"People Management Skills, Employee Attrition, and Manager Rewards: Evidence from a High-Tech Firm": Online Appendix

Mitchell Hoffman
U. Toronto Rotman & NBER

Steven Tadelis
UC Berkeley Haas & NBER

The Online Appendix is organized as follows. Appendix A provides derivations and additional results. 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

A.1 Comparison between Table 1 and Appendix Table C1 (Accompanying Section 2.4 from the Main Text)

Table 1 gives summary statistics for our main sample. In contrast, Appendix Table C1 provides summary statistics using the data before imposing that MOR be non-missing for a worker's manager in the current period and other period. The sample in Appendix Table C1 is 2.2 times larger than in Table 1, reflecting that MOR is missing in one period for over half the managers in our dataset. Despite the survey having a 95% response rate, managers have missing MOR during one of the two periods if they did not work as a manager in both periods (e.g., they worked as an individual contributor in one period, or joined the firm during the second period) or they managed a small team in one of the periods (i.e., a team who size was not over the required threshold to take the survey).

The largest differences between the two tables are that (1) the average span of control is much lower in our main sample (5.10 vs. 9.35), reflecting that workers on small teams are excluded from the sample because MOR is missing, and (2) workers in the main sample experience fewer managers (reflecting that worker-months are excluded for certain managers). There are some other smaller differences (e.g., a lower attrition rate in Table 1), but means on several key variables are similar (i.e., subjective performance scores, MOR, share co-located with managers).

To address potential concerns regarding selection bias, we repeat all of our main results using two imputation strategies suggested by the firm, and obtain the same conclusions. These imputation strategies are detailed below in Section B.

A.2 Econometric Derivations (Section 3.1)

OLS Derivation.

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

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

IV Derivation.

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

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 3.2)

In Section 3, we present probability limits for OLS, IV, and reduced form estimators based on the assumption that manager quality is fixed over time. Here, we derive the probability limits of the estimators 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 the same as when manager quality is fixed. However, for IV, we have:

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

Relative to the version with constant people management over time, the difference is that σ_m^2 is replaced by σ_{12} in the denominator. This makes attenuation bias worse. For the reduced

form, we have:

$$\begin{aligned}
\text{plim}(\widehat{b}_{RF}) &= \frac{cov\left(y_t, \widetilde{m}_{-\tau}\right)}{var\left(\widetilde{m}_{-\tau}\right)} \\
\text{plim}(\widehat{b}_{RF} - \beta) &= \underbrace{\frac{\sigma_{12} - \sigma_m^2 - \sigma_u^2}{\sigma_m^2 + \sigma_u^2}\beta}_{\text{Attenuation Bias}} + \underbrace{\frac{cov(\varepsilon_t, u_{-\tau})}{\sigma_m^2 + \sigma_u^2}}_{\text{Asynchronously Corr. ME}} + \underbrace{\frac{cov(\varepsilon_t, m)}{\sigma_m^2 + \sigma_u^2}}_{\text{Assignment Bias}}
\end{aligned}$$

Attenuation bias is also worsened here the larger the divergence between σ_{12} and σ_m^2. However, the formula is relatively similar.

A.4 Robustness Regarding Research Design Based on Workers Joining the Firm or Changing Managers in the Second Period (Section 4.3)

The analysis in Section 4.3 combines both workers joining the firm and worker 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 C10 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.

A.5 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 early-measured employee outcomes on the MOR of a future manager as measured during the second period. If a given 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:

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

For IV, we have that:

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

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 $cov\left(u_{1,new}, \varepsilon_t\right) = 0$, 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.

A.6 Managers Moving Across Locations or Job Functions (Section 4.4)

Locations and robustness. 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 check that such instances do not drive our results, Appendix Table C11 repeats the analysis in Table 3, but 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 Appendix Table C11. 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.

Comparison between our approach and Chetty et al. (2014). One difference between our approach and Chetty et al. (2014) is that, because Chetty et al. (2014) have a long panel, they can calculate leave-two-out VA estimators. For us, this is not feasible because we only have two waves of the survey.[1]

A.7 Assessing Coefficient Stability when Adding Richer Controls using Oster Test

To assess coefficient stability, we consider the test of Oster (2017), who builds on Altonji et al. (2005). Oster (2017) 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.

The idea of the Oster (2017) 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 C12-C14 and Table C23, 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 (2017), 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 (2017), 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 (2017) 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 C24, in almost all cases, we obtain δ values either greater than 1 or less than 0, thereby strengthening our evidence for robustness.[2]

The idea in applying the Oster test to the reduced form is, 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 (relative to selection on observables) 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.

A.8 Heterogeneity Analysis (Section 4.5)

Hierarchy. Appendix Table C17 shows that the negative relation between MOR and attrition actually appears to be larger for individuals toward the upper part of the firm hierarchy. We divide individuals at the firm into three levels of hierarchy according to their salary grade,

[1] Recall from Section 2.3 of the main text that we were provided data from a third survey wave, but it is missing for a large business unit at the firm and has some different survey questions from the other two waves.

[2] The only cases where δ is not either greater than 1 or less than 0 occur for Table C15. For attrition, the estimated δ coefficient is -3.7 for the first 4 columns of Table C15 and 0.90 for the second 4 columns of Table C15, and the latter value is close to 1. The only other values occur for firing as an outcome, where the δ values are 0.28 and 0.97. The 0.28 value corresponds to columns 1-4, where the coefficient shrinks from -0.13(se=0.10) to -0.06(se=0.12). This is not surprising that the firing result in Table C15 can be "zeroed out" by unobservables, as the base coefficient was not statistically significant to start with.

following how the firm often segments employees in its internal reporting. It is natural to analyze heterogeneity in manager effects by hierarchy, as theories of managers emphasize different roles for managers at different levels of hierarchy. For example, in knowledge-based theories of the firm (Garicano, 2000), managers solve increasingly complex problems as they ascend the firm hierarchy. As a caveat, we note that standard errors increase at higher levels of hierarchy, reflecting that there are fewer people there.

Geography. There has been a lot of recent interest in how management varies across countries, particularly in rich vs. poor countries. Bloom et al. (2014) document that management practices are substantially better in richer countries than in poorer countries. In work-in-progress, Hoffman et al. (2018) use data from several low-skill firms to examine the determinants of frontline manager productivity around the world. Hoffman et al. (2018) document that frontline supervisors appear to matter more in rich countries than in poor countries for the case of employee attrition. Most of the workers we study are in rich countries (particularly the US), but there are roughly 10% of employee records in "poor countries" (China, India, and Malaysia). In our setting, in Table C16, MOR has a stronger negative relation for US workers than for non-US workers, and particularly so compared to non-US poor countries (though the instrument is weak with $F = 3$ for workers in poor, foreign countries at the firm). We reiterate our caveat that some standard errors are large.

