable local management to respond nimbly and swiftly to departure threats from key staff members. However, the specifications in columns (4) through (6) ensure that our results are not related to increasing pay for local employees through local managers, so under this interpretation capital expenditures and marketing decisions made by local plant management are driving their ability to retain key employees. Note that we do not add the interaction of employee dispersion with wage rate and the main effect of employee dispersion in those columns where we have no firm fixed effects, given our outcome variable is delegation to plant management. Headquarters are not concerned about information exchange among dispersed employees about how their local managers are treated.

[19] E.g. at the sample mean of employee dispersion (0.489), marginal effect of $GrowthWageRate_{m-p}$ is $0.166 + (-.141 \times 0.489) = 0.097$. Rescaling this marginal effect based on $\sigma_{GrowthWageRate_{m-p}} = 0.057$ and $\sigma_{GrowthWageRate_{p}} = 0.174$ produces a standardized coefficient of 0.032.

As we hone in further on the notion that, in multi-plant firms, retention responses are not set by one plant in isolation, our last table (Table 9) starts the exploration of whether the non-wage retention levers complement or substitute for the use of increased wages as a retention lever. To answer this question we regress changes in our non-wage retention levers on growth in the local wage rate, growth in the plant wage rate, and the interaction of the two. Our coefficient of interest is the interaction term—how do non-wage retention levers respond when the firm experiences local wage rate pressure and responds by increasing wages. We find that the meritocracy of employee promotions substitutes for wage increases as a retention mechanism in that columns (1) and (2) document that the interaction effect between the local country wage growth and the focal plant wage growth loads negatively. The signs on the interaction with target transparency (columns (3) and (4)) and localized performance targets for bonuses (column (5) and (6)) are positive but insignificant. These results on substitution, together with our result that non-wage levers spill over less than wage levers, represent only an initial exploration of the complex interactions between the use of various wage and non-wage retention levers and we welcome further research on this topic.

Insert Table 9 about here.

5. Conclusion

Our large scale analysis of the use of the wage and non-wage retention levers in multi-divisional manufacturing firms in the US suggests the following conclusions. First, plants adjust wages paid to employees in response to wage increases in the local MSA labor market (minus focal plant) of the focal plant as they generate retention concerns. These wage increases will be less elastic to retention concerns when employees have lower human capital: when the information required to operate the plant is available in formal internal information systems or resides in plant management rather than employees, the wage increases for employees in response to local MSA wage increases will be less strong. Furthermore, when plant management has more decision-making authority (specifically with respect to human resource decisions), such wage increases are also muted, consistent with those plant managers having the ability to tailor wage

increases to high performers at greater risk of leaving the firm, rather than to bluntly increase wages across the board. These findings indicate that we are indeed capturing retention concerns.

Second, while pay elasticity is below one, plants pull non-wage retention levers in response to wage increases in the local labor market of the plant, consistent with the notion that those other levers may be subject to lower transaction and adjustment costs in re-contracting and provide a less permanent mechanism to deal with (potentially temporary) retention concerns. We find that plants adjust the performance targets on which they pay bonuses: performance targets become less transparent throughout the plant as well as less tied to localized performance. This may offer plant management more leeway to pay bonuses in the short run, thereby increasing utility of the employees to meet their reservation utility, suggestive of an empirical link between the individual rationality and the incentive compatibility constraints. Promotions become more meritocratic, offering long-term incentives to remain with the plant to the high performing employees. Lastly, more decision-making authority is granted to plant management, consistent with the notion that offering more agency can also alleviate retention concerns. We offer some exploratory evidence into the complementarity and substitutability of some non-wage retention levers with the wage retention lever.

Third, we research the inequity aversion constraints imposed in multi-plant firms with respect to the plant's ability to respond to local retention concerns. We find that such inequity aversion limits the use of both wage and non-wage retention levers. This dampening of the use of retention levers due to inequity concerns is warranted because the use of both wage and non-wage retention levers spills over to other plants in the firm, more so than justified by the retention pressure in their own local labor markets.

