Having a voice in your group:

Increasing productivity through group participation

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We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. All survey items, item groupings, and analyses can be found at the Open Science Framework (<http://bit.ly/2zWf3Ga>). Study materials and additional analyses can be found in the supplementary material. The study was approved by Princeton University Institutional Review Board and was funded by grants from the Canadian Institute For Advanced Research to ELP and Princeton University's Fund for Experimental Social Sciences to SJW.

Abstract

Human social groups exert powerful influence over their members' behavior. We test the hypothesis that increasing individuals' participation in their group turns the group into a source of higher motivation. We conducted a 6-week field experiment with 65 Chinese factory groups (1752 workers). Half of the groups were randomly assigned to a 20-minute participatory meeting once per week for six weeks, in which the group's supervisor stepped aside and workers contributed ideas and personal goals in an open discussion of their work. The other half continued with status quo meetings in which supervisors spoke, workers listened, and a researcher observed. We found that participatory vs. a hierarchical structure led to a 10.6% average increase in individual treatment workers' productivity, an increase that endured for 9 weeks after the participatory experiment ended. The brief participatory meetings also increased treatment workers' feelings of empowerment such as job satisfaction and sense of control. We find no evidence that informational gains or new worker goals were responsible for increases in productivity; instead, evidence suggests that the increase in frequency of workers' voicing opinions may have driven higher productivity. Participatory work structure is a popular concept but its causal impacts in real world work groups have heretofore been unidentified and research has been Western-centric. The results contribute a richer theoretical understanding of participatory group structures, and a pragmatic intervention for behavior change.

Word count: 227

Significance Statement

Although the idea of participation is not new to Western society and democracy, scant evidence can attest to the causal impact of participatory group structures on individual behavior and attitudes, particularly outside of the Western world. In a pre-registered field experiment with 65 Chinese factory work groups and 1,752 workers, encouragements to voice an opinion in a weekly group meeting significantly increased workers' productivity and wages, as well as their satisfaction and sense of control, for over two months after the encouragements ended. These findings provide rare causal evidence in a setting where participation is not a normative default, indicating the benefits of participation for changing and sustaining behavior and attitudes.

Word count = 111 (120 max)

Ideas about the benefits of individuals' participation in their work groups, citizen groups, and religious groups have fascinated a wide range of scholars. Economists have been interested in the relationship between participation and economic development (1, 2), organizational scientists in whether participatory groups are more efficient at their work (3, 4), and political scientists in the democratic effects of participation in civic groups (5, 6). Participation has generally been defined as a process in which influence or decision power is shared between hierarchical superiors and their subordinates (7).

A number of theories exist to explain the benefits of participation in groups. First, participation may flatten hierarchy, by sharing influence, decision power, or more general involvement across group members. A less hierarchical group structure may reduce conflict among different group members and increase performance (8, 9). Second, participation may boost performance through amplified information sharing (10). Lastly, participation increases opportunities to voice one's perspective in decision-making processes (11, 12). The experience of having one's voice heard by group members may be a motivational force for behavior change.

However, there is mixed evidence for the benefits of participation across domains of economic and political life (2, 13). Of interest to the present investigation, the effects of participation on worker productivity in particular are far from established. Extant research has produced debates and conflicting findings: from organizational science about team participation (e.g., 14-17), from cognitive psychology about particular forms of participation in goal-setting (e.g., 10, 18), and from social psychology about the structure of groups in relation to participation and productivity (e.g., 16, 19). In some cases, research finds positive effects of participation, broadly defined, on group members' behavior or attitudes (17); in others, null and even negative effects (18, 20). The evidence suffers from the additional problem that there is no

tradition of using experiments to study causal effects with real world work groups (21-23). Most research on the effects of participation in work groups involves experimental studies with artificial laboratory groups that have unknown translation to the real world, or correlational studies in the field that cannot rule out alternative influences on individual behavior. To our knowledge, the current research represents the only well-powered, randomized field experiment testing a causal relationship between a participatory structure and a real world behavioral outcome among pre-existing groups. Without such a causal test of long-term behavioral change in the real world, theory on the topic will be difficult to advance.

Value-based endorsements of participation is perhaps one reason that the popularity of participatory strategies at work outreaches the evidential base. Participation is a value rooted in Western political ideology. Modern notions of group participation echo 18th and 19th century western philosophical thought embodied in writings from Rousseau and John Stuart Mill, who argued that participation serves an educational function and trains individuals to be responsible citizens (5). In Western societies, managers and academicians often advocate the use of participation, regardless of its (un)known practical benefits and challenges with implementation (24, 25).

