**Supplementary Materials**

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## **Section A – Participatory Meetings Training Protocol**

Participatory meetings are comprised of three parts: discussion, group leader summary, and goal setting. Each part should be connected fluently and be treated as an organic entity.

Discussion leaders should start to gather people with the help of the group leaders starting 7:30am. Each meeting lasts around 20 minutes and should end before 8am. A discussion leader’s duty is to facilitate the discussion, encourage workers to speak up and actively engage in solving production related issues jointly as a group. Discussion leaders should let workers talk for most of the time during the meeting, rather than the group leader or the discussion leader herself. While workers engage in active discussion and goal setting, discussion leaders will facilitate. For the best discussion facilitation, always use simple and everyday Mandarin that fits the workers’ communication habits. Do not use any formal or written language expressions. In your first meetings, get a general impression of the group’s dynamics such as the gender and age composition, whether people were talkative, and what people cared about the most. Use these insights to prepare for your next meetings’ facilitation.

**Discussion (around 15 minutes).**A pre-arranged shuttle picks up and takes everyone to the factory before 7:30am. Each research assistant has to be on the production floor where her assigned group is located. As a discussion leader (or an observer in the control condition), we can never show up late. Greet your workers politely when you arrive on the production floor. As 7:30 approaches, start to gather workers in the group with its group leader. When every worker in the group arrives, ask them to gather in a circle and greet them warmly.

During the first meetings, discussion leaders initiate a round of self-introduction, such as names and how long the workers have been working in the factory. Discussion leaders set clear expectations during the first meeting, and briefly repeat the expectations at the start of each subsequent meeting. The protocol for discussion leaders goes:

“My name is *Zhang Xiaohong*, and you can call me Xiaohong. I’m a student from *Soochow University*, and I am helping a professor with a project on work experience. From this week on, I will come every *Monday* to lead a discussion with you on work related issues during your regular morning meeting time, for a period of six weeks. We will discuss the problems you have experienced in work, and the aim is for you to work better! Our meetings are easy-going. We encourage everyone to speak up! Just voice out whatever’s on your mind about your work, such as issues yesterday or in the past week, the difficulties you have at work, or things you think will help you and others. I may ask some questions, and there’s no right or wrong answers. Whatever you share will be helpful for the group and for us. I will take some notes during the discussion for research purposes, but I will not show my notes or talk with anyone who’s not in our project team, including the factory people.”

In subsequent meetings, discussion leaders repeat the expectation, “as we all know, it’s a meeting for us to share our opinions on production related issues. I’m here to discuss with you on how to work better, rather than testing you. No worry about being right or wrong. Just say whatever you think of about work and participate!”

As a warm-up for problem solving, discussion leaders can start with easy questions such as “what type of order are you all working on today?” and “what steps are each of you in charge of?”. Discussion leaders prepare and facilitate two questions for the workers to discuss. The number of discussion questions is secondary to the depth of the discussion. Though the content of discussion is flexible as long as it is work-related, we do have a module of focus for each week during the six-week intervention period. The module and suggested discussion questions are as follows:

Week 1: General feedback meeting, getting to know each other

Week 2: Production speed and quantity (e.g., how to work faster? What gestures and strategies are most efficient?)

Week 3: Quality control (e.g., how to avoid defects? If a defect occurs, how to most efficiently coordinate for repairing? How to self-examine that finished pieces are good before going through quality control?)

Week 4: Order switch (e.g. how to shorten the adaptation period when production orders change? How to deal with issues in this fast transition period?)

Week 5: Group coordination (e.g. how to increase group efficiency, such as the arrangement and transition of finished pieces? How to coordinate with the person before and after you?)

Work 6: Discussion topic tailored to specific groups (e.g. if a group’s major concern is its production speed, then focus more on this topic, etc.)

**Supervisor summary (0-3 minutes).** As the pre-existing 20-minute morning meetings were led by the supervisors for managerial purposes, we left this time for them in case there are other important managerial issues group members need to know that cannot be conveyed during group discussion. The first author and the discussion leaders had reminded the supervisors to keep their post-discussion summary brief.

**Goal setting (2-3 minutes).** Towards the meeting’s end, workers are encouraged to make individual goals on their daily production. Since orders are placed by customers and have tentative amounts and deadlines for production, the discussion leaders (research assistants) tell the workers about the orders placed by customers and specifically how many pieces each order requires and how long they have before the suggested deadline. For example, if an order placed asks for 10,000 pieces within 20 days, then a worker or a group is expected to produce around 500 pieces daily if they spread production evenly across days. The calculation is simple enough to do for workers with a Chinese elementary school education. Instead of being assigned a fixed production goal daily, workers will be given all the relevant information and encouraged to come up with a daily production goal themselves. Each worker is given a small piece of paper to do simple calculation and asked to voice out their goals in front of their group members.

In the end, discussion leaders wrap up the meeting and remind them about the following week’s participatory meeting.

## **Section B – Qualitative Observations**

**About the factory.**

The study took place in the Chinese branch of a multinational apparel manufacturer, which is the largest in employee size among all branches and is located in the eastern coastal area of China. Our study population, the factory workers, were mostly young women in their twenties or thirties[[1]](#footnote-1) who migrated from rural China to the city. The factory is built on the edge of the city and far from the city center, in a location that is relatively inconvenient to reach by public transportation. Around half of the workers live in adjacent factory dorms and another half commute to work on a daily basis. From field interviews prior to the experiment, we find that these workers are eager to work, but have little education (most of them have not finished high school) or training that would allow them to get a high-skilled job in the city. Hence, they enter manual work in apparel manufacturing, which is regarded as labor-intensive and low in skill requirement. Compared with its competitors, the factory pays very well and its workers, although extremely busy, mostly receive a salary in the rank of the lower-middle class[[2]](#footnote-2) in the city.

**Qualitative findings from the pilot intervention,**

We recount the lessons learned from the pilot intervention (labeled *a* to *d*), followed by a series of field-note episodes within these experimental meetings, which briefly sketched parts of the meeting flow and group dynamics. Rather than a unified narrative, the following entries are a series of unfolding actions taken from different meetings across time. We understand that observer biases are hard to avoid in qualitative data collection (Emerson, Fretz, & Shaw, 1995), but tried to be as impartial as possible about our observations and writings.

1. ***Workers were very quiet in the first treatment meetings, and gradually talked more and more as they got used to this participatory style of meetings.***

In the first meeting with the quality control group, the workers automatically formed two strictly straight lines close to each other, one in front and one back, like soldiers in an army. The researcher told them to feel more relaxed and form a circle so that everyone could face each other. In response to this, nobody moved. The same thing happened in the first meeting with the embroidery group, where workers automatically lined up, with a sizeable distance (at least 6 feet) away from the researcher. The supervisor later told us that the workers were never required to stand in lines during meetings, but they had formed such a habit for some unknown reasons. We speculate that workers have internalized the authoritarian work style of the factory, including the hierarchical arrangements, and were ready to follow any rule of an authority without question.

Workers were reluctant to speak up in the first meetings, and refrained even from saying their names, as demonstrated in the following excerpts from field notes:

[1st meeting with the embroidery group, July 1]

*I*[[3]](#footnote-3) *started the meeting with self-introduction and went around the circle asking for their names. A silence. They were reluctant to talk. The girl standing in the middle of the workers facing me said “let’s start with supervisor Wang.” Wang said I had already met her. A short silence and I asked the person standing right next to me to start the self-introductions. The girl looked down to the ground and quietly said her name. Then one after another. I repeated each of their names, making sure I got them right.*

[1st meeting with the packing group, July 7]

*“What are you working on today as a group?” I asked.*

*The workers looked at each other and nobody spoke. I encouraged them to speak up. A woman raised her hand and said they were packing clothes. The others murmured.*

However, workers adapted to the participatory style at a faster rate than we had expected. For example, at the second meeting with the embroidery group, the workers started to smile and greet the researcher when she came in, and actively discussed the June salary payment[[4]](#footnote-4). During the third and fourth meetings, most group members voluntarily expressed their opinions on production-related issues such as difficulty encountered with a new order, and how to develop good gestures with a machine.

1. ***A participatory meetings intervention was the most effective when the tasks involved some level of collaboration between workers.***

One question that remained unclear in Lewin’s work was whether a participatory meetings intervention was equally applicable to every work group. As a large part of the intervention treatment focuses on eliciting information exchange among workers on production related issues, we suspected the intervention would be most relevant for the groups which require collaborative tasks between group members, or for which an individual worker’s performance is affected by and will affect the performance of her coworkers. It was indeed what we found in our pilot intervention. In groups that require collaboration between workers, like the sewing, packing, and cutting groups, workers expressed many constructive suggestions on what they need from the workers next to them to help themselves work faster and better, and what they could do to help their coworkers work faster and better. They had never thought of or had the chance to openly discuss working strategies like those. However, the discussion about group collaboration was not very successful for the embroidery and quality control groups, whose tasks did not necessitate collaboration between workers, as illustrated in the following episodes:

[1st meeting with the embroidery group, July 1]

*“Are you working on short-sleeve or long-sleeve clothes? What kind of things are you all working on as a group today?” I asked.*

*“Each of us works on different things.” A worker said.*

*“What are each of you working on today?” I asked a second question.*

*“We all work on different things. Different things every day. We follow the supervisor’s assignments.”*

*“What are some of the strategies you’ve used for this task? Do you mind sharing with others? You know as a group, we need collaboration.”*

*A silence.*

*“Collaboration is not needed. We work on different things.” A woman quietly responded.*

1. ***The discussion flow was much more fluent for the groups whose workers’ jobs were interdependent. Any work problem could be easily turned into a discussion after the first meeting.***

The sewing division is the factory’s largest and most labor-intensive. Workers are organized into 20-30 person groups which work on a specific order placed by companies all over the world. For example, a group may specifically work on a purple baby one-piece while another group works specifically on a blue dress during a certain time period. Each worker in a group is assigned a step in the apparel production processes and tends to repeat the same step until the whole order is completed. As a group is vertically integrated, an individual’s work performance might affect the workers after her, even though their salary earnings only depend on individual piece rates. Nevertheless, the optimal strategy is for the group to achieve its maximum productivity so that everyone can have a stable high level of output, rather than for each individual to maximize her own profit (which results in a fluctuation of individual productivity because an individual cannot produce faster when prior steps are not finished). Coordination issues become more prominent when there is a production order switch. One problem came with new cloth patches, and inefficient coordination between workers and between different divisions. Workers complained about frequent order switches because they thought their salaries would suffer. Workers expressed grudges in the discussions. As one put it: “I can’t work fast with new tasks. And I can’t work fast unless the person before me works fast.” Workers looked surprised when they heard that actually everyone shared the same problem. A solution might be as simple as help to unpack patches:

[2nd meeting with Friday’s sewing group, July 10]

*A girl standing in the middle, who is in charge of the first step of the work process, said: “It would be great if the person after me or someone else will lend me a hand to carry the materials from carts to my working desk. The materials are too heavy for me and it slows me and also the group down.”*

The woman after her nodded immediately and said she never noticed that the material-moving was slowing their performance. Another worker said she hoped others would help her to do a few pieces when she could not finish all of them in time.[[5]](#footnote-5) For the sewing groups, any production-related issue could be developed into a discussion. Another example follows:

[2nd meeting with Thursday’s sewing group, July 9]

*“We just changed new machines four days ago. It’s hard to adapt to them.”*

*“I’m a lot slower under the new machine and I don’t like it.”*

*“The technicians are not very responsive to our needs. I asked him several times to adjust my machine, but he’s slow.”*

*“I have that problem too!”*

*“Me too.”*

These responses were prompted by the question, “what are some of your production problems that you’ve encountered this week?”. It turned out that the sewing departments just changed new machines the previous week. The new machines were supposed to be better and safer than the old ones. But workers did not like them. Even though the factory had organized a lecture series from a technician on using the new machines, workers still had many problems unsolved. In the meeting workers discussed the problems they had encountered with the new machines. Hearing their voice, the supervisor focused on these problems in her supervisor summary part of the meeting, such as how to avoid leaking machine oil and how to communicate problems to the technicians.