Our results are subject to important caveats. First, we do not study whether the inequity aversion in multi-plant firms that limits their ability to strongly pull retention levers leads to a lower ability to retain a highly qualified labor force. While our paper is studying a broader set of wage and non-wage retention levers than the prior literature, there are more ways in which plants can retain employees on which we do not have data. Given we only start to explore the complementarity and substitutability of various levers, it is too early to answer this question. Second, while our results are strongly

suggestive, we cannot draw strong causal conclusions despite our research design that looks at changes, and our numerous controls and fixed effects. Third, our sample covers a time period during which retention concerns increase. Given prior evidence that wages are rigid in the downward direction (Campbell and Kamlani, 1997; Eberts and Stone, 1992) and that employees consider pay cuts unfair even if local labor markets would warrant them (Charness and Levine, 2002), we cannot speak to the generalizability of our results to such periods characterized by decreasing retention concerns, nor to whether or not there may be an asymmetry in the change in the use of the various retention levers during boom versus bust periods. Last, while the Census MOPS data captures a very large and stratified sample of manufacturing employees, we cannot speak to retention of other types of employees, such as knowledge workers where retention concerns may be even stronger (Grabner et al., 2020). Given the importance of employee retention for firms' competitiveness, we look forward to further theoretical and empirical research on the management of employee retention that can answer these questions.

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Table 1
Descriptive Statistics.

This table provides descriptive statistics for those variables used as either a dependent variable, or with a tabulated coefficient in our results tables. Panel A presents means and standard deviations. Panel B presents the number of plants and the number of distinct firms represented in each sample. To comply with Census disclosure procedures, all counts are rounded.

Panel A: Variable Means and Standard Deviations

Variable	Observations	Mean	Standard Deviation
$GrowthWageRate_p$	14,000	0.126	0.174
$GrowthCapEx_p$	14,000	0.010	0.027
$GrowthWageRate_{m,-p}$	14,000	0.108	0.057
$DataAvail_p$	14,000	0.715	0.207
$LocalMgtChoose_p$	14,000	0.836	0.370
$HQMgtChoose_p$	14,000	0.627	0.484
$WorkersChoose_p$	14,000	0.222	0.416
$EmpDispersion_f$	14,000	0.489	0.399
$InterplantXfers_f$	14,000	0.424	0.494
$\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p}$	14,000	0.0003	0.040
$\Delta TargetTransparency_p$	14,000	0.003	0.317
$\Delta LocalizedMetrics_p$	14,000	0.018	0.477
$\Delta BroadBonus_p$	14,000	0.047	0.547
$\Delta StaffPromotions_p$	14,000	0.002	0.327
$Delegation_p$	5,100	0.346	0.173
$DelHiring_p$	5,100	0.642	0.251
$DelRaises_p$	5,100	0.406	0.273
$DelNewProd_p$	5,100	0.320	0.302
$DelPricing_p$	5,100	0.253	0.327
$DelAdvert_p$	5,100	0.164	0.291
$DelCapEx_p$	5,100	0.292	0.229
$\Delta Delegation_p$	5,100	0.065	0.938
$\Delta DelegationNoHR_p$	5,100	0.021	0.700

Panel B: Firm Counts

Sample	Observations (Plants)	Distinct Firms
Full Sample	14,000	7,100
Remote Plant Sample	5,100	2,000

Table 2
Validation of MSA Wage Pressure as Measure of Local Retention Concerns.

This table presents regressions of growth in the average wage rate (or capital expenditures) at a focal plant in response to growing wages at local peer manufacturing plants. Column (1) supresses the intercept whereas column (2) includes one. Columns (3)-(5) layer in industry fixed effects. Columns (4) and (5) include additional control variables in the estimation, though for Census disclosure purposes their coefficients and associated standard errors are not tabulated. Standard errors are clustered at the firm level. All variables are defined in Appendix A.

