"People Management Skills, Employee Attrition, and Manager Rewards: An Empirical Analysis": Online Appendix

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The Online Appendix is organized as follows. Appendix A provides additional results and derivations. For each subsection, we list the section of the main text that it accompanies. Appendix B is our Data Appendix. Appendix C presents additional tables and figures.

A Additional Results and Derivations

A.1 PCA, Functional Form, Transition Matrix, and Correlation Table for the Manager Questions (Section 2)

PCA. As discussed in Section 2, our analysis uses MOR, which is an equal weighted average of the 6 questions. As an alternative to a simple average, we consider principal component analysis (PCA). The first component explains 69% of the variation in manager scores and is close to an equal weighted average of the 6 individual items, as can be seen in Table A1 below. Thus, beyond simplicity, another justification for MOR is it is close to the first principal component. Our main results are similar if we use the first principal component instead of MOR. We also examined the second principal component of manager scores, and saw little evidence of a relation between a manager's second component and worker outcomes.

Table A1: Principal Component Analysis

Variables:	Component 1	Component 2	Component 3	Component 4
Eigenvalue	4.13	0.58	0.42	0.34
Proportion variance explained	0.69	0.10	0.07	0.06
Manager gives clear expectations	0.40	0.29	0.77	0.15
Manager provides coaching	0.40	0.56	-0.09	-0.05
Manager supports career development	0.41	0.35	-0.60	-0.04
Manager involves people in decisions	0.40	-0.41	-0.15	0.79
Manager instills positive attitude	0.41	-0.45	-0.01	-0.49
Manager is someone I trust	0.42	-0.32	0.09	-0.34

Notes: This table presents the results of the principal components analysis. The table uses data from employee responses to the 6 questions about managers in Section 2.1. An observation is a manager-survey (i.e., with two survey periods per manager).

MOR functional form. Our main results become even stronger when grouping MOR in percentiles or quintiles (instead of normalized MOR). This is unsurprising given the fairly linear relationship in the reduced form in Figure 2. In each survey, 12% of managers have MOR=100, but our main results are robust to excluding these cases.

Transition matrix and correlation table. Table A2 below shows a transition matrix for MOR and Table A3 is a correlation table.

Table A2: Transition Matrix, MOR, by Quintile

	Q1 in Y_2	Q2 in Y_2	Q3 in Y_2	Q4 in Y_2	Q5 in Y_2
1st Quintile in Y_1	.37	.28	.18	.1	.07
2nd Quintile in Y_1	.27	.27	.19	.17	.1
3rd Quintile in Y_1	.2	.24	.2	.22	.13
4th Quintile in Y_1	.1	.15	.23	.25	.28
5th Quintile in Y_1	.09	.09	.21	.21	.39

Notes: This table uses the data from the 6 questions from employees about their managers in Section 2.1. The numbers represent the share of managers in a given MOR quintile during Y_1 who transition to a particular MOR quintile during Y_2. Higher quintiles represent higher underlying MOR scores.

Table A3: Manager Characteristics, Correlation Table

Variables:	Clear expect.	Coaching	Career dev.	Involves people	Positive attitude	Someone I trust
Mgr gives clear expectations	1.00					
Mgr provides coaching	0.66	1.00				
Mgr supports career development	0.58	0.71	1.00			
Mgr involves people in decisions	0.57	0.55	0.60	1.00		
Mgr instills positive attitude	0.58	0.57	0.59	0.68	1.00	
Mgr is someone I trust	0.63	0.59	0.63	0.68	0.73	1.00

Notes: Correlation coefficients are reported. An observation is a manager-survey (i.e., with two survey periods per manager).

A.2 Econometric Derivations (Section 3)

OLS Derivation, i.e., Derivation of Equation (4).

$$
\begin{aligned}
\text{plim}(\widehat{b}_{OLS}) &= \frac{cov\left(y_t, \widetilde{m}_\tau\right)}{var\left(\widetilde{m}_\tau\right)} \\
&= \frac{\beta\sigma_m^2 + \beta cov\left(m, u_\tau\right) + cov\left(\varepsilon_t, m\right) + cov\left(\varepsilon_t, u_\tau\right)}{\sigma_m^2 + 2cov\left(m, u_\tau\right) + \sigma_u^2} \\
&= \frac{\sigma_m^2}{\sigma_m^2+\sigma_u^2}\beta + \frac{cov(\varepsilon_t, u_\tau)}{\sigma_m^2+\sigma_u^2} + \frac{cov(\varepsilon_t, m)}{\sigma_m^2+\sigma_u^2} \\
\text{plim}(\widehat{b}_{OLS} - \beta) &= \underbrace{-\frac{\sigma_u^2}{\sigma_m^2+\sigma_u^2}\beta}_{\text{Attenuation Bias}} + \underbrace{\frac{cov(\varepsilon_t, u_\tau)}{\sigma_m^2+\sigma_u^2}}_{\text{Contemp. Corr. ME}} + \underbrace{\frac{cov(\varepsilon_t, m)}{\sigma_m^2+\sigma_u^2}}_{\text{Assignment Bias}} \qquad (9)
\end{aligned}
$$

where we used $cov\left(m, u_\tau\right) = 0$ (Assumption 1) to go from the second line to the third line.

IV Derivation, i.e., Derivation of Equation (5).

$$
\begin{aligned}
\text{plim}(\widehat{b}_{IV}) &= \frac{cov\left(y_t, \widetilde{m}_{-\tau}\right)}{cov\left(\widetilde{m}_{\tau}, \widetilde{m}_{-\tau}\right)} \\
&= \frac{\beta\sigma_m^2 + \beta cov\left(m, u_{-\tau}\right) + cov\left(\varepsilon_t, m\right) + cov\left(\varepsilon_t, u_{-\tau}\right)}{\sigma_m^2 + cov\left(m, u_{\tau}\right) + cov\left(m, u_{-\tau}\right) + cov\left(u_{\tau}, u_{-\tau}\right)} \\
&= \frac{\sigma_m^2}{\sigma_m^2 + cov\left(u_{\tau}, u_{-\tau}\right)}\beta + \frac{cov\left(\varepsilon_t, u_{-\tau}\right)}{\sigma_m^2 + cov\left(u_{\tau}, u_{-\tau}\right)} + \frac{cov\left(\varepsilon_t, m\right)}{\sigma_m^2 + cov\left(u_{\tau}, u_{-\tau}\right)} \\
\text{plim}(\widehat{b}_{IV} - \beta) &= \underbrace{-\frac{cov\left(u_{\tau}, u_{-\tau}\right)}{\sigma_m^2 + cov\left(u_{\tau}, u_{-\tau}\right)}\beta}_{\text{Attenuation Bias}} + \underbrace{\frac{cov\left(\varepsilon_t, u_{-\tau}\right)}{\sigma_m^2 + cov\left(u_{\tau}, u_{-\tau}\right)}}_{\text{Asynchronously Corr. ME}} + \underbrace{\frac{cov\left(\varepsilon_t, m\right)}{\sigma_m^2 + cov\left(u_{\tau}, u_{-\tau}\right)}}_{\text{Assignment Bias}} \quad (10)
\end{aligned}
$$

Reduced Form. For the reduced form expression in equation (5), the derivation is very similar to those above for OLS and IV, so it is omitted for brevity.

A.3 What Happens When Manager Quality Varies Over Time? (Section 3)

What if a manager's underlying people management skill varies over time? We redo the above formulas allowing manager quality to vary over the two periods. In sum, for IV, the three bias terms in (5) are essentially the same except σ_m^2 is replaced by the covariance of people management skill over time. This could accentuate any of the three biases, but we would imagine that underlying people management skill is relatively constant over 27 months. Moreover, the logic of our identification strategy is unchanged.

In more detail, we present the probability limits while allowing underlying manager quality to vary across the two periods in our data. Suppose that $y_{it} = \beta m_{j,\tau(t)} + \varepsilon_{it}$ and write $\sigma_{12} \equiv cov(m_\tau, m_{-\tau})$. We further assume that $var(m_1) = var(m_2) = \sigma_m^2$. Under these assumptions, OLS is essentially the same as when manager quality is fixed.[1] For IV, we have:

$$
\text{plim}(\widehat{b}_{IV} - \beta) = \underbrace{-\frac{cov\left(u_{\tau}, u_{-\tau}\right)}{\sigma_{12} + cov\left(u_{\tau}, u_{-\tau}\right)}\beta}_{\text{Attenuation Bias}} + \underbrace{\frac{cov\left(\varepsilon_t, u_{-\tau}\right)}{\sigma_{12} + cov\left(u_{\tau}, u_{-\tau}\right)}}_{\text{Asynchronously Corr. ME}} + \underbrace{\frac{cov\left(\varepsilon_t, m_{-\tau}\right)}{\sigma_{12} + cov\left(u_{\tau}, u_{-\tau}\right)}}_{\text{Assignment Bias}}
$$

Relative to (5) in the main text, the key difference is that σ_m^2 is replaced by σ_{12} in the denominator. This may accentuate any of the three bias terms relative to when manager quality is fixed. However, the empirical strategies we present in Section 4 for eliminating these biases will function in the same manner. Further, we believe that any accentuation is likely relatively small because manager quality is likely to be relatively fixed over a couple years. For the reduced form, we have:

$$
\text{plim}(\widehat{b}_{RF} - \beta) = \underbrace{\frac{\sigma_{12} - \sigma_m^2 - \sigma_u^2}{\sigma_m^2 + \sigma_u^2}\beta}_{\text{Attenuation Bias}} + \underbrace{\frac{cov(\varepsilon_t, u_{-\tau})}{\sigma_m^2 + \sigma_u^2}}_{\text{Asynchronously Corr. ME}} + \underbrace{\frac{cov(\varepsilon_t, m_{-\tau})}{\sigma_m^2 + \sigma_u^2}}_{\text{Assignment Bias}}
$$

[1] The difference is that $cov\left(\varepsilon_t, m\right)$ is replaced by $cov\left(\varepsilon_t, m_\tau\right)$ in the assignment bias term.

Attenuation bias is worsened the larger the divergence between σ_{12} and σ_m^2, but the formula is otherwise similar.

What happens if people management has persistent effects? The key identification assumptions for IV are that $cov(\widetilde{m}_{j,-\tau}, \theta_{it}) = 0$ and that the only way that $\widetilde{m}_{j,-\tau}$ affects $y_{i,t}$ is through its influence on $\widetilde{m}_{j,\tau}$. This can fail if there are persistent effects of good people management, but some of our identification strategies rule this out. For example, new workers joining the firm in period 2 interact with their current manager for the first time, so it is impossible that the new workers were influenced by their current manager during period 1. Persistent effects can also be addressed by looking at workers after they switch managers during period 2. That we reach qualitatively similar conclusions with these identification strategies is consistent with people management having primarily a contemporaneous effect.

A.4 Non-Instrumental Variable Methods of Addressing Measurement Error and Hold-out Sample Analysis (Sections 3-4)

Non-IV methods of addressing measurement error. Beyond our IV approach, we also considered two non-IV methods of addressing measurement error. First, we performed OLS while restricting attention to workers on larger teams, as measurement error in people management skills is presumably lessened in these circumstances. Appendix Table C12 presents results while restricting attention to worker-months where the worker's manager's team size in the month of the survey is at or above the median team size. The median team size at the worker-month level is 9 workers whereas the median team size at the manager level is 8 workers. As seen in Appendix Table C12, our main coefficient estimates are similar when restricted to workers on larger teams. Compared to our full-sample OLS estimates, the coefficients are generally slightly larger, consistent with less measurement error, though we also have less precision in the restricted samples, reflecting the smaller sample size. Still, we continue to see strong statistical significance on the paper's main attrition outcomes.

Second, we performed OLS where the key regressor is a weighted mean of the two MOR scores, with the weights given by a manager's team size at the time of the surveys. Re-doing our attrition results, we observed a strong relationship between weighted MOR and attrition outcomes, though coefficients were smaller in magnitude relative to our IV results.

While highly statistically significant, the OLS estimates restricting to larger teams or using weighted MOR are still substantially smaller than our IV estimates, consistent with the idea that these non-IV estimators may not fully address attenuation bias.

Hold-out sample analysis. Our main IV approach requires a manager's MOR to be non-missing in both periods. We also considered analyses (OLS, reduced-form, and two-sample IV (TSIV)) on a "hold-out sample" of worker-months where the manager's MOR is observed for one period. TSIV combines the reduced form on the hold-out sample with the 1st stage on the main sample. As seen in Table C13, hold-out sample results are broadly similar to our main results. TSIV confidence intervals overlap with those in our main IV regressions.

A.5 Robustness Regarding Workers Joining the Firm or Changing Managers in the Second Period (Sections 4.2-4.3)

Switchers only. The analysis in Section 4.3 combines both workers joining the firm and workers changing managers in the second period. As a robustness check, the analysis can also be performed solely using incumbent workers changing managers in the second period. Appendix Table C6 shows that the results are broadly similar to those in Table 5, though with a few differences. While the regretted quit coefficient is still statistically significantly negative, the non-regretted quit coefficient is now significantly positive at the 10% level. Thus, while the overall quit coefficient is still negative (as is the overall attrition coefficient), it is no longer statistically significant. However, the overall picture from Table 5 is unchanged.

Two additional robustness checks. First, although we cannot precisely observe who is a post-university hire for our full dataset, we perform analysis while restricting to the 5 countries in which university graduates often join the company, while also excluding workers joining above the grades at which university graduates join the firm. For this subsample, the firm seems especially unlikely to have substantial information about worker quality separate from the hiring manager. Performing our analyses on this subsample, our conclusions were substantively unchanged. Our conclusions remained substantively unchanged when additionally restricting to a worker's first manager spell (i.e., before future manager changes) in the analysis sample, which we checked for the purpose of further minimizing potential assignment bias.

Second, potential assignment bias may be dampened when more workers are switching or joining in the same month, as it may be harder for the firm to optimally pair workers and managers when lots of joins or switches occur in the same month. As mentioned in Section 4.3, several re-organizations ("re-orgs") occurred at the firm for exogenous reasons. Specifically, these re-orgs occurred due to product and business considerations instead of human resource considerations. In the prime months of the re-orgs in period 2, the number of switches and joins was about double the median monthly number in our sample. Our goal in this robustness check is to exploit the re-orgs that occur in the data, which appear to have been most pronounced for U.S. workers. Thus, for U.S. workers, we rank the 18 months in period 2 by the number of switches and joins occurring in that month, and re-do our Table 5 analysis while restricting attention to switches and joins occurring in months with an above-median number of switches and joins. Again, our conclusions were substantively unchanged.

A.6 Testing for Assignment Bias (Section 4.3)

The Rothstein test in Table 6 differs from our main analyses in that we are looking at an employee's early outcomes as a function of the people management skills of their future managers. While the goal of the Rothstein test is to isolate the degree of assignment bias, there is also a possibility that bias could arise due to attenuation bias or correlated measurement error. Consider an OLS regression of period 1 employee outcomes on the MOR of a future manager as measured during period 2. If an employee is cheerful, there could be bias if being cheerful makes the employee both more likely to achieve certain outcomes in period 1, as well as more likely to rate his/her manager in a certain way. To overcome this potential bias, as well as to address attenuation bias, we instrument the future manager's MOR as measured during the second period with the future manager's MOR as measured during the first period.