Occupation. Appendix Table C18 examines heterogeneity in attrition results by occupation / job function. IV estimates are relatively similar across workers in engineering, marketing, and finance.

A.9 Further Discussion on VA (Section 4.5)

Section 4.5 of the main text discusses our split sample approach for estimating the variance of manager fixed effects in retention. (Recall that fixed effects in retention constitute our measure of manager value-added (VA).) Assuming that the sampling error is uncorrelated across samples and with underlying VA, the covariance of the estimated manager fixed effects across the two samples is equal to the variance of underlying VA.

Beyond dealing with sampling error, this approach may also be useful in addressing correlated shocks. For example, if a manager's team is assigned to do a good project, this might cause the manager to appear to matter a lot for reducing attrition, whereas it is the good project that is reducing attrition. Thus, an advantage of splitting across the two periods (instead of randomly splitting the sample) is that doing so might do a better job of addressing transient correlated shocks. However, a disadvantage of splitting across the two periods is that the two periods are uneven in size; the second period lasts 18 months, compared to 9 months for the first period.

A.10 Rewards Results, Including Manager VA as a Regressor (Section 6.2)

As seen in Table C26, we see that the relation of MOR to rewards is mostly similar when controlling for manager VA. An additional difference (relative to Table 9) is that the promotion results are no longer statistically significant, but the magnitudes are very similar.

Beyond the exercise in Table C26, we can additionally include a manager's subjective performance as a regressor, with the goal of seeing whether "managing up" is rewarded more at the firm than "managing down." Appendix Table C27 shows the results of these regressions. While adding manager's subjective performance shrinks the coefficients on MOR, we do not emphasize these regressions for two reasons. First, subjective performance may be a "bad control" (Angrist and Pischke, 2008), as it a critical means by which MOR affects the other variables. Second, subjective performance scores can be given taking into account a manager's MOR, so it is not surprising that subjective performance scores are more predictive.

B Data Appendix

Data assembly. We were provided two main datasets for our project. First, we received the main employee-month personnel dataset that was assembled for us by an analyst at the high-tech firm. A variety of files were combined together during this process. The analyst also subjected the data to cleaning. Second, we received manager-level results of the three employee surveys. The data cover workers only, not applicants.

Manager survey variables and MOR. As described in Section 2.3 of the main text, manager survey scores are not collected when workers are part of small teams. In addition, some managers did not work as managers during both periods.

One concern is that selection bias from missing MOR data could affect our results. To address this concern, we pursued two different imputation strategies, and our conclusions were unaffected by both.[3]

In the first strategy, we filled in missing MOR scores using "roll-up survey values" (when available). Roll-up scores are manager scores using all the individuals under a given manager in the organization. A rationale for using roll-up scores in imputing MOR is that excellent people management skills may flow downward in an organization, making one's employees better people managers. We pursued the strategy of using roll-up scores, as this is what our study firm often does for reporting purposes. In the second strategy, we take advantage of the fact that the cleaned employee-month personnel dataset we were provided also contains MOR scores that have been subject to various analyst-added imputations, including the roll-up survey imputations. After starting with these MOR variables, we filled in missing values using the raw scores, and if still missing, using the roll-up scores.

As a robustness check, we performed all our analyses using both strategies. Doing so leads to results that are very similar and that are even sharper/more precise than our reported results, reflecting a larger sample size. This suggests that missing data on MOR does not drive our conclusions.

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.

[3]In both strategies, we first perform imputations of MOR. After doing this, we then impose that MOR be non-missing in each period for both managers before re-doing the analysis. Because the imputation procedures do not fill in MOR for all missing observations, there are still worker-months that get dropped. In the first strategy described here, the sample size is 22% larger in worker-months. In the second strategy described here, the sample size is 88% larger in worker-months.

Beyond the questions that go into the firm's manager effectiveness scores, workers are asked additional questions about their managers (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. In addition, we do not currently know which of the other data fields in our dataset would correspond to other manager questions.

Regretted and non-regretted attrition. 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.[4]

Thus, some caution is warranted in interpreting our results on regretted and non-regretted attrition. Still, whether the classification is done by a manager or using subjective performance data, our regretted attrition variable still reflects a desire to classify attrition as good or bad from the perspective of the firm.

Our time fixed effects adjust for possible changes over time in how regretted/non-regretted was classified.[5] Importantly, however, 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.

Salary. While workers at the firm are paid in different currencies, we restrict our salary analyses in the paper to workers paid in US dollars. However, we checked that our results on MOR and salary increases in Table 8 are robust to including all workers. To do this, we convert salaries to US dollars using the exchange rate as of March 1 of year Y_2 (which falls in the middle of our data period).

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. A 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. Only individuals sufficiently high up in the corporate hierarchy (i.e., with sufficiently high salary grades) are eligible to receive stock grants. The required level varies between technical and non-technical jobs. In the data that was

[4]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.

[5]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.

provided to us, the holding power variable is missing for a lot of observations, presumably reflecting that many employees are not eligible to receive stock grants. Our analysis of stock grants is performed only using observations that are non-missing. (That is, we do not assign zero values to observations where holding power is missing.)

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.

B.1 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).

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.

B.2 Y_3 Survey Questions

The survey questions were slightly different for the Y_3. They are listed below.

1. My immediate manager provides ongoing coaching and guidance on how I can improve my performance.

2. My immediate manager actively supports my efforts regarding professional / career development.

3. My immediate manager extends influence and leadership across organizational boundaries.

4. My immediate manager creates the conditions that support stronger engagement at work.

5. I would recommend my manager to others.

C Additional Figures and Tables

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

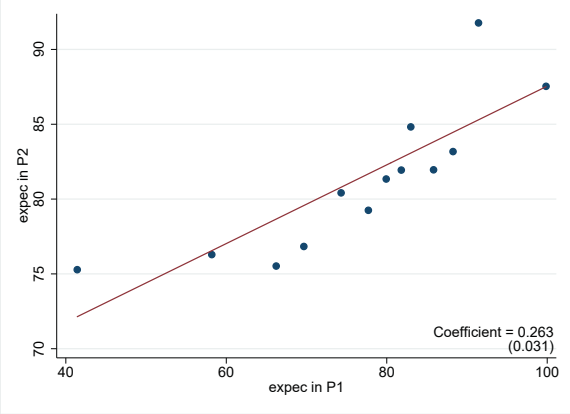
Share of records, employee in US	0.66
Share of records from managers	0.20
Share of records for engineers	0.33
Co-located with manager	0.81
Same function as manager	0.85
Average manager span (employees/mgr)	5.10
Managers per employee	2.27
Managers per employee (weighted by tenure)	2.56