	$GrowthWageRate_p$				$GrowthCapEx_p$
	(1)	(2)	(3)	(4)	(5)
$GrowthWageRate_{m-p}$	0.896***	0.123***	0.105***	0.103***	0.109***
	(0.028)	(0.039)	(0.035)	(0.034)	(0.005)
Constant		0.107***			
		(0.005)			
Intercept:	Suppressed	Yes	N/A	N/A	N/A
Industry Fixed Effects:			Yes	Yes	Yes
Additional Controls:					
$\ln(ValShip_{p,2010})$				Yes	Yes
$CostMat_{p,2010}$				Yes	Yes
$CapEx_{p,2010}$				Yes	Yes
$SalariesAndWages_{p,2010}$				Yes	Yes
$GrowthValShip_p$				Yes	Yes
$GrowthCostMat_p$				Yes	Yes
$GrowthCapEx_p$				Yes	
$GrowthWageRate_p$					Yes
$Unionization_{p,2010}$				Yes	Yes
$\ln(Employees_{f,2010})$				Yes	Yes
$\ln(PlantCount_{f,2010})$				Yes	Yes
$\Delta MgtEducation_p$				Yes	Yes
$\Delta StaffEducation_p$				Yes	Yes
$\Delta DataAvail_p$				Yes	Yes
$NewOwner_p$				Yes	Yes
$GrowthValShip_{m,-p}$				Yes	Yes
N	14,000	14,000	14,000	14,000	14,000
R^2	-0.079	0.002	0.058	0.071	0.164

Table 3
Differentiated Effects of Wage Pressure, Validating Retention Concerns Measure.

This table presents estimates of plant wage rate growth regressed on the local wage rate growth interacted with moderators capturing the human capital value of employees to the plant (panel A), and the local wage rate interacted with the amount of decision-making authority delegated to local management (panel B). Main effects and a battery of control variables are included in the estimation, but their coefficients and standard errors are not reported to minimize Census disclosure risks. Estimates include 4-digit NAICS industry fixed effects and Metropolitan Statistical Area fixed effects. Standard errors are clustered at the firm level. All variables are defined in Appendix A.

Panel A: Human capital value of employees

	$GrowthWageRate_p$ (1)	$GrowthWageRate_p$ (2)
$GrowthWageRate_{m-p} \times DataAvail_{p,2010}$	-1.626^{***}	
	(0.168)	
$GrowthWageRate_{m-p} \times LocalMgtChoose_{p,2010}$		-0.809^{***}
		(0.112)
$GrowthWageRate_{m-p} \times HQMgtChoose_{p,2010}$		-0.429^{***}
		(0.083)
$GrowthWageRate_{m-p} \times WorkersChoose_{p,2010}$		0.279^{***}
		(0.087)
Industry Fixed Effects:	Yes	Yes
MSA Fixed Effects:	Yes	Yes
Additional Controls:		
$DataAvail_{p,2010}$	Yes	
$LocalMgtChoose_{p,2010}$		Yes
$HQMgtChoose_{p,2010}$		Yes
$WorkersChoose_{p,2010}$		Yes
$EmpDispersion_{f,2010}$	Yes	Yes
$\ln(ValShip_{p,2010})$	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes
$GrowthValShip_p$	Yes	Yes
$GrowthCostMat_p$	Yes	Yes
$GrowthCapEx_p$	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes
$NewOwner_p$	Yes	Yes
$GrowthValShip_{m,-p}$	Yes	Yes
$GrowthWageRate_{m,-p} \times EmpDispersion_{f,2010}$	Yes	Yes
N	14,000	14,000
R^2	0.172	0.166

Panel B: Decision-making delegated to local managers

	$GrowthWageRate_p$ (1)	(2)
$GrowthWageRate_{m,-p} \times Delegation_{p,2010}$	-1.60^{***}	
	(0.280)	
$GrowthWageRate_{m-p} \times DelHiring_{p,2010}$		-1.25^{***}
		(0.231)
$GrowthWageRate_{m-p} \times DelRaises_{p,2010}$		-0.441^{**}
		(0.193)
$GrowthWageRate_{m-p} \times DelNewProd_{p,2010}$		−0.228
		(0.243)
$GrowthWageRate_{m-p} \times DelPricing_{p,2010}$		−0.017
		(0.239)
$GrowthWageRate_{m-p} \times DelAdvert_{p,2010}$		0.096
		(0.248)
$GrowthWageRate_{m-p} \times DelCapEx_{p,2010}$		−0.113
		(0.221)
Industry Fixed Effects:	Yes	Yes
MSA Fixed Effects:	Yes	Yes
Additional Controls:		
$Delegation_{p,2010}$	Yes	
$DelHiring_{p,2010}$		Yes
$DelRaises_{p,2010}$		Yes
$DelNewProd_{p,2010}$		Yes
$DelPricing_{p,2010}$		Yes
$DelAdvert_{p,2010}$		Yes
$DelCapEx_{p,2010}$		Yes
$EmpDispersion_{f,2010}$	Yes	Yes
$\ln(ValShip_{p,2010})$	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes
$GrowthValShip_p$	Yes	Yes
$GrowthCostMat_p$	Yes	Yes
$GrowthCapEx_p$	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes
$NewOwner_p$	Yes	Yes
$GrowthWageRate_{m,-p} \times EmpDispersion_{f,2010}$	Yes	Yes
N	5100	5100
R^2	0.313	0.322

Table 4
Inequity Concerns.