More concretely, consider an employee who changes from an initial manager (referred to as the "old" manager) to a "new" manager. For OLS, we regress initial employee outcomes on the MOR of the new manager during the second period. We obtain that:

$$\begin{aligned}
\widehat{b}_{OLS} &= \frac{cov\left(\widetilde{m}_{new,1}, y_t\right)}{var\left(\widetilde{m}_{new,1}\right)} \\
&= \frac{cov\left(m_{new} + u_{new,1}, \beta m_{old} + \varepsilon_t\right)}{var\left(m_{new} + u_1\right)} \\
&= \frac{\beta cov\left(m_{new}, m_{old}\right) + cov\left(m_{new}, \varepsilon_t\right) + \beta cov\left(u_{new,1}, m_{old}\right) + cov\left(u_{new,1}, \varepsilon_t\right)}{\sigma_m^2 + \sigma_u^2 + 2cov\left(u_{new,1}, m_{old}\right)} \\
&= \frac{1}{\sigma_m^2 + \sigma_u^2}\left[\beta cov\left(m_{new}, m_{old}\right) + cov\left(m_{new}, \varepsilon_t\right) + cov\left(u_{new,1}, \varepsilon_t\right)\right]
\end{aligned}$$

For IV, we have that:

$$\begin{aligned}
\widehat{b}_{IV} &= \frac{cov\left(\widetilde{m}_{new,1}, y_t\right)}{cov\left(\widetilde{m}_{new,1}, \widetilde{m}_{new,2}\right)} \\
&= \frac{cov\left(m_{new} + u_{new,1}, \beta m_{old} + \varepsilon_t\right)}{cov\left(m_{new} + u_1, m_{new} + u_2\right)} \\
&= \frac{\beta cov\left(m_{new}, m_{old}\right) + cov\left(m_{new}, \varepsilon_t\right) + \beta cov\left(u_{new,1}, m_{old}\right) + cov\left(u_{new,1}, \varepsilon_t\right)}{\sigma_m^2 + cov\left(u_{new,1}, m_{old}\right) + cov\left(u_{new,2}, m_{old}\right) + cov\left(u_1, u_2\right)} \\
&= \frac{1}{\sigma_m^2 + cov\left(u_1, u_2\right)}\left[\beta cov\left(m_{new}, m_{old}\right) + cov\left(m_{new}, \varepsilon_t\right) + cov\left(u_{new,1}, \varepsilon_t\right)\right]
\end{aligned}$$

Thus, instead of σ_u^2 in the denominator, we have $cov\left(u_1, u_2\right)$ in the denominator, so we will be less likely to suffer from attenuation bias. Provided that the two manager qualities are uncorrelated over time (i.e., $cov\left(m_{new}, m_{old}\right) = 0$) and that $cov\left(u_{new,1}, \varepsilon_t\right) = 0$, then IV should identify a coefficient which is proportional to $cov\left(m_{new}, \varepsilon_t\right)$, and is therefore a measure of systematic assignment.

Our Rothstein test is performed using our analysis sample of worker-months where the manager has MOR for both periods. However, many workers transition from having a manager who does not have MOR for both periods to a manager who has MOR for both periods, and such workers can also be used for Rothstein test analysis because our Rothstein IV test uses the MOR of the new manager. As seen in Appendix Table C7, our Rothstein test results are highly robust to using this extended sample.

A.7 Managers Moving Across Locations or Functions (Section 4.4)

Locations are denoted in the data using a string variable. In the dataset, there are cases of a large number of location string changes occurring during the same month. Thus, there are some locations that only appear in period 1 and others that only appear in period 2. These likely represent cases where either a location was simply re-named in our dataset (without any physical movement of employees taking place) or where an entire office re-located to another office building. To ensure that such instances do not drive our results, Table 7 restricts to location-job functions that occur during both periods in our data. For example, if there is a location that suddenly seems to emerge in period 2 (perhaps due to a simple re-labeling of the building), that "new location" will be removed from the sample in Table 7. The "old location" will still be included for the months before the location string re-labeling occurred, and the collapsed means (made from collapsing the employee-month panel) will take into account that the old location was not observed for all of the second period.

Beyond this approach, as a robustness check, we did a careful manual examination of locations in our dataset that appeared to possibly change names. For ones where we have a high degree of confidence that it was merely a name change as opposed to moving all workers to a different location, we changed the name so that it would be consistent throughout the dataset. Our results are essentially unchanged after doing this. We also performed the analysis while restricting attention to locations that do not drop out of the dataset (potentially due to a name change), and conclusions remain unchanged.

A.8 Assessing Coefficient Stability when Adding Richer Controls using the Oster Test (Sections 4.5 and 7)

To assess coefficient stability, we consider the test of Oster (2019), who builds on Altonji et al. (2005). Oster (2019) presents her test using OLS regressions. To adopt the test to our IV setting, we follow Enikolopov et al. (2017) and perform the Oster test using the reduced form. As mentioned in the main text, the additional controls we add are two-way interactions between business unit, job function, and salary grade, as well as current month dummies. For example, instead of just having dummies for being an engineer and being at a particular salary grade, we add dummies for being an engineer of a particular salary grade.

The idea of the Oster (2019) test is to compare the degree of coefficients movements with the amount of movement in R-squared values. We take the IV regressions reported in Tables C8-C10 and Table C20, and perform the reduced form regressions instead. Column 1 represents the specification with base controls, whereas column 5 represent the specification with full controls. Following Oster (2019), we assume a maximum R-squared value that is 1.3 times the R-squared with the fullest controls (i.e., the column 5 specifications for us).

Following Oster (2019), we calculate values of δ, which represent the ratio of selection on unobservables relative to selection on observables that would be required in order for the true coefficient to not be in the observed direction. Oster (2019) argues that estimated δ values of one or greater provide evidence of coefficient stability. In addition, δ coefficients less than 0 suggest that the true, bias-adjusted coefficients are larger than the estimated ones (Satyanath et al., 2017). As seen in Appendix Table C21, in all cases, we obtain δ values either greater than 1 or less than 0, thereby strengthening our evidence for robustness.

The idea in applying the Oster test to the reduced form is as follows: suppose that there is some component of the error term (e.g., a good project) which is correlated with the instrument (MOR score of current manager in the other period), whereas the rest of the error term is uncorrelated with the instrument. How much selection on unobservables would there need to be to overturn the result? Still, it should be noted that it is not yet widespread econometric practice to apply the Oster test in IV analyses. Thus, at the least, our analyses where we gradually add controls show that our key IV and reduced form coefficients remain generally stable as stronger and stronger controls are added.

Further adding job title dummies. In terms of even finer controls, the data have over 1,000 job titles. Controlling for job titles is computationally demanding, and titles are too numerous to include for analyses on location-function-period cells. Still, we extended the Oster (2019) tests in columns 1-3 and 6 of Table C21 to additionally include job title dummies, and the conclusions were unchanged. An HR analyst thought that job title dummies might be over-controlling, given they are so numerous and given that some employees negotiate their own titles. Titles are generally grouped into slightly broader job families, of which there are a few hundred. Our main conclusions are also robust to controlling for job family, though this may still be over-controlling as some are quite rare and may still be potentially affected by employee negotiation. Thus, we prefer using broader job function for our main results.

A.9 Is People Management Skills the Cause of our Results? Or is it a Managerial Trait Correlated with People Management Skills? (Section 4.5)

Table C22 analyzes other manager characteristics besides MOR. We study manager tenure at the firm, manager tenure overseeing a worker, and whether a manager was hired by referral. We also study dummies for the manager's job function—while our base specifications already control for worker job function, adding these accounts for the fact that workers are sometimes managed by managers in different job functions. These variables are available for only portions of our base analysis sample. Manager tenure at the firm is available for most workers. However, a manager's tenure with a particular worker is only available in cases where a worker changes manager during our sample period; if a worker started working with a manager before our sample period begins, we do not know how long they have worked together. In addition, we only have information on manager referral status for recent hires. Given the high amount of missing data for these different characteristics, we run the analysis in different samples. We show results on the exact same sample both with and without controls.

Panel A of Table C22 examines correlates of MOR. Manager tenure at the firm in years is associated with a small increase in MOR over time. Each year of manager tenure predicts a 0.016σ increase in MOR. In addition, each year of manager tenure with a particular worker predicts a 0.11σ increase in MOR.[2] Manager referral status does not significantly predict MOR. Panel B of Table C22 shows the main attrition regressions both with and without controlling for the other manager variables. As can be seen, controlling for the other manager characteristics tends to have little effect on the MOR coefficients. We also repeated Panel B of Table C22 using the research designs from Sections 4.2 and 4.3, and we continue to find little impact of controlling for these other manager characteristics.

A.10 Further Discussion on Quantitative Importance (Section 4.5)

Blatter et al. (2012) estimate hiring costs using detailed surveys of Swiss firms. Their hiring costs include both recruiting costs and adaptation costs, though they do not include costs of a position being vacant. For large firms (100+ employees), Blatter et al. (2012) estimate a

[2] These correlations are not robust to including manager fixed effects, suggesting the presence of selection over time (e.g., higher MOR managers are more likely to persist on the job). This bolsters the point that it is hard to predict MOR from other manager characteristics.

hiring cost of 17 weeks of wages per hire, which we round to 4 months. This is still likely a lower bound, as Blatter et al. (2012) find that hiring cost in weeks is increasing in skill, and they focus on Swiss workers with vocational degrees at the upper-secondary level, as opposed to the highly skilled workers at our firm.[3] The in-text calculation is (0.00475pp monthly per σ of MOR) * (2.56σ for MOR at p90 vs. MOR at p10) * (12 months) * ($\frac{4}{12}$ salaries of hiring cost per hire) $\approx$ 0.05 salaries. That is, having MOR at p90 saves the firm hiring costs equal to 5% of worker salaries for each worker on his or her team relative to having MOR at p10.

Section 4.5 discusses labor costs instead of profit margins in order to protect firm confidentiality. However, given that labor is a large share of total costs in knowledge sectors like high-tech, a 5% reduction in salary costs (the implication of having a p90 MOR manager vs. a p10 MOR manager) is very consequential for firm profits.

Other work on turnover costs. To provide further context on turnover costs, we turn to several other sources. First, there are recent documents put out by the Work Institute called the "Work Institute Retention Report" (Work Institute, 2018). In the 2017 and 2018 Retention Reports, which are focused on U.S. workers (and seemingly more so on higher-skilled U.S. workers), the authors use a turnover cost of 33% of worker annual salary, which is exactly in line with the turnover cost we use. Second, we turn to Boushey and Glynn (2012) who summarize various articles written on turnover costs. Among all jobs in their sample, the median turnover cost was 21% of worker salary, which is lower than the 33% of worker salary cost number that we use. However, Boushey and Glynn (2012) find that the costs of turnover tend to be higher among higher-skilled jobs as a function of worker salary.[4] Thus, our hiring cost of 4 months of salary is in line with Boushey and Glynn (2012).

A.11 Variation in MOR (Section 5)

This Appendix examines predictors of people management skills and analyzes what share of variance in people management skills can be attributed to different factors. As in our other heterogeneity analysis, the main predictors of interest are hierarchy, geography (countries or locations), and occupation. The analysis has parallels to Bloom et al. (2019), who study variation across firms and plants in management practices. In contrast, we study variation across managers in their people management skills. To do this, we perform regressions of a manager's MOR on various predictors or fixed effects. An observation is a manager-period.

Predictors of MOR. Table A4 shows regressions of MOR and the individual manager questions on various predictors. Engineer managers have an MOR that is 0.22σ lower than that of non-engineer managers.[5] US managers score 0.10σ higher than foreign managers, but the difference is not statistically significant. However, US managers do score significantly higher

[3] Blatter et al. (2012) report that workers with vocational degrees at the upper-secondary level comprise two-thirds of the Swiss workforce.

[4] Boushey and Glynn (2012) cite some studies estimating turnover costs of \$62k-\$67k for registered nurses, \$66k for doctors, ~\$100k for middle managers making \$50k-\$125k per year, \$185k for lower executives making \$125k per year, and \$260k for senior-level executives making \$200k per year. Many of these estimates are higher than our assumption of 4 months of salary.

[5] That engineers have lower MOR than non-engineers is robust to controlling for location dummies and salary grade dummies. The engineer coefficient is also size in magnitude when controlling for manager referral status, as in Table C22.

Table A4: Predicting MOR and the Individual Manager Questions

Dep. var.:	MOR	MOR	Clear expect.	Coaching	Career dev.	Involves people in decisions	Positive attitude	Someone I trust
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Manager is Engineer	-0.22***	-0.23	-0.13*	-0.21***	-0.17**	-0.18**	-0.19**	-0.21***
	(0.08)	(0.35)	(0.07)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
Mgr is Domestic (US)	0.10	0.10	0.01	0.06	0.05	0.16**	0.17**	0.07
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.07)
Manager is Medium or high in hierarchy	-0.02	-0.03	-0.16	-0.28***	-0.15	0.26*	0.14	0.14
	(0.13)	(0.14)	(0.11)	(0.10)	(0.11)	(0.14)	(0.13)	(0.11)
Manager is Engineer X Manager is Medium or high in hierarchy		0.01						
		(0.35)						

Notes: Standard errors clustered by manager in parentheses. All regressions control for business unit dummies, period dummies, year of hire dummies, manager span, and the manager's manager's span (including a dummy for this being missing). Broadly similar to Bloom et al. (2019) who restrict to firms with 2+ plants for their Figure 3, we restrict attention here to countries, locations, salary grades, and job functions that have at least two managers. We also require that managers are in the data for both periods. * significant at 10%; ** significant at 5%; *** significant at 1%

in terms of creating a positive attitude in the workplace and in terms of involving people in decisions, consistent with evidence that US workplaces have relatively lower power distances (Hofstede, 2001). Managers who are at medium or a high position in the firm hierarchy score no better relative to lower-level managers. Higher-level managers do, however, score 0.28σ worse in coaching and 0.26σ better in terms of involving workers in decisions, consistent with greater delegation and less direct guidance at higher levels of the firm hierarchy.

Variation in MOR. Before analyzing the share of variance in MOR due to various factors, we need to address measurement error in MOR. Bloom et al. (2019) address measurement error by comparing OLS and IV estimates, exploiting the fact that they have two management surveys for some plants in their sample. Paralleling this, we compare OLS and IV estimates, exploiting that we have two surveys per manager. We assume that (i) $cov(\varepsilon_t, u_\tau) = cov(\varepsilon_t, u_{-\tau}) = 0$; (ii) $cov(\varepsilon_t, m)=0$; and (iii) $cov(u_\tau, u_{-\tau}) = 0$.[6] Under these conditions, IV is consistent and $\text{plim}(\widehat{b}_{OLS}) = \frac{\sigma_m^2}{\sigma_m^2+\sigma_u^2}\beta$, as can be seen using equations (4) and (5) in the main text. Thus, $\frac{\widehat{b}_{OLS}}{\widehat{b}_{IV}} = \frac{\sigma_m^2}{\sigma_m^2+\sigma_u^2}$, is the share of variation in observed MOR due to true people management skills. Using our baseline results in Table 3, we see that $\widehat{b}_{OLS}/\widehat{b}_{IV} = -0.156/-0.475 = 0.33$, so 67% of the variation in MOR is due to measurement error. This is slightly higher than—but broadly consistent with—Bloom and Van Reenen (2007) and Bloom et al. (2019), who find that roughly half the variation in management prac-

[6]We believe these assumptions are reasonable based on our results. Regarding (i) and (ii), our baseline attrition estimates are qualitatively similar under strategies that address correlated measurement error and assignment bias (e.g., Sections 4.2 and 4.3), which is consistent with correlated measurement error and assignment bias being fairly modest. The Rothstein test also finds little evidence for assignment bias. (iii) is likely to hold when measurement error is driven by sampling error or short-term mood, and longer-run correlation in mood can be addressed by looking at managers moving across locations or job functions in the firm, which gives qualitatively similar results to the baseline.

tices is due to measurement error. If instead we use the results in Table 4 ($\widehat{b}_{OLS}/\widehat{b}_{IV} = 0.46$) or Table 5 ($\widehat{b}_{OLS}/\widehat{b}_{IV} = 0.47$), which are designed to address any correlated measurement error, then we obtain that 53-54% of variation in MOR reflects measurement error, which is very close to Bloom and Van Reenen (2007) and Bloom et al. (2019).