1. ***Putting questions in context and activating social roles elicited more responses than asking about individual experiences alone. Asking a question in an utmost concrete way was the most effective in getting responses from workers.***

At the first several meetings, we encountered a problem that the workers found it difficult to describe “working strategies” in detail. Some workers thought on a very abstract level and said there were no specific strategies and everything came with some working experience. Several women mentioned that people would know the right gestures with experience but were unable to describe the process further. The researcher asked what a good gesture looked like and how to develop it. Again, the workers were unable to describe it in detail. However, when we put the question in the current context of the group and asked the question in another way, workers were able to understand the question in a concrete level and start the discussion:

[4rd meeting with Saturday’s sewing group, July 25]

*The group switched order from producing a summer dress to a winter baby outfit at the beginning of this week. In the discussion, everyone said something about why switching tasks was hard for them. “We cannot work fast with new tasks. It takes time.” Several workers said. I asked whether everyone slowed down during order switch and they all said yes, but some workers took less time to get used to the new tasks because they have “good gesture.”*

*“What is a good gesture? Do you mind sharing with the rest of us?”*

*A silence. Some people appeared to be thinking.*

*“A gesture is something that comes naturally.” A worker said.*

*“Previously you said more experienced workers tend to develop good gestures. For those of you who have been here long enough, how would you teach the newer workers here? What would you do if a new worker asks you about the good gestures?”*

*A woman then walked close to the machine and showed how she used a mold to help sew a squared patch onto the front of an outfit seamlessly.*

Apparently, the second way of asking the same question on “good gestures” was more effective as it created a concrete scenario for the workers to act upon, in particular when the social role of a “more experienced worker” in relation to a “new worker” was activated. Similarly, when we discussed why product defects occurred and how to avoid them, the workers’ first reactions were: “*I should be more careful,” “It comes with working experience. With more working experience, workers know how to avoid the defects,*” as two workers said during the discussions. But when the researcher pointed to a specific defective piece and asked how it occurred and how to repair it, workers focused the discussions on working strategies to fix that specific piece as well as other more general issues on product defects.

Workers were not used to thinking analytically about problems unless provided a concrete example or scenario. It may reflect a cross-cultural difference in people’s thinking style (Nisbett, Peng, Choi, & Norenzayan, 2011). The factory workers are used to thinking holistically rather than analytically. Thus in the actual intervention, we always asked a question in the most concrete way possible and activated the context and social relations surrounding the target question to help workers engage in extended discussions.

## **Section C – Randomization**

We used a logistic regression with pre-treatment characteristics to predict treatment assignment. These characteristics included both worker demographics and work group characteristics (baseline productivity, gender composition of the group, worker experience, age, and education). The balance test revealed no significant observed differences on average between groups in the participatory meetings and observer condition.

**Table S1**

Balance Check

|  |  |
| --- | --- |
|  | |
|  | Condition Assignment |
|  |  |
|  |  |
|  | |
| Education | 0.303 |
|  | (0.219) |
| DeptA3 | -0.647 |
|  | (1.164) |
| DeptB3 | -0.532 |
|  | (1.218) |
| DeptC2 | -0.501 |
|  | (1.193) |
| DeptC3 | -0.326 |
|  | (1.180) |
| DeptD2 | -0.048 |
|  | (1.181) |
| DeptD3 | -0.614 |
|  | (1.243) |
| Work experience | -0.095 |
|  | (0.052) |
| Baseline productivity | -0.0002 |
| (first 6-week period) | (0.0002) |
| Baseline productivity | 0.0002 |
| (second 6-week period) | (0.0002) |
| Gender | 0.363 |
|  | (0.304) |
| Age | -0.024 |
|  | (0.015) |
| Constant | 0.852 |
|  | (1.344) |
|  | |
|  | |

Note: The balance test showed there was no significant differences between participatory meetings and observer condition for any pre-treatment characteristics. Omnibus p = 0.40. Note: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001.

**Table S2**

*Demographics*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable |  | Entire Sample (*n = 1974)* | Treatment (*n = 958)* | Control (*n = 1016)* |
| *Gender* |  |  |  |  |
| Male |  | 6.3 | 5.3 | 7.2 |
| Female |  | 67.3 | 68.5 | 66.1 |
| *Age* |  | 32.5 | 32.1 | 32.9 |
| *Work Experience* | | 2.1 | 2 | 2.2 |
| *Education* |  |  |  |  |
| Elementary School | | 92.4 | 91.7 | 92.9 |
| Middle or High School | | 1.6 | 2.2 | 1.1 |
| Post High School | | 1.5 | 1.3 | 1.6 |
| *Origin* |  |  |  |  |
| Urban |  | 2.3 | 1.8 | 2.8 |
| Rural |  | 69.3 | 70.3 | 68.4 |
| Note: Entries are percentages except for age and work experience, which are in years. | | | | |

Optimal non-bipartite matching codes.

library("nbpMatching") # Beck, Lu, & Greevy, 2015  
# Generate example data

my\_data <- data.frame(x1 = rnorm(100),

                      x2 = rnorm(100),

                      x3 = rnorm(100),

                      x4 = rnorm(100))

# Extract variables we want to match on

match\_data <- my\_data[, c("x1", "x3", "x4")]

# Make distance matrix (can use `gendistance` function as well)

dist\_mat <- as.matrix(dist(match\_data))

# Construct matches

matches <- nonbimatch(distancematrix(dist\_mat))

# Each row in `extracted\_matches` is a paired-match

extracted\_matches <- cbind(matches$halves$Group1.Row,

                           matches$halves$Group2.Row)

## **Section D – Productivity Results Robustness Checks**

### **Section D1 – Robustness checks with market value as a dependent variable.**

During the six weeks of the treatment, workers in the participatory meetings condition were significantly more productive than workers in the control observer condition. This difference is large in monetary terms, and is robust to different measures of productivity (Table S2). Treatment workers produced 368.76 Yuan ($54.63) more goods in market value (measured by raw amount produced) than control workers (*CI* = [56.35, 681.16], *SE* = 159.26, *p* = .021). This difference, which is of primary interest to the factory, represents an 8.68% increase in average raw amount produced.

The productivity gains among workers in the participatory meetings condition relative to observer condition endured for 6 weeks after the experiment, a time in which none of the groups experienced a participatory meeting. Treatment workers produced 351.28 Yuan ($56.97) more goods in market value than control workers (*CI* = [79.92, 622.65], *SE* = 138.34, *p* = 0.011), a 9.41% increase in treatment workers’ market production relative to control. Again, results are robust to using departmental fixed effects and baseline covariates. The statistically significant treatment difference endured until 9 weeks following the intervention (Table S3).

***Relationship between productivity and attitudes***

We did not find a significant relationship between objective levels of productivity and individual or group-based worker empowerment. We then calculated the percentage change in market value produced from each worker’s baseline productivity to their productivity observed at the end of the intervention (six weeks after the start of the participatory meetings) to predict attitudes. On average, treatment workers experienced an 9.28% increase in productivity, compared to -0.62% of change in productivity among control workers (β = 0.09, CI = [0.005, 0.170], SE = 0.042, *t* = 2.09, *p* = .037). Of all the attitudinal constructs, only job satisfaction was related to a change in productivity. We found a trending evidence on the interaction effect between condition and change in productivity: among treatment workers, the greater the change in productivity, the more job satisfaction they reported (β = 0.17, CI = [-.07, .40], SE = 0.16, *t* = 1.41, *p* = .15). The pattern did not hold for control workers. Further, among treatment workers, job satisfaction at the end of the intervention predicted future increases in productivity six weeks later. The more job satisfaction treatment workers expressed in survey wave 1, the more their productivity increased six weeks after the survey (β = 0.047, CI = [.001, .093], SE = 0.023, *t* = 2.00, *p* = .046).

***Process of change***

*No difference in informational gain.* We next analyze the variability among treatment groups’ discussion of information and strategic coordination in their meetings, to see whether higher discussion of this information leads to greater productivity among these groups. Specifically, we use the estimated proportion of the discussion spent on problem solving and the number of workers who actively participated in problem solving. Used separately as two measures, and combined multiplicatively, we find the same results. We did not find significant evidence that problem solving was linked to higher group productivity using a weekly lag of ratings and productivity (market value produced) over the course of the intervention (β = 13.13, SE = 10.33, *p* = .21). We also did not find evidence that problem solving averaged over the treatment period predicted increased productivity in the six weeks following the intervention—in fact, we found that problem solving marginally predicted decreased productivity in terms of gross salary (β = -421.74, CI = [-913.30, 69.83], SE = 237.03, *p* = .09).

We also analyzed whether group-level variance in productivity decreased over time, which we might expect if workers were learning from one another and strategically coordinating around their goals. We found no difference in group-level variance in productivity (market value) comparing treatment and control groups (means of SD: MPM = 1143.09, SD = 409.99; Mo = 1118.02, SD = 291.99; n.s.). However, individual-levels of productivity across time became more stable for treatment workers (mean of SD: MPM = 28.88, SD = 9.65) compared with control workers (Mo =39.56, SD = 12.01), β = -10.38, CI = [-13.79, -6.97], SE = 1.74, *t* = -5.97, *p* < .001). Thus participatory meetings did not make groups less variable, but did make individual production more stable.

*Voice in the participatory meetings correlates with productivity.* We found that voicing one’s opinions was significantly correlated with subsequent productivity (market value), on the group level. Both voicing opinions about production issues and about non-production-related issues marginally predicted higher group-level productivity during the treatment (βproduction = 32.21, CI = [-2.57, 67.00], SE = 17.62, *t* = 1.83, *p* = .07; βnon-production = 21.70, CI = [-0.51, 43.90], SE = 11.25, *t* = 1.93, *p* = .06). Voicing opinions about production and non-production related issues also both predicted higher group-level productivity in the six weeks following the treatment (βproduction = 520.75, CI = [112.31, 929.19], SE = 196.95, *t* = 2.64, *p* = .01; βnon-production = 294.03, CI = [-30.37, 618.44], SE = 156.42, *t* = 1.88, *p* = .07).

In the positive direction, we found that group leaders’ encouragement and praise of workers’ participation in the meetings significantly predicted subsequent group productivity during the intervention (β = 48.13, SE = 24.49, t = 1.97, *p* = .05). In the negative direction, group leaders’ interruption in the discussion (discouragement of voice) negatively predicted group performance during the intervention (β = -46.36, SE = 21.15, *t* = -2.19, *p* = .03). The positive pattern extended to productivity findings six weeks following the intervention; group leaders’ frequency of encouragement significantly predicted greater group productivity (β = 1244.97, SE = 391.26, t = 3.18, *p* = .004). There were no significant predictive effects of other group leader behaviors following the intervention. We did not find a relationship between the frequency of leader scolding workers during treatment meetings and group productivity.