This table presents estimates of regressing growth in the focal plant's average wage on interactions of local wage growth and inequity concerns created by firms' exposure to multiple labor markets. Columns (1), (2), and (5) interact local wage growth with employee dispersion and columns (3), (4), and (5) interact it with an indicator if the firm has plants that produce items that are shipped to other company-owned plants. Main effects and a battery of control variables are included in the estimation, but their coefficients and standard errors are not reported to minimize census disclosure risks. Estimates include 4-digit NAICS industry fixed effects and Metropolitan Statistical Area fixed effects in columns (2), (4), and (5). Standard errors are clustered at the firm level. All variables are defined in Appendix A.

	$GrowthWageRate_p$				
	(1)	(2)	(3)	(4)	(5)
$GrowthWageRate_{m,-p}$	0.166***		0.153***		
	(0.052)		(0.045)		
$GrowthWageRate_{m,-p} \times EmpDispersion_{f,2010}$	−0.141*	−0.583***			−0.440***
	(0.079)	(0.092)			(0.126)
$GrowthWageRate_{m,-p} \times InterplantXfers_{f,2010}$			−0.139**	−0.426***	−0.174*
			(0.064)	(0.068)	(0.093)
Industry Fixed Effects:	Yes	Yes	Yes	Yes	Yes
MSA Fixed Effects:	No	Yes	No	Yes	Yes
Additional Controls:					
$EmpDispersion_{f,2010}$	Yes	Yes			Yes
$InterplantXfers_{f,2010}$			Yes	Yes	Yes
$GrowthValShip_{m,-p}$	Yes		Yes		
$\ln(ValShip_{p,2010})$	Yes	Yes	Yes	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes	Yes	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes	Yes	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes	Yes	Yes	Yes
$GrowthValShip_p$	Yes	Yes	Yes	Yes	Yes
$GrowthCostMat_p$	Yes	Yes	Yes	Yes	Yes
$GrowthCapEx_p$	Yes	Yes	Yes	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes	Yes	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes	Yes	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes	Yes	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes	Yes	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes	Yes	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes	Yes	Yes	Yes
$NewOwner_p$	Yes	Yes	Yes	Yes	Yes
N	14,000	14,000	14,000	14,000	14,000
R^2	0.071	0.157	0.071	0.155	0.157

Table 5
Intracompany Spillover of Wage Pressure.

This table tests how much wage growth at the focal plant spills over to other plants in the firm. We include in our estimation the listed controls, but for parsimony and census disclosure reasons do not tabulate their coefficients. . Standard errors are clustered at the firm level. All variables are defined in Appendix A.

	$GrowthWageRate_p$	
	(1)	(2)
$\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p}$	0.260***	0.126
	(0.066)	(0.107)
$(\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p}) \times InterplantXfers_{f,2010}$		0.196*
		(0.107)
Industry Fixed Effects:	Yes	Yes
MSA Fixed Effects	Yes	Yes
Additional Controls:		
$InterplantXfers_{f,2010}$	Yes	Yes
$\ln(ValShip_{p,2010})$	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes
$GrowthValShip_p$	Yes	Yes
$GrowthCostMat_p$	Yes	Yes
$GrowthCapEx_p$	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes
$NewOwner_p$	Yes	Yes
N	14,000	14,000
R^2	0.153	0.154

Table 6
Change in Characteristics of Performance Targets used in Bonus Plans.

This table presents estimates of changes in characteristics of performance targets used in bonus plans at the plant as a function of local wage rate pressure interacted with inequity concerns created by firms' exposure to multiple labor markets (Panel A), and as a function of wage rate growth experienced in other plants within the company (Panel B). Main effects and a battery of control variables are included in the estimation, but their coefficients and standard errors are not reported to minimize census disclosure risks. Estimates include 4-digit NAICS industry fixed effects and Metropolitan Statistical Area fixed effects as noted. Standard errors are clustered at the firm level. All variables are defined in Appendix A.