Table A5: Share of Variance due to Different Factors

	Share	Std error
Country	0.117	(0.015)
Location	0.212	(0.017)
Salary grade	0.034	(0.012)
Job function	0.079	(0.014)

Notes: Each row corresponds to a separate regression. The share of variance is the R^2 from a regression of residualized MOR on different sets of dummies (e.g., country dummies), then divided by the assumed share of MOR reflecting true people management skills (we use 33%). Standard errors are calculated via the bootstrap (100 replications). MOR is first residualized on business unit dummies, period dummies, year of hire dummies, and manager span. Broadly similar to Bloom et al. (2019) who restrict to firms with 2+ plants for their Figure 3, we restrict attention here to countries, locations, salary grades, and job functions that have at least two managers. We also require that managers are in the data for both periods. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A5 shows the share of variance in MOR after correcting for measurement error in MOR. Country dummies explain 12% of the variance in people management skill, whereas 88% of the variance is within-country. Location dummies explain 21% of the variance in people management skills, and 79% is between locations. Dummies for different levels within the firm hierarchy and job function dummies explain only a very modest share of the variance.

A.12 Heterogeneity Analysis for Attrition Results (Section 5)

Hierarchy. As discussed in Section 5, we divide the firm's employees into three groupings of hierarchy (low, medium, and high) according to their salary grade, following how the firm often segments employees in its internal reporting. It is natural to analyze heterogeneity in MOR results by hierarchy, as theories of managers emphasize different roles for managers at different levels of hierarchy.

Panels A-C of Table C15 report results for three separate samples based on whether employees are at a low, medium, or high position in the firm hierarchy in a given month. We observe that the coefficients tend to be larger at higher levels of the hierarchy, particularly for quits and regretted quits. However, standard errors are large for the high level of hierarchy (Panel C), reflecting that there are fewer people there. Thus, Panel D re-does the results pooling together workers at medium or high positions in the firm hierarchy, and these coefficients are larger in magnitude than those in Panel A.

Panel E presents a pooled specification, where we include manager MOR and an interaction of manager MOR with a dummy for an employee being at a medium or high level of the firm hierarchy. We have two excluded instruments: MOR of the current manager in the other period, and a dummy for the employee being at a medium or high level of the hierarchy interacted with MOR of the current manager in the other period. In 4 of 6 columns, the interaction term is significantly negative, meaning that there is a stronger relation between MOR and the attrition variables for employees at the medium or high level of the firm hierarchy. Panels F and G show results using the research designs from Section 4.2 ("joiners") and

Section 4.3 ("joiners+switchers"), respectively. The interaction terms tend to stay negative in magnitude, but they are insignificant, reflecting large standard errors due to small samples.

Geography. There has been a lot of recent interest in how management practices vary across regions and countries (Bloom et al., 2012, 2014, 2019). Given this work, it is natural to study heterogeneity in our key results according to geography. As noted in Table 1, about 30% of employee records are for workers outside the U.S. About 90% of records are for "rich countries" (U.S. and other wealthier countries), with roughly 10% of records in "poor countries" (China, India, and Malaysia).

Comparing Panels A and B of Table C16, we see that MOR coefficients are larger in magnitude for U.S. workers than foreign workers at the firm.[7] Looking at the interaction of manager MOR with an employee being domestic in Panel C, the coefficient is always negative but is only statistically significant in 1 of 6 specifications. For example, for Attrition in Panel C, the coefficient on MOR is -0.262(s.e.=0.176), whereas the coefficient on MOR x Domestic is -0.294(s.e.=0.211), indicating that the relation is over twice as large for domestic workers than foreign workers. The p-value on the interaction term is 0.16. However, in the research designs in Panels D and E, despite the smaller sample size, statistical significance is achieved in one of the two panels for 5 of the 6 attrition variables. Thus, we have some suggestive evidence that MOR is more important in the US than abroad.

Occupation. Appendix Table C17 examines heterogeneity in attrition results by occupation. Given it is a high-tech firm, the largest occupational divide in our sample is between engineers and non-engineers. This contrast is particularly interesting given that engineering jobs are generally thought of as having less social skill demands (Deming, 2017), at least compared to non-engineering business functions such as marketing. While the relation between MOR and overall attrition is larger for non-engineers, the relation between MOR and quits, as well as between MOR and regretted quits, is larger for engineers. Thus, we do not see clear heterogeneity by occupation in our data.

Comparison with a VA Approach. One question regarding our heterogeneity analysis is whether we would reach similar conclusions using a VA analysis. Though VA focuses on the overall impact of managers as opposed to people management skills, one could still ask whether there was greater dispersion in manager VA among certain subgroups, such as at higher levels of hierarchy. Using our split sample approach from Section 4.5, we do not observe that the standard deviation of attrition VA is larger at the medium or high levels of hierarchy (compared to lower levels of the hierarchy). That is, our main heterogeneity result using MOR (i.e., that people management skills seem to matter more for attrition at higher levels of the hierarchy) would not be observed in a VA analysis.

Other dimensions of heterogeneity. We examined heterogeneity in MOR by employee people management skills. We found no evidence of complementarity between employee and manager people management skills (if anything, manager's MOR has more of an impact for workers with worse own MOR, though nothing was statistically significant), but we are severely restricted in terms of power because most employees are not also managers themselves. We also observed no consistent heterogeneity based on whether a manager and worker

[7] We also repeated Panel B, but while break foreign workers into "foreign poor" (China, India, Malaysia) and "foreign rich." Unfortunately, for foreign poor countries, the instrument is weak ($F = 3$) and power is somewhat limited. Thus, going forward, we will continue lumping all foreign countries together.

are co-located with one another. Furthermore, we do not observe heterogeneity in results based on team size (i.e., we do not observe stronger effects on managers with smaller teams).

A.13 Analyses on Non-attrition Outcomes (Section 6)

Heterogeneity in employee non-attrition outcomes. We examined heterogeneity in non-attrition results by hierarchy, geography, and occupation. That is, we repeated the results in Table 8 using different subgroups or using interactions of MOR with subgroup characteristics, as in Tables C15-C17. With the exception of subjective performance (which is also positive in Table 8), our null results on non-attrition outcomes are robust within different subsamples. Our conclusions on non-attrition outcomes are unchanged when restricting to U.S. workers.

Dynamics in employee non-attrition outcomes. Re-doing the results in Figures 3 and C4 but for employee non-attrition outcomes, there is no evidence of significant effects of MOR which take time to be realized.

Evidence on managerial tradeoffs: innovation by managers. Table 8 shows no relation between manager MOR and *employee* patenting. It is also interesting to examine whether there is a relation between manager MOR and *manager* patenting. For example, perhaps some managers make up for their low people management skills by being very innovative themselves. However, in an IV regression of manager patents on manager MOR instrumenting with manager MOR in the other period, we observed no significant relation between MOR and manager patents (and same for citation-weighted patents).

A.14 Rewards Results (Section 7)

How much cost does the firm incur in higher manager salaries relative to the benefits of lower worker turnover? The turnover benefit of a p90 MOR manager versus a p10 MOR manager is $Nc\delta_y$, where N is average team size, c is the cost of turnover, and δ_y is the annual turnover events avoided by a p90 MOR manager versus a p10 MOR manager. Using $c = \frac{w}{3}$ (i.e., turnover cost of a one-third of a worker's annual wage), the benefit is $\frac{N}{3}\delta_y w$. For N, the average team size weighted by worker-months is 12.[8] Recall that $\delta_y = 0.146$.

Turning to salary costs, our Table 9 IV results imply that a p90 MOR manager will get an annual raise that is 0.036 log points higher than that of a p10 MOR manager. We assume that such differences cumulate over T years, where T is the duration that a manager is at the firm. We assume p10 and p90 MOR managers start at the same salary. If raises come at the end of the year, this means that the total salary cost of a p10 MOR manager is $w^M \sum_{t=0}^{T-1}(1+\bar{R})^t$, where $\bar{R}$ is the annual raise for a p10 MOR manager. In contrast, the total salary cost of a p90 MOR manager is about $w^M \sum_{t=0}^{T-1}(1+\bar{R}+\delta_w)^t$, where $\delta_w = 0.036$ is the additional raise that a p90 MOR manager receives relative to a p10 MOR manager. Thus, the ratio of salary costs to turnover benefits is:

$$Ratio = \frac{w^M Z}{\frac{N}{3}\delta_y w}$$

[8]Table 1 presents average team size across managers.

where $Z = \frac{1}{T}\sum_{t=0}^{T-1}\left[(1+\bar{R}+\delta_w)^t - (1+\bar{R})^t\right]$. Letting M be the typical ratio of a worker's manager's salary to the worker's salary, we have $w^M = Mw$. Thus, the ratio of salary costs to turnover benefits is $\frac{3MZ}{N\delta_y}$.

In the data, manager salaries are roughly 50% higher than worker salaries, i.e., $M = 1.5$. The exact average raise for p10 MOR managers is confidential, but we will assume $\bar{R} = 0.03$, $\bar{R} = 0.04$, or $\bar{R} = 0.05$.

Because our data cover only 27 months, we cannot directly observe information on T, i.e., the average number of years that a manager stays with the firm. Assuming that the expected duration is the inverse of the annual attrition rate, we obtain $T = 8$ for managers. However, it is quite common for workers at high-tech firms for individuals in managerial roles to stay shorter periods of time than this; thus, for robustness, we will also consider $T = 4$, as well as the midpoint of $T = 6$, which we use for our baseline calculation.

Table A6: Ratio of Salary Costs of Higher MOR to Turnover Benefits of Higher MOR Under Different Assumptions

T	$\bar{R}$	Ratio
6	0.04	0.27
6	0.03	0.26
6	0.05	0.28
8	0.03	0.39
8	0.05	0.42
4	0.03	0.15
4	0.05	0.15

Notes: Each row calculates the ratio of salary costs of MOR to turnover benefits of MOR under different assumptions. The variable T is the number of years at which the manager is at the firm. The variable $\bar{R}$ is the average annual salary increase for p10 MOR managers.

Assuming $T = 6$ and $\bar{R} = 0.04$, Table A6 shows that the ratio of costs to benefits is 0.27, meaning that the firm pays out 27 cents in higher salary for each dollar it saves in lower turnover. The estimated ratio is relatively sensitive to T (i.e., a manager's duration at the firm), but depends little on $\bar{R}$ (i.e., the average raise for p10 MOR managers).

Adding richer controls. A concern for our rewards results is whether they could reflect some unobserved variable. For example, if there were a persistent unobservable (e.g., a good project) that affected manager rewards and how employees rate their manager, this could be a violation of the exclusion restriction. Similar to Section 4.5, Appendix Table C20 presents results on the statistically significant reward variables (subjective performance, promotions, and salary increases) as further controls are added. The MOR IV coefficients are fairly stable across specifications, with limited selection on observables suggesting that selection on unobservables is likely small (Oster, 2019). Appendix A.8 discusses further.

Heterogeneity. We analyzed heterogeneity in Table 9 by hierarchy, geography, and occupation. The relationship between MOR and rewards is generally stronger for engineers than for non-engineers. This may be explained by the result in Section 5 that for engineers, good people management skills are more scarce. Our conclusions on manager rewards are unchanged when restricting to U.S. managers.

Manager VA in employee attrition as a regressor. To include manager VA as a regressor in analyzing rewards for managers, we normalize the overall turnover fixed effects estimated in Section 4.5, and multiple them by -1 to create a manager fixed effect in terms of retention (instead of turnover). To account for sampling error in manager VA, we use a split sample IV approach (e.g., Frederiksen et al., 2017). As in Section 4.5, we estimate manager fixed effects separately after splitting the data in two using two methods. First, we randomly split the data in two. Second, we split the data by period. We use one fixed effect as the endogenous regressor and one as the instrument.

Panels A and B of Appendix Table C23 show results including VA in retention without including MOR. When split into two random groups, we see that retention VA only has a statistically significant relation to one variable (subjective performance), with significance at the 10% level. When split by period, the coefficient for subjective performance is now negative and statistically insignificant, and the only positive coefficient is for change in span of control. Standard errors are large, and very large in several columns, reflecting a very low first-stage F-stat in some specifications. Panels C and D of Appendix Table C23 show that the same qualitative patterns from Table 9 remain when retention VA is added as a regressor. MOR still significantly predicts subjective performance and salary increases. For promotions, the coefficient is statistically significant in one specification, and in the other, the coefficient is similar to that in Table 9, but with a larger standard error.

Why is MOR a stronger predictor of firm rewards than attrition VA? One explanation is that people enjoy being around a manager with good people management skills (including people who do not report to that manager). Alternatively, the results could follow because a firm should optimally reward performance metrics with less noise (Baker, 1992) and there is significant noise in attrition VA—however, our IV strategy is designed to address sampling error in VA (as well as measurement error in MOR), so this seems less likely. Third, it could be that MOR has positive impacts on additional unobserved-to-the-researcher dimensions of worker performance. Fourth, high-MOR managers may be better at negotiating rewards.

B Data Appendix

B.1 Additional Information on the Dataset and Key Variables

Data assembly. We were provided two main datasets. First, we received the main employee-month personnel dataset that was assembled for us by an analyst at the high-tech firm. To create this, the analyst combined and cleaned various data files. Second, we received manager-level results from the different employee surveys. We augmented these with patent data.

The dataset we were provided also includes April and May of Y_3 (i.e., a 28th and 29th month beyond the 27 months), but we exclude them from our sample, as the firm's location identifiers change in these months compared to before.[9] Thus, our sample runs from January Y_1-March Y_3, though our main results are qualitatively similar to extending through May Y_3.

Manager survey variables and MOR. Because we only observe the share of respon-

[9]For our analysis of 12-month salary growth, to maximize statistical power, we use the salary data from April and May Y_3 so that observations from April and May Y_2 can be included, though our conclusions are unchanged if these months are excluded.

dents marking Agree or Strongly Agree per question for each manager, it is impossible for us to analyze other moments of the survey responses (e.g., the standard deviation of responses about a manager). Our analysis is done using manager overall rating ("MOR"). This is calculated by normalizing MOR separately by period. We note also that MOR is an acronym created by the authors—the firm usually refers to the score as the manager effectiveness score.[10]

Fires. We refer to involuntary attrition events as "fires," even though we cannot distinguish between true fires and layoffs in the data provided. However, we know that most of our firm's "fires" are true fires instead of layoffs, and that most layoffs in our sample occurred in two months. If we exclude the two months where the main layoffs occurred, we obtain the same conclusion that MOR substantially reduces fires, and the results tend to become more precise, which is unsurprising if MOR reduces true fires but not layoffs.

Regretted and non-regretted quits. As described in the main text, the firm's administrative data classifies quits as regretted or non-regretted. Here, we provide more information on this classification, highlighting a caveat regarding this variable. We also discuss why we believe that the caveat does not affect our substantive conclusions.

A manager from HR informed us that the data field in our data about whether a quit was regretted or non-regretted may not have always been recorded in the same manner, and may have changed over time. Usually, the data would be entered by a person's former manager. However, it could also be that the data field would incorporate information from an HR business partner who conducted an exit interview of the former employee. Furthermore, the manager informed us that the regretted/non-regretted field could also sometimes be "algorithmic" based on the subjective performance scores of the former employee.[11]

Thus, some caution is warranted in interpreting our results on regretted and non-regretted quits. Still, whether the classification is done by a manager or using subjective performance data, our regretted quit variable still reflects a desire to classify attrition as good or bad from the perspective of the firm. Further, any random classification error seems likely to work against us seeing differences in results based on whether quits are regretted. Our time fixed effects adjust for possible changes over time in how regretted/non-regretted was classified.[12] Last, our conversations with the firm gave us no reason to be concerned that whether a quit was classified as regretted or non-regretted would be mechanically related to or correlated with whether a manager had good people management skills.

Subjective performance. As noted in Section 2.2, there is not a fixed curve across managers in the distribution of subjective performance scores. However, at high levels of aggregation within the firm (i.e., for top managers), there may be a curve with respect to subjective performance. To address possible bias from curving, we verified that our subjective performance results are robust to excluding managers in the high portion of the hierarchy.

[10]Beyond the questions that go into the firm's manager effectiveness scores, workers are asked additional questions about their manager (e.g., whether a manager exemplifies particular company message/slogans) as part of the annual surveys. We follow the firm in restricting attention to the questions that go into the manager effectiveness scores.

[11]The HR manager also did not seem certain whether the method of classification had changed over time or whether the computer default had changed over time. Throughout the data, regretted quits are more common than non-regretted quits.