**Table S3**

*Productivity Using Market Value*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
|  | Dependent variable: Productivity (in Chinese Yuan) | | | | | | | | | |
|  |  | | | | | | | | | |
|  |  | | | | | | | | | |
|  | Experimental period | | | | | | Long-term | | | |
|  | Gross salary | | Market value | | | | Gross salary | | Market value | |
|  | (1) | (2) | | (3) | (4) | (5) | | (6) | (7) | (8) |
|  | | | | | | | | | | |
| Participatory meetings | 584.39\* | 592.30\*\* | | 362.97\* | 368.76\* | 491.17\* | | 532.72\*\* | 320.94\* | 351.28\* |
|  | (259.12) | (229.31) | | (178.00) | (159.26) | (206.21) | | (179.70) | (159.10) | (138.34) |
| Work experience |  | 42.87 | |  | 32.20 |  | | 63.72\*\* |  | 50.44\*\* |
|  |  | (30.78) | |  | (20.72) |  | | (23.63) |  | (17.83) |
| Education |  | 184.19 | |  | 119.92 |  | | -109.21 |  | -95.51 |
|  |  | (118.97) | |  | (87.89) |  | | (180.72) |  | (146.69) |
| Baseline productivity |  | 0.44\*\*\* | |  | 0.40\*\*\* |  | | 0.33\*\*\* |  | 0.34\*\*\* |
| (first 6-week period) |  | (0.06) | |  | (0.05) |  | | (0.06) |  | (0.05) |
| Baseline productivity |  | 0.04 | |  | 0.06 |  | | 0.13\* |  | 0.14\*\* |
| (second 6-week period) |  | (0.05) | |  | (0.05) |  | | (0.05) |  | (0.05) |
| Departmental fixed effects | YES | YES | | YES | YES | YES | | YES | YES | YES |
| Constant | 6,310.16 | 4,043.36 | | 4,800.59 | 3,086.77 | 7,656.74 | | 5,860.00 | 5,761.08 | 4,229.34 |
|  | (466.48) | (411.36) | | (345.24) | (299.23) | (279.19) | | (379.50) | (205.49) | (297.80) |
| *N* (clusters) | 65 | 65 | | 65 | 65 | 65 | | 65 | 65 | 65 |
| *N* (individuals) | 1611 | 1490 | | 1611 | 1490 | 1561 | | 1440 | 1561 | 1440 |
| Control mean estimate | 6320.64 | 6455.84 | | 4902.48 | 5008.78 | 5648.30 | | 5603.92 | 4522.36 | 4503.07 |
|  | | | | | | | | | | |

Note: Productivity change during the six-week experiment period and sustained productivity change after the experiment with gross salary and market value. The comparison condition to the participatory meetings is the observer condition. Models include full-time sewing workers paid by piece-rates. Supervisors (*N* = 65) and staff members (*N* = 76) whose productivity cannot be determined by either gross salary or market value were excluded in the productivity data analysis. \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

### **Section D2 – Robustness checks with outcomes at the average group level, using group averages as a dependent variable.**

In order to get an estimate of productivity gain for the individual level, we conducted an analysis on average group productivity—dividing total group productivity by the number of workers that were initially in each group (see SI *Table S4*); since that initial number is fixed, there should be no post-treatment bias. This estimate as well supports our general conclusion.

In addition to individual treatment effects (error clustered at the group level), we estimate group-level outcomes as robustness checks, which takes the group averages of each outcome variables as one data point (i.e., there are 65 data points for each regression). The group-level robustness checks will take the form of

Pt = β0 + Dtβ1 + **Htγ**1 + gt +μt. (2)

where for group *t*, β1 represents the average causal effect of the treatment on group average productivity, as measured by group average productivity Pt during and after the 6-week period of the experiment. Dt refers a binary variable of experimental manipulation randomly assigned to groups (1 = treatment participatory meetings, 0 = control observer meetings), and **Ht** denotes a vector of baseline controls for pre-treatment group productivity, broken up into 6-week averages. *g****i*** denotes a departmental fixed-effect. *μ* is a zero-mean error term, assumed to be mutually independent across groups.

***Average worker productivity.***

In the six-week period of the experiment, workers who participated in weekly participatory meetings were significantly more productive than workers who had a weekly outside observer at their meeting. The difference is large in monetary terms, and is robust to different measures of productivity (refer to Table S2). Treatment workers earned 561.29 Yuan ($81.50) more than the control workers over the course of six weeks (CI = [42.95, 1079.62], t = 2.17, p = 0.03, SE = 258.31). This equals 8.49% of workers’ average gross salary during this time period. In addition, treatment workers produced 323.71Yuan ($47.0) more goods in market value (measured by raw amount produced) than control workers (CI = [-37.49, 684.91], SE = 180.00, *t* = 1.80, *p* = .078). This difference, which is of primary interest to the factory, equals 6.37% of workers’ average raw amount produced. Thus, participatory meetings increased productivity from both the workers’ and factory management’s perspective. These results are robust to using departmental fixed effects and baseline covariates.

***Long-term average worker productivity.***

The productivity gains among workers in the participatory meetings condition relative to the observer condition sustained for at least 6 weeks after the experiment, during which all workers returned to their previous regular morning meeting schedule without group discussion. The sustained gains were observed for both gross salary and raw amount produced. Workers who participated in participatory meetings earned 617.14 Yuan (89.61 USD) more than workers in the observer condition (CI = [190.02, 1044.25], SE = 212.85, *t* = 2.90, *p* = 0.005), which equaled 10.41% of workers’ average gross salary. Furthermore, treatment workers produced 407.05 Yuan (59.10 USD) more goods in market value than control workers (CI = [81.48, 732.62], SE = 162.24, *t* = 2.51, *p* = 0.015), which equaled 8.65% of workers’ average raw amount produced. Again, results are robust to using departmental fixed effects and baseline covariates (see table S4).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table S4**Productivity at the Average Group Level | | | | | | | | |
|  | Dependent variable: | | | | | | | |
|  |  | | | | | | | |
|  | Experimental period | | | | Long term | | | |
|  | Gross salary | | Market value | | Gross salary | | Market value | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | | | | | | | | |
| Participatory meetings | 772.9\* | 561.3\* | 505.5\* | 323.7+ | 704.6\*\* | 617.1\*\* | 487.9\* | 407.0\* |
|  | (296.5) | (258.3) | (210.6) | (180.0) | (240.9) | (212.9) | (185.3) | (162.2) |
| Baseline productivity |  | 0.3\* |  | 0.2 |  | 0.3 |  | 0.2 |
| (first 6-week) |  | (0.2) |  | (0.2) |  | (0.1) |  | (0.1) |
| Baseline productivity |  | 0.1 |  | 0.2 |  | 0.3\* |  | 0.3\* |
| (second 6-week) |  | (0.1) |  | (0.1) |  | (0.1) |  | (0.1) |
| Constant | 5,947.0\*\*\* | 4,506.1\*\*\* | 4,525.4\*\*\* | 3,671.7\*\*\* | 7,113.7\*\*\* | 5,433.4\*\*\* | 5,352.1\*\*\* | 4,054.6\*\*\* |
|  | (447.0) | (772.1) | (317.4) | (577.2) | (363.1) | (636.2) | (279.4) | (520.2) |
|  | | | | | | | | |
| Observations | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
|  | | | | | | | | |
| Note: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001. |  | | | | | | | |

### **Section D3 – Robustness checks with outcomes at the total group level.**

***Total group productivity.***

In the six-week period of the experiment, work groups that participated in weekly participatory meetings were significantly more productive than work groups that had a weekly outside observer at their meeting. The difference is large in monetary terms, and is robust to different measures of productivity (refer to Table S3). Treatment groups earned 18,612.42 Yuan ($2,808) more than the control groups over the course of six weeks (CI = [3,841.58, 33,383.26], SE = 7,360.96, *t* = 2.53, *p* = 0.01). In addition, treatment groups produced 12,551.78 Yuan ($1,894) more goods in market value (measured by raw amount produced) than control groups (CI = [1,904.19, 23,199.37], SE = 5,306.16, *t* = 2.37, *p* = .02). Thus, participatory meetings increased productivity from both the workers’ and factory management’s perspective. These results are robust to using departmental fixed effects and baseline covariates.

***Long-term total group productivity.***

The productivity gains among groups in the participatory meetings condition relative to observer condition sustained for at least 6 weeks after the experiment, during which all groups returned to their previous regular morning meeting schedule without group discussion. The sustained gains were observed for both gross salary and raw amount produced. Groups who participated in participatory meetings earned 18179.96 Yuan ($2874.43) more than groups in the observer condition (CI = [4002.97,32356.95], SE = 7074.19, *t* = 2.57, *p* = 0.013). This equals 11.11% of workers’ average gross salary during this time period. Furthermore, treatment groups produced 12097.43 Yuan ($1912.92) more goods in market value than control groups (CI = [1919.95, 22274.91], SE = 5078.47, *t* = 2.38, *p* = 0.021), which equaled 9.71% of work groups’ average raw amount produced. Again, results are robust to using departmental fixed effects and baseline covariates (see Table S5).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table S5**Productivity at the Total Group Level | | | | | | | | |
|  | Dependent variable | | | | | | | |
|  |  | | | | | | | |
|  | Experimental period | | | | Long term | | | |
|  | Gross salary | | Market value | | Gross salary | | Market value | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | | | | | | | | |
| Participatory meetings | 30,582.6 | 18,180.0\* | 21,198.9 | 12,097.4\* | 26,855.0 | 15,786.7\*\* | 19,550.0 | 10,949.7\* |
|  | (17,162.4) | (7,074.2) | (12,722.3) | (5,078.5) | (14,207.8) | (5,881.5) | (11,065.0) | (4,355.9) |
| Baseline productivity |  | 0.9\*\*\* |  | 0.9\*\*\* |  | 0.6\*\*\* |  | 0.6\*\*\* |
| (first 6-week) |  | (0.1) |  | (0.1) |  | (0.1) |  | (0.1) |
| Baseline productivity |  | -0.1 |  | -0.02 |  | 0.2 |  | 0.2 |
| (second 6-week) |  | (0.2) |  | (0.2) |  | (0.1) |  | (0.1) |
| Department fixed effects | YES | YES | YES | YES | YES | YES | YES | YES |
| Constant | 120,516.7\*\*\* | 45,685.6\*\*\* | 91,827.5\*\*\* | 32,460.7\*\*\* | 153,655.1\*\*\* | 97,884.4\*\*\* | 115,382.7\*\*\* | 68,627.3\*\*\* |
|  | (25,869.7) | (12,433.8) | (19,176.9) | (9,324.0) | (21,416.1) | (10,337.6) | (16,678.9) | (7,997.4) |
|  | | | | | | | | |
| Observations | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
|  | | | | | | | | |

Note: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

### **Section D4 – Robustness checks with 62 groups (intact pairs).**

We applied a non-bipartite matching scheme within each department and randomly assigned groups from all seven departments (*N* = 65) to either the treatment or the control condition. For departments with an odd number of groups, we assigned the one group that did not achieve a match to the observer condition, as was desired by the factory. Here we report results excluding those three unmatched departments. The results were consistent.