Panel A: Changes in characteristics of performance targets moderated by inequity concerns

	$\Delta TargetTransparency_p$			$\Delta LocalizedMetrics_p$		
	(1)	(2)	(3)	(4)	(5)	(6)
$GrowthWageRate_{m,-p}$	−0.393***			−0.422***		
	(0.143)			(0.161)		
$GrowthWageRate_{m,-p} \times EmpDispersion_f$	0.375**	0.368**		0.647***	0.801***	
	(0.188)	(0.164)		(0.245)	(0.226)	
$GrowthWageRate_{m,-p} \times InterplantXfers_f$			0.411***			0.400**
			(0.121)			(0.186)
Industry Fixed Effects:	Yes	Yes	Yes	Yes	Yes	Yes
MSA Fixed Effects	No	Yes	Yes	No	Yes	Yes
Additional Controls:						
$EmployeeDispersion_{f,2010}$	Yes	Yes		Yes	Yes	
$InterplantXfers_{f,2010}$			Yes			Yes
$GrowthValShip_{m,-p}$	Yes			Yes		
$\ln(ValShip_{p,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthValShip_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthCostMat_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthCapEx_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthSalariesAndWages_p$	Yes	Yes	Yes	Yes	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes	Yes	Yes	Yes	Yes
$NewOwner_p$	Yes	Yes	Yes	Yes	Yes	Yes
N	14,000	14,000	14,000	14,000	14,000	14,000
R^2	0.057	0.144	0.145	0.038	0.119	0.118

Panel B: Spillovers in changes of characteristics of performance targets

	$\Delta TargetTransparency_p$		$\Delta LocalizedMetrics_p$	
	(1)	(2)	(3)	(4)
$\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p}$	−0.078		−0.438**	
	(0.126)		(0.177)	
$\mathbb{I}(InterplantXfers_f = 1) \times (\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p})$		−0.227*		−0.494**
		(0.126)		(0.208)
$\mathbb{I}(InterplantXfers_f = 0) \times (\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p})$		0.254		−0.319
		(0.187)		(0.256)
Industry Fixed Effects:	Yes	Yes	Yes	Yes
MSA Fixed Effects	Yes	Yes	Yes	Yes
Additional Controls:				
$InterplantXfers_{f,2010}$		Yes		Yes
$\ln(ValShip_{p,2010})$	Yes	Yes	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes	Yes	Yes
$GrowthValShip_p$	Yes	Yes	Yes	Yes
$GrowthCostMat_p$	Yes	Yes	Yes	Yes
$GrowthCapEx_p$	Yes	Yes	Yes	Yes
$GrowthSalariesAndWages_p$	Yes	Yes	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes	Yes	Yes
$NewOwner_p$	Yes	Yes	Yes	Yes
N	14,000	14,000	14,000	14,000
R^2	0.144	0.145	0.118	0.118

Table 7
Change in Meritocracy of Promotion Incentives.

This table presents changes in the meritocracy of employee promotion incentives as a function of local wage pressure in Panel A and wage increases around the company over and above local wage pressure in Panel B. We include MSA and 4-digit NAICS industry fixed effects as noted along with a battery of additional control variables. Standard errors are clustered at the firm level. All variables are defined in Appendix A.

Panel A: Changes in meritocracy of promotion incentives moderated by inequity concerns

	$\Delta StaffPromotions_p$		
	(1)	(2)	(3)
$GrowthWageRate_{m,-p}$	0.374**		
	(0.182)		
$GrowthWageRate_{m,-p} \times EmpDispersion_{f,2010}$	−0.518**	−0.403**	
	(0.219)	(0.175)	
$GrowthWageRate_{m,-p} \times InterplantXfers_{f,2010}$			−0.313**
			(0.134)
Industry Fixed Effects:	Yes	Yes	Yes
MSA Fixed Effects		Yes	Yes
Additional Controls:			
$EmployeeDispersion_{f,2010}$	Yes	Yes	
$InterplantXfers_{f,2010}$			Yes
$GrowthValShip_{m,-p}$	Yes		
$\ln(ValShip_{p,2010})$	Yes	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes	Yes
$GrowthValShip_p$	Yes	Yes	Yes
$GrowthCostMat_p$	Yes	Yes	Yes
$GrowthCapEx_p$	Yes	Yes	Yes
$GrowthSalariesAndWages_p$	Yes	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes	Yes
$NewOwner_p$	Yes	Yes	Yes
N	14,000	14,000	14,000
R^2	0.047	0.143	0.143