[12]In a regression of whether a quit was regretted on year dummies and other basic controls, the share of quits which are regretted is 3pp higher in Y_2 than Y_1 and is 9pp higher in Y_3 than Y_1.

Salary. While we restrict our salary analyses in the paper to U.S. workers, we checked that our results are robust to including all workers by converting foreign salaries to USD (exchange rate from March 1 of year Y_2). The paper's salary analyses include salary grade/level dummies (as in other regressions) to control for hierarchy. Within salary grade, there is substantial variation in salary. Still, the null result in column 2 of Table 8 and the positive result in column 3 of Table 9 are robust to excluding salary grade dummies, e.g., the estimate in column 3 of Table 9 is now 1.65 (s.e.=0.61).

Patents. In May 2018, using Google Patents, we extracted the patent applications for which the firm is the assignee, as well as the count of any patent citations. We restricted the search to applications filed between Jan. Y_1 and Dec. Y_3. We merged patent information to personnel records using inventor name.[13] The share of inventors from a patent successfully merged to personnel records was roughly 85%, a match rate almost at the level of the 88% rate in Bell et al. (2017). Patents cannot be merged to the personnel data for various reasons, such as the inventor being missing from personnel records (due to them being a consultant/contractor/intern instead of a full-time employee) and the inventor having already left the firm at the time of patent application. Patents often have multiple authors, and we assign a full patent to each author, following work such as Bell et al. (2017) and Burks et al. (2015). Our results are robust to defining monthly citation-weighted patents as patent applications+citations (instead of patent applications+log(1+citations)).

In Table 8, we assume that the "month of innovation" (i.e., the month which is potentially affected by an employee's manager's MOR) is equal to the month in which the patent application is filed. This assumption reflects that inventors are occurred to immediately disclose their inventions. Our results are qualitatively robust to assuming a lag of a couple months between exposure to a manager and the month of a patent application.

As mentioned in Section 6 of the main text, in order to restrict to new ideas as opposed to possible revisions of past patent applications, we restrict our sample of patent applications to ones where the priority date equals the application date. this also helps ensure that the original ideation process was relatively recent. If we don't make this restriction, the number of patents increases, increasing the statistical power. When we do, we continue to find no relation between MOR and patent applications, with slightly more statistical power.

Cash bonus compensation. Beyond stock grants, workers at the firm often receive (cash-based) bonus compensation. Unfortunately, we do not currently have data on bonus compensation. However, we do not believe that adding bonus compensation to the analysis would affect any of our conclusions. The key reason is that a large share of bonus compensation is based on the overall performance of the firm (e.g., whether the firm meets certain targets).

Stock grants and holding power. Not all employees are eligible to receive stock grants. Eligibility depends on several factors, including a person's position in the firm hierarchy, job type, and tenure. In the data provided to us, the holding power variable is sometimes missing, reflecting lack of eligibility to receive stock grants. Observations with missing data on stock grants are not included in the analysis.

[13] In cases where an inventor matched to more than one employee, we used inventor location and employee characteristics (e.g., business unit) to locate the match. If an inventor merged to both an engineering and non-engineer employee, we assumed the correct match was the engineer.

Key individual. Persons at the firm who are recognized as an integral part of the company are designated "key individuals." The firm uses a slightly different term to refer to such persons, but we have modified it for the paper to preserve firm confidentiality.

Location identifiers. As noted in Table 2, in our regressions, we only include separate location identifiers for locations with at least 2,000 employee-months.[14] We do this to increase computational speed, as well as to avoid soaking up variation in locations with relatively small numbers of employee-months. We repeated our main results while including dummies for all locations, and this had no effect on the substantive conclusions.

B.2 Summary of Sample Restrictions

1. In cleaning our employee-month panel, we exclude observations sharing the same person ID and month (dropping 1% of observations).

2. To focus on high-skill workers, we eliminate worker records in the job function of customer service / operations (dropping 32% of observations relative to the start).[15] Doing this drops the vast majority of managers (and manager's managers) of customer service workers.[16]

3. We exclude observations occurring in April and May of Y_3, as the location identifiers change during this period (dropping 4% of observations relative to the start).

4. We exclude workers for whom the manager does not have MOR in both the current and the other period (dropping 34% of observations relative to the start). We require that both MOR in the current period and MOR in the other period be observed in order to perform our main IV analysis.

C Additional Figures and Tables

[14]Locations with less than 2,000 employee-months are lumped into a separate location category, and we also include a separate dummy variable for a location being in the US.

[15]Specifically, we drop all employee-months where the job function variable is "Customer Support/Ops." In the dataset we were provided, over 1/3 of observations are from customer service workers, making them even more numerous than engineers. Thus, if we did not exclude customer service workers, they would play an outsized role in our analysis.

[16]Customer service workers are managed by another customer service worker in 89% of worker-months. However, there are a small number of cases where a customer service worker's manager (or manager's manager) is outside of customer service. Such managers are included in the data, but our conclusions are unchanged when excluding managers who manage any customer service workers. For managers in our sample with subordinates working in customer service, the evaluations of those subordinates are still included in calculating those managers' MOR scores.

Table C1: Summary Statistics for Dataset before Imposing Restriction of Non-missing MOR for Managers in the Current and Other Period

Panel A: Overall numbers	
Share of records, employee in US	0.66
Share of records from managers	0.20
Share of records for engineers	0.33
Co-located with manager	0.81
Same function as manager	0.85
Average manager span (employees/mgr)	5.10
Managers per employee	2.27
Managers per employee (weighted by tenure)	2.56
Worker was hired during the sample period	0.33
Low level in the firm hierarchy	0.54
Medium level in the firm hierarchy	0.39
High level in the firm hierarchy	0.06

Panel B: Summary statistics for outcomes and regressors

Variable:	mean	sd	min	max
Attrition probability (monthly) x100	1.55	12.36	0	100
Quit probability (monthly) x100	0.87	9.28	0	100
Fire probability (monthly) x100	0.34	5.82	0	100
Regretted quit prob (monthly) x100	0.69	8.27	0	100
Non-regretted quit prob (monthly) x100	0.18	4.22	0	100
Subjective performance rating	3.31	0.81	1	5
Manager overall rating	80	16	0	100
Manager gives clear expectations	83	17	0	100
Manager provides coaching	74	21	0	100
Manager supports career dev	77	20	0	100
Manager involves people in decisions	84	17	0	100
Manager instills poz attitude	82	19	0	100
Manager is someone I trust	82	18	0	100

Notes: This table is similar to Table 1. The difference is that it summarizes the data before imposing the restriction of a worker's manager having non-missing MOR in both the current and other period. Appendix B provides more detail on the MOR data.

Table C2: Summary Statistics Splitting by Group

	Engi-neers	Non-engi-neers	Domestic	Foreign	Low level in hier-archy	Medium or high level	Medium in hier-archy	High in hier-archy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Overall numbers								
Share of records, employee in US	0.66	0.72	1	0	0.70	0.70	0.70	0.73
Share of records from managers	0.18	0.23	0.19	0.26	0.04	0.44	0.35	0.85
Share of records for engineers	1	0	0.34	0.41	0.29	0.46	0.52	0.23
Colocated with manager	0.84	0.80	0.83	0.76	0.89	0.70	0.73	0.57
Same function as manager	0.92	0.83	0.88	0.82	0.90	0.80	0.81	0.74
Average manager span (employees/mgr)	8.66	9.6	9.86	8.54	9.96	8.05	8.08	7.79
Managers per employee (weighted by tenure)	1.53	1.51	1.56	1.43	1.54	1.47	1.46	1.49
Managers per employee	1.41	1.37	1.42	1.32	1.39	1.37	1.35	1.38
Worker was hired during the sample period	0.28	0.29	0.28	0.31	0.34	0.19	0.19	0.19
Low level in the firm hierarchy	0.45	0.64	0.57	0.57	1	0	0	0
Medium level in the firm hierarchy	0.50	0.26	0.35	0.36	0	0.81	1	0
High level in the firm hierarchy	0.05	0.10	0.08	0.07	0	0.19	0	1
Tenure at the firm in years	3.77	4.18	4.28	3.44	3.39	4.89	4.77	5.41
Panel B: Outcome variables								
Attrition probability (monthly)	1.23	1.46	1.43	1.23	1.53	1.16	1.10	1.43
Quit probability (monthly)	0.82	0.77	0.85	0.66	0.84	0.72	0.72	0.76
Fire probability (monthly)	0.16	0.37	0.37	0.11	0.37	0.18	0.16	0.30
Regretted quit prob (monthly)	0.62	0.62	0.67	0.50	0.67	0.56	0.56	0.58
Non-regretted quit prob (monthly)	0.21	0.15	0.17	0.16	0.17	0.16	0.16	0.18
Subjective performance rating	3.33	3.32	3.33	3.30	3.30	3.35	3.35	3.32

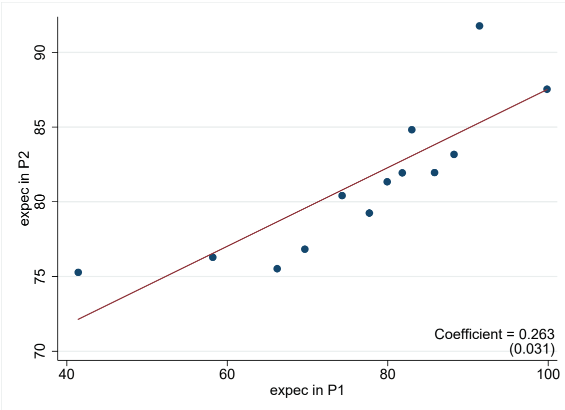
Notes: This table presents summary statistics across various dimensions of heterogeneity. The sample is the same as that in Table 1 and an observation is a worker-month. Column 1 provides summary statistics among employees who are engineers (i.e., they work in the engineering job function), whereas column 2 analyzes non-engineer employees. Columns 3-4 split by whether an employee is located in the U.S. (i.e., "domestic") or not. Columns 5-8 split by a worker's position in the firm hierarchy. As discussed in Section 5, a worker's hierarchy position is based on their salary grade.

Table C3: Means and Standard Deviations of Manager Survey Scores

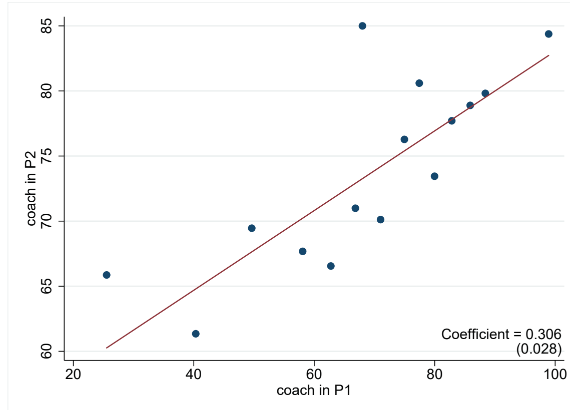
	Engi-neers (1)	Non-engi-neers (2)	Domestic (3)	Foreign (4)	Low level in hier-archy (5)	Medium or high level (6)	Medium in hier-archy (7)	High in hier-archy (8)
Manager overall rating (MOR)	81	84	83	82	85	83	83	81
	(15)	(15)	(14)	(16)	(15)	(15)	(15)	(15)
MOR in Period 1	81	84	83	82	84	83	83	81
	(15)	(15)	(14)	(16)	(15)	(15)	(15)	(14)
MOR in Period 2	80	85	83	82	85	83	83	81
	(15)	(14)	(14)	(16)	(16)	(15)	(14)	(15)
Manager gives clear expectations	80	83	82	81	89	81	82	79
	(17)	(17)	(17)	(17)	(15)	(17)	(17)	(18)
Manager provides coaching	73	72	72	74	83	71	73	66
	(20)	(23)	(22)	(20)	(18)	(22)	(21)	(23)
Manager supports career dev	77	77	77	77	85	76	78	71
	(18)	(20)	(19)	(19)	(17)	(19)	(18)	(20)
Manager involves people	85	86	86	85	88	85	86	84
	(14)	(14)	(14)	(14)	(15)	(14)	(15)	(13)
Manager instills poz attitude	84	85	85	83	87	84	85	83
	(18)	(17)	(17)	(19)	(18)	(17)	(18)	(16)
Manager is someone I trust	84	86	85	85	87	85	86	83
	(16)	(16)	(16)	(15)	(16)	(16)	(16)	(16)

Notes: This table provides summary statistics on the upward feedback survey scores, but divided by different dimensions of heterogeneity. Means are shown not in parentheses, with standard deviations in parentheses. The sample corresponds to that for our analysis in Appendix A.11 on variation in manager scores. An observation is a manager-period.

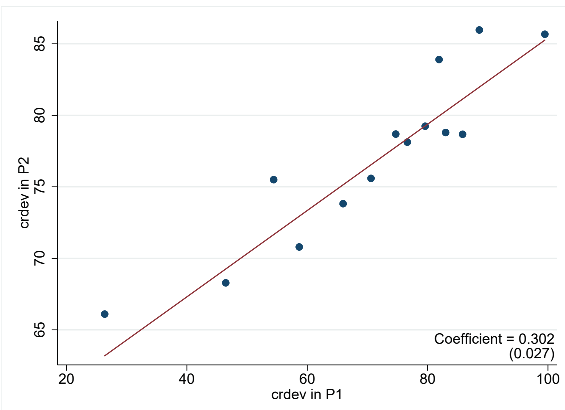
Figure C1: Correlation of Survey Items across the Two Waves



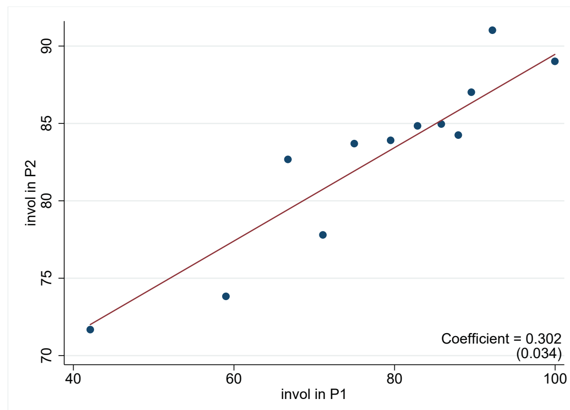
(a) Manager gives clear expectations



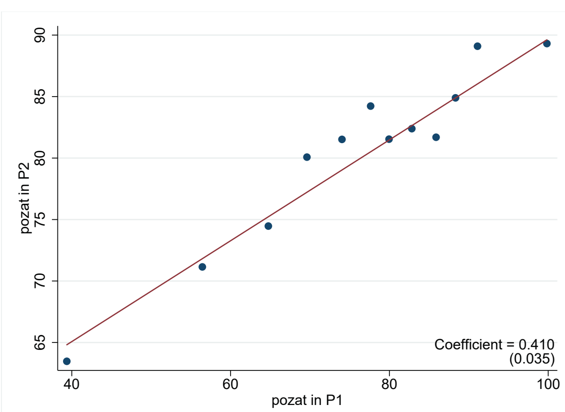
(b) Manager provides coaching



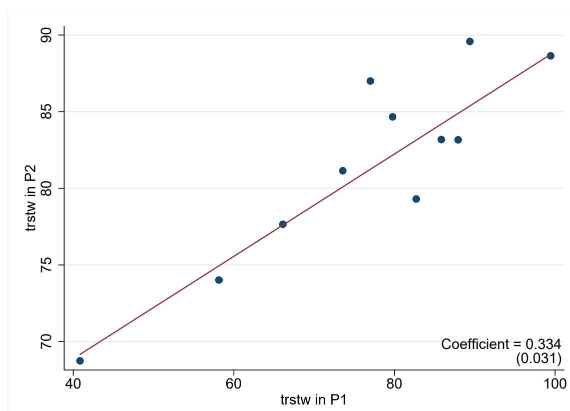
(c) Manager supports career development



(d) Manager involves people in decisions



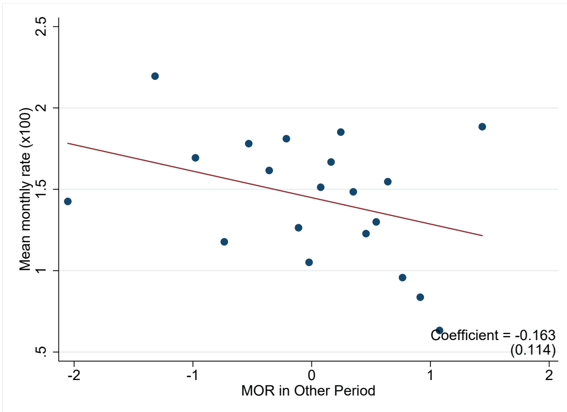
(e) Manager instills positive attitude



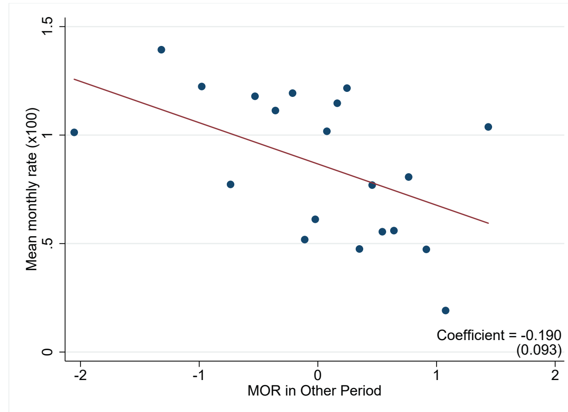
(f) Manager is someone I trust

Notes: These graphs are similar to Panel (a) of Figure 1 in the main text. The difference is that these are graphs for the six individual manager questions (as opposed to MOR).