Panel B: Several outcomes and regressors of interest

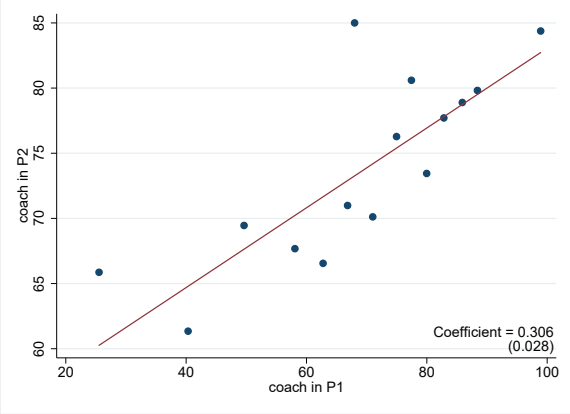
Variable:	mean	sd	min	max
Attrition probability (monthly) x100	1.55	12.36	0	100
Quit probability (monthly) x100	0.87	9.28	0	100
Fire probability (monthly) x100	0.34	5.82	0	100
Regretted quit prob (monthly) x100	0.69	8.27	0	100
Non-regretted quit prob (monthly) x100	0.18	4.22	0	100
Subjective performance rating	3.32	.81	1	5
Log salary	Confidential			
Promotion probability (monthly)	Confidential			
Manager overall rating	80.25	15.87	0	100
Manager gives clear expectations	82.75	17.44	0	100
Manager provides coaching	73.94	21.34	0	100
Manager supports career dev	76.54	20.02	0	100
Manager involves people	83.77	17.16	0	100
Manager instills poz attitude	82.15	19.2	0	100
Manager is someone I trust	82.01	18.22	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 discusses more on the MOR data and describes how our results are robust to two strategies of imputing missing instances of MOR.

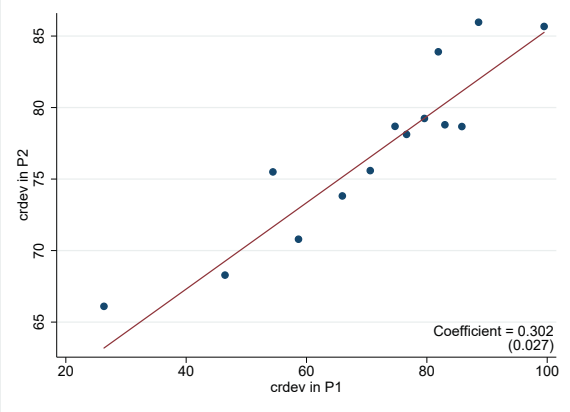
Figure C1: Correlation of Survey Items across the Two Waves



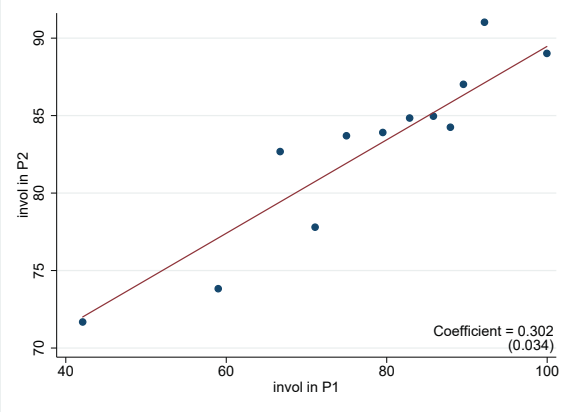
(a) Manager gives clear expectations



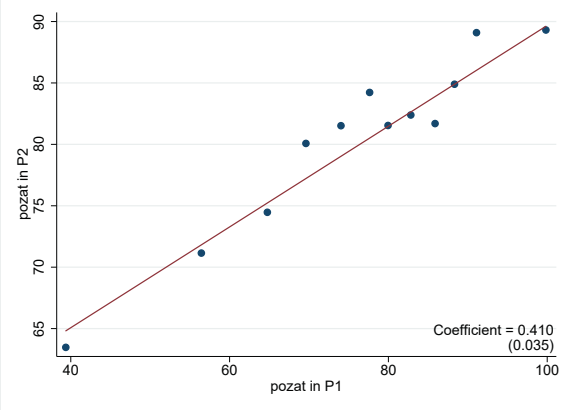
(b) Manager provides coaching



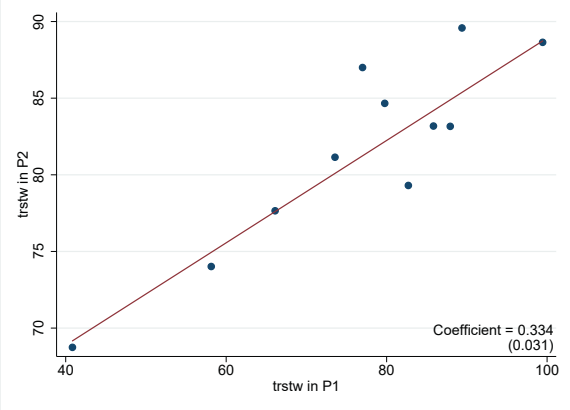
(c) Manager supports career development



(d) Manager involves people



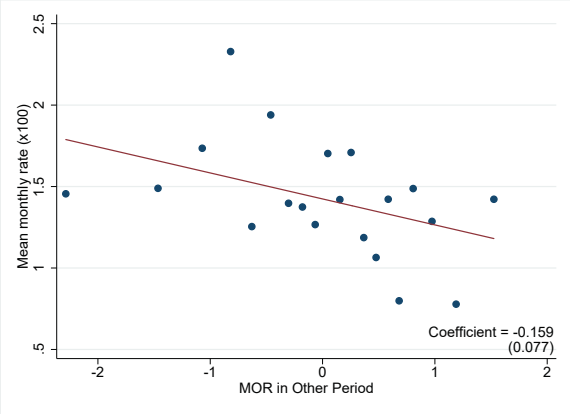
(e) Manager instills positive attitude



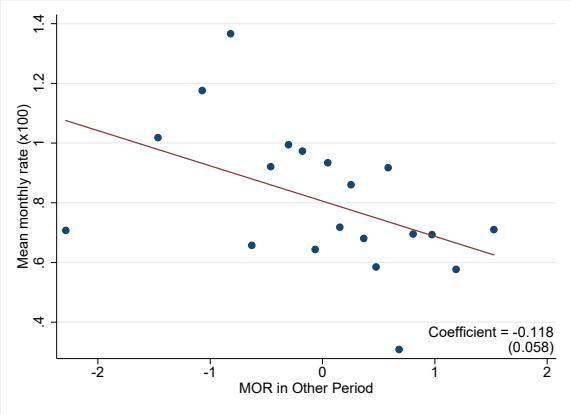
(f) Manager is someone I trust

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

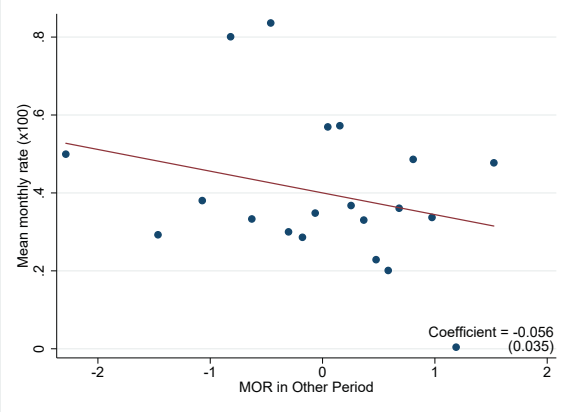
Figure C2: Reduced Form Binned Scatter Plots: Exploiting New Joiners