Panel B: Spillovers in changes in meritocracy of promotion incentives

	$\Delta StaffPromotions_p$ (1)	(2)
$\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p}$	0.250**	
	(0.126)	
$\mathbb{I}(InterplantXfers_f = 1) \times (\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p})$		0.337**
		(0.136)
$\mathbb{I}(InterplantXfers_f = 0) \times (\overline{GrowthWageRate}_f - GrowthWageRate_{m,-p})$		0.073
		(0.178)
Industry Fixed Effects:	Yes	Yes
MSA Fixed Effects	Yes	Yes
Additional Controls:		
$InterplantXfers_{f,2010}$		Yes
$\ln(ValShip_{p,2010})$	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes
$GrowthValShip_p$	Yes	Yes
$GrowthCostMat_p$	Yes	Yes
$GrowthCapEx_p$	Yes	Yes
$GrowthSalariesAndWages_p$	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes
$NewOwner_p$	Yes	Yes
N	14,000	14,000
R^2	0.143	0.143

Table 8
Change in Delegation to Local Managers.

This table presents estimates of regressing the change in delegation at the plant on local wage pressure. We employ two measures of delegation: one including the HR dimensions (authority to hire and award large raises), and one with those dimensions excluded. We include 4-digit NAICS and firm fixed effects as noted (NAICS is assigned at the plant-level and hence industry fixed effects are not collinear with plant fixed effects). We also include a battery of control variables as noted below. Standard errors are clustered at the firm level. All variables are defined in Appendix A.

	$\Delta Delegation_p$			$\Delta DelegationNoHR_p$		
	(1)	(2)	(3)	(4)	(5)	(6)
$GrowthWageRate_{m,-p}$	0.646**	1.097**	1.068**	0.618**	0.894*	0.976***
	(0.283)	(0.454)	(0.451)	(0.285)	(0.478)	(0.456)
Industry Fixed Effects:	Yes		Yes	Yes		Yes
Firm Fixed Effects		Yes	Yes		Yes	Yes
Additional Controls:						
$\ln(ValShip_{p,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthValShip_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthCostMat_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthCapEx_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthSalariesAndWages_p$	Yes	Yes	Yes	Yes	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln(Employees_{f,2010})$	Yes			Yes		
$\ln(PlantCount_{f,2010})$	Yes			Yes		
$\Delta MgtEducation_p$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes	Yes	Yes	Yes	Yes
$NewOwner_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthValShip_{m,-p}$	Yes	Yes	Yes	Yes	Yes	Yes
N	5,100	5,100	5,100	5,100	5,100	5,100
R^2	0.107	0.526	0.588	0.108	0.509	0.573

Table 9
Substitutes and Complements.

This table presents regressions of changes in contractual features on interactions of local wage pressure and the focal plant's wage rate response. A battery of control variables are included in the estimation, but their coefficients and standard errors are not reported to minimize census disclosure risks. Estimates include 4-digit NAICS industry fixed effects and Metropolitan Statistical Area fixed effects are included as noted. Standard errors are clustered at the firm level. All variables are defined in Appendix A.