However, participation is not universally valued in the structure of societies' workplaces and institutions. In East Asian cultures, endorsement of strict social hierarchies featuring minimal participation is prevalent in philosophical literatures. As a particular case in point, Confucianism denotes a basic set of moral principles for women (Three Obediences and Four Virtues), which emphasize absolute obedience for females to their male counterparts. Even though strict adherence to these behavioral codes have been abandoned, they have shaped East Asian cultures to the extent that harmony and obedience are prioritized over participation and

dissent (26, 27). Thus, predictions about the benefits of participation are less clear in non-Western societies. Are cultural beliefs in the benefits of participation a prerequisite for the salutatory effects of participation in groups? Or is participation a more universal good, and just used to differing degrees across different human contexts?

The present work incorporates the advantages of both laboratory experiments and field studies by implementing a longitudinal randomized experiment with existing work groups in a large multinational textile factory in China. We investigate the central question of whether groups that encourage participation increase individuals' productivity and improve workplace attitudes. We also test why participatory structures work in this case, and measure the persistence of any changes. To increase participation, we adopt a classic participatory meeting paradigm (28) in which workers are invited to speak while supervisors mandated to listen. We did not overhaul workers' group work environments; rather, we randomly assigned half of the work groups to experience a participatory meeting once per week for 20 minutes, while the rest of groups experienced their status quo work meeting. Status quo meetings in the Chinese factory under study, like many others, follow a hierarchical structure in which supervisors speak and workers listen.

The effects of participatory group structures in the manufacturing sector in China may represent a boundary case of the effect of group participation on individual behavior—either of the minimal or maximum effect of participation. On one hand, participatory group structures may not work well because the idea of participation and individual dissent is relatively less welcome in China and in the factory. The factory management under study explicitly values authoritarian practices, and the factory's young female workers have little experience with participation. On the other hand, one could argue that participatory group structures may have an

outsized effect in this context, because Chinese factory workers are not typically offered the opportunity and thus a small dose might have a larger effect than in other contexts where participation is more common.

Following political theories of participatory democracy (5, 29) and psychological theories of group dynamics (28) and flattened hierarchy (19), we predict that being invited to speak with one's group in the workplace will change a worker's view of the group, of her workplace, and most of all will turn her group into a source of motivation to increase productivity. We predict these benefits may occur for a few reasons, all of which we can test in our experiment: group participatory structures may increase the flow of information among workers, or improve the quality or number of workers' production goals, or increase the frequency with which workers voice their individual thoughts or opinions ("voice"), which has known motivational benefits (11). Because the intervention represents a brief experience with participatory structure and not a transformation in workers' engagement with their workplace, the intervention represents a challenging test of the effects of participatory structure on productivity, as well as a highly scalable solution, if it works.

Methods

Our field experiment sampled all 65 sewing groups (1752 workers, 93.6% female; mean age = 32.5 years, ranging from 18 to 53)¹ in the China branch of a multinational apparel manufacturer. Sewing workers' monthly gross salary is a direct reflection of their individual productivity under the piece-rate payment scheme—the more each worker produces, the more she earns. Workers are assigned to a specific work group after they are hired and rarely transfer

¹ Among the 65 supervisors, 88.3% are women (mean age = 32.7 years, ranging from 21 to 47). There were no differential treatment effects for groups with a male supervisor compared with groups with a female supervisor.

to a different group; each sewing group has its own supervisor who oversees group work. As part of their normal work routine, all groups have a daily morning meeting, in which the supervisor summarizes the previous days' work performance, recommends individual and group working strategies, and announces goals for individual workers.

We randomly assigned half of all work groups to a treatment participatory meeting condition ($N = 31$, totaling 863 workers), and the other half of work groups to a control-observer condition ($N = 34$, totaling 889 workers). Once per week for six weeks during the status-quo 20-minute morning meeting slot, Chinese research assistants (RAs; all female) facilitated a participatory meeting in the treatment condition or conspicuously observed the meetings in the control-observer condition to control for work groups' awareness of the research study.