***Worker productivity.***

In the six-week period of the experiment, workers who participated in weekly participatory meetings were significantly more productive than workers who had a weekly outside observer at their meeting. The difference is large in monetary terms, and is robust to different measures of productivity (refer to Table S4). Treatment workers earned 530.22 Yuan ($80) more than the control workers over the course of six weeks (CI = [466.25, 994.18], SE = 236.52, *t* = 2.24, *p* = 0.025). This equals 9.38% of workers’ average gross salary during this time period. In addition, treatment workers produced 328.92 Yuan ($50.00) more goods in market value (measured by raw amount produced) than control workers (CI = [8.29, 649.55], SE = 163.45, *t* = 2.01, *p* = .044). This difference, which is of primary interest to the factory, equals 7.60% of workers’ average raw amount produced. Thus, participatory meetings increased productivity from both the workers’ and factory management’s perspective. These results are robust to using departmental fixed effects and baseline covariates.

***Long-term worker productivity.***

The productivity gains among workers in the participatory meetings condition relative to observer condition sustained for at least 6 weeks after the experiment, during which all workers returned to their previous regular morning meeting schedule without group discussion. The sustained gains were observed for both gross salary and raw amount produced. Workers who participated in participatory meetings earned 548.73 Yuan ($83.00) more than workers in the observer condition (CI = [174.66, 923.80], SE = 191.19, *t* = 2.87, *p* = 0.004), which equaled 10.09% of workers’ average gross salary. Furthermore, treatment workers produced 368.10 Yuan ($56.00) more goods in market value than control workers (CI = [80.62, 655.57], SE = 146.54, *t* = 2.51, *p* = 0.012), which equaled 8.99% of workers’ average raw amount produced. Again, results are robust to using departmental fixed effects and baseline covariates (see Table S6).

#### **Table S6**

#### Robustness Check – Worker Productivity With 62 Groups

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | |
|  | Dependent variable | | | | | | | |
|  |  | | | | | | | |
|  | Experimental period | | | | Long term | | | |
|  | Gross salary | | Market value | | Gross salary | | Market value | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | | | | | | | | |
| Participatory meetings | 540.46\* | 530.22\* | 340.64 | 328.92\* | 524.63\* | 548.73\*\* | 356.19\* | 368.10\* |
|  | (266.86) | (236.52) | (182.35) | (163.45) | (216.57) | (191.19) | (166.46) | (146.54) |
| Work experience |  | 38.28 |  | 28.55 |  | 71.07\*\* |  | 56.37\*\* |
|  |  | (32.51) |  | (21.94) |  | (24.91) |  | (18.76) |
| Education |  | 162.32 |  | 104.50 |  | -105.06 |  | -91.55 |
|  |  | (118.30) |  | (87.51) |  | (181.17) |  | (147.14) |
| Baseline productivity |  | 0.45\*\*\* |  | 0.41\*\*\* |  | 0.32\*\*\* |  | 0.32\*\*\* |
| (first 6-week) |  | (0.06) |  | (0.05) |  | (0.06) |  | (0.06) |
| Baseline productivity |  | 0.05 |  | 0.06 |  | 0.14\* |  | 0.15\*\* |
| (second 6-week) |  | (0.05) |  | (0.05) |  | (0.05) |  | (0.05) |
| Constant | 6,333.20\*\*\* | 4,051.23\*\*\* | 4,812.30\*\*\* | 3,083.37\*\*\* | 7,639.20\*\*\* | 5,870.74\*\*\* | 5,742.59\*\*\* | 4,247.47\*\*\* |
|  | (468.87) | (416.00) | (346.98) | (304.98) | (283.91) | (394.36) | (209.45) | (309.00) |
|  | | | | | | | | |
|  |  | | | | | | | |

Note: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

### **Section D5 – Robustness checks with randomization inference.**

Since we do not have a large number of clusters (work groups), we also report the results using randomization inference over all the possible randomizations that could have occurred according to the design (Gerber & Green, 2012). We use the “ri2” R package for randomization inference, in a blocked-and-clustered design (Coppock, 2020). We change the random assignment declaration to accommodate the fact that clusters of work groups are assigned to treatment and control within seven separate production departments. The results were consistent.

***Worker productivity.***

In the six-week period of the experiment, workers who participated in weekly participatory meetings were significantly more productive than workers who had a weekly outside observer at their meeting. The difference is large in monetary terms, and is robust to different measures of productivity (refer to Table S7). Treatment workers earned 584.40 Yuan ($89) more than the control workers over the course of six weeks (*p* = 0.033). In addition, treatment workers produced 363.67 Yuan ($55) more goods in market value (measured by raw amount produced) than control workers (*p* = .036). Thus, participatory meetings increased productivity from both the workers’ and factory management’s perspective. These results are robust to using departmental fixed effects and baseline covariates.

***Long-term worker productivity.***

The productivity gains among workers in the participatory meetings condition relative to observer condition sustained for at least 6 weeks after the experiment, during which all workers returned to their previous regular morning meeting schedule without group discussion. The sustained gains were observed for both gross salary and raw amount produced. Workers who participated in participatory meetings earned 507.49 Yuan ($77.00) more than workers in the observer condition (*p* = 0.022). Furthermore, treatment workers produced 342.60 Yuan ($52.00) more goods in market value than control workers (*p* = 0.027). Again, results are robust to using departmental fixed effects and baseline covariates (see Table S7).

#### **Table S7**

#### Robustness Check – Randomization Inference

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | |
|  | Dependent variable | | | | | | | |
|  |  | | | | | | | |
|  | Experimental period | | | | Long term | | | |
|  | Gross salary | | Market value | | Gross salary | | Market value | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | | | | | | | | |
| Participatory meetings | 572.52\* | 584.40\* | 347.67+ | 363.67\* | 494.92\* | 507.49\* | 318.05+ | 342.60\* |
|  | (0.043) | (0.033) | (0.063) | (0.036) | (0.030) | (0.022) | (0.063) | (0.027) |
| Work experience |  | X |  | X |  | X |  | X |
| Education |  | X |  | X |  | X |  | X |
| Baseline productivity |  | X |  | X |  | X |  | X |
|  | | | | | | | | |
|  |  | | | | | | | |

Note: Numbers indicate estimated average treatment effects from randomization inference. Two-tailed p values are included in the parenthesis.  +*p* < 0.10; \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

### **Section D6 – Multiple Imputation**

#### **Table S8**

#### Robustness Check – Missing Value Multiple Imputation

|  |  |  |
| --- | --- | --- |
|  |  | |
|  | | | | | | | | |
|  | | | | Productivity per 6-week (in Chinese Yuan) | | | | |
|  | | | |  | | | | |
|  | | | |  | | | | |
|  | | | | Experimental period  (6 weeks during intervention) | | Long-term  (6 weeks post-intervention) | | |
|  | | | | (1) | (2) | (3) | | (4) |
|  | | | | | | | | |
| Participatory meetings | | | | 584.39\* | 621.03\*\* | 515.09\* | | 547.38\*\* |
|  | | | | (259.12) | (219.99) | (205.04) | | (171.53) |
| Work experience | | | |  | 47.73 |  | | 64.13\*\* |
|  | | | |  | (29.43) |  | | (23.71) |
| Education | | | |  | 145.44 |  | | -142.38 |
|  | | | |  | (118.27) |  | | (173.72) |
| Baseline productivity | | | |  | 0.41\*\*\* |  | | 0.24\*\*\* |
| (first 6-week period) | | | |  | (0.05) |  | | (0.05) |
| Baseline productivity | | | |  | 0.04 |  | | 0.10\* |
| (second 6-week period) | | | |  | (0.04) |  | | (0.04) |
| Departmental fixed effects | | | | YES | YES | YES | | YES |
| Constant | | | | 6,310.16\*\*\* | 4,115.85\*\*\* | 7,644.20\*\*\* | | 6,289.40\*\*\* |
|  | | | | (466.48) | (304.27) | (279.40) | | (296.80) |
| *N* (clusters) | | | | 65 | 65 | 65 | | 65 |
| *N* (individuals) | | | | 1611 | 1611 | 1611 | | 1611 |
| Control mean estimate | | | | 6320.64 | 6320.64 | 5612.07 | | 5612.07 |
|  | | | | | | | | |
|  | | | | | | | | |
| *Note:* | | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | | | | |

## **Section E – Survey materials**

**Table S9**

*Survey Items*

|  |  |  |
| --- | --- | --- |
| Category | Item | Repeated in survey wave 2 |
| Job satisfaction | All in all I am satisfied with my job | Yes |
|  | In general, I don’t like my job\* | Yes |
|  | I often think about quitting\* |  |
|  | I am looking for a new job\* |  |
|  | Being frustrated comes with this job\* | Yes |
| Sense of control | To what extent do you have control over what happens on your job? | Yes |
|  | I sometimes feel I am being pushed around in my life\* | Yes |
|  | There is really no way I can solve all the problems I have at work\* | Yes |
| Happiness and wellbeing | Did you experience happiness during a lot of the day yesterday? |  |
|  | All things considered, how satisfied are you with your life as a whole these days? | Yes |
| Sense of individuation | Most of the people on my group know my name. |  |
| Group attitudes | How do you like your coworkers? |  |
|  | How often do you socialize with your coworkers during work? |  |
|  | I feel I am really part of my group. | Yes |
|  | I have confidence and trust in my coworkers. | Yes |
|  | I like my group. |  |
|  | I feel that in the factory, everyone’s part of a big family. | Yes |
|  | I get involved to benefit my work group. |  |
|  | I help others in my work group learn about the work. |  |
|  | I assist others in my group with their work for the benefit of the group. |  |
|  | The work we do here is important to the factory |  |
| Felt care and respect | The factory (“the higher” as in Chinese) cares about and respects us. | Yes |
| Loneliness | Think about your good friend(s) in the factory, and list the number of people you can go to at the factory when you have problems because they will help you. (list #) |  |
|  | I feel lonely in this factory\* | Yes |
| Informational gain | How many different gestures or strategies are you aware of that you can use to do your task? |  |
|  | Do you know who to ask for if your machine needs fixing during the order switch? |  |
| Subjective productivity | I think my productivity has increased over the past month |  |

Note: Items are translated into Chinese and back-translated to English by two independent Chinese-English bilingual speakers. Most of the items were piloted with an independent group of workers. Asterisks signify items that are reverse coded.