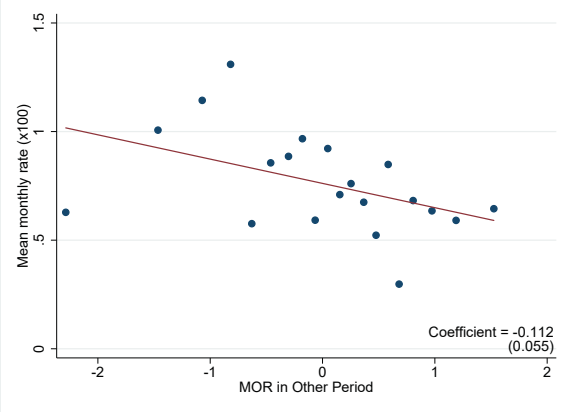
(a) Attrition



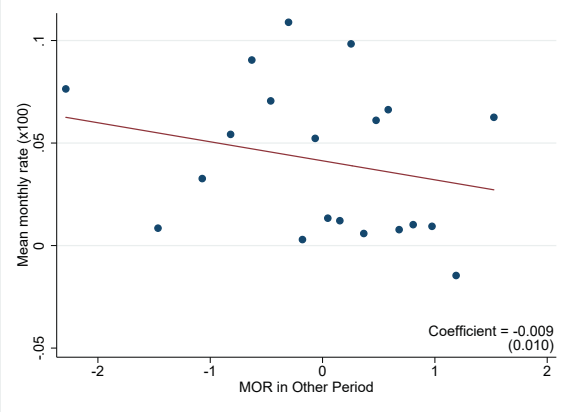
(b) Quits



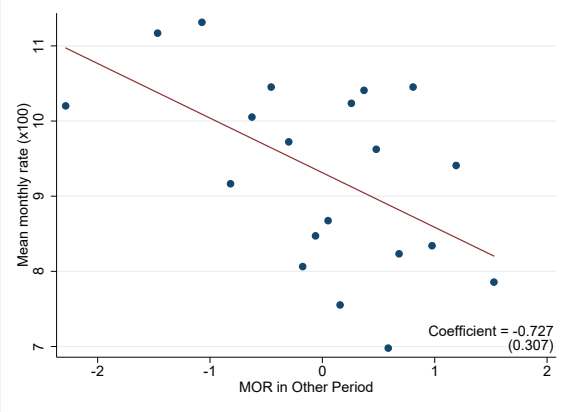
(c) Fires



(d) Regretted Quits



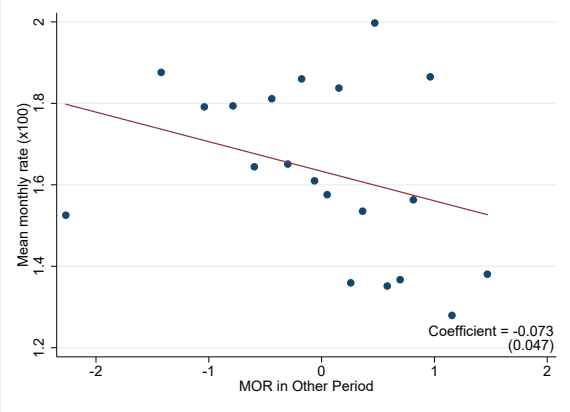
(e) Non-regretted Quits



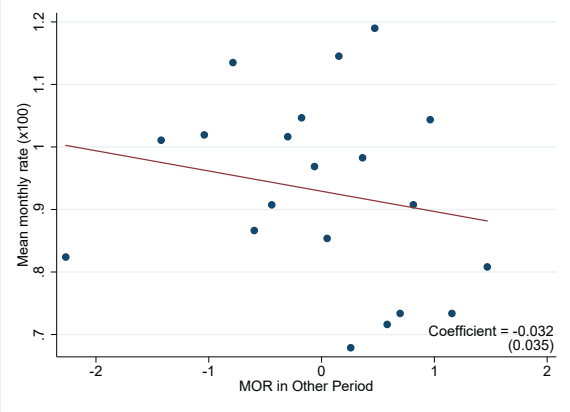
(f) Worker changes manager

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.

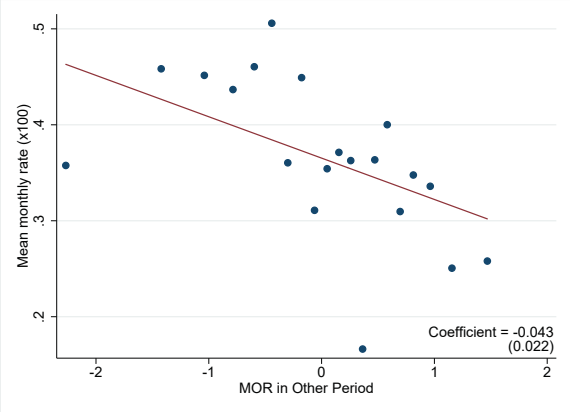
Figure C3: Reduced Form Binned Scatter Plots: Exploiting New Joiners and People Switching Managers