In the control-observer condition, the RA introduced herself as part of the research team visiting the factory to learn management strategies from the production floors. The RA then stood with the group and observed, as supervisors led the status quo morning meetings in which workers were not invited to speak. We designed the control condition to include obtrusive observation by the RAs to address concerns regarding possible Hawthorne effects (although claims from the original Hawthorne study about changes from mere observation have been shown to be spurious (30)). In the treatment participatory meeting condition, an RA facilitated the meeting for 20 minutes, in the presence of the group's supervisor. The RA encouraged all members of the group to participate in a discussion about production-related issues. Workers were specifically encouraged to share work experiences and production strategies for their own tasks, such as how to prepare piecework or the best way to pass finished pieces to the next worker in group. RAs were trained to redirect any non-work-related conversation to production-

related issues. Supervisors were informed in advance that they should refrain from speaking during the discussion.

RAs completed a descriptive rating sheet of each meeting directly following its completion, which we used to track pre-registered possible mechanisms of change: informational gain and voice in the work group. For a group-level assessment of informational gain, RAs estimated the amount of time each treatment group spent on concrete problem solving (1 = *almost no one was engaged*, 4 = *almost everyone was engaged*). To measure group members' voices outside of concrete problem solving, RAs rated the amount of time spent discussing non-informational or strategic issues, specifically: raising awareness of existing problems (without problem solving), and non-production-related issues such as food in cafeteria (1–4, same scale). We also recorded two negative measures of voice—the frequency of supervisors interrupting worker discussion, and the frequency of supervisors scolding the workers (expressing negativity)—and one positive measure (encouraging workers to speak out) on a 1–3 scale (“never,” “a few times,” “more than several times”).

We also measured (but did not pre-register hypotheses about) the content and specificity of the goals set by workers in their meetings. Treatment workers wrote down their personal goals on a paper before announcing them to the group; RAs collected these papers. Because workers frequently did not write their names on the papers, these goals are recorded at the group and not the individual level.

We administered the weekly participatory meetings treatment for a total of six weeks, with 18 weeks of direct observation of productivity measurement and self-report survey. For productivity, we recorded each worker's gross salary, acquired from the factory's human resources department (see Table S11 for results using market value).

To measure self-reported attitudes, one week after the experimental intervention ended, a team of 11 RAs and the first author collected individual surveys from all 1752 members of the 65 sewing groups. We repeated this survey procedure three weeks later, a full month after the intervention ended. The first survey that all workers took one week after the end of the intervention measured multiple work-related attitudes and preferences (survey completion rate = 83.8%; 93.8% female; see SM section E). The survey consisted of four parts: individual job-related attitudes (*individual empowerment*) such as job satisfaction and sense of control at work, individuals' attitudes and feelings toward their work groups (*group empowerment*), demographic information, and their self-reported productivity. Both exploratory and confirmatory factor analyses supported these pre-registered item groupings. In addition, two survey questions elicited workers' informational gain. A second survey was implemented to all workers four weeks after the end of the intervention (survey completion rate = 84.07%; 93.49% female; see SM section E) to assess whether any attitudinal effect would sustain over a longer period of time.

Results

First, results indicate that participatory meetings were successful at increasing worker productivity during the 6 weeks of the intervention (see Table 1 and Figure 1). This difference is large in monetary terms, and is robust to different measures of productivity and model specifications (see SM). Treatment workers earned on average 592.30 Yuan (\$87.74) more than the control workers ($p = 0.010$), representing a 10.63% increase in average gross salary relative to control workers. Before the intervention, the treatment and control-observer groups did not differ in productivity.

The productivity gains among workers in the participatory meetings condition relative to the control-observer condition persisted for another 6 weeks after the experiment ended, a time

in which none of the groups experienced a participatory meeting. Treatment workers earned 532.72 Yuan (\$85.20) more than control workers ($p = 0.003$), a 10.74% increase in average gross salary relative to control. Figure 1 visualizes this contrast, and also displays well-known seasonal trends in production patterns (30): productivity is expected to rise steadily from February to early summer, in a post New Year production surge, and decrease from June to October, a lackluster season for apparel manufacturing. Given these trends, the figure suggests that the intervention stabilized the treatment groups' productivity, preventing it from decreasing as otherwise would be expected from seasonal patterns of production. Interestingly, these behavioral results were not mirrored by participants' self-reported change in productivity. In the first post-treatment survey, participants' self-reported productivity ("I think my productivity has increased over the past month" on a 1–6 scale) showed no differences between treatment and control workers ($p = 0.32$).