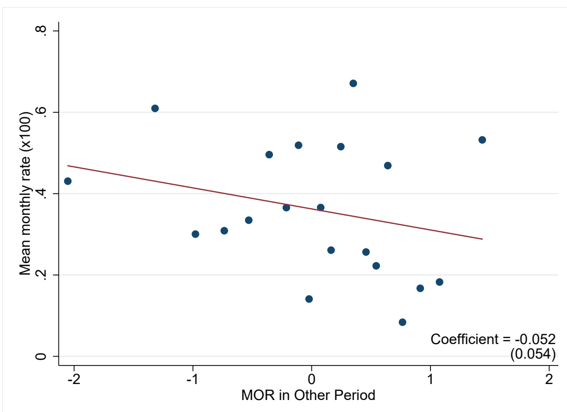
Figure C2: Reduced Form Binned Scatter Plots: Exploiting New Joiners



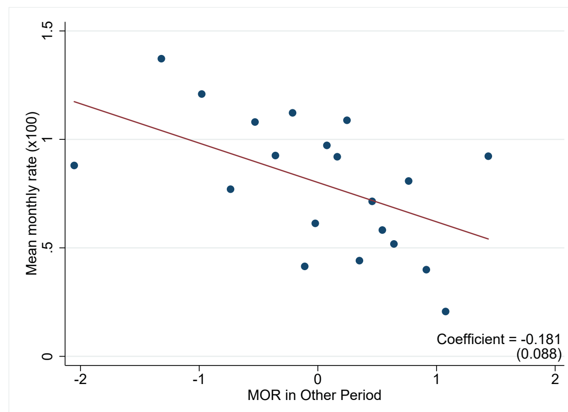
(a) Attrition



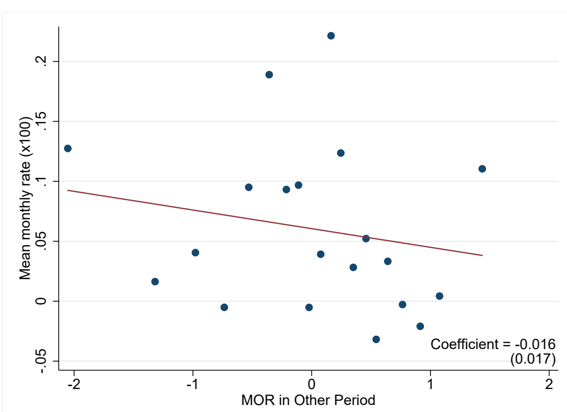
(b) Quits



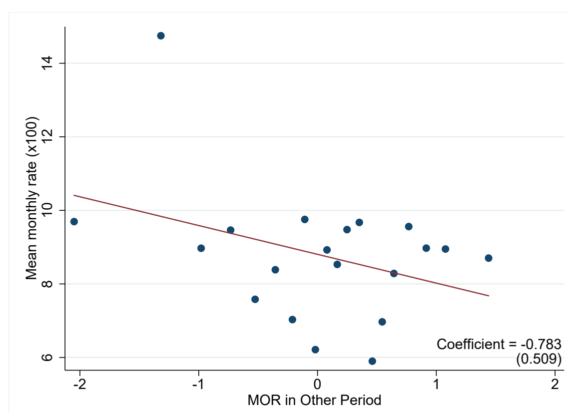
(c) Fires



(d) Regretted Quits



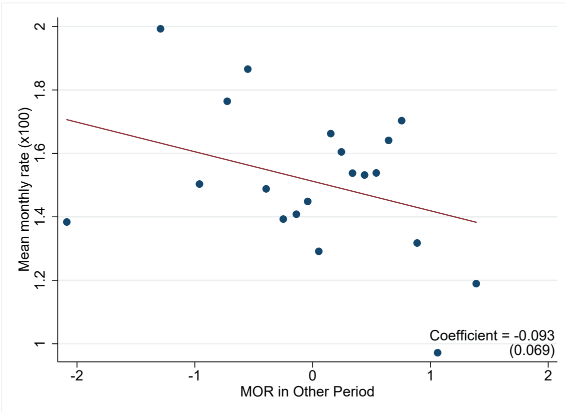
(e) Non-regretted Quits



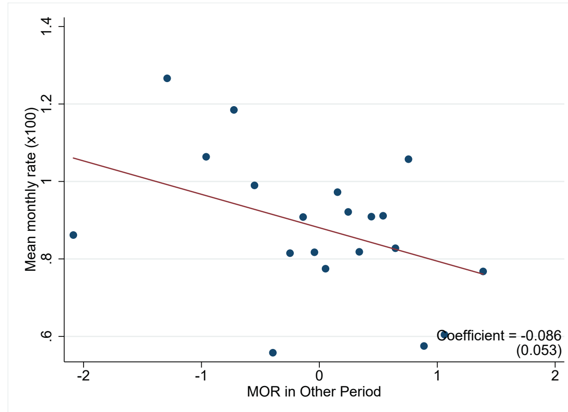
(f) Worker changes manager

Notes: This figure is similar to Figure 2 in the main text. The difference is that these figures are made for the joiners analysis. That is, the regressions correspond to those in Table 4.

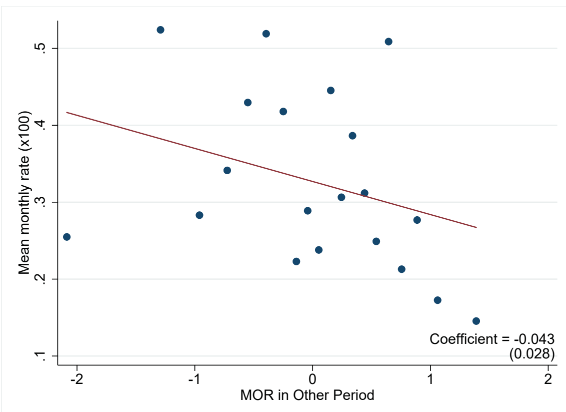
Figure C3: Reduced Form Binned Scatter Plots: Exploiting New Joiners and People Switching Managers



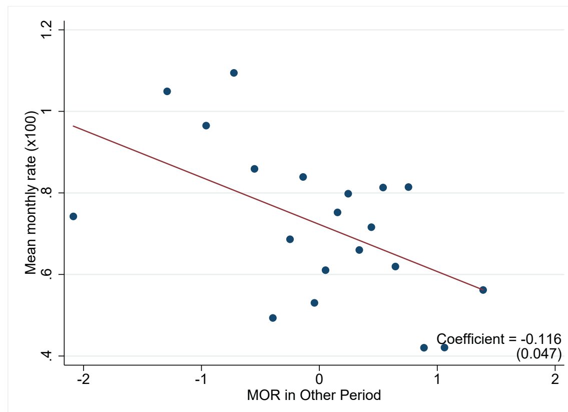
(a) Attrition



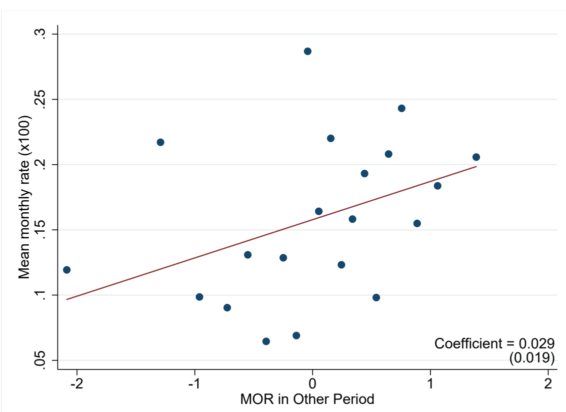
(b) Quits



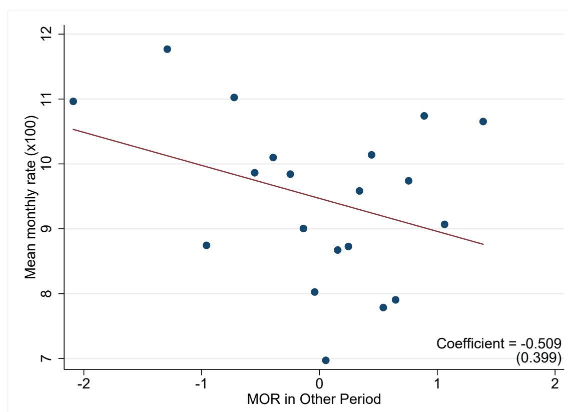
(c) Fires



(d) Regretted Quits



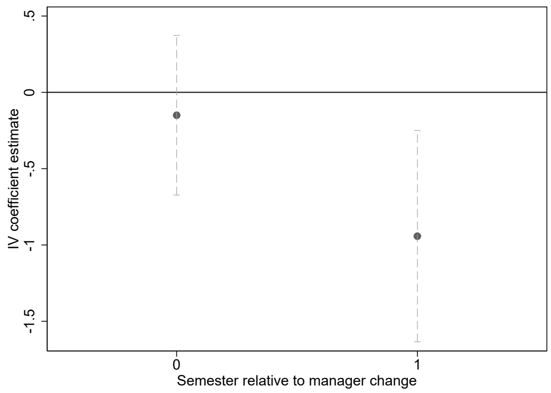
(e) Non-regretted Quits



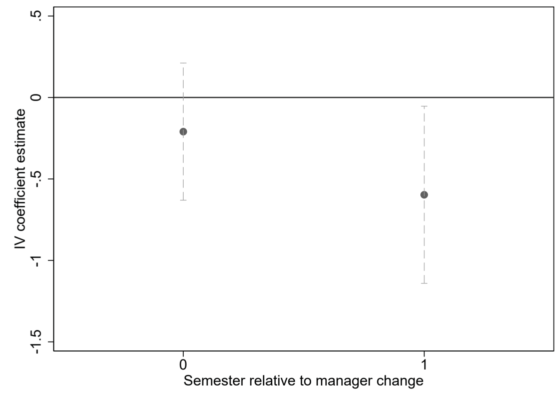
(f) Worker changes manager

Notes: This figure is similar to Figure 2 in the main text. The difference is that these figures are made for the pooled analysis of workers joining the firm in period 2 or workers switching managers in period 2. That is, the regressions correspond to those in Table 5.

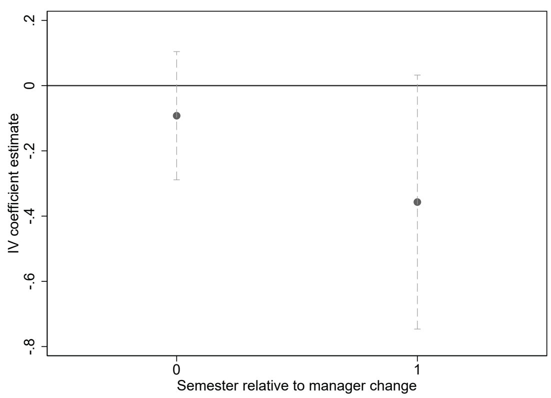
Figure C4: Impacts of MOR on Attrition Outcomes by Semester (i.e., Half-Year) Since Getting New Manager



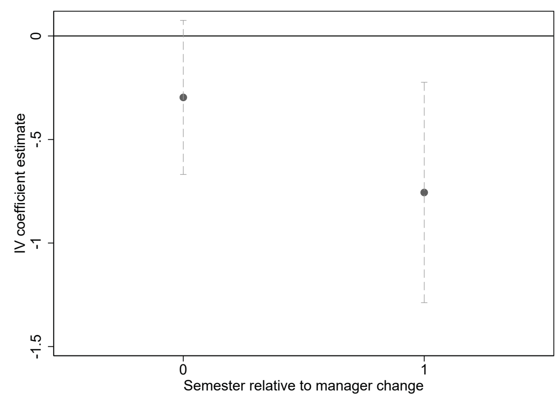
(a) Attrition



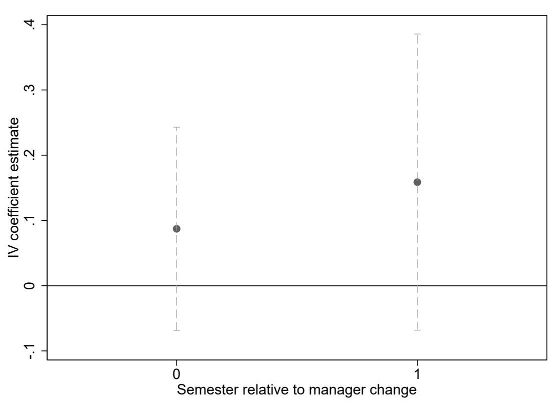
(b) Quits



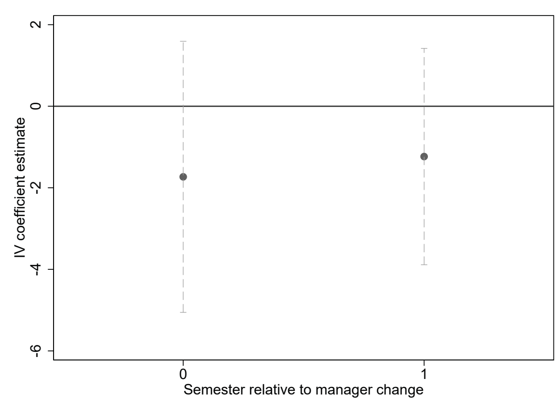
(c) Fires



(d) Regretted Quits



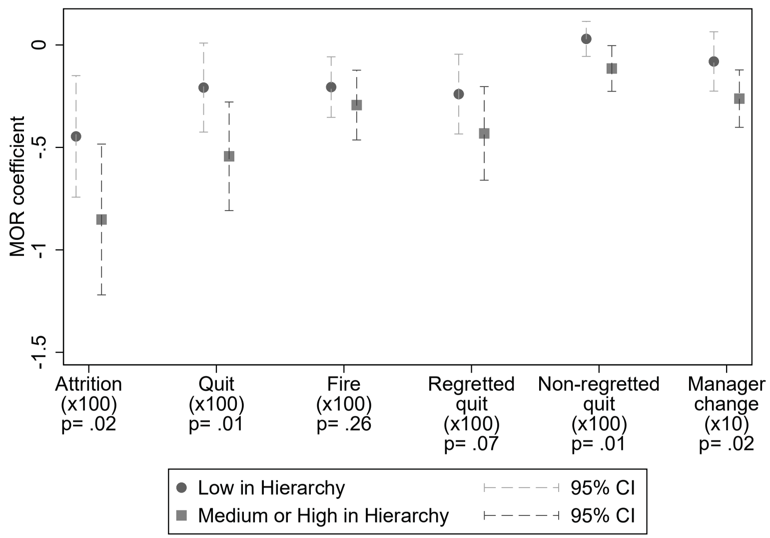
(e) Non-regretted Quits



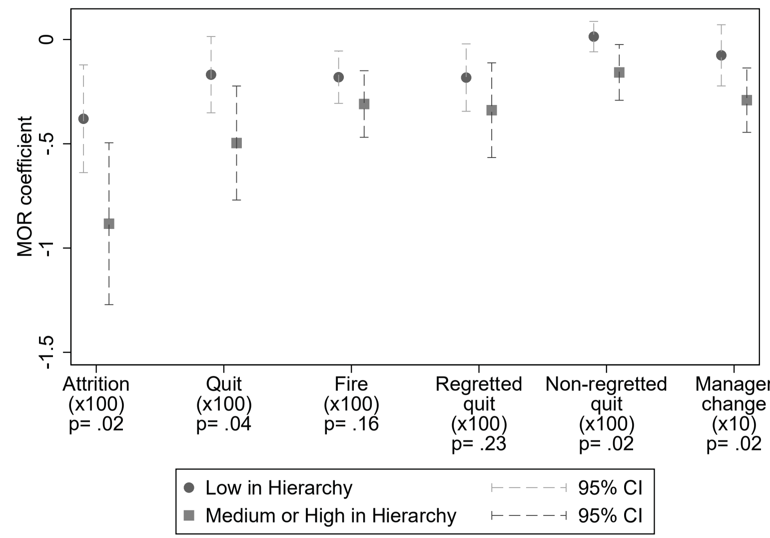
(f) Worker changes manager

Notes: The dotted lines show 95% confidence intervals on coefficients, with standard errors clustered by manager. This figure is similar to Figure 3. The difference is that we analyze MOR interacted with semester (i.e., half-year) since getting a new manager instead of quarter since getting a new manager. Similar to Figure 3, beyond semesters 0-1 shown here, we also include a dummy for being in semester 2.