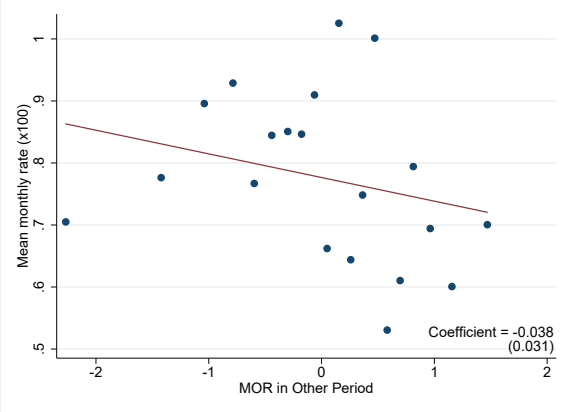
(a) Attrition



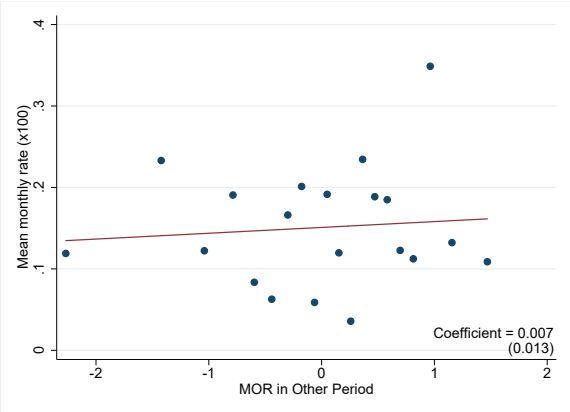
(b) Quits



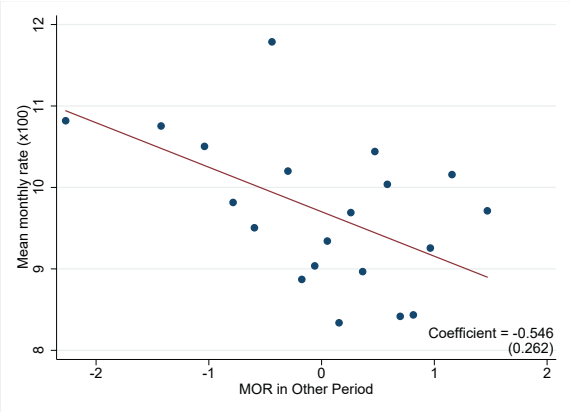
(c) Fires



(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 joiners analysis. That is, the regressions correspond to those in Table 5.

Table C2: Manager Characteristics, Correlation Table

Variables:	Clear expectations	Coaching	Career dev	Involves people	Positive attitude	Someone I trust
Manager gives clear expectations	1					
Manager provides coaching	0.664	1				
Manager supports career development	0.580	0.706	1			
Manager involves people	0.573	0.554	0.601	1		
Manager instills positive attitude	0.575	0.569	0.589	0.675	1	
Manager is someone I trust	0.634	0.587	0.633	0.676	0.728	1

Notes: Correlation coefficients are reported. The table uses data from employee responses to the 6 questions about managers in Section 2.3. An observation is a manager-survey (i.e., with two survey periods per manager).

Table C3: Principal Component Analysis

Variables:	Component 1	Component 2	Component 3	Component 4
Eigenvalue	4.33	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	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 2.3. An observation is a manager-survey (i.e., with two survey periods per manager).

Table C4: 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 2.3. 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. For example, the number in the first row and fourth column indicates, among managers in the 1st MOR quintile (i.e., lowest 20% of scores) during Y_1, the share that achieve a score in the 4th MOR quintile (i.e., the second highest quintile) during Y_2.

Table C5: Robustness Analysing on Persistence of Managerial Characteristics: Using all the Manager Characteristics as Regressors at the Same Time

Dep. Variables:	(1) Clear expectations	(2) Coaching	(3) Career dev	(4) Involves people	(5) Positive attitude	(6) Someone I trust
Manager sets clear expectations	0.15***	0.03	-0.02	0.08	-0.02	-0.01
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Manager gives coaching	0.09*	0.23***	0.14***	0.00	-0.01	0.01
	(0.06)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)
Manager promotes career development	0.06	0.09*	0.19***	0.04	0.06	0.08
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.05)
Manager involves people	0.01	0.00	-0.00	0.12**	0.02	0.04
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Manager instills a positive attitude	0.00	-0.05	0.06	0.13**	0.36***	0.13**
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Employees trust the manager	0.01	0.03	0.02	0.02	0.06	0.18***
	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)
R-squared	0.237	0.255	0.266	0.230	0.277	0.252

Notes: This table is a robustness check to Table 2. Instead of regressing a particular Y_2 characteristic on the same characteristic in Y_1 and various controls, we regress each Y_2 characteristics on all the Y_1 characteristics at once (plus controls). * significant at 10%; ** significant at 5%; *** significant at 1%

Table C6: Robustness Analysing on Persistence of Managerial Characteristics: Using the Y_3 Survey

Variables:	(1) Overall MOR	(2) Overall MOR
Sample:	Y_3	Y_1, Y_2, Y_3
Lagged MOR	0.22***	0.27***
	(0.08)	(0.05)

Notes: This table is a robustness check to Table 2. The difference is that we use all three surveys (in Y_1, Y_2, Y_3) as opposed to just the Y_1 and Y_2 surveys. The sample is restricted to managers for whom we observe all three surveys. Column 1 analyzes MOR in Y_3 as a function of MOR in Y_2. Column 2 analyzes MOR in Y_2 and Y_3 as a function of the MOR in the previous period. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C7: Summary of Identification Strategies

Strategy:	Rationales
Baseline IV	-Eliminates attenuation bias (if survey measurement error is uncorrelated across periods). -Replaces contemporaneously correlated measurement error with asynchronously correlated measurement error.
Joiners	-Setting with little bias from asynchronously correlated measurement error. Likely zero bias if common component of survey measurement error ($u_{-\tau}$) and quitting equation error term (ε_t) is not persistent. -Setting where assignment bias is likely very small.
Workers switching managers or joiners	-Broader sample than joiners (good for external validity). -Can formally test for assignment bias. -Can examine time path of people management effects (separate from tenure effects). -Less risk of asynchronously correlated measurement error than baseline IV.
Managers switching locations or functions	-Eliminates concern about persistent, common component of survey measurement error ($u_{-\tau}$) and quitting equation error term (ε_t). -Setting where assignment bias is likely very small.

Notes: This table lists the different identification strategies in the paper, as well as rationales for them.

Table C8: MOR and Employee Attrition: High- vs. Low-Productivity Employees

Specification:	1st Stg	OLS	IV	Reduced Form
Panel A: All attrition, high-productivity employees				
MOR in other period	0.318***			-0.070**
	(0.030)			(0.029)
MOR in current period		-0.099***	-0.221**	
		(0.031)	(0.093)	
Mean dep. var.		0.655	0.655	0.655
F-stat on excl instrument			110.0	
Panel B: All attrition, low-productivity employees				
MOR in other period	0.326***			-0.185***
	(0.029)			(0.046)
MOR in current period		-0.118***	-0.566***	
		(0.044)	(0.148)	
Mean dep. var.		1.540	1.540	1.540
F-stat on excl instrument			129.1	