	$\Delta StaffPromotions_p$		$\Delta TargetTransparency_p$		$\Delta LocalizedMetrics_p$	
	(1)	(2)	(3)	(4)	(5)	(6)
$GrowthWageRate_{m,-p}$	0.288**		−0.241**		−0.205*	
	(0.140)		(0.104)		(0.121)	
$GrowthWageRate_p$	0.135**	0.078	−0.028	−0.043	−0.092	−0.049
	(0.067)	(0.059)	(0.050)	(0.045)	(0.071)	(0.067)
$GrowthWageRate_{m,-p} \times GrowthWageRate_p$	−1.183**	−0.812*	0.123	0.180	0.608	0.420
	(0.531)	(0.473)	(0.409)	(0.376)	(0.545)	(0.520)
Industry Fixed Effects:	Yes	Yes	Yes	Yes	Yes	Yes
MSA Fixed Effects:		Yes		Yes		Yes
Additional Controls:						
$GrowthValShip_{m,-p}$	Yes		Yes		Yes	
$\ln(ValShip_{p,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$CostMat_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$CapEx_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$SalariesAndWages_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthValShip_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthCostMat_p$	Yes	Yes	Yes	Yes	Yes	Yes
$GrowthCapEx_p$	Yes	Yes	Yes	Yes	Yes	Yes
$Unionization_{p,2010}$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln(Employees_{f,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$\ln(PlantCount_{f,2010})$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta MgtEducation_p$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta StaffEducation_p$	Yes	Yes	Yes	Yes	Yes	Yes
$\Delta DataAvail_p$	Yes	Yes	Yes	Yes	Yes	Yes
$NewOwner_p$	Yes	Yes	Yes	Yes	Yes	Yes
N	14,000	14,000	14,000	14,000	14,000	14,000
R^2	0.047	0.143	0.056	0.144	0.037	0.117

Appendix A. Variable Definitions

GrowthWageRate$_p$ Salaries and wages scaled by total employees of plant p in 2015 minus salaries and wages scaled by total employees of plant p in 2010, all divided by salaries and wages scaled by total employees of plant p in 2010

GrowthCapEx$_p$ Capital expenditures of plant p in 2015 minus capital expenditures of p in 2010, scaled by capital expenditures of plant p in 2010

GrowthWageRate$_{m-p}$ Excluding focal plant p, 2015 weighted (by Census sample weights) average salaries and wages scaled by total employees of plants in metropolitan statistical area m minus 2010 weighted average, scaled by 2010 value

DataAvail$_p$, 2010 Amount of data available for decision-making from the 2010 MOPS question 27. Responses are encoded as follows: "All the data we need to support decision-making is available" = 1, "A great deal of data to support decision-making is available" = 0.75, "A moderate amount of data to support decision-making is available" = 0.5, "A small amount of data to support decision-making is available" = 0.25, "Data to support decision-making are not available" = 0

LocalMgtChoose$_{p,2010}$ 1 if respondent checked local management chooses the data to collect at the plant for the 2010 recall response to the 2015 MOPS question 26, 0 otherwise

HQMgtChoose$_p$, 2010 1 if respondent checked management outside of the local plant chooses the data to collect at the plant for the 2010 recall response to the 2015 MOPS question 26, 0 otherwise

WorkersChoose$_{p,2010}$ 1 if respondent checked production workers choose the data to collect at the plant for the 2010 recall response to the 2015 MOPS question 26, 0 otherwise

EmpDispersion$_f$ Inverse of the Herfindahl index of employees per plant at company-owned establishments. 0 = employees are fully concentrated in one plant; in the limit 1 = employees are fully dispersed (i.e. each employee has their own plant)

InterplantXfers$_f$ 1 if any plant in the firm has a non-zero amount of interplant transfer shipments reported in the 2012 CMF, 0 otherwise

$\overline{\textbf{\textit{GrowthWageRate}}_f}$ Weighted (by plant employee count) average of growth in the wage rate across plants in firm f

Δ***TargetTransparency***$_p$ Change in response to question 8 of 2015 MOPS from 2010 to 2015 ("who was aware of production targets at this establishment"). Each year's value is encoded as follows: "Only senior managers"=0, "most managers and some production workers" = 0.333, "most managers and most production workers" = 0.667, "all managers and most production workers" = 1

Δ***LocalizedMetrics***$_p$ Change in indicator of localized performance metrics for staff bonuses from 2010 to 2015 using question 9 of the 2015 MOPS. Each year is encoded 1 if response checked either "own performance" or "team and shift performance", 0 otherwise

Δ***StaffPromotions***$_p$ Change from 2010 to 2015 in 2015 MOPS question 13 how much staff promotions are based on "performance or ability": each year encoded "solely"=1, "partly"=0.667,"mainly other factors... for example, tenure or family connections"=0.333, "non-managers not usually promoted"=0