The statistically significant treatment productivity difference ended 9 weeks after the intervention ended. We tested the possibility that group or institutional level forces, such as change in the makeup of the groups or factory's task allocation, gradually attenuated the effects. First, worker turnover happens on a regular basis, and so it is possible that workers who quit shifted group dynamics and thereby affected group productivity. In the first 12 weeks after the end of the experiment, 190 (23%) workers in the control-observer condition quit, while 124 (15%) workers in the participatory meetings condition quit. While control workers were 53.3% more likely to quit their jobs than treatment workers ($p < .001$), quitting within a group is not likely responsible for the attenuation of the treatment effect on productivity beyond 9 weeks ($p = .41$; Table S12-S13). Second, one could predict that after the intervention began, middle management might have observed higher productivity among treatment groups and consequently allocated more difficult tasks to these high-performing groups. This may explain why the

treatment effect attenuated after 9 weeks—because of institutional adjustment to real changes. However, we found no difference in the unit price (an indicator of difficulty) of the assigned order piece between treatment and control groups after the start of the experiment ($p = 0.40$), and unit price did not predict group productivity ($p = 0.59$; Table S14). In other words, this particular institutional “force” shaping group behavior does not seem responsible for the attenuation of the treatment effect after 9 weeks.

Table 1. *Productivity Change During the Six-Week Experiment Period and Sustained Productivity Change After the Experiment.*

	<i>Productivity (in Chinese Yuan)</i>			
	Experimental period		Long-term	
	(1)	(2)	(3)	(4)
Participatory meetings	584.39*	592.30**	491.17*	532.72**
	(259.12)	(229.31)	(206.21)	(179.70)
Work experience		42.87		63.72**
		(30.78)		(23.63)
Education		184.19		-109.21
		(118.97)		(180.72)
Baseline productivity		0.44***		0.33***
(first 6-week period)		(0.06)		(0.06)
Baseline productivity		0.04		0.13*
(second 6-week period)		(0.05)		(0.05)
Departmental fixed effects	YES	YES	YES	YES
Constant	6,310.16***	4,043.36***	7,656.74***	5,860.00***
	(466.48)	(411.36)	(279.19)	(379.50)
<i>N</i> (clusters)	65	65	65	65
<i>N</i> (individuals)	1611	1490	1561	1440
Control mean estimate	6320.64	6455.84	5648.30	5603.92

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

Figure 1. *Worker Productivity, Comparing Groups Using Participatory Meetings and Control-Observer Meetings, Across a 27-Week Period.*

Note: Fitted lines with 95% confidence intervals chart the complete time series of worker productivity in terms of gross salary for the participatory meetings (treatment) and observer (control) work groups—specifically, the immediate effect of the participatory meetings that emerged following the first week of intervention, and the duration of the effect for 9 weeks following the cessation of participatory meetings. Each red and blue dot represents the sum gross salary for a participating work group (red for treatment and blue for control) for one day.

What was the active ingredient of participatory meetings that drove the productivity change? Neither informational gain nor goal content mediated productivity increase. In the first post-treatment survey, treatment work groups did not appear to have an informational advantage over control work groups in terms of the number of gestures or strategies workers reported knowing for their sewing tasks ($p = 0.53$) and knowledge of whom to contact if their machines were broken ($p = 0.42$). Furthermore, from RAs' record in meetings, the amount of time spent in problem solving did not correlate with their concurrent group productivity over the course of the intervention ($p = .29$) or predict productivity in the six weeks following the intervention ($p = .07$; Table S15-S17). We also analyzed whether group-level variance in productivity became smaller 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 comparing treatment and control groups ($p = 0.52$). Instead, individual levels of productivity across time became more stable for treatment workers compared with control workers ($p = .006$; Table S18-S19). Thus, participatory meetings made individual but not group productivity more stable. Further, the size of the goal, specifically the number of pieces that workers aimed to complete, did not correlate with workers' weekly productivity ($p = 0.07$; Table S20-S21)².