Notes: The panels in this table are similar to Panel A of 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 4.1. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C9: 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	0.225***			-0.727**
	(0.029)			(0.307)
MOR in current period		-1.260***	-3.205**	
		(0.307)	(1.434)	
Mean dep. var.		9.319	9.319	9.319
F-stat on excl instrument			63.27	
Panel C: Joiners or Switchers (as in Table 5)				
MOR in other period	0.230***			-0.546**
	(0.023)			(0.262)
MOR in current period		-0.826***	-2.378**	
		(0.242)	(1.186)	
Mean dep. var.		9.705	9.705	9.705
F-stat on excl instrument			97.65	
Panel D: Mgrs Switching Locations or Job Funcs (as in Table 7)				
MOR of current manager in 1st period	-0.335		-2.561***	
	(0.381)		(0.956)	
MOR of current manager in 2nd period		-0.968***		-0.748
		(0.364)		(0.754)
Mean dep. var.	8.066	8.066		
F-stat on excl instrument			32.45	38.48

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 C10: 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 C11: Robustness Check on Exploiting Managers Moving Across Locations and Job Functions: Restrict to Location-Job Functions in Both Periods of the Data

Specification:	OLS	OLS	IV	IV
Panel A: Attrition				
MOR of current manager in 1st period	-0.267**		-0.738***	
	(0.107)		(0.265)	
MOR of current manager in 2nd period		-0.271***		-0.622***
		(0.099)		(0.227)
Mean dep. var.	1.458	1.458	1.458	1.458
F-stat on excl instrument			22.99	27.19
Panel B: Quits				
MOR of current manager in 1st period	-0.076		-0.237	
	(0.063)		(0.152)	
MOR of current manager in 2nd period		-0.087		-0.178
		(0.061)		(0.135)
Mean dep. var.	0.722	0.722	0.722	0.722
F-stat on excl instrument			22.99	27.19
Panel C: Fires				
MOR of current manager in 1st period	-0.123**		-0.195*	
	(0.056)		(0.115)	
MOR of current manager in 2nd period		-0.072*		-0.286**
		(0.043)		(0.117)
Mean dep. var.	0.238	0.238	0.238	0.238
F-stat on excl instrument			22.99	27.19
Panel D: Regretted Quits				
MOR of current manager in 1st period	-0.029		-0.244*	
	(0.057)		(0.144)	
MOR of current manager in 2nd period		-0.090*		-0.067
		(0.054)		(0.121)
Mean dep. var.	0.606	0.606	0.606	0.606
F-stat on excl instrument			22.99	27.19
Panel E: Non-regretted Quits				
MOR of current manager in 1st period	-0.050		-0.001	
	(0.032)		(0.074)	
MOR of current manager in 2nd period		-0.000		-0.116
		(0.030)		(0.073)
Mean dep. var.	0.116	0.116	0.116	0.116
F-stat on excl instrument			22.99	27.19

Notes: This table is a robustness check to Table 7. The difference is that we restrict attention to location-job functions that are observed during both periods. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C12: 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 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 C13: 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 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 C14: 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 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 C15: Robustness for IV in Table 7: Gradually Adding Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Attrition								
MOR of current manager in 1st period	-0.572**	-0.782***	-0.759***	-0.645***				
	(0.229)	(0.253)	(0.251)	(0.247)				
MOR of current manager in 2nd period					-0.680***	-0.727***	-0.593***	-0.581***
					(0.204)	(0.229)	(0.223)	(0.225)
Panel B: Quits								
MOR of current manager in 1st period	-0.173	-0.278*	-0.239	-0.220				
	(0.136)	(0.153)	(0.157)	(0.162)				
MOR of current manager in 2nd period					-0.241*	-0.280**	-0.255*	-0.260*
					(0.125)	(0.137)	(0.138)	(0.146)
Panel C: Fires								
MOR of current manager in 1st period	-0.129	-0.149	-0.122	-0.0604				
	(0.100)	(0.106)	(0.112)	(0.112)				
MOR of current manager in 2nd period					-0.257**	-0.291**	-0.235**	-0.213*
					(0.104)	(0.117)	(0.113)	(0.112)
Panel D: Regretted Quits								
MOR of current manager in 1st period	-0.192	-0.274*	-0.266*	-0.250*				
	(0.125)	(0.144)	(0.148)	(0.150)				
MOR of current manager in 2nd period					-0.0961	-0.124	-0.122	-0.132
					(0.110)	(0.121)	(0.123)	(0.128)
Panel E: Non-regretted Quits								
MOR of current manager in 1st period	0.0158	-0.00766	0.0250	0.0311				
	(0.0708)	(0.0754)	(0.0799)	(0.0859)				
MOR of current manager in 2nd period					-0.150**	-0.159**	-0.136*	-0.130*
					(0.0679)	(0.0734)	(0.0746)	(0.0772)
Base Controls	Y	Y	Y	Y	Y	Y	Y	Y
Business Unit X Job Function Dummies	N	Y	Y	Y	N	Y	Y	Y
Business Unit X Salary Grade Dummies	N	N	Y	Y	N	N	Y	Y
Job Function X Salary Grade Dummies	N	N	N	Y	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. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C16: MOR and Employee Attrition: Heterogeneity by Geography

Specification:	1st Stg	OLS	IV	Reduced Form
Panel A: Domestic				
MOR in other period	0.348***			-0.205***
	(0.033)			(0.041)
MOR in current period		-0.189***	-0.588***	
		(0.039)	(0.128)	
Mean dep. var.		1.435	1.435	1.435
F-stat on excl instrument			109.5	
Panel B: Foreign				
MOR in other period	0.263***			-0.068
	(0.052)			(0.047)
MOR in current period		-0.103**	-0.258	
		(0.051)	(0.181)	
Mean dep. var.		1.231	1.231	1.231
F-stat on excl instrument			25.90	
Panel C: Foreign, Poor Country				
MOR in other period	0.137*			0.004
	(0.079)			(0.077)
MOR in current period		-0.097	0.029	
		(0.095)	(0.564)	
Mean dep. var.		1.286	1.286	1.286
F-stat on excl instrument			2.974	
Panel D: Foreign, Rich Country				
MOR in other period	0.311***			-0.096*
	(0.067)			(0.056)
MOR in current period		-0.096*	-0.308	
		(0.058)	(0.188)	
Mean dep. var.		1.197	1.197	1.197
F-stat on excl instrument			21.88	

Notes: Each panel is similar to Panel A of Table 3. The difference is that we examine heterogeneity by geography. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C17: MOR and Employee Attrition: Heterogeneity by Hierarchy

Specification:	1st Stg	OLS	IV	Reduced Form
Panel A: Low Level in Hierarchy				
MOR in other period	0.349***			-0.124***
	(0.037)			(0.043)
MOR in current period		-0.164***	-0.354***	
		(0.043)	(0.127)	
Mean dep. var.		1.532	1.532	1.532
F-stat on excl instrument			86.97	
Panel B: Medium Level in Hierarchy				
MOR in other period	0.274***			-0.190***
	(0.037)			(0.045)
MOR in current period		-0.145***	-0.691***	
		(0.045)	(0.180)	
Mean dep. var.		1.103	1.103	1.103
F-stat on excl instrument			54.12	
Panel C: High Level in Hierarchy				
MOR in other period	0.198***			-0.248**
	(0.075)			(0.111)
MOR in current period		-0.136	-1.253*	
		(0.092)	(0.751)	
Mean dep. var.		1.425	1.425	1.425
F-stat on excl instrument			7.039	