Delegation$_{p,2010}$ Average of $DelHiring_{p,2010}$, $DelRaises_{p,2010}$, $DelNewProd_{p,2010}$, $DelPricing_{p,2010}$, $DelAdvert_{p,2010}$, and $DelCapEx_{p,2010}$

DelHiring$_{p,2010}$ encoding of question 18 of the 2010 MOPS (where are decisions made about hiring): 0 if headquarters only, 1 if at the local plant only, 0.5 if both at headquarters and the local plant

DelRaises$_{p,2010}$ encoding of question 19 of the 2010 MOPS (where are decisions made about large pay increases): 0 if headquarters only, 1 if at the local plant only, 0.5 if both at headquarters and the local plant

DelNewProd$_{p,2010}$ encoding of question 20 of the 2010 MOPS (where are decisions made about new product introductions): 0 if headquarters only, 1 if at the local plant only, 0.5 if both at headquarters and the local plant

DelPricing$_{p,2010}$ encoding of question 21 of the 2010 MOPS (where are decisions made about pricing): 0 if headquarters only, 1 if at the local plant only, 0.5 if both at headquarters and the local plant

DelAdvert$_{p,2010}$ encoding of question 22 of the 2010 MOPS (where are decisions made about advertising): 0 if headquarters only, 1 if at the local plant only, 0.5 if both at headquarters and the local plant

DelCapEx$_{p,2010}$ encoding of question 23 of the 2010 MOPS (the threshold at which local plant management can make capital expenditures without headquarters approval): "under $1000" = 0, "$1000-$9999"=0.25, "$10,000-$99,999"=0.5, "$100,000-$999,999"=0.75, "$1 million or more"=1

Δ***Delegation***$_p$ Change in *Delegation*$_p$ from 2010 MOPS to 2015 MOPS

Δ***DelegationNoHR***$_p$ Change in *Delegation*$_p$ from 2010 MOPS to 2015 MOPS excluding HR dimensions (questions 18 and 19)

ValShip$_{p,2010}$ Plant p's total value of shipments in 2010 from the ASM

CostMat$_{p,2010}$ Cost of materials at plant p in 2010 from the ASM scaled by *ValShip*$_{p,2010}$

CapEx$_{p,2010}$ Capital expenditures at plant p in 2010 from the ASM scaled by *ValShip*$_{p,2010}$

SalariesAndWages$_{p,2010}$ Salaries and wages at plant p in 2010 from the ASM scaled by *ValShip*$_{p,2010}$

GrowthValShip$_p$ Change in total value of shipments at plant p from 2010 to 2015 scaled by *ValShip*$_{p,2010}$

GrowthCostMat$_p$ Change in cost of materials (scaled by total value of shipments) from 2010 to 2015, divided by 2010 quotient

GrowthCapEx$_p$ Change in capital expenditures (scaled by total value of shipments) from 2010 to 2015, divided by 2010 quotient

GrowthSalariesAndWages$_p$ Change in salaries and wages scaled by total employees from 2010 to 2015, divided by 2010 quotient

Unionization$_{p,2010}$ Response to question 36 of 2010 MOPS (what percent of employees at the establishment belong to a labor union), encoded "0%" = 0, "1-20%" = 0.2, "21-40%" = 0.4, "41-60%" = 0.6, "61-80%" = 0.8, "More than 80%" = 1

Employees$_{f,2010}$ Total employees across all establishments in the firm in 2010

PlantCount$_{f,2010}$ Number of manufacturing plants across the firm in 2010

Δ***MgtEducation***$_p$ Change in score portion of managers with a bachelor's degree from 2010 to 2015. Each year is encoded: '0%" = 0, "1-20%" = 0.2, "21-40%" = 0.4, "41-60%" = 0.6, "61-80%" = 0.8, "More than 80%" = 1

Δ***StaffEducation***$_p$ Change in score portion of non-managers with a bachelor's degree from 2010 to 2015. Each year is encoded: '0%" = 0, "1-10%" = 0.333, "11-20%" = 0.667, "More than 21%" = 1

Δ***DataAvail***$_p$ Change in data available for decision-making, encoded for 2010 and 2015 each as described for $DataAvail_p$

NewOwner$_p$ 1 if plant ownership changed between 2010 and 2015, 0 otherwise

GrowthValShip$_{m-p}$ Growth in the average (weighted by census weights) total value of shipments from plants in MSA m excluding plant p