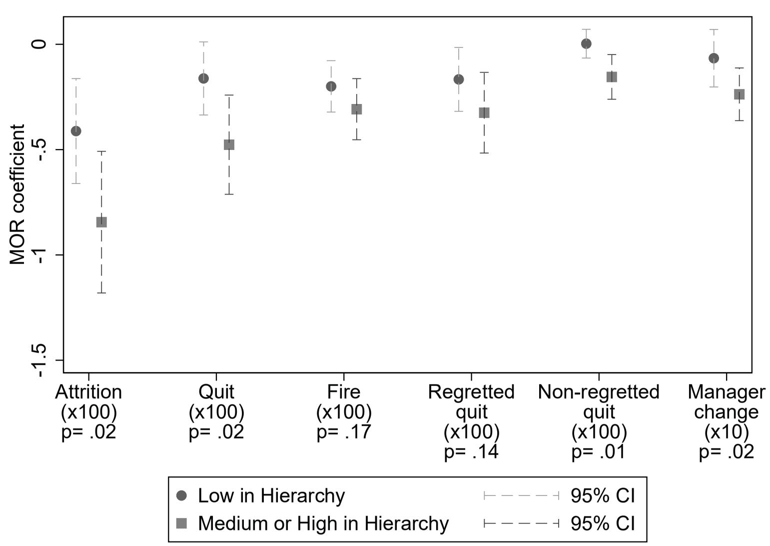
Figure C5: Robustness for Figure 4 Results on Heterogeneity by Hierarchy



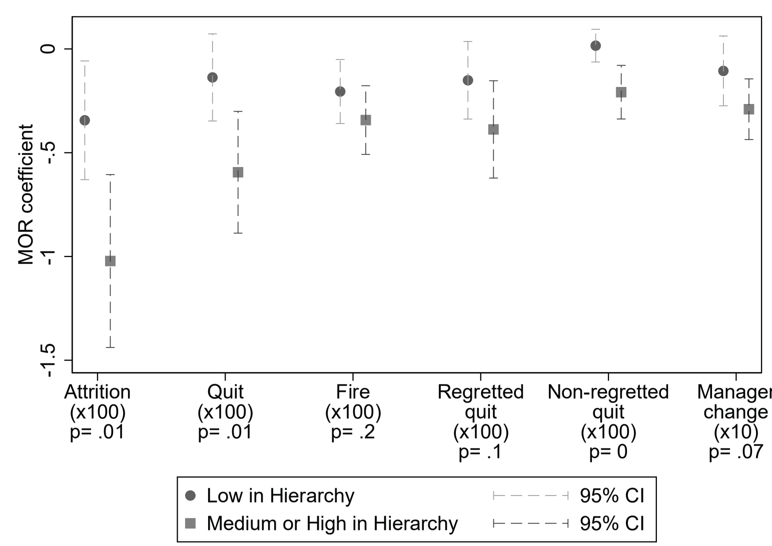
(a) Control for MOR x (Above Median Tenure)



(b) Individual Contributors (i.e., Non-Managers) Only



(c) Control for MOR x (Worker is Engineer)



(d) U.S. Workers Only

Notes: This figure repeats Figure 4, but adds more controls or restricts to different subsamples. Panel (a) adds MOR in current period x (Worker has Above Median Tenure) as an endogenous regressor and MOR in other period x (Above Median Tenure) as an excluded instrument. We also add a dummy for the worker having above median tenure to our controls. Panel (c) adds MOR in current period x (Worker is an Engineer) as an endogenous regressor and MOR in other period x Engineer as an excluded instrument.

Table C4: MOR and Employee Attrition: High- vs. Low-Productivity Employees

Dep. Var.:	Attrition (x100)	Quit (x100)	Fire (x100)	Regretted quit (x100)	Non-regretted quit (x100)	Mgr change (x100)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Sample is high-productivity employees						
MOR in current period	-0.217***	-0.155**	-0.041	-0.154**	-0.001	-1.696***
	(0.076)	(0.061)	(0.032)	(0.061)	(0.005)	(0.606)
Mean dep. var.	0.597	0.365	0.0790	0.362	0.00387	5.506
F-stat on excl instrument	114.6	114.6	114.6	114.6	114.6	114.8
Panel B: Sample is low-productivity employees						
MOR in current period	-0.452***	-0.224**	-0.228***	-0.160**	-0.067	-1.102**
	(0.126)	(0.090)	(0.072)	(0.073)	(0.052)	(0.554)
Mean dep. var.	1.463	0.838	0.368	0.552	0.284	6.298
F-stat on excl instrument	113.4	113.4	113.4	113.4	113.4	113.5

Notes: This table presents IV results on the relation between MOR and employee attrition outcomes, similar to the IV specifications in Table 3 (with the same controls as in Table 3). The difference is that we split the sample based on whether employees are "high" or "low" productivity individuals. Workers are classified as high or low productivity based on subjective performance scores, as described in Section 4.5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C5: MOR and Whether an Employee Gets Changed to a New Manager

Specification:	1st Stg	OLS	IV	Reduced Form
Panel A: Baseline (as in Table 3)				
MOR in other period	0.326***			-0.443**
	(0.029)			(0.174)
MOR in current period		-0.767***	-1.361**	
		(0.182)	(0.547)	
Mean dep. var.		6.087	6.087	6.087
F-stat on excl instrument			125.3	
Panel B: Joiners (as in Table 4)				
MOR in other period	0.297***			-0.783
	(0.043)			(0.509)
MOR in current period		-1.453***	-2.640	
		(0.444)	(1.760)	
Mean dep. var.		8.789	8.789	8.789
F-stat on excl instrument			47.19	
Panel C: Joiners or Switchers (as in Table 5)				
MOR in other period	0.281***			-0.509
	(0.037)			(0.399)
MOR in current period		-0.960***	-1.814	
		(0.354)	(1.446)	
Mean dep. var.		9.466	9.466	9.466
F-stat on excl instrument			57.93	
Panel D: Mgrs Switching Locations or Job Funcs (as in Table 7)				
Specification:	OLS	OLS	IV	IV
MOR of current manager in 1st period	-0.303		-2.562**	
	(0.378)		(1.091)	
MOR of current manager in 2nd period		-0.906**		-0.699
		(0.379)		(0.767)
Mean dep. var.	6.388	6.388	6.388	6.388
F-stat on excl instrument			24.22	27.90

Notes: Panel A of this table is similar to any of the panels in Table 3. The difference is that instead of analyzing attrition, we analyze whether an employee changes to a different manager in the next month (with coefficients multiplied by 100 for ease of exposition). For example, the table examines whether the MOR of an employee's manager in January Y_1 predicts whether January is the last month that the employee is supervised by that manager (i.e., the manager ID for February Y_1 is different from that in January Y_1). Likewise, Panels B-D of this table are similar to any of the panels of Tables 4, 5, and 7, respectively. The difference is that we analyze whether an employee changes to a different manager (as opposed to attrition). * significant at 10%; ** significant at 5%; *** significant at 1%

Table C6: Robustness Check on Exploiting New Joiners and People Switching Managers: Only Analyze People Switching Managers

Specification:	1st Stg	OLS	IV	Reduced Form
Panel A: Attrition				
MOR in other period	0.267***			-0.061
	(0.040)			(0.072)
MOR in current period		-0.135*	-0.228	
		(0.071)	(0.265)	
Mean dep. var.		1.543	1.543	1.543
F-stat on excl instrument			44.50	
Panel B: Quits				
MOR in other period	0.267***			-0.040
	(0.040)			(0.054)
MOR in current period		-0.137***	-0.150	
		(0.053)	(0.202)	
Mean dep. var.		0.890	0.890	0.890
F-stat on excl instrument			44.50	
Panel C: Fires				
MOR in other period	0.267***			-0.034
	(0.040)			(0.030)
MOR in current period		-0.004	-0.127	
		(0.025)	(0.111)	
Mean dep. var.		0.311	0.311	0.311
F-stat on excl instrument			44.50	
Panel D: Regretted Quits				
MOR in other period	0.267***			-0.092*
	(0.040)			(0.049)
MOR in current period		-0.123**	-0.345*	
		(0.049)	(0.187)	
Mean dep. var.		0.688	0.688	0.688
F-stat on excl instrument			44.50	
Panel E: Non-regretted Quits				
MOR in other period	0.267***			0.052*
	(0.040)			(0.027)
MOR in current period		-0.014	0.195*	
		(0.020)	(0.107)	
Mean dep. var.		0.202	0.202	0.202
F-stat on excl instrument			44.50	

Notes: This table is similar to Table 5, but restricts only to observations following a change in manager during the second period (more precisely, to observations where a worker's manager differs from the manager they had during September Y_1 when first survey was administered). That is, we exclude workers who join the firm during the second period.* significant at 10%; ** significant at 5%; *** significant at 1%

Table C7: Robustness to Table 6: Extending the Sample

Dep. Var.	Subjective performance (normalized)	Log salary x100	Log salary growth x100	Promoted x100	Log stock grant holdings x100	Key individual (x100)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS						
MOR of future manager	0.003	-0.673***	0.177	-0.007	-0.841	0.216
measured in 2nd period	(0.014)	(0.257)	(0.107)	(0.073)	(1.025)	(0.350)
Panel B: IV						
MOR of future manager	-0.036	-1.205	0.416	-0.122	-1.019	-1.013
measured in 2nd period	(0.063)	(1.055)	(0.468)	(0.315)	(4.905)	(1.222)
F-stat on excl instrument	39.45	36.16	35.38	45.27	22.51	45.27
Panel C: Red. Form						
MOR of future manager	-0.010	-0.361	0.103	-0.043	-0.088	-0.205
measured in 1st period	(0.016)	(0.339)	(0.133)	(0.082)	(1.109)	(0.351)

Notes: This table is similar to Table 6, where the Rothstein test is performed using our analysis sample of worker-months where the manager has MOR for both periods. However, many workers transition from having a manager who does not have MOR for both periods to a manager who has MOR for both periods, and such workers can also be used for Rothstein test analysis because our Rothstein IV test uses the MOR of the new manager. Thus, this table additionally includes worker-months from the Table C1 sample where the worker has an old manager who doesn't have MOR for both periods, but where the worker moves to a new manager who has MOR for both periods. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C8: Robustness for IV in Table 3: Gradually Adding Additional Controls

	(1)	(2)	(3)	(4)	(5)
Panel A: Attrition					
MOR in current period	-0.475***	-0.481***	-0.487***	-0.499***	-0.495***
	(0.103)	(0.104)	(0.105)	(0.106)	(0.107)
Panel B: Quits					
MOR in current period	-0.278***	-0.283***	-0.281***	-0.285***	-0.281***
	(0.0741)	(0.0750)	(0.0752)	(0.0754)	(0.0754)
Panel C: Fires					
MOR in current period	-0.188***	-0.190***	-0.193***	-0.200***	-0.201***
	(0.0483)	(0.0490)	(0.0498)	(0.0501)	(0.0501)
Panel D: Regretted Quits					
MOR in current period	-0.230***	-0.235***	-0.234***	-0.236***	-0.234***
	(0.0648)	(0.0656)	(0.0661)	(0.0664)	(0.0664)
Panel E: Non-regretted Quits					
MOR in current period	-0.0475	-0.0485	-0.0465	-0.0485	-0.0471
	(0.0298)	(0.0301)	(0.0299)	(0.0303)	(0.0303)
Base Controls	Y	Y	Y	Y	Y
Business Unit X Job Function Dummies	N	Y	Y	Y	Y
Business Unit X Salary Grade Dummies	N	N	Y	Y	Y
Job Function X Salary Grade Dummies	N	N	N	Y	Y
Current Month-Year Dummies	N	N	N	N	Y

Notes: Standard errors clustered by manager in parentheses. This table is a robustness check to Table 3. It takes the IV specifications in the 5 panels and gradually adds additional control variables. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C9: Robustness for IV in Table 4: Gradually Adding Additional Controls

	(1)	(2)	(3)	(4)	(5)
Panel A: Attrition					
MOR in current period	-0.550	-0.533	-0.535	-0.573	-0.576
	(0.370)	(0.376)	(0.384)	(0.408)	(0.408)
Panel B: Quits					
MOR in current period	-0.643**	-0.636**	-0.617*	-0.677**	-0.670**
	(0.308)	(0.312)	(0.317)	(0.341)	(0.341)
Panel C: Fires					
MOR in current period	-0.175	-0.166	-0.159	-0.156	-0.173
	(0.180)	(0.179)	(0.179)	(0.192)	(0.193)
Panel D: Regretted Quits					
MOR in current period	-0.613**	-0.607**	-0.600**	-0.671**	-0.664**
	(0.292)	(0.296)	(0.302)	(0.326)	(0.325)
Panel E: Non-regretted Quits					
MOR in current period	-0.0526	-0.0511	-0.0406	-0.0334	-0.0336
	(0.0567)	(0.0534)	(0.0478)	(0.0469)	(0.0473)
Base Controls	Y	Y	Y	Y	Y
Business Unit X Job Function Dummies	N	Y	Y	Y	Y
Business Unit X Salary Grade Dummies	N	N	Y	Y	Y
Job Function X Salary Grade Dummies	N	N	N	Y	Y
Current Month-Year Dummies	N	N	N	N	Y

Notes: Standard errors clustered by manager in parentheses. This table is a robustness check to Table 4. It takes the IV specifications in the 5 panels and gradually adds additional control variables. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C10: Robustness for IV in Table 5: Gradually Adding Additional Controls

	(1)	(2)	(3)	(4)	(5)
Panel A: Attrition					
MOR in current period	-0.332	-0.317	-0.314	-0.336	-0.340
	(0.236)	(0.235)	(0.235)	(0.243)	(0.244)
Panel B: Quits					
MOR in current period	-0.308*	-0.289	-0.295	-0.245	-0.248
	(0.185)	(0.182)	(0.181)	(0.186)	(0.187)
Panel C: Fires					
MOR in current period	-0.153	-0.148	-0.144	-0.194**	-0.198**
	(0.0971)	(0.0956)	(0.0968)	(0.0958)	(0.0964)
Panel D: Regretted Quits					
MOR in current period	-0.412**	-0.393**	-0.406**	-0.365**	-0.368**
	(0.166)	(0.162)	(0.161)	(0.165)	(0.166)
Panel E: Non-regretted Quits					
MOR in current period	0.105	0.104	0.112	0.120*	0.120*
	(0.0728)	(0.0721)	(0.0707)	(0.0721)	(0.0721)
Base Controls	Y	Y	Y	Y	Y
Business Unit X Job Function Dummies	N	Y	Y	Y	Y
Business Unit X Salary Grade Dummies	N	N	Y	Y	Y
Job Function X Salary Grade Dummies	N	N	N	Y	Y
Current Month-Year Dummies	N	N	N	N	Y