However, our data suggest that one important mechanism of the participatory meetings treatment was the workers' experience of speaking up in their group, or "voice." A 25% increase in the amount of time speaking up about production issues (without problem solving) among the treatment workers was estimated to increase group-level productivity by \$58 weekly during the

² The number of finished pieces the workers set as a goal imprecisely captures goal difficulty—some workers might work on a simpler task that can be completed at a faster rate, for example. Without knowing the difficulty of a hood vs. a sleeve, we found a small but nonsignificant correlation between goal content and productivity.

intervention ($p = .01$) or \$769 in the six weeks following the treatment ($p = .01$). Even voicing opinions about non-production issues predicted higher group-level productivity: a 25% increase was estimated to raise group-level productivity by \$32 weekly during the intervention ($p = .03$) or \$444 in the six weeks following the treatment ($p = .05$). We examined whether supervisors' encouragement of workers' voice during the meetings similarly affected productivity. We found that supervisors' encouragement and praise of voice positively predicted subsequent group productivity during the intervention ($p = .047$) and six weeks following ($p = .006$). By contrast, supervisors' interruption of the discussion (discouragement of voice) negatively predicted group productivity during the intervention ($p = .021$; Table S22-S23), although this effect did not endure following the end of the intervention. We did not find an effect of supervisors "scolding" the workers, as captured by RA observation forms.

We found significant changes for treatment workers' work-related attitudes one week and four weeks following the intervention's end. As depicted in Figure 2, one week after the end of the intervention workers assigned to the participatory meetings reported higher individual and group empowerment, as measured by several indices (Table S24). For the indices that we pre-specified as indicating individual empowerment, treatment workers reported significantly more job satisfaction ($\beta = 0.17, p = .03$), and more sense of control at work ($\beta = 0.25, p < .001$), compared with workers in the control-observer condition. One exception was happiness and well-being, where the difference between treatment and control workers was in the expected direction, but not significant ($p = 0.10$). Workers in participatory meetings expressed greater group-based empowerment as well, including more favorable attitudes toward their work group than workers in the observer condition ($\beta = 0.13, p = 0.043$). Treatment workers also felt less

lonely ($\beta = -0.31, p = 0.003$) and reported that the factory cared about and respected them to a greater extent than workers in the control-observer condition ($\beta = 0.48, p < .001$).

In the second survey, four weeks after the end of participatory meetings, these shifted attitudes endured: workers assigned to participatory meetings still reported more positive attitudes indicating individual empowerment (Table S25). Treatment workers reported more job satisfaction ($\beta = 0.22, p = .001$), and more sense of control at work ($\beta = 0.27, p = .001$) compared to control workers. Again, there was no difference in reported happiness and well-being between treatment and control workers ($p = 0.79$). For the indices indicating aspects of group-based empowerment, treatment workers continued to report that the factory cared about and respected them to a greater extent than the control workers ($\beta = 0.34, p = 0.002$). Even though treatment workers expressed more favorable attitudes toward group life and felt less lonely one week post-treatment, after four weeks there was no difference in attitudes toward their groups ($p = 0.41$) or feelings of loneliness ($p = 0.13$).³

³ During the second survey, 78 new workers participated, having arrived after the end of the participatory meetings treatment (fewer than 10% of our sample). When their responses are added, our significant treatment results in the survey are unchanged (see SM section F). This could reflect their socialization into more productive groups; however, their small number may preclude finding a real significant difference between the group of new workers and treated workers. Because we do not know how the factory decided to assign new workers to groups, we leave their responses out of the main analyses.

Figure 2. *Difference of Work-Related Attitudes Between Treatment and Control Workers, Measured One Week and Four Weeks Following the End of the Intervention.*

a.

b.

Note: Solid dots indicate the average treatment effect of the participatory meetings on each attitudinal index. Error bars represent 95% confidence intervals of the estimates.

Discussion

The present field experiment provides clear causal evidence that participatory meetings—a group process in which workers discuss their work with one another in a non-hierarchical manner—can change behavioral patterns and increase productivity. During the 6-week experimental period, treatment workers on average increased their productivity by 11%, or \$88 above their previous productivity compared to control workers. Data suggest that the frequency of speaking up in the groups, or voice, mediated the treatment workers' increase in productivity. Voice, measured here as a group behavior, may in theory correspond to workers' feelings of self-control, or of identification with work. However, we do not find that workers' thoughts or feelings mediated the change from participatory meetings to increased productivity—rather, one behavior (expressing more opinions) led to the other (producing more pieces).

This increase in productivity persisted for over two months after the cessation of the participatory meetings. While the immediate appearance of a treatment effect could be questioned as a Hawthorne effect [24], the persistence of the effect for 9 weeks after the removal of all observation argues against such an interpretation. Workers assigned to participatory meetings also reported higher individual and group-based sense of empowerment over the long term, including job satisfaction, sense of control, and more favorable attitudes toward their coworkers, and were less likely to quit their job. The current study represents to our knowledge the only well-powered, randomized field experiment testing causal relationships between participatory structures for real world work groups and their productivity and attitudes toward work.