Notes: Each panel is similar to Panel A of Table 3. The difference is that we examine heterogeneity by heterogeneity in the firm hierarchy. As discussed in Section A.8, 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 C18: MOR and Employee Attrition: Heterogeneity by Occupation

Specification:	1st Stg	OLS	IV	Reduced Form
Panel A: Engineers				
MOR in other period	0.190***			-0.055
	(0.043)			(0.046)
MOR in current period		-0.163***	-0.288	
		(0.045)	(0.244)	
Mean dep. var.		1.231	1.231	1.231
F-stat on excl instrument			20.08	
Panel B: Marketing				
MOR in other period	0.343***			-0.170**
	(0.084)			(0.080)
MOR in current period		-0.012	-0.495*	
		(0.068)	(0.269)	
Mean dep. var.		1.284	1.284	1.284
F-stat on excl instrument			16.66	
Panel C: Finance				
MOR in other period	0.309***			-0.204*
	(0.087)			(0.114)
MOR in current period		-0.405***	-0.660*	
		(0.137)	(0.383)	
Mean dep. var.		1.094	1.094	1.094
F-stat on excl instrument			12.51	

Notes: Each panel is similar to Panel A of Table 3. The difference is that we examine heterogeneity by worker occupation (job function). * significant at 10%; ** significant at 5%; *** significant at 1%

Table C19: 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	1.20	0.67	0.67
Panel B: Quits (x100)			
SD of mgr effects	0.82	0.38	0.48
Panel C: Fires (x100)			
SD of mgr effects	0.55	0.33	0.19
Panel D: Regretted Quits (x100)			
SD of mgr effects	0.71	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 C20: MOR and Non-Attrition Outcomes: Exploiting New Joiners

Dep. Var.:	Subjective performance	Log Salary Growth (x100)	Promotion
	(1)	(2)	(3)
Panel A: OLS			
MOR (normalized)	0.032	-0.003	-0.023
	(0.026)	(0.319)	(0.036)
Panel B: IV			
MOR (normalized)	-0.060	-0.729	-0.047
	(0.084)	(0.904)	(0.152)
Panel C: Reduced Form			
MOR (normalized)	-0.018	-0.200	-0.014
	(0.024)	(0.246)	(0.045)
Employee FE	No	No	No

Notes: Standard errors clustered by manager in parentheses. The specifications are similar to the odd columns in Table 8, but this table restricts to new employees joining the firm after the administration of the second survey (as in Table 4). * significant at 10%; ** significant at 5%; ***significant at 1%

Table C21: MOR and Non-Attrition Outcomes: Exploiting New Joiners and People Switching Managers

Dep. Var.:	Subjective performance	Log Salary Growth (x100)	Promotion
	(1)	(2)	(3)
Panel A: OLS			
MOR (normalized)	0.027**	0.210	0.191***
	(0.011)	(0.171)	(0.053)
Panel B: IV			
MOR (normalized)	-0.014	-0.472	0.217
	(0.048)	(0.554)	(0.272)
Panel C: Reduced Form			
MOR (normalized)	-0.004	-0.149	0.061
	(0.013)	(0.176	(0.076)
Employee FE	No	No	No

Notes: Standard errors clustered by manager in parentheses. The specifications are similar to the odd columns in Table 8, but restricts to employees who experience their first change (during our data period) in manager (as in Table 5). * significant at 10%; ** significant at 5%; ***significant at 1%

Table C22: MOR and Employee Engagement

	(1)	(2)
Panel A: OLS		
MOR (normalized)	0.048***	0.027
	(0.011)	(0.017)
Panel B: IV		
MOR (normalized)	0.069**	0.018
	(0.034)	(0.026)
Panel C: Red. Form		
MOR (normalized)	0.023**	-0.009
	(0.011)	(0.017)
Employee FE	No	Yes

Notes: Standard errors clustered by manager in parentheses. The specifications are similar in controls and format to those in Table 8. The difference is that the dependent variable here is normalized employee engagement. * significant at 10%; ** significant at 5%; ***significant at 1%

Table C23: Robustness for Significant Results in Table 9: Gradually Adding Controls

	(1)	(2)	(3)	(4)	(5)
Panel A: Subjective Perf					
MOR in current period	0.419***	0.447***	0.470***	0.510***	0.506***
	(0.0870)	(0.0904)	(0.0933)	(0.102)	(0.101)
Panel B: Promotions					
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. Column 1 here is the same as column 1 (Panels A and B) of Table 9. Columns 2-5 subsequently add additional controls, similar to Tables C12-C14. * significant at 10%; ** significant at 5%; *** significant at 1%

Table C24: Delta Values for Oster Test on the Reduced Form

	Table C12	Table C13	Table C14	Table C15 Instrument is MOR of current mgr in T_1	Table C15 Instrument is MOR of current mgr in T_2	Table C23
Attrition	149.9	3.6	9.7	-3.7	0.90	
Quits	35.5	4.7	3.6	-1.2	6.0	
Fires	-64.6	4.3	-51.0	0.28	0.97	
Regretted quits	38.1	5.5	6.1	-1.0	-1.1	
Non-regretted quits	33.6	2.9	-8.2	-1.2	1.9	
Subjective performance						27.0
Promoted						27.0
Log salary growth						-8.5

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 C12, Table C13, Table C14, Table C15, and Table C23. 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).

Table C25: What are Managers Rewarded For? Employees Survey Scores (MOR), Period 1 Only

Dep var:	Subjective performance (normalized)	Promoted (x100)	Log salary (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)	(8)
Panel A: OLS								
MOR in current period	0.102***	0.00172	-0.867	0.248	0.0852	-2.592	0.111	-2.289
	(0.0378)	(0.221)	(0.640)	(0.218)	(2.299)	(5.378)	(0.135)	(1.723)
Panel B: IV								
MOR in current period	0.195**	0.936	-0.223	0.518	-3.626	22.66	0.196	2.879
	(0.0926)	(0.573)	(1.644)	(0.582)	(6.289)	(14.36)	(0.357)	(4.292)
Panel C: Red. Form								
MOR in other period	0.0725**	0.348*	-0.0832	0.195	-1.311	7.890	0.0732	1.072
	(0.0340)	(0.207)	(0.621)	(0.222)	(2.267)	(4.885)	(0.134)	(1.589)