#### **Table S10**

#### Descriptive Statistics for Survey Constructs

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Wave 1 | | | | Wave 2 | | | |
|  |  | Treatment | N | Control | N | Treatment | N | Control | N | |
| Individual  empower-ment | Job satisfaction | 4.473 (0.340) | 665 | 4.286 (0.345) | 685 | 4.062 (0.294) | 685 | 3.842 (0.309) | 640 | |
| Happiness and well-being | 4.075 (0.329) | 665 | 3.945 (0.493) | 659 | 3.947 (0.254) | 686 | 3.836 (0.188) | 642 | |
| Sense of control | 3.966 (0.321) | 664 | 3.681 (0.302) | 658 | 3.775 (0.326) | 682 | 3.528 (0.393) | 636 | |
| Group  empower-  ment | Group attitudes | 4.657 (0.222) | 666 | 4.533 (0.313) | 659 | 4.192 (0.266) | 685 | 4.117 (0.531) | 639 | |
| Loneliness | 2.989 (0.476) | 661 | 3.296 (0.445) | 652 | 3.081 (0.482) | 682 | 3.238 (0.405) | 639 | |
| Perceived respect | 3.601 (0.411) | 659 | 3.087 (0.623) | 654 | 3.420 (0.403) | 683 | 3.088 (0.574) | 634 | |
| Man. check | Frequency of communication | 2.597 (0.253) | 663 | 2.388 (0.261) | 660 | 2.454 (0.201) | 685 | 2.233 (0.322) | 639 | |
|  | Subjective productivity | 4.56  (0.47) | 686 | 4.45  (0.40) | 663 | N/A | N/A | N/A | N/A | |

**Table S11**

*Average Treatment Effects on Attitudinal Outcomes in Survey Wave 1, Measured One Week After the Experiment*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
|  | Dependent variable: | | | | | |
|  |  | | | | | |
|  |  | | | | | |
|  | Individual empowerment | | | Group empowerment | | |
|  | Job  satisfaction | Sense of control | Well-being | Group  attitudes | Loneliness | Perceived  respect |
|  | | | | | | |
| Participatory meetings | 0.17\* | 0.25\*\*\* | 0.16 | 0.14\* | -0.33\*\* | 0.50\*\*\* |
|  | (0.08) | (0.06) | (0.08) | (0.07) | (0.10) | (0.13) |
| Male | -0.37\* | 0.003 | -0.68\*\*\* | -0.37\*\* | 0.24 | -0.65\*\*\* |
|  | (0.15) | (0.13) | (0.16) | (0.12) | (0.20) | (0.19) |
| Single | -0.10 | 0.15 | -0.66\*\* | -0.46\*\* | 0.02 | -0.13 |
|  | (0.23) | (0.23) | (0.26) | (0.17) | (0.33) | (0.32) |
| Number of children | -0.02 | -0.06 | 0.09 | 0.08 | 0.08 | 0.16\* |
|  | (0.04) | (0.05) | (0.07) | (0.04) | (0.08) | (0.08) |
| Children in city | 0.05 | 0.07 | 0.34\*\*\* | 0.23\*\*\* | -0.21 | 0.29\* |
|  | (0.09) | (0.07) | (0.09) | (0.05) | (0.14) | (0.12) |
| Country origin | -0.01 | -0.15 | 0.23 | 0.11 | -0.30 | 0.33 |
|  | (0.21) | (0.19) | (0.22) | (0.11) | (0.32) | (0.27) |
| Departmental fixed effects | YES | YES | YES | YES | YES | YES |
| Constant | 4.34\*\*\* | 3.68\*\*\* | 3.45\*\*\* | 4.20\*\*\* | 3.66\*\*\* | 2.42\*\*\* |
|  | (0.28) | (0.20) | (0.28) | (0.14) | (0.40) | (0.34) |
| *N* (clusters) | 65 | 65 | 65 | 65 | 65 | 65 |
| *N* (individuals) | 1350 | 1348 | 1350 | 1351 | 1339 | 1339 |
| Control mean estimate | 4.28 | 3.68 | 3.92 | 4.54 | 3.31 | 3.11 |
|  | | | | | | |
|  | | | | | | |
| Note: | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | | | | | |

**Table S12**

*Average Treatment Effects on Attitudinal Outcomes in Survey Wave 2, Measured Four Weeks After the Experiment*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
|  | Dependent variable: | | | | | |
|  |  | | | | | |
|  |  | | | | | |
|  | Individual empowerment | | | Group empowerment | | |
|  | Job  satisfaction | Sense of control | Well-being | Group  attitudes | Loneliness | Perceived  respect |
|  | | | | | | |
| Participatory meetings | 0.22\*\*\* | 0.26\*\* | 0.07 | -0.16 | 0.07 | 0.35\*\* |
|  | (0.07) | (0.08) | (0.05) | (0.09) | (0.07) | (0.11) |
| Male | -0.28 | 0.18 | 0.04 | -0.07 | -0.29\* | -0.37\* |
|  | (0.15) | (0.17) | (0.07) | (0.20) | (0.13) | (0.19) |
| Single | -0.16 | -0.08 | -0.19 | 0.93\* | -0.55\* | -0.32 |
|  | (0.24) | (0.30) | (0.17) | (0.40) | (0.27) | (0.34) |
| Number of children | 0.01 | -0.04 | 0.03 | -0.05 | 0.11\* | 0.09 |
|  | (0.05) | (0.05) | (0.04) | (0.09) | (0.05) | (0.07) |
| Children in city | 0.09 | -0.05 | 0.14\* | -0.36\*\*\* | 0.27\*\* | 0.19 |
|  | (0.08) | (0.10) | (0.06) | (0.11) | (0.09) | (0.12) |
| Country origin | -0.06 | -0.33 | 0.20 | 0.16 | 0.02 | -0.12 |
|  | (0.21) | (0.23) | (0.11) | (0.18) | (0.16) | (0.26) |
| Departmental fixed effects | YES | YES | YES | YES | YES | YES |
| Constant | 3.84\*\*\* | 3.72\*\*\* | 3.58\*\*\* | 3.45\*\*\* | 3.81\*\*\* | 2.86\*\*\* |
|  | (0.22) | (0.27) | (0.14) | (0.28) | (0.18) | (0.35) |
| *N* (clusters) | 65 | 65 | 65 | 65 | 65 | 65 |
| *N* (individuals) | 1346 | 1339 | 1349 | 1345 | 1342 | 1338 |
| Control mean estimate | 3.85 | 3.53 | 3.52 | 4.08 | 3.25 | 3.11 |
|  | | | | | | |
|  | | | | | | |
| Note: | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | | | | | |

## **Section F – Survey Robustness Check**

### **Section F1 - Survey robustness checks including new workers.**

***Survey results.***

*Attitudes: Individual and group empowerment.* Workers assigned to the participatory meetings reported more individual and group empowerment. For the loose group of measures designated as individual empowerment, treatment workers reported significantly more positive attitudes, including more job satisfaction (MPM = 4.05, SD = 0.29; MO = 3.84, SD = 0.25; β = 0.21, CI = [0.08, 0.33], SE = 0.06, *p* = .001), and more sense of control at work (MPM = 3.77, SD = 0.32; MO = 3.56, SD = 0.35; β = 0.25, CI = [0.09, 0.41], SE = 0.08, *p* = .002), compared with workers in the observer condition. One exception was happiness and well-being, where there was no difference between treatment (MPM = 3.91, SD = 0.21) and control workers (MO = 3.84, SD = 0.18, p = 0.06).

Workers in participatory meetings expressed more favorable attitudes toward their work group, including affiliation with the group and trust and confidence in group members, than workers in the observer condition (MPM = 4.68, SD = 0.23; MO = 4.55, SD = 0.30; β = 0.13, CI = [0.01, 0.26], SE = 0.07, p = 0.042). Treatment workers also felt less lonely (MPM = 2.98, SD = 0.45; MO = 3.32, SD = 0.34; β = -0.33, CI = [-0.52, -0.14], SE = 0.10, p < .001) and reported that the factory cared about and respected them to a greater extent than workers in the observer condition (MPM = 3.65, SD = 0.41; MO = 3.11, SD = 0.61; β = 0.53, CI = [0.29, 0.78], SE = 0.13, p < .001).

*Longitudinal attitude change.* In the second wave of the survey four weeks after the end of participatory meetings, we repeated the manipulation check question. Even though they no longer participated in participatory meetings, workers in the participatory meetings condition reported more frequent discussion with group members about how to do their job well than did the control workers (MPM = 2.44, SD = 0.20; MO = 2.22, SD = 0.27; β = 0.22, CI = [0.12, 0.32], SE = 0.05, *p* < .001).

Just as they did in Wave 1, workers assigned to participatory meetings reported higher job satisfaction (MPM = 4.05, SD = 0.29; MO = 3.84, SD = 0.25; β = 0.21, CI = [0.08, 0.34], SE = 0.06, p = .001), and more sense of control at work (MPM = 3.77, SD = 0.32; MO = 3.56, SD = 0.35; β = 0.25, CI = [0.09, 0.41], SE = 0.08, p = .002) compared to control workers. Again, there was no difference in reported happiness and well-being between treatment (MPM = 3.91, SD = 0.21) and control workers (MO = 3.84, SD = 0.18; p = 0.11).

Treatment workers continued to feel that the factory cared about and respected them (MPM = 3.47, SD = 0.39) to a greater extent than the control workers did (MO = 3.13, SD = 0.55; β = 0.38, CI = [0.17, 0.58], SE = 0.11, *p* < .001). Though treatment workers expressed more favorable attitudes toward group life and felt less lonely in Wave 1, by Wave 2 there was no difference in attitudes toward their work groups (MPM = 4.19, SD = 0.28; MO = 4.10, SD = 0.32; β = 0.07, CI = [-0.07, 0.21], SE = 0.07, *p* = 0.31) or feelings of loneliness (MPM = 3.10, SD = 0.46; MO = 3.24, SD = 0.39; β = -0.16, CI = [-0.33, 0.02], SE = 0.09, *p* = .075).

### **Section F2 – Survey robustness checks for missing value imputation.**

As a robustness check, if a worker skipped a certain question, we replace the missing response with the mean sample score of the corresponding survey item, and report the survey results with missing value imputation. The results were consistent with those from the main text.

***Survey results.***

*Attitudes: Individual and group empowerment.* Workers assigned to the participatory meetings reported more individual and group empowerment. For the loose group of measures designated as individual empowerment, treatment workers reported significantly more positive attitudes, including more job satisfaction (MPM = 4.46, SD = 0.29; MO = 4.29, SD = 0.28; β = 0.16, CI = [0.03, 0.29], SE = 0.06, *p* = .013), and more sense of control at work (MPM = 3.94, SD = 0.26; MO = 3.70, SD = 0.27; β = 0.24, CI = [0.14, 0.34], SE = 0.05, *p* < .001), compared with workers in the observer condition. One exception was happiness and well-being, where there was no difference between treatment (MPM = 4.06, SD = 0.27) and control workers (MO = 3.93, SD = 0.34, p = 0.052).

Workers in participatory meetings expressed more favorable attitudes toward their work group, including affiliation with the group and trust and confidence in group members, than workers in the observer condition (MPM = 4.66, SD = 0.18; MO = 4.55, SD = 0.26; β = 0.11, CI = [0.01, 0.22], SE = 0.05, p = 0.029). Treatment workers also felt less lonely (MPM = 3.02, SD = 0.41; MO = 3.28, SD = 0.39; β = -0.25, CI = [-0.41, -0.09], SE = 0.08, p = .002) and reported that the factory cared about and respected them to a greater extent than workers in the observer condition (MPM = 3.56, SD = 0.35; MO = 3.15, SD = 0.54; β = 0.40, CI = [0.21, 0.59], SE = 0.10, p < .001).

*Longitudinal attitude change.* In the second wave of the survey four weeks after the end of participatory meetings, we repeated the manipulation check question. Even though they no longer participated in participatory meetings, workers in the participatory meetings condition reported more frequent discussion with group members about how to do their job well than did the control workers (MPM = 2.44, SD = 0.17; MO = 2.25, SD = 0.24; β = 0.18, CI = [0.09, 0.27], SE = 0.04, *p* < .001).

Just as they did in Wave 1, workers assigned to participatory meetings reported higher job satisfaction (MPM = 4.05, SD = 0.26; MO = 3.87, SD = 0.22; β = 0.18, CI = [0.08, 0.27], SE = 0.05, p < .001), and more sense of control at work (MPM = 3.76, SD = 0.27; MO = 3.55, SD = 0.34; β = 0.22, CI = [0.09, 0.41], SE = 0.06, *p* < .001) compared to control workers. Again, there was no difference in reported happiness and well-being between treatment (MPM = 3.90, SD = 0.18) and control workers (MO = 3.85, SD = 0.18; *p* = 0.15).