Notes: Standard errors clustered by manager in parentheses. This table is a robustness check to Table 5. It takes the IV specifications in the 5 panels and gradually adds additional control variables. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C11: Robustness for IV in Table 7: Gradually Adding Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Attrition										
MOR of current manager in 1st period	-0.661**	-0.702***	-0.708***	-0.678**	-0.699***					
	(0.266)	(0.272)	(0.274)	(0.272)	(0.263)					
MOR of current manager in 2nd period						-0.525**	-0.532**	-0.547**	-0.542**	-0.544**
						(0.222)	(0.228)	(0.232)	(0.235)	(0.239)
Panel B: Quits										
MOR of current manager in 1st period	-0.181	-0.213	-0.182	-0.170	-0.183					
	(0.151)	(0.155)	(0.156)	(0.156)	(0.153)					
MOR of current manager in 2nd period						-0.199	-0.194	-0.184	-0.185	-0.181
						(0.131)	(0.133)	(0.137)	(0.138)	(0.139)
Panel C: Fires										
MOR of current manager in 1st period	-0.246*	-0.253*	-0.243*	-0.229*	-0.208*					
	(0.128)	(0.131)	(0.136)	(0.135)	(0.122)					
MOR of current manager in 2nd period						-0.254**	-0.258**	-0.253**	-0.249**	-0.256**
						(0.118)	(0.121)	(0.123)	(0.124)	(0.123)
Panel D: Regretted Quits										
MOR of current manager in 1st period	-0.224	-0.269*	-0.252*	-0.228	-0.222					
	(0.142)	(0.149)	(0.151)	(0.150)	(0.145)					
MOR of current manager in 2nd period						-0.108	-0.104	-0.0909	-0.0867	-0.0846
						(0.120)	(0.121)	(0.126)	(0.127)	(0.125)
Panel E: Non-regretted Quits										
MOR of current manager in 1st period	0.0324	0.0471	0.0604	0.0497	0.0314					
	(0.0801)	(0.0775)	(0.0798)	(0.0802)	(0.0788)					
MOR of current manager in 2nd period						-0.0950	-0.0949	-0.0979	-0.103	-0.101
						(0.0674)	(0.0679)	(0.0698)	(0.0707)	(0.0727)
Base Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Business Unit X Job Function Dummies	N	Y	Y	Y	Y	N	Y	Y	Y	Y
Business Unit X Salary Grade Dummies	N	N	Y	Y	Y	N	N	Y	Y	Y
Job Function X Salary Grade Dummies	N	N	N	Y	Y	N	N	N	Y	Y
Collapsed Current Month-Year Dummies	N	N	N	N	Y	N	N	N	N	Y

Notes: Standard errors clustered by manager in parentheses. This table is a robustness check to Table 7. It takes the two IV specifications in the 5 panels and gradually adds additional control variables. Since the sample size is much smaller in Table 3 than in our baseline analyses (due to an observation being a location-job function-period), we use coarse versions of business unit, job function, and salary grade to create the interaction terms. Specifically, for creating interaction terms, salary grade is broken into three categories (as in Table C15), job function is broken into engineer or not (as in Table C17), and business unit is divided into three categories. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C12: OLS Results on MOR and Employee Attrition: Restricting to Managers with Above-Median Team Size

Dep. Var.:	Attrition (x100)	Quit (x100)	Fire (x100)	Regretted quit (x100)	Non-regretted quit (x100)	Mgr change (x100)
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: OVERALL RESULTS						
Full Sample OLS Results						
MOR in current period	-0.156***	-0.103***	-0.033**	-0.084***	-0.019**	-0.767***
	(0.031)	(0.023)	(0.014)	(0.021)	(0.010)	(0.182)
Mean dep. var.	1.374	0.791	0.291	0.621	0.169	6.087
Manager's Team Had At Least 8 Members						
MOR in current period	-0.179***	-0.114***	-0.042**	-0.098***	-0.016	-0.842***
	(0.045)	(0.034)	(0.020)	(0.031)	(0.014)	(0.242)
Mean dep. var.	1.462	0.857	0.315	0.678	0.177	5.680
Manager's Team Had At Least 9 Members						
MOR in current period	-0.195***	-0.115***	-0.063***	-0.094***	-0.020	-0.814***
	(0.051)	(0.037)	(0.024)	(0.033)	(0.016)	(0.278)
Mean dep. var.	1.497	0.866	0.341	0.684	0.180	5.593
PANEL B: JOINERS RESULTS						
Joiners OLS Results						
MOR in current period	-0.252**	-0.212**	-0.028	-0.190**	-0.024*	-1.453***
	(0.100)	(0.086)	(0.045)	(0.083)	(0.015)	(0.444)
Mean dep. var.	1.446	0.864	0.362	0.798	0.0603	8.789
Manager's Team Had At Least 8 Members, Joiners						
MOR in current period	-0.366**	-0.375***	0.003	-0.342***	-0.036	-1.557**
	(0.156)	(0.135)	(0.056)	(0.129)	(0.023)	(0.667)
Mean dep. var.	1.641	1.029	0.343	0.955	0.0671	8.082
Manager's Team Had At Least 9 Members, Joiners						
MOR in current period	-0.469***	-0.412***	-0.055	-0.368***	-0.047	-1.079
	(0.181)	(0.149)	(0.065)	(0.140)	(0.029)	(0.843)
Mean dep. var.	1.703	1.036	0.360	0.948	0.0790	8.250
PANEL C: JOINERS + SWITCHERS RESULTS						
Joiners + Switchers OLS Results						
MOR in current period	-0.157***	-0.147***	-0.015	-0.127***	-0.020	-0.960***
	(0.061)	(0.047)	(0.024)	(0.045)	(0.015)	(0.354)
Mean dep. var.	1.512	0.880	0.327	0.722	0.158	9.466
Manager's Current Team Had At Least 8 Members, Joiners or Switchers						
MOR in current period	-0.198**	-0.190***	-0.025	-0.140**	-0.050**	-0.761
	(0.086)	(0.067)	(0.029)	(0.063)	(0.022)	(0.505)
Mean dep. var.	1.598	0.988	0.331	0.813	0.175	8.868
Manager's Current Team Had At Least 9 Members, Joiners or Switchers						
MOR in current period	-0.244**	-0.208***	-0.060*	-0.143**	-0.066***	-0.368
	(0.101)	(0.076)	(0.035)	(0.071)	(0.024)	(0.572)
Mean dep. var.	1.613	0.966	0.351	0.790	0.176	8.897

Notes: This table examines our OLS attrition results while requiring that managers had at least a time size of 8 or 9 workers at the time of the surveys. More specifically, we restrict attention to worker-months in period 1 where the worker's manager had at least 8 or 9 workers on their team in September Y_1, and to worker-months in period 2 where the worker's manager had at least 8 or 9 workers on their team in September Y_2. In our sample, 9 workers is the median size at the worker-month level, whereas 8 workers (i.e., 7.9 workers rounded to 8) is the median size compared across managers in terms of the manager's average span. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C13: Robustness of Attrition Results on a "Hold-out Sample"

Dep. Var.:	Attrition (x100)	Quit (x100)	Fire (x100)	Regretted quit (x100)	Non-regretted quit (x100)	Mgr change (x100)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS Regressions						
MOR	-0.088**	-0.047*	-0.003	-0.033	-0.014	-0.634***
	(0.037)	(0.027)	(0.016)	(0.023)	(0.013)	(0.184)
Mean dep. var.	1.412	0.809	0.271	0.644	0.164	6.731
Panel B: Reduced Form Regressions						
MOR	-0.226***	-0.094**	-0.041*	-0.023	-0.067***	-0.647***
	(0.054)	(0.037)	(0.023)	(0.032)	(0.016)	(0.224)
Mean dep. var.	1.755	0.963	0.375	0.769	0.192	10.07
Panel C: Two-Sample IV Estimates						
MOR	-0.695***	-0.290**	-0.127*	-0.072	-0.205***	-1.986***
	(0.178)	(0.116)	(0.071)	(0.099)	(0.052)	(0.710)
Mean dep. var.	1.755	0.963	0.375	0.769	0.192	10.07

Notes: This table repeats our main results but on a "hold-out sample" of managers for whom MOR is only observed for one of the two periods. Controls are the same as in Table 3, with standard errors clustered by manager in parentheses. Two-sample IV standard errors are computed using the Delta Method and account for first-stage estimation error. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C14: The Standard Deviation of Manager Value-added

Method:	One Sample (1)	Split Sample (split randomly) (2)	Split Sample (split by period) (3)
Panel A: Attrition (x100)			
SD of mgr effects	1.24	0.67	0.67
Panel B: Quits (x100)			
SD of mgr effects	0.84	0.38	0.48
Panel C: Fires (x100)			
SD of mgr effects	0.54	0.33	0.19
Panel D: Regretted Quits (x100)			
SD of mgr effects	0.72	0.29	0.40
Panel E: Non-regretted Quits (x100)			
SD of mgr effects	0.35	0.13	0.08

Notes: This table presents estimates of the standard deviation of manager value-added for five attrition variables (attrition, quits, fires, regretted quits, and non-regretted quits). In all columns, we estimate a version of equation (7) from the main text while using the baseline controls from Table 3 (excluding MOR). We use the same data as from Table 3 where an observation is an employee-month. The standard deviations shown are weighted by the number of observations. In (1), we estimate one set of manager fixed effects using the full sample. In (2), we randomly split the data in two, randomly assigning each employee-month to one of two samples. The standard deviations shown are calculated using the covariance of the fixed effects estimated using the two samples. (The standard deviations shown are the square root of the estimated covariances.) In (3), we split the data into the first and second periods, and estimate manager fixed effects separately by period. The standard deviations in (2) and (3) are smaller than in (1) as they are adjusted for sampling error.

Table C15: MOR and Employee Attrition: Heterogeneity by Hierarchy

Dep. Var.:	Attrition (x100)	Quit (x100)	Fire (x100)	Regretted quit (x100)	Non-regretted quit (x100)	Mgr change (x100)
Panel A: Sample is Employees at Low Level in the Firm's Hierarchy						
MOR	-0.354***	-0.151*	-0.183***	-0.173**	0.022	-0.836
	(0.127)	(0.090)	(0.063)	(0.081)	(0.038)	(0.706)
Mean dep. var.	1.532	0.842	0.373	0.667	0.173	6.207
F-stat on excl instrument	86.97	86.97	86.97	86.97	86.97	87.64
Panel B: Sample is Employees at Medium Level in Hierarchy						
MOR	-0.691***	-0.457***	-0.166**	-0.323***	-0.135**	-2.746***
	(0.180)	(0.132)	(0.074)	(0.110)	(0.056)	(0.737)
Mean dep. var.	1.103	0.716	0.155	0.556	0.160	6.148
F-stat on excl instrument	54.12	54.12	54.12	54.12	54.12	54.20
Panel C: Sample is Employees at High Level in Hierarchy						
MOR in current period	-1.253*	-1.026*	-0.527*	-0.586	-0.440	0.700
	(0.751)	(0.601)	(0.299)	(0.443)	(0.275)	(1.659)
Mean dep. var.	1.425	0.760	0.299	0.580	0.181	4.939
F-stat on excl instrument	7.039	7.039	7.039	7.039	7.039	7.161
Panel D: Sample is Employees at Medium or High Level in Hierarchy						
MOR in current period	-0.711***	-0.520***	-0.199***	-0.346***	-0.175***	-2.276***
	(0.177)	(0.133)	(0.071)	(0.108)	(0.056)	(0.641)
Mean dep. var.	1.162	0.724	0.182	0.560	0.164	5.926
F-stat on excl instrument	57.18	57.18	57.18	57.18	57.18	57.39
Panel E: Pooled Specification (i.e., Full Sample with Interaction Term)						
MOR	-0.346***	-0.165*	-0.163***	-0.172**	0.007	-0.728
	(0.118)	(0.085)	(0.058)	(0.075)	(0.034)	(0.671)
MOR X (Medium or High in Hierarchy)	-0.364**	-0.318**	-0.070	-0.164	-0.154***	-1.782**
	(0.176)	(0.131)	(0.077)	(0.109)	(0.056)	(0.749)
Mean dep. var.	1.374	0.791	0.291	0.621	0.169	6.087
F-stat on excl instrument for MOR	63.26	63.26	63.26	63.26	63.26	63.65
F on excl inst for MOR x (Medium or High)	57.95	57.95	57.95	57.95	57.95	58.36
Panel F: Sample Restricted to that in Table 4 ("Joiners" Research Design)						
MOR	-0.414	-0.481	-0.166	-0.494	-0.016	-2.286
	(0.435)	(0.363)	(0.208)	(0.341)	(0.054)	(2.181)
MOR X (Medium or High in Hierarchy)	-0.468	-0.558	-0.031	-0.410	-0.126	-1.224
	(0.624)	(0.519)	(0.292)	(0.492)	(0.113)	(2.462)
Mean dep. var.	1.446	0.864	0.362	0.798	0.0603	8.789
F-stat on excl instrument for MOR	23.79	23.79	23.79	23.79	23.79	23.85
F on excl inst for MOR x (Medium or High)	11.56	11.56	11.56	11.56	11.56	11.45
Panel G: Sample Restricted to that in Table 5 ("Joiners+Switchers" Research Design)						
MOR	-0.306	-0.285	-0.181	-0.408**	0.123	-1.144
	(0.294)	(0.234)	(0.121)	(0.205)	(0.080)	(1.836)
MOR X (Medium or High in Hierarchy	-0.078	-0.069	0.083	-0.012	-0.056	-2.006
	(0.430)	(0.353)	(0.183)	(0.318)	(0.143)	(1.965)
Mean dep. var.	1.512	0.880	0.327	0.722	0.158	9.466
F-stat on excl instrument for MOR	29.83	29.83	29.83	29.83	29.83	29.82
F on excl inst for MOR x (Medium or High)	17.07	17.07	17.07	17.07	17.07	17.18

Notes: Standard errors clustered by manager in parentheses. This table shows IV regressions similar to those in Table 3. The difference is that we examine heterogeneity in results by an employee's level in the firm hierarchy. As discussed in Section A.12, we divide individuals at the firm into three levels of hierarchy according to their salary grade, following how the firm often segments employees in its internal reporting. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C16: MOR and Employee Attrition: Heterogeneity by Geography