Notes: Standard errors clustered by manager in parentheses. This table is similar to Table 9 in the main text except that we restrict attention to manager-months using the first period of the data (i.e., the data on or before September Y_1). * significant at 10%; ** significant at 5%; *** significant at 1%

Table C26: What are Managers Rewarded For? Employees Survey Scores vs. VA

Dep var:	Subjective performance (normalized)	Promoted (x100)	Log salary (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)	(8)
Panel A: OLS								
MOR in current period	0.0611***	0.0950	-0.471	0.120	-2.657*	-0.169	0.0672	-1.104
	(0.0226)	(0.0903)	(0.410)	(0.167)	(1.558)	(3.229)	(0.0941)	(0.864)
Manager FE in retention	0.0379	0.0774	-0.0753	0.152	-0.328	4.620	-0.0417	2.764***
	(0.0232)	(0.0796)	(0.536)	(0.209)	(2.003)	(3.275)	(0.108)	(0.961)
Panel B: IV								
MOR in current period	0.410***	0.636	-2.438	1.995*	-2.631	0.306	0.339	0.953
	(0.128)	(0.418)	(2.818)	(1.021)	(7.459)	(14.49)	(0.411)	(4.091)
Manager FE in retention	0.0385	0.153	0.156	-1.898	7.662	19.75	-0.365	4.541
	(0.291)	(0.885)	(5.714)	(2.077)	(16.48)	(27.26)	(1.132)	(9.759)
Panel C: Red. Form								
MOR in other period	0.134***	0.214**	-0.719	0.474**	-0.286	1.571	0.0861	0.620
	(0.0223)	(0.0947)	(0.450)	(0.192)	(1.702)	(3.187)	(0.0983)	(0.882)
Manager FE in retention	0.0434	0.0801	-0.212	-0.0980	0.903	3.308	-0.0184	0.701
	(0.0292)	(0.0929)	(0.577)	(0.196)	(2.033)	(3.321)	(0.108)	(1.034)

Notes: Standard errors clustered by manager in parentheses. This table is similar to Table 9. The difference is that we also include the manager's fixed effect in retention (i.e., the manager's value added or VA) as a regressor. In calculating the manager's fixed effect, we randomly split the sample of all worker-months in two. Using this, we estimate two manager fixed effects for each manager, hereafter M_0 and M_1. In the OLS, we use M_0 as the regressor. In the IV, we use M_0 as the regressor and use M_1 as an instrument. In the reduced form, we use M_1 as the regressor. For a very small number of observations (8 person-months), M_1 is missing; for these observation, we mean-impute the missing values (i.e., we assign the fixed effect to 0). * significant at 10%; ** significant at 5%; *** significant at 1%

Table C27: What are Managers Rewarded For? Employees Survey Scores vs. Subjective Performance Score vs. VA

Dep var:	Subjective performance (normalized)	Promoted (x100)	Log salary (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)	(8)
Panel A: OLS								
MOR in current period	0.0611***	-0.00709	-0.540	0.0261	-3.292**	-1.373	0.0764	-1.555*
	(0.0226)	(0.0909)	(0.412)	(0.167)	(1.520)	(3.201)	(0.0967)	(0.843)
Subj performance		1.701***	0.853***	0.904***	11.68***	11.39***	-0.0995	6.229***
		(0.111)	(0.327)	(0.120)	(1.246)	(2.308)	(0.0958)	(0.739)
Manager FE in retention	0.0379	0.00595	-0.124	0.131	-0.702	4.801	-0.0662	2.636***
	(0.0232)	(0.0798)	(0.528)	(0.211)	(1.973)	(3.323)	(0.109)	(0.974)
Panel B: IV								
MOR in current period	0.410***	-0.0370	-3.154	1.638*	-6.360	-4.123	0.219	-1.496
	(0.128)	(0.367)	(2.589)	(0.903)	(6.972)	(13.78)	(0.391)	(3.812)
Subj performance		1.700***	0.968***	0.831***	11.70***	11.18***	-0.107	6.154***
		(0.112)	(0.356)	(0.145)	(1.295)	(2.380)	(0.0970)	(0.767)
Manager FE in retention	0.0385	0.0667	0.631	-1.830	5.829	20.31	-0.148	4.553
	(0.291)	(0.752)	(5.070)	(1.718)	(15.04)	(25.02)	(1.009)	(9.116)
Panel C: Red. Form								
MOR in other period	0.134***	-0.00743	-0.891**	0.370*	-1.601	0.132	0.0617	-0.178
	(0.0223)	(0.0921)	(0.449)	(0.192)	(1.671)	(3.169)	(0.100)	(0.871)
Subj performance		1.701***	0.927***	0.886***	11.64***	11.29***	-0.102	6.235***
		(0.111)	(0.329)	(0.120)	(1.273)	(2.332)	(0.0960)	(0.754)
Manager FE in retention	0.0434	0.00596	-0.201	-0.150	0.310	3.011	-0.00320	0.501
	(0.0292)	(0.0868)	(0.566)	(0.190)	(2.034)	(3.224)	(0.111)	(1.030)

Notes: Standard errors clustered by manager in parentheses. This table is similar to Table C26. The difference is that we further add a manager's own subjective performance score (received from his/her superiors) as a regressor. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix References

Altonji, Joseph G., Todd E. Elder, and Christopher R. Taber, "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools," *Journal of Political Economy*, 2005, *113* (1), 151–184.

Angrist, Joshua D and Jörn-Steffen Pischke, *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton university press, 2008.

Bloom, Nicholas, Renata Lemos, Raffaella Sadun, Daniela Scur, and John Van Reenen, "JEEA-FBBVA Lecture 2013: The New Empirical Economics of Management," *Journal of the European Economic Association*, 2014, *12* (4), 835–876.

Chetty, Raj, John N. Friedman, and Jonah E. Rockoff, "Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates," *American Economic Review*, September 2014, *104* (9), 2593–2632.

Enikolopov, Ruben, Alexey Makarin, and Maria Petrova, "Social Media and Protest Participation: Evidence from Russia," 2017. Working paper, Universitat Pompeu Fabra.

Garicano, Luis, "Hierarchies and the Organization of Knowledge in Production," *Journal of Political Economy*, 2000, *108* (5), 874–904.

Hoffman, Mitchell, Matthew Bidwell, John McCarthy, and Michael Housman, "The Determinants of Managerial Productivity around the World," 2018. Mimeo, University of Toronto.

Oster, Emily, "Unobservable Selection and Coefficient Stability: Theory and Evidence," *Journal of Business & Economic Statistics*, 2017, *0* (0), 1–18.

Satyanath, Shanker, Nico Voigtländer, and Hans-Joachim Voth, "Bowling for fascism: social capital and the rise of the Nazi Party," *Journal of Political Economy*, 2017, *125* (2), 478–526.