Treatment workers continued to feel that the factory cared about and respected them (MPM = 3.40, SD = 0.36) to a greater extent than the control workers (MO = 3.14, SD = 0.51; β = 0.26, CI = [0.09, 0.43], SE = 0.09, *p* = .002). Even though treatment workers expressed more favorable attitudes toward group life and felt less lonely in Wave 1, by Wave 2 there was no difference in attitudes toward their groups (MPM = 4.18, SD = 0.24; MO = 4.09, SD = 0.28; β = 0.09, CI = [-0.02, 0.21], SE = 0.06, *p* = 0.11) or feelings of loneliness (MPM = 3.09, SD = 0.42; MO = 3.23, SD = 0.29; β = -0.13, CI = [-0.28, 0.01], SE = 0.07, *p* = .074).

### **Section F3 – Survey robustness checks with randomization inference**

**Table S13**

*Survey Wave 1 Randomization Inference*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
|  | Dependent variable: | | | | | |
|  |  | | | | | |
|  |  | | | | | |
|  | Individual empowerment | | | Group empowerment | | |
|  | Job  Satis. | Control | Well  Being | Group  Attitudes | Affiliation | Perceived  Respect |
|  | | | | | | |
| Participatory meeting | 0.19\* | 0.29\*\*\* | 0.15 | 0.13 | 0.32\*\*\* | 0.48\*\*\* |
|  | (0.017) | (0.001) | (0.072) | (0.08) | (0.001) | (0.001) |
| Department fixed effects | YES | YES | YES | YES | YES | YES |
|  |
|  | | | | | | |
|  | | | | | | |

Note: Numbers indicate estimated average treatment effects from randomization inference. Two-tailed p values are included in the parenthesis.  +*p* < 0.10; \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

**Table S14**

*Survey Wave 2 Randomization Inference*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
|  | Dependent variable: | | | | | |
|  |  | | | | | |
|  |  | | | | | |
|  | Individual empowerment | | | Group empowerment | | |
|  | Job  Satis. | Control | Well  Being | Group  Attitudes | Affiliation | Perceived  Respect |
|  | | | | | | |
| Participatory meeting | 0.22\*\* | 0.25\*\* | 0.07 | 0.11 | 0.17 | 0.30\*\* |
|  | (0.002) | (0.006) | (0.097) | (0.22) | (0.088) | (0.004) |
| Department fixed effects | YES | YES | YES | YES | YES | YES |
|  |
|  | | | | | | |
|  | | | | | | |

Note: Numbers indicate estimated average treatment effects from randomization inference. Two-tailed p values are included in the parenthesis.  +*p* < 0.10; \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

## **Section G – Working Hour Results**

A workday for the factory workers starts at 8am and ends at 5pm, with a 1-hour lunch break and 45-minute dinner break. Workers are allowed to work overtime for at most 3 hours during workdays (except Saturday).

There was no difference of normal working hours between treatment workers and control workers both during the intervention (MPM = 219.03, SD = 23.14; MO = 221.77, SD = 19.33) and 6 weeks after the intervention (MPM = 225.10, SD = 40.00; MP = 224.90, SD = 39.71).

**Table S15**

*Results for Working Hours*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
|  | Dependent variable: | | | |
|  |  | | | |
|  |  | | | |
|  | During intervention | | Long term | |
|  | | | | |
| Participatory meetings | -1.749 |  | 0.951 |  |
|  | (0.912) |  | (2.606) |  |
| Work experience | 0.345 |  | 2.378\*\*\* |  |
|  | (0.208) |  | (0.451) |  |
| Education | 0.224 |  | -5.278 |  |
|  | (1.751) |  | (5.072) |  |
| Baseline work hours | 0.067\*\*\* |  | 0.130\*\*\* |  |
| (first 6-week) | (0.019) |  | (0.036) |  |
| Baseline work hours | -0.018\* |  | 0.005 |  |
| (second 6-week) | (0.008) |  | (0.020) |  |
| Department fixed effects | YES |  | YES |  |
| Constant | 184.532\*\*\* |  | 176.399\*\*\* |  |
|  | (6.376) |  | (12.669) |  |
| Note: |  | | | |

## **Section I. Main Results Tables.**

**Table S16**

*Summary Statistics for RA Reports for Participatory Meetings*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Six week ave. |
| % time spent in problem solving | 22.75 (21.06) | 35.13 (20.74) | 44.97 (17.90) | 42.84 (17.52) | 60.33 (17.86) | 56.69 (21.59) | 43.49 (22.97) |
|  |  |  |  |  |  |  |  |
| Problem solving rating (1-4) | 1.83 (0.91) | 2.13 (0.63) | 2.23 (0.63) | 2.52 (0.81) | 3.73 (1.28) | 3.38 (1.20) | 2.62 (1.15) |
|  |  |  |  |  |  |  |  |
| % time spent in general discussion | 29.22 (18.68) | 21.20 (14.88) | 24.97 (11.96) | 20.03 (10.82) | 17.87 (9.77) | 18.21 (11.02) | 21.99 (13.66) |
|  |  |  |  |  |  |  |  |
| General work voice rating (1-4) | 1.70 (0.70) | 1.97 (0.72) | 1.93 (0.69) | 1.84 (0.78) | 1.97 (0.76) | 1.54 (0.58) | 1.83 (0.72) |
|  |  |  |  |  |  |  |  |
| % time spent in nonproduction discussion | 11.90 (13.40) | 11.20 (16.54) | 4.17 (8.21) | 5.77 (9.83) | 3.23 (5.69) | 5.92 (11.96) | 7.05 (11.80) |
|  |  |  |  |  |  |  |  |
| Nonwork voice rating (1-4) | 1.87 (1.41) | 2.03 (1.13) | 1.63 (0.93) | 1.71 (0.97) | 2.03 (1.22) | 1.46 (0.65) | 1.80 (1.09) |
|  |  |  |  |  |  |  |  |
| Interference (1-3) | 2.00 (0.82) | 1.65 (0.63) | 1.63 (0.72) | 1.48 (0.51) | 1.48 (0.64) | 1.71 (0.62) | 1.65 (0.67) |
|  |  |  |  |  |  |  |  |
| Scold (1-3) | 1.28 (0.54) | 1.50 (0.65) | 1.33 (0.55) | 1.21 (0.41) | 1.33 (0.55) | 1.29 (0.55) | 1.32 (0.54) |
| Encouragement (1-3) | 1.53 (0.73) | 1.23 (0.43) | 1.27 (0.52) | 1.10 (0.30) | 1.13 (0.43) | 1.04 (0.20) | 1.22 (0.49) |

**Table S17**

*Individual Quitting in the First 12 Weeks After the Experiment*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | -0.14 | 0.45 | -0.31 | 0.76 |
| Participatory meetings | -0.52 | 0.15 | -3.54 | 0.0004 |
| Education | 0.44 | 0.25 | 1.77 | 0.08 |
| Work experience | -0.13 | 0.04 | -3.47 | 0.0005 |
| Baseline productivity | -0.0003 | 5.7x10-5 | -5.20 | 2.0x10-7 |
| (first 6-week period) |  |  |  |  |
| Baseline productivity 2 | -0.0001 | 5.1x10-5 | -2.03 | 0.04 |
| (second 6-week period) |  |  |  |  |

Note: Logistic regression with clustered standard error.

**Table S18**

*Relationship Between Group Quitting Rate and Group Productivity*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 5211.72 | 1191.98 | 4.37 | 0.0003 |
| Quitting | -2279.22 | 7851.96 | -0.29 | 0.77 |
| Treatment | 615.20 | 519.95 | 1.18 | 0.25 |
| Quitting x Treatment | -1722.75 | 10401.40 | -0.17 | 0.87 |
| Baseline productivity | -0.12 | 0.29 | -0.42 | 0.68 |
| (first 6-week period) |  |  |  |  |
| Baseline productivity 2 | 0.22 | 0.25 | 0.88 | 0.39 |
| (second 6-week period) |  |  |  |  |

**Table S19**

*Relationship Between Unit Price and Worker Productivity*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 4122.97 | 445.37 | 9.26 | < 2.2x10-16 |
| Unit price | -48.73 | 91.05 | -0.54 | 0.59 |
| Treatment | 572.54 | 398.00 | 1.44 | 0.15 |
| Work experience | 40.45 | 29.33 | 1.38 | 0.17 |
| Education | 181.16 | 119.21 | 1.52 | 0.13 |
| Baseline productivity | 0.45 | 0.06 | 7.85 | 8.2x10-15 |
| (first 6-week period) |  |  |  |  |
| Baseline productivity 2 | 0.05 | 0.05 | 0.95 | 0.34 |
| (second 6-week period) |  |  |  |  |
| Unit price x Treatment | 7.33 | 111.62 | 0.07 | 0.95 |

Effects after 9 weeks by Unit price, Interaction Term. Linear regression with clustered standard errors.

**Table S20**

*Self-Reported Informational Difference Between Treatment and Control Workers*

|  |  |  |
| --- | --- | --- |
|  | | |
|  | Dependent variable: Information | |
|  |  | |
|  |  | |
|  | Gestures | Machines |
|  | | |
| Participatory meetings | 0.065 | 0.538 |
|  | (0.109) | (0.374) |
| Gender | 0.292 | -0.308 |
|  | (0.226) | (0.580) |
| Marital status | -0.257 | -0.123 |
|  | (0.212) | (1.055) |
| No. children | -0.071 | -0.496\*\* |
|  | (0.051) | (0.184) |
| Lo. children | 0.044 | 0.377 |
|  | (0.129) | (0.426) |
| Rural | -0.113 | -14.688\*\*\* |
|  | (0.258) | (0.349) |
| Departmental fixed effects | YES | YES |
| Constant | 2.059\*\*\* | 18.559\*\*\* |
|  | (0.298) | (0.766) |
|  | | |
|  | | |
| Note: | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | |

Treatment and control workers reported similar levels of information and knowledge on work strategies.

**Table S21**

*Group Level Problem Solving Does Not Predict Group Productivity During Intervention*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 672.87 | 99.60 | 6.76 | 2.23x10-10 |
| Problem solving | 14.87 | 14.09 | 1.06 | 0.29 |
| Baseline productivity | 0.47 | 0.07 | 6.59 | 5.42x10-10 |

Group level information ratings were used to predict group productivity over the time course of the intervention using weekly time lag regressions on each week’s rating.

**Table S22**

*Averaged Group Level Problem Solving Does Not Predict Group Productivity Post Intervention*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 6695.67 | 1399.60 | 4.78 | 8.9x10-5 |
| Problem solving | -655.31 | 339.62 | -1.93 | 0.07 |
| Baseline productivity | 0.42 | 0.18 | 2.30 | 0.03 |

Averaged group level information ratings were used to predict post-treatment group productivity using regressions that averaged RA ratings over the entire intervention period.