Dep. Var.:	Attrition (x100)	Quit (x100)	Fire (x100)	Regretted quit (x100)	Non-regretted quit (x100)	Mgr change (x100)
Panel A: Domestic (U.S.)						
MOR	-0.588***	-0.302***	-0.255***	-0.236***	-0.065*	-1.725***
	(0.128)	(0.092)	(0.062)	(0.080)	(0.036)	(0.668)
Mean dep. var.	1.435	0.846	0.368	0.673	0.172	6.182
F-stat on excl instrument	109.5	109.5	109.5	109.5	109.5	110.2
Panel B: Foreign (Non-U.S.)						
MOR	-0.258	-0.221*	-0.035	-0.215*	-0.009	-0.699
	(0.181)	(0.123)	(0.063)	(0.113)	(0.059)	(0.885)
Mean dep. var.	1.231	0.663	0.111	0.500	0.161	5.863
F-stat on excl instrument	25.90	25.90	25.90	25.90	25.90	26.17
Panel C: Pooled Specification						
MOR	-0.262	-0.187	-0.045	-0.185*	-0.005	-0.685
	(0.176)	(0.117)	(0.065)	(0.106)	(0.056)	(0.801)
MOR X Domestic	-0.294	-0.124	-0.197**	-0.063	-0.058	-0.931
	(0.211)	(0.147)	(0.086)	(0.130)	(0.065)	(0.999)
Mean dep. var.	1.374	0.791	0.291	0.621	0.169	6.087
F-stat on excl instrument for MOR	66.39	66.39	66.39	66.39	66.39	66.81
F-stat on excl inst for MOR X Domestic	57.41	57.41	57.41	57.41	57.41	57.76
Panel D: Pooled Specification, Joiners						
MOR	0.213	-0.090	0.125	-0.145	-0.000	-0.017
	(0.446)	(0.390)	(0.152)	(0.388)	(0.019)	(1.864)
MOR X Domestic	-1.385*	-1.004*	-0.545*	-0.850	-0.095	-4.801
	(0.709)	(0.598)	(0.329)	(0.572)	(0.095)	(3.494)
Mean dep. var.	1.446	0.864	0.362	0.798	0.0603	8.789
F-stat on excl instrument for MOR	23.87	23.87	23.87	23.87	23.87	23.85
F-stat on excl inst for MOR X Domestic	13.44	13.44	13.44	13.44	13.44	13.36
Panel E: Pooled, Joiners & Switchers						
MOR	0.120	0.003	0.019	-0.301	0.304***	1.467
	(0.275)	(0.225)	(0.105)	(0.228)	(0.116)	(1.445)
MOR X Domestic	-0.726	-0.500	-0.277	-0.179	-0.321**	-5.299**
	(0.446)	(0.347)	(0.175)	(0.317)	(0.156)	(2.603)
Mean dep. var.	1.512	0.880	0.327	0.722	0.158	9.466
F-stat on excl instrument for MOR	29.34	29.34	29.34	29.34	29.34	29.34
F-stat on excl inst for MOR X Domestic	21.33	21.33	21.33	21.33	21.33	21.25

Notes: Standard errors clustered by manager in parentheses. This table shows IV regressions similar to those in Table 3. The difference is that we examine heterogeneity in results by geography. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C17: MOR and Employee Attrition: Heterogeneity by Occupation

Dep. Var.:	Attrition (x100)	Quit (x100)	Fire (x100)	Regretted quit (x100)	Non-regretted quit (x100)	Mgr change (x100)
Panel A: Engineer						
MOR	-0.288	-0.434**	-0.053	-0.376**	-0.052	-1.989
	(0.244)	(0.199)	(0.109)	(0.184)	(0.081)	(1.301)
Mean dep. var.	1.231	0.823	0.161	0.616	0.205	6.276
F-stat on excl instrument	20.08	20.08	20.08	20.08	20.08	20.21
Panel B: Business (Non-engineer)						
MOR	-0.545***	-0.258***	-0.231***	-0.215***	-0.046	-1.390**
	(0.118)	(0.082)	(0.057)	(0.070)	(0.032)	(0.597)
Mean dep. var.	1.455	0.773	0.366	0.624	0.148	5.978
F-stat on excl instrument	110.3	110.3	110.3	110.3	110.3	111.1
Panel C: Pooled Specification						
MOR	-0.247	-0.346**	-0.039	-0.284*	-0.056	-1.967*
	(0.201)	(0.160)	(0.086)	(0.147)	(0.068)	(1.104)
MOR x Non-engineer	-0.296	0.089	-0.194**	0.070	0.012	0.787
	(0.223)	(0.174)	(0.097)	(0.158)	(0.073)	(1.206)
Mean dep. var.	1.374	0.791	0.291	0.621	0.169	6.087
F-stat on excl instrument for MOR	66.37	66.37	66.37	66.37	66.37	66.82
F on excl inst for MOR x Non-engineer	63.18	63.18	63.18	63.18	63.18	63.55
Panel D: Pooled Specification, Joiners						
MOR	-0.462	-0.484	-0.040	-0.435	-0.044	1.278
	(0.678)	(0.597)	(0.282)	(0.588)	(0.052)	(3.182)
MOR x Non-engineer	-0.124	-0.223	-0.191	-0.252	-0.012	-5.548
	(0.793)	(0.678)	(0.346)	(0.655)	(0.101)	(3.725)
Mean dep. var.	1.446	0.864	0.362	0.798	0.0603	8.789
F-stat on excl instrument for MOR	25.07	25.07	25.07	25.07	25.07	25.15
F on excl inst for MOR x Non-engineer	20.52	20.52	20.52	20.52	20.52	20.61
Panel E: Pooled, Joiners & Switchers						
MOR	0.250	0.012	0.183	-0.272	0.283	0.131
	(0.513)	(0.376)	(0.226)	(0.341)	(0.209)	(2.784)
MOR x Non-engineer	-0.781	-0.428	-0.451*	-0.188	-0.240	-2.606
	(0.565)	(0.422)	(0.246)	(0.376)	(0.214)	(3.070)
Mean dep. var.	1.512	0.880	0.327	0.722	0.158	9.466
F-stat on excl instrument for MOR	39.73	39.73	39.73	39.73	39.73	39.92
F on excl inst for MOR x Non-engineer	40.54	40.54	40.54	40.54	40.54	40.80

Notes: Standard errors clustered by manager in parentheses. This table shows IV regressions similar to those in Table 3. The difference is that we examine heterogeneity in results by occupation. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C18: Robustness on MOR and Non-Attrition Outcomes

Dep. Var.	Subjective performance (normalized) (1)	Log salary growth (x100) (2)	Promotion (x100) (3)	Log patents (x100) (4)	Log citation-weighted patents (x100) (5)
Panel A: Section 4.2 Design					
MOR in current period	-0.016	-0.729	-0.047	0.201	0.175
	(0.078)	(0.904)	(0.152)	(0.383)	(0.566)
F-stat on excl instrument	45.27	13.90	47.19	47.19	47.19
Panel B: Section 4.3 Design					
MOR in current period	-0.010	-0.472	0.217	0.142	0.211
	(0.047)	(0.554)	(0.272)	(0.166)	(0.274)
F-stat on excl instrument	54.02	43.74	57.94	57.94	57.94
Panel C: Section 4.4 Design					
MOR of current manager in 1st period	0.218***	-1.263	-0.200	0.029	0.041
	(0.071)	(0.881)	(0.278)	(0.205)	(0.340)
F-stat on excl instrument	24.10	43.76	24.24	24.24	24.24
MOR of current manager in 2nd period	0.191***	0.038	-0.131	0.032	0.029
	(0.058)	(0.933)	(0.282)	(0.176)	(0.295)
F-stat on excl instrument	27.77	30.80	27.93	27.93	27.93
Panel D: Control for Current Month-Year Dummies					
MOR in current period	0.090***	0.058	-0.033	0.011	0.037
	(0.022)	(0.204)	(0.130)	(0.065)	(0.110)
F-stat on excl instrument	129.5	113.2	124.6	124.6	124.6

Notes: This table presents robustness checks to the IV regressions (Panel B) of Table 8. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C19: Robustness for Non-Attrition Outcome Results (Section 6): Addressing the Concern About Differential Attrition by Restricting to Managers with Few Subordinate Attrition Events

Dep. Var.	Subjective performance (normalized) (1)	Log Salary Growth (x100) (2)	Promotion (x100) (3)	Patents (x100) (4)	Citation-weighted patents (x100) (5)
Panel A: Restrict to Managers with Zero Attrition Events in Sample ($N = 14\%$ of sample)					
MOR in current period	0.014	-0.176	-0.283	-0.112	-0.244
	(0.048)	(0.373)	(0.177)	(0.113)	(0.224)
F-stat on excl instrument	16.40	22.87	18.15	18.15	18.15
Panel B: Restrict to Managers with ≤ 1 Attrition Event in Sample ($N = 32\%$ of sample)					
MOR in current period	0.097***	-0.035	0.027	0.000	-0.007
	(0.032)	(0.272)	(0.113)	(0.058)	(0.114)
F-stat on excl instrument	58.62	58.37	60.28	60.28	60.28
Panel C: Restrict to Managers with ≤ 2 Attrition Event in Sample ($N = 47\%$ of sample)					
MOR in current period	0.087***	-0.125	0.037	0.024	0.046
	(0.030)	(0.278)	(0.139)	(0.052)	(0.100)
F-stat on excl instrument	63.96	53.04	60.65	60.65	60.65

Notes: This table presents robustness checks to the IV results on non-attrition outcomes (Panel B of Table 8). The difference is that each panel restricts to worker-months where the worker has a manager whose subordinates experience zero or a small number of attrition events during the analysis sample. The figures on the percent of observations relative to the full analysis sample are based on observation counts in column 3 of each panel. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C20: Robustness for Statistically Significant Results in Table 9: Gradually Adding Controls

	(1)	(2)	(3)	(4)	(5)
Panel A: Subjective Perf					
MOR in current period	0.397***	0.425***	0.444***	0.479***	0.478***
	(0.0833)	(0.0864)	(0.0889)	(0.0968)	(0.0963)
Panel B: Promotions (x100)					
MOR in current period	0.673**	0.726**	0.765**	0.739**	0.717**
	(0.311)	(0.325)	(0.341)	(0.365)	(0.360)
Panel C: Log Salary Growth (x100)					
MOR in current period	1.405**	1.633**	1.935***	2.283***	2.298***
	(0.627)	(0.653)	(0.733)	(0.882)	(0.880)
Base Controls	Y	Y	Y	Y	Y
Business Unit X Job Function Dummies	N	Y	Y	Y	Y
Business Unit X Salary Grade Dummies	N	N	Y	Y	Y
Job Function X Salary Grade Dummies	N	N	N	Y	Y
Current Month Dummies	N	N	N	N	Y

Notes: Standard errors clustered by manager in parentheses. The column 1 results here are the same as the IV results for the associated variables in Panel B of Table 9. Columns 2-5 subsequently add additional controls, similar to Tables C8-C10. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C21: Delta Values for Oster Test on the Reduced Form

	Table C8	Table C9	Table C10	Table C11	Table C11	Table C20
				Instrument is MOR of current mgr in T_2	Instrument is MOR of current mgr in T_1	
	(1)	(2)	(3)	(4)	(5)	(6)
Attrition	149.9	11.1	228.6	-2.1	-9.4	
Quits	35.5	8	5.6	-3.3	2.7	
Fires	-64.6	11.2	-8.2	3.8	-118.1	
Regretted quits	38.1	14.5	9.9	-4.4	1.1	
Non-regretted quits	33.6	1.4	-20.5	-8.3	-7.4	
Subjective performance						-45.4
Promoted						26.5
Log salary growth						-7.5

Notes: This table reports the δ values corresponding to the Oster test. Each value represents the degree of selection on unobservables (relative to the degree of selection on observables) that would be required in order for the true coefficient to not be in the observed direction. Each row of the table corresponds to the different outcome variables shown in Table C8, Table C9, Table C10, Table C11, and Table C20. However, those tables plot IV coefficients as more controls are added. Instead, the δ values shown here correspond to the reduced form equations. Each δ corresponds to a comparison of the column 5 specification (most controls) versus the column 1 specification (base controls). Since Table C11 shows results with two instruments (i.e., the MOR of the current manager as measured in T_1 or the MOR of the current manager as measured in T_2), we report δ values for both corresponding reduced form specifications.

Table C22: Robustness: Controlling for Other Manager Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Predicting MOR, OLS						
Manager tenure at firm in years	0.016**	0.016**	0.017**	0.017**	0.032**	0.037**
	(0.007)	(0.007)	(0.008)	(0.008)	(0.015)	(0.016)
Mgr tenure overseeing a worker in years				0.116***	0.113**	0.119**
				(0.036)	(0.055)	(0.054)
Manager was hired via referral						0.203
						(0.149)
Mgr Job Function Dummies	No	Yes	No	No	No	No
Sample Number	1	1	2	2	3	3
R-squared	0.179	0.182	0.186	0.188	0.310	0.313
Panel B: Attrition, IV Regressions						
MOR in current period	-0.463***	-0.440***	-0.560***	-0.552***	-0.803**	-0.889**
	(0.107)	(0.108)	(0.146)	(0.150)	(0.353)	(0.381)
Manager tenure at firm in years		-0.022***		-0.009		0.040
		(0.009)		(0.011)		(0.031)
Mgr tenure overseeing a worker in years				-0.090		0.038
				(0.098)		(0.191)
Manager was hired via referral						0.276
						(0.248)
Mgr Job Function Dummies	No	Yes	No	Yes	No	Yes
Sample Number	1	1	2	2	3	3

Notes: This table accompanies the discussion in Section 4.5 and Appendix A.9. Standard errors clustered by manager in parentheses. An observation is a worker-month. All regressions include the controls in Table 3. Panel A examines how a worker's manager's characteristics predict a worker's manager's MOR. In Panel B, the dependent variable is worker attrition. We study the IV relation of a worker's manager's MOR to worker attrition (similar to Panel A of Table 3), and examine how the coefficient changes as additional manager controls are added. Sample 1 is restricted to observations with non-missing manager tenure at the firm. Sample 2 further restricts to observations with non-missing information on the years that a manager has managed a worker. This limits attention to manager-worker relationships that begin during our data period. Sample 3 restricts attention to observations with non-missing information on manager referral status. Referral status is only available for managers joining the firm more recently.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table C23: What are Managers Rewarded For? Employees Survey Scores vs. VA

Dep var:	Subjective performance (normalized)	Promoted (x100)	Log salary growth (x100)	Log stock grant holdings (x100)	Log change in stock grants (x100)	Change in span of control	Key individual (x100)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: IV, Value-Added, Split into Two Random Groups							
Manager FE in retention	0.496**	0.722	-0.263	5.447	20.015	-0.071	5.395
	(0.235)	(0.673)	(1.344)	(12.680)	(19.217)	(0.928)	(7.252)
F-stat on excl instrument	12.58	12.41	8.023	12.69	13.87	6.413	12.41
Panel B: IV, Value-Added, Split by Period							
Manager FE in retention	-0.709	-2.104	-1.195	76.670	1,671.288	2.199**	-18.980
	(0.589)	(1.910)	(1.420)	(415.462)	(25,874.955)	(0.915)	(18.994)
F-stat on excl instrument	2.871	2.589	7.509	0.0507	0.00408	9.185	2.589
Panel C: IV, MOR vs. Value-Added, Split into Two Random Groups							
MOR in current period	0.350***	0.636	1.995*	-2.631	0.306	0.339	0.953
	(0.122)	(0.418)	(1.021)	(7.459)	(14.492)	(0.411)	(4.091)
Manager FE in retention	0.192	0.153	-1.898	7.662	19.746	-0.365	4.541
	(0.300)	(0.885)	(2.077)	(16.479)	(27.262)	(1.132)	(9.759)
F-stat on excl instrument for MOR	48.52	48.76	31.83	41.47	40.07	31.45	48.76
F-stat on excl instrument for Mgr FE	11.18	11.09	8.487	10.93	11.46	5.692	11.09
Panel D: IV, MOR vs. Value-Added, Split by Period							
MOR in current period	0.468***	0.991**	1.469*	-6.470	45.964	-0.328	5.839
	(0.126)	(0.426)	(0.805)	(19.613)	(65.502)	(0.399)	(4.200)
Manager FE in retention	-0.253	-1.109	-0.160	22.009	-117.117	1.995***	-13.121
	(0.377)	(1.260)	(1.011)	(75.356)	(204.381)	(0.730)	(13.515)
F-stat on excl instrument for MOR	34.86	34.85	27.88	29.49	32.32	25.48	34.85
F-stat on excl instrument for Mgr FE	6.682	6.468	9.004	3.634	5.328	10.56	6.468

Notes: Standard errors clustered by manager in parentheses. This table is broadly similar to Panel B of Table 9. The difference is that we analyze manager VA in retention (or both manager VA and MOR) instead of only MOR. We use manager fixed effects from columns 2 and 3 of Panel A of Table C14, i.e., where we calculate two fixed effects per manager, M_0 and M_1, one splitting worker-months randomly in two and the other splitting by period. We use M_0 as the regressor and M_1 as an instrument. Both MOR and the VA variables are normalized. * significant at 10%; ** significant at 5%; *** significant at 1%

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