**Table S23**

*No Treatment Difference in* *Group Level Variation in Productivity*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 1180.31 | 173.43 | 6.81 | 6.7x10-9 |
| Participatory meetings | 74.33 | 115.06 | 0.65 | 0.52 |

mean *SD*: *MPM* = 1512.27, *SD* = 547.01; *MO* = 1449.79, *SD* = 385.96; *p* = 0.52

**Table S24**

*Treatment Difference in Individual Level Variation in Productivity*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 56.13 | 4.46 | 12.57 | < 2.2x10-16 |
| Participatory meetings | -5.72 | 2.09 | -2.74 | 0.01 |
| Work experience | 0.60 | 0.27 | 2.24 | 0.03 |
| Education | 0.69 | 1.16 | 0.60 | 0.55 |
| Baseline productivity | 0.06 | 0.05 | 1.31 | 0.19 |

mean *SD*: *MPM* = 64.21, *SD* = 12.70; *MO* = 68.65, *SD* = 15.05;

**Table S25**

*Relationship Between Goals and Productivity*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 745.35 | 72.71 | 10.25 | < 2.2x10-16 |
| Goal | 0.02 | 0.01 | 1.43 | 0.15 |
| Baseline productivity | 0.50 | 0.03 | 19.69 | < 2.2x10-16 |

**Table S26**

*Relationship Between Weekly Goal Changes and the Following Week’s Productivity*

|  | **Estimate** | **Std. Error** | ***t*** | ***p*** |
| --- | --- | --- | --- | --- |
| Intercept | 2.22 | 13.99 | 0.16 | 0.87 |
| Changes in Goals | 0.05 | 0.03 | 1.67 | 0.09 |
| Baseline productivity | 0.49 | 0.03 | 13.89 | < 2.2x10-16 |

Note: Treatment workers’ goals did not rise significantly from week to week (*τ* = -13.40, *p* < 0.01), using an augmented Dickey-Fuller joint probability test of the distribution of their actual goals against a non-stationary stochastic distribution of goals over time. The change in goal content from week to week also did not predict worker productivity within the treatment condition (*p* = 0.09).

**Table S27**

*Group Level Voice Ratings Predict Group Productivity During Intervention*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | |
|  | *Dependent variable:* | | | | | | |
|  |  | | | | | | |
|  | Productivity (Model 1) | | | | | | |
|  | (1) | (2) | (3) | (4) | (5) |  |  |
|  | | | | | | | |
|  |  |  |  |  |  | |  |
| Voice-production | 58.274\* |  |  |  |  | |  |
|  | (23.523) |  |  |  |  | |  |
| Voice-nonproduction |  | 31.732\* |  |  |  | |  |
|  |  | (15.139) |  |  |  | |  |
| Supervisor interruption |  |  | -57.426\* |  |  | |  |
|  |  |  | (25.751) |  |  | |  |
| Supervisor encouragement |  |  |  | 65.752\* |  | |  |
|  |  |  |  | (32.931) |  | |  |
| Supervisor scolding |  |  |  |  | -4.328 | |  |
|  |  |  |  |  | (31.785) | |  |
| Baseline productivity | 0.418\*\*\* | 0.422\*\*\* | 0.455\*\*\* | 0.442\*\*\* | 0.464\*\*\* | |  |
|  | (0.069) | (0.070) | (0.072) | (0.069) | (0.073) | |  |
| Departmental fixed effects | YES | YES | YES | YES | YES | |  |
| Constant | 641.726\*\*\* | 689.856\*\*\* | 826.845\*\*\* | 654.381\*\*\* | 748.700\*\*\* | |  |
|  | (92.458) | (88.335) | (102.464) | (93.505) | (106.597) | |  |
|  | | | | | | | |
|  | | | | | | | |
| *Note:* | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | | | | | | |

Group level voice ratings were used to predict group productivity over the time course of the intervention using weekly time lag regressions on each week’s rating.

**Table S28**

*Averaged Group Level Voice Ratings Predict Group Productivity Post Intervention*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | |
|  | *Dependent variable:* | | | | | | | | |
|  |  | | | | | | | | |
|  | Productivity (Model 2) | | | | | | | | |
|  | (1) | | (2) | (3) | (4) | | (5) |  |  |
|  | | | | | | | | | |
|  |  |  | |  |  |  | | |  |
| Voice-production | 769.063\* |  | |  |  |  | | |  |
|  | (279.470) |  | |  |  |  | | |  |
| Voice-nonproduction |  | 443.929\* | |  |  |  | | |  |
|  |  | (222.887) | |  |  |  | | |  |
| Supervisor interruption |  |  | | -198.271+ |  |  | | |  |
|  |  |  | | (359.156) |  |  | | |  |
| Supervisor encouragement |  |  | |  | 1,739.604\*\* |  | | |  |
|  |  |  | |  | (568.500) |  | | |  |
| Supervisor scolding |  |  | |  |  | -663.197 | | |  |
|  |  |  | |  |  | (661.618) | | |  |
| Baseline productivity | 0.538\*\* | 0.506\*\* | | 0.569\*\* | 0.528\*\* | 0.602\*\* | | |  |
|  | (0.156) | (0.169) | | (0.179) | (0.151) | (0.178) | | |  |
| Departmental fixed effects | YES | YES | | YES | YES | YES | | |  |
| Constant | 3,183.878\*\* | 3,976.597\*\*\* | | 4,827.165\*\*\* | 2,722.698\* | 5,310.315\*\*\* | | |  |
|  | (937.791) | (896.306) | | (1,040.875) | (976.541) | (1,175.679) | | |  |
|  | | | | | | | | | |
| *Note:* | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | | | | | | | | |

Averaged group level voice ratings were used to predict post-treatment group productivity using regressions that averaged RA ratings over the entire intervention period.

**Table S29**

*Comparing Weekly Productivity Following the End of the Intervention—Significant Difference Sustained Until 9 Weeks Post-Treatment*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | | | |
|  | *Dependent variable:* | | | | | | | | | | | |
|  |  | | | | | | | | | | | |
|  |  | | | | | | | | | | | |
|  | Week 7 | | Week 8 | | Week 9 | | Week 10 | | Week 11 | | Week 12 | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|  | | | | | | | | | | | | |
| Participatory meetings | 82.9\* | 96.8\* | 80.0+ | 87.7\* | 75.7\* | 67.1+ | 62.4 | 65.4 | 14.5 | 32.1 | 51.8 | 56.2 |
|  | (42.1) | (43.2) | (43.3) | (40.1) | (37.7) | (36.6) | (40.7) | (37.9) | (51.9) | (43.4) | (49.5) | (43.9) |
| Work experience |  | 3.3 |  | -18.3 |  | 2.2 |  | 22.4 |  | 4.6 |  | -26.4 |
|  |  | (27.8) |  | (29.9) |  | (22.3) |  | (23.5) |  | (34.4) |  | (35.1) |
| Education |  | -2.9 |  | -1.4 |  | -0.2 |  | 3.2 |  | -3.3 |  | -3.3 |
|  |  | (7.6) |  | (5.4) |  | (4.1) |  | (4.8) |  | (5.6) |  | (5.4) |
| Baseline productivity |  | 0.03\*\* |  | 0.1\*\*\* |  | 0.04\*\*\* |  | 0.04\*\* |  | 0.03\* |  | 0.1\*\*\* |
| (1st 6-week) |  | (0.01) |  | (0.01) |  | (0.01) |  | (0.01) |  | (0.01) |  | (0.01) |
| Baseline productivity |  | 0.01 |  | 0.03\*\* |  | 0.03\*\*\* |  | 0.04\*\*\* |  | 0.1\*\*\* |  | 0.03\* |
| (2nd 6-week) |  | (0.01) |  | (0.01) |  | (0.01) |  | (0.01) |  | (0.01) |  | (0.01) |
| Department fixed effects | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Constant | 1,246.4\*\*\* | 1,055.3\*\*\* | 1,262.4\*\*\* | 1,052.0\*\*\* | 1,323.8\*\*\* | 1,069.0\*\*\* | 1,567.5\*\*\* | 1,352.6\*\*\* | 1,143.9\*\*\* | 982.7\*\*\* | 945.8\*\*\* | 666.5\*\*\* |
|  | (38.1) | (72.3) | (73.1) | (84.7) | (52.1) | (70.2) | (95.3) | (126.4) | (129.2) | (134.7) | (71.1) | (82.4) |
|  | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| *Note:* | \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 | | | | | | | | | | | |

**Table S30**

*Comparison of Treatment Effects on Daily Piece Rate And Total Output During the Six-Week Experiment Period*

*(in Chinese Yuan)*

Output per hour Total output

(Piece rate) (Gross salary)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
| Participatory meetings | 0.65+ | 0.70\* | 584.39\* | 592.30\*\* |
|  | (0.37) | (0.32) | (259.12) | (229.31) |
| Work experience |  | 0.08\* |  | 42.87 |
|  |  | (0.03) |  | (30.78) |
| Education |  | 0.09 |  | 184.19 |
| Baseline piece rate |  | (0.16)  0.48\*\*\* |  | (118.97)  0.44\*\*\* |
|  |  | (0.04) |  | (0.06) |
| Departmental fixed effects Constant | YES  13.82\*\*\* | YES  8.22\*\*\* | YES  6,310.16\*\*\* | YES  4,043.36\*\*\* |
|  | (0.87) | (0.58) | (466.48) | (411.36) |
| *N* (clusters) | 65 | 65 | 65 | 65 |
| *N* (individuals) | 1611 | 1490 | 1611 | 1490 |
| Control mean estimate | 13.38 | 13.41 | 6320.64 | 6455.84 |
| x |  |  |  |  |

Note: The comparison condition to the participatory meetings is the control-observer condition. Models include full-time sewing workers paid by piece-rates. Supervisors (*N* = 65) and staff members (*N* = 76) whose productivity cannot be determined by gross salary were excluded in the productivity data analysis. See Table S8 for substantively and statistically consistent results using missing data imputation to account for those who did not provide demographic information or who left their positions. + p < .1; \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

**Table S31**

Attitudinal Changes with Pooled Wave 1 and Wave 2 Survey Data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
|  | *Dependent variable:* | | | | | |
|  |  | | | | | |
|  |  | | | | | |
|  | Job  Satisfaction | Sense of  Control | Well  Being | Group  Attitudes | Affiliation | Perceived  Respect |
|  | | | | | | |
| Participatory meetings | 0.172\* | 0.269\*\*\* | 0.175\* | 0.142\* | 0.338\*\* | 0.501\*\*\* |
|  | (0.083) | (0.069) | (0.083) | (0.066) | (0.103) | (0.129) |
| Survey wave | -0.451\*\*\* | -0.144\* | -0.104 | -0.430\*\*\* | -0.064 | -0.015 |
|  | (0.053) | (0.058) | (0.068) | (0.038) | (0.059) | (0.077) |
| Treatment x Survey wave | 0.047 | -0.022 | -0.117 | -0.072 | -0.186\* | -0.158 |
|  | (0.079) | (0.077) | (0.089) | (0.052) | (0.087) | (0.107) |
| Demographic controls | YES | YES | YES | YES | YES | YES |
| Departmental fixed effects | YES | YES | YES | YES | YES | YES |
| Constant | 4.312\*\*\* | 3.763\*\*\* | 3.557\*\*\* | 4.221\*\*\* | 3.597\*\*\* | 2.635\*\*\* |
|  | (0.222) | (0.197) | (0.191) | (0.131) | (0.303) | (0.319) |
| *N* (clusters) | 65 | 65 | 65 | 65 | 65 | 65 |
| *N* (observations) | 2912 | 2912 | 2912 | 2912 | 2912 | 2912 |
| Control mean estimate | 4.099 | 3.644 | 3.913 | 4.349 | 3.250 | 3.128 |
|  | | | | | | |
|  | | | | | | |
|  |  | | | | | |

Note: The comparison condition to the participatory meetings is the control-observer condition. Survey wave is a dummy variable where 0 = survey wave 1 and 1 = survey wave 2.

\**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

## **Section H – Pilot Studies and Archival Analysis**

**Pilot Study**

**Sample and Method**

One year prior to the main experiment, we conducted qualitative field observation in the factory (in another independent branch) for one month, and then conducted a pilot experiment with seven treatment groups from different departments (*N* = 145 workers), all selected by the factory. The pilot experiment had two goals: 1) observe how our translation of Lewinian participatory meeting structure would be experienced by different kinds of work groups at the factory, and 2) collect salary data before and after the participatory meeting trial run, to address factory management’s concerns that a change in the status quo meeting structure could hamper productivity.

Instead of holding six weekly meetings as planned for the main field experiment, the pilot study held four total weekly participatory meetings over the course of one month. The participatory meeting procedure was similar to the method described above. Our only dependent variable for the pilot study was workers’ productivity.

**Pilot Results**

We compared productivity for workers in the seven groups that were (non-randomly) assigned to the participatory meetings to the productivity of workers in all remaining factory work groups who did not hold participatory meetings (*N* = 140 groups from 19 departments, or 2,202 workers), over the course of one month. Pre-treatment productivity between these two conditions was not significantly different, *p* = 0.30 (see Table S30).

The balance test showed there was no significant difference between workers assigned to the treatment participatory meetings and all the other factory workers for pre-treatment productivity in terms of salary.

**Table S32**

*Pilot Balance Test*

|  |  |
| --- | --- |
|  | |
|  | Condition assignment |
|  | |
| Baseline productivity | -0.0001 |
| (1 month prior) | (0.0001) |
| Baseline productivity | 0.00001 |
| (2 months prior) | (0.0001) |
|  |  |
| Constant | -0.743 |
|  | (0.756) |
|  | |
|  | |
| Note: | \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001. |

We did not find any evidence that the participatory meetings decreased productivity (our partnering factory’s main concern). By contrast, we found a statistically significant increase in monthly worker productivity among the workers in the pilot participatory meetings condition (*β* = 35.78, Robust *SE* = 1.39, *CI* = [18.17, 53.39], *p* = .025; measured by piece rate salary, see main experiment Method for detail), controlling for productivity during the month prior to the treatment. This productivity increase translates to 35.78 Yuan ($5.76), extra earned for the month, or 0.73% more earnings for the workers who were in the four participatory meetings over the course of the month. This difference is estimated to be stronger when an additional month’s pre-treatment productivity is covaried, as pre-registered (Table S31).

**Table S33**

*Pilot study Results. Participation in Pilot Participatory Meetings Increased Workers’ Productivity (Yuan).*

|  |  |  |
| --- | --- | --- |
| Productivity (in Yuan) | (1) | (2) |
|  |
|  |  |  |
| Participatory meetings | 35.78\* | 49.08\* |
|  | (1.39) | (3.27) |
| Baseline productivity | 0.46\* | 0.430\*\* |
| (1 month prior) | (0.0082) | (0.0027) |
| Baseline productivity |  | 0.19\* |
| (2 months prior) |  | (0.0067) |
| Constant | 2,344\* | 1,533\*\* |
|  | (40.88) | (21.22) |
|  |  |  |
| Department fixed effects | YES | YES |
| Observations | 2,225 | 2,103 |
| R-squared | 0.31 | 0.36 |

Note: Robust standard errors clustered by work group in parentheses. The dependent variable is number of Yuan earned in one month during treatment. \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

**Pilot Discussion**

Based on our qualitative observations in the pilot, we concluded that the main field experiment should sample medium-sized groups (eliminating small 4-person cutting groups and over 30-person quality control groups), to best enable worker participation in discussion (see SM section B for full qualitative analyses). Our qualitative results also suggested that sewing workers were able to set individual goals at the end of the meeting, as did participants in Lewin’s original demonstration.

The positive and statistically significant increase in productivity was encouraging for the research design and for the factory. Our pilot helped us to test and fine-tune the participatory meeting paradigm, which we had replicated to the best of our ability from Lewin and his colleagues’ scattered writings. In our main experiment, we tested our full set of hypotheses with a larger and fully randomized sample of work groups.

**Findings from archival salary data.**

Along with the general observation in the factory, we examined a longitudinal dataset covering worker productivity in terms of gross salary of a 32-worker sewing group from June to December 2014. We offer several main findings from the dataset about worker productivity, which motivated the pilot intervention:

1. There are large variations in productivity across workers (refer to *Figure S1* and *S2*).

2. There are moderate to large within-worker variations in productivity across time (see Figure S3).

3. The structural factors that the factory is responsible for, like hours, overtime pay, and work assignments, do not explain all the variations in productivity (see Table S32).

4. More experience does not entail higher productivity; in fact, experienced workers tend to produce less than newer ones (see Table S32).

There are two types of variations in productivity: within-worker and between-worker variations. Within-worker variations refer to how much one worker’s productivity varies across time (a month being a unit), whereas between-worker variations refer to how much different workers’ productivity varies during the same time period (a worker being a unit). We found sizeable variations in productivity both within and between workers. However, there is a much smaller variation in working hours of each worker. Combining with qualitative evidence, we can infer that there are considerable margins in worker productivity. In other words, despite the stable long hours each worker spends at work, they are not always achieving the level of productivity that they would like to achieve.

In Table S32, we regressed workers’ piece earnings on unit price, quantity, normal and overtime hours, and work experience, with fixed effects on the orders received by the group over the period. The structural factors do not explain most of the variations, even when a fixed-effect model tends to radically reduce total variation and exaggerate the R-square (Nickell, 1981). Thus we think for this reason there are group dynamics that can explain this variation, in particular the kind of group dynamics that Lewin studied and learned to manage.

Contrary to common beliefs of the workers and supervisors, work experience does not necessarily increase worker productivity. As the skills involved in sewing tasks are low, workers do not need extensive training before they become experienced in their jobs. As a worker reflected in an interview, she thought she did not work as hard at the time of the interview as when she first got the job. We speculate nonstructural motivational factors may contribute to this difference.

The tremendous variations in workers’ salary earnings under similar working hours are intriguing. The variations may come from the worker herself, such as fluctuation in motivation, stress at work, or other nonstructural factors related to her perceptions of the work at hand and her group. Through the Lewinian participatory meeting intervention, we hoped to stabilize these nonstructural variations and help the workers work better and more efficient under the same effort. From the analysis of the qualitative observation and archival salary data, we see the potential of a participatory meeting intervention to increase worker productivity and change the social outcomes, including workplace empowerment like job satisfaction, sense of control, and attitudes toward participatory work and group life, which further stabilizes a high level of productivity.

*Figure S1*. Gross salary variation across different workers in the month of July 2014. There were 30 active workers earning wages in July. The x-axis indicates each worker and the y-axis indicates gross salary in CNY (Chinese Yuan).

*Figure S2*. Hourly pay variation across different workers in the month of July 2014. There were 30 active workers earning wages in July. The x-axis indicates each worker and the y-axis indicates hourly pay in CNY (calculated from gross salary divided by total working hours in July). Note: worker 28 was paid by a fixed rate rather than piece rate; thus her hour pay was counted as 0.

*Figure S3.* Gross salary variation plotted across time for each worker on one 32-worker group, from June to December 2014. The x-axis indicates months and the y-axis indicates gross salary. Note: the incomplete plots were either for workers whose wage did not depend on individual productivity (e.g. group leaders and fixed-wage workers), or workers who took a leave or left the job during this period.



Panel data regression table of piece earnings on unit price, quantity, working hours, and working experience, with order fixed effects. There were 58 exogenous orders received over the time period. The structural factors that the factory is responsible for, like hours, overtime pay, and work assignments, do not explain most of the variations, indicating the role of social psychological factors in determining worker productivity.

**Table S34**

*Archival Data Analysis.*

|  |  |
| --- | --- |
| Piece Earnings |  |
| Unit Price | 25.67\*\* |
|  | (.369) |
| Quantity | 1.27\*\* |
|  | (.018) |
| Normal hours | 1.62\*\* |
|  | (.141) |
| Overtime hours | .31 |
|  | (.227) |
| Work experience | -1.09\*\* |
|  | (.176) |
| Order1 FE | 15.77 |
|  | (27.28) |
| Order2 FE | -38.43 |
|  | (27.58) |
| . |  |
|  |  |
|  |  |
| . |  |
|  |  |
| Order58 FE | -75.33+ |
|  | (43.06) |
| Constant | -48.81+ |
|  | (27.27) |
| *R*2 | 0.54 |
| *N* | 7,606 |

+ p<0.1; \* *p*<0.05; \*\* *p*<0.01

## **Section I – Relationship Between Productivity and Attitudes**

We also predicted that productivity and attitudes might correlate with one another, for instance if higher productivity promoted perceived workplace empowerment outcomes. Our experimental design cannot distinguish whether the intervention directly influenced both attitudes and productivity, or whether it directly influenced one (e.g., productivity), which influenced the other (e.g., attitudes). Instead, we explore the correlations between attitudes and productivity in the same survey wave and between waves. Specifically, we use productivity and change in productivity during the intervention to predict attitudes in survey wave 1 at the end of the intervention, and we use attitudes measured in survey wave 1 to predict productivity measured 6 weeks after the intervention during survey wave 2.

Of all the attitudinal constructs, only job satisfaction was positively (though not significantly) related to productivity; moreover, this result only held for measured changes in productivity and not absolute levels of productivity. Among treatment workers, the more their productivity increased during the intervention, the more job satisfaction they reported immediately afterward (*β* = 0.28, *CI* = [-0.04, 0.59], *SE* = 0.16, *p* = .08). The pattern did not hold for control workers. Further, among treatment workers, job satisfaction at the end of the intervention significantly predicted future increases in productivity six weeks later. The more job satisfaction treatment workers expressed in survey wave 1, the more their productivity increased six weeks after that survey (*β* = 0.05, *CI* = [-0.0009, 0.10], *SE* = 0.025, *p* = .05). We did not find a significant relationship between absolute levels of productivity or changes in productivity and individual or group-based worker empowerment.

1. The fact that the workers are mostly young village women with little education is very similar to the personnel composition in the Harwood factory in Lewin’ time. Whereas Harwood had around 300 workers, the current factory has thousands of workers, with quite different manufacturing scale. [↑](#footnote-ref-1)
2. The monthly wage of a typical worker in the experimental factory ranges from 3,000 Yuan ($483.82) to more than 7,000 Yuan ($1128.92). Some reference statistics: In 2013, the minimum wage per month in Beijing was 1,400 Yuan, about 24 percent of the 5,793 Yuan average monthly wage, as calculated by the municipal bureau of statistics. In Shanghai, the 2013 minimum wage was 1,620 Yuan, or 32.2 percent of the 5,036 Yuan average wage. Those are two of the highest income cities in China. The living standard of Suzhou is very close to Shanghai. [↑](#footnote-ref-2)
3. Taken from field notes. “I” refers to the first author. [↑](#footnote-ref-3)
4. The salary payment day is on the 7th of each month. [↑](#footnote-ref-4)
5. Every piece that is done by a certain individual will be counted as her own production, no matter if the pieces are assigned to her or to others. Thus helping is not “free.” However, from observation and interviews, workers seldom help others unless the group leader intervenes either because they did not know others need a help or they thought helping others waste their time. [↑](#footnote-ref-5)