Because we implemented a small adjustment in the workers' actual workplace—scheduling the participatory meetings during the factory's regular meeting times and measuring

productivity in the form of workers' real salary—our results speak to the power of these group interactions measured against the pre-existing equilibrium of forces acting on workers' behavior. For example, our results show that discussing work with one's coworkers for 20 minutes each week can improve average worker behaviors and attitudes across various work tasks and supervisor styles, and even when some workers leave and new group members arrive. Our results also show that this intervention substantially improves productivity even among workers who are already highly motivated to earn as much money as possible to send home to their families. The attenuation of these gains after 9 weeks after the participatory meetings ended was not predicted by within-factory responses to the intervention (such as changes in group composition by quitting, or reassignment of difficult tasks to treatment groups). This suggests that maintaining these productivity gains may require sustaining the minimal amount of participation in the workers' weekly meetings. Given the intervention requires 20 minutes of time per week, this seems like a scalable solution for increasing productivity.

China's context may mean that these findings represent a boundary case—these may be larger effects due to the contrast to everyday life, or muted effects because participation is not valued at baseline by the workplaces. The participatory meetings positively impacted young female workers who have spent a lifetime spent toward the bottom of the workplace and social hierarchy in the factory and in society more generally. Our qualitative evidence collected prior to the experiment suggests that workers were not interested in more participation at work. Both the institutional setting, which featured a strict hierarchical relationship between supervisors and their young female workers, and the Chinese national setting, which features discouragement of social and political dissent, present restraining forces for the workers to speak out their opinions at work. This study issues a call for more research—how do real world groups in Westernized

workplaces, where participation is culturally and institutionally encouraged, compare in their reactions to more participatory work structures?

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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 thirties⁴ 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 class⁵ 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

⁴ 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's time. Whereas Harwood had around 300 workers, the current factory has thousands of workers, with quite different manufacturing scale.

⁵ 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.

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.

(a) 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]

I⁶ 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

⁶ Taken from field notes. “I” refers to the first author.

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 payment⁷. 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.

(b) 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

⁷ The salary payment day is on the 7th of each month.

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.

(c) 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.⁸ 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

⁸ 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.

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.

(d) 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

Table S1. Balance check. 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: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

	<i>Condition Assignment</i>
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 (first 6-week period)	-0.0002 (0.0002)
Baseline productivity (second 6-week period)	0.0002 (0.0002)
Gender	0.363

	(0.304)
Age	-0.024
	(0.015)
Constant	0.852
	(1.344)

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.

From section “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 ($\beta = 0.09$, $CI = [0.005, 0.170]$, $SE = 0.042$, $t = 2.09$, $p = .037$). 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 ($\beta = 0.17$, $CI = [-.07, .40]$, $SE = 0.16$, $t = 1.41$, $p = .15$). 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 ($\beta = 0.047$, $CI = [.001, .093]$, $SE = 0.023$, $t = 2.00$, $p = .046$).

From section “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 ($\beta = 13.13$, $SE = 10.33$, $p = .21$). 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 ($\beta = -421.74$, $CI = [-913.30, 69.83]$, $SE = 237.03$, $p = .09$).

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: $M_{PM} = 1143.09$, $SD = 409.99$; $M_0 = 1118.02$, $SD = 291.99$; n.s.). However, individual-levels of productivity across time became more stable for treatment workers (mean of SD: $M_{PM} = 28.88$, $SD = 9.65$) compared with control workers ($M_0 = 39.56$, $SD = 12.01$), $\beta = -10.38$, $CI = [-13.79, -6.97]$, $SE = 1.74$, $t = -5.97$, $p < .001$). 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 ($\beta_{\text{production}} = 32.21$, $CI = [-2.57, 67.00]$, $SE = 17.62$, $t = 1.83$, $p = .07$; $\beta_{\text{non-production}} = 21.70$, $CI = [-0.51, 43.90]$, $SE = 11.25$, $t = 1.93$, $p = .06$). Voicing opinions about production and non-production

related issues also both predicted higher group-level productivity in the six weeks following the treatment ($\beta_{\text{production}} = 520.75$, $CI = [112.31, 929.19]$, $SE = 196.95$, $t = 2.64$, $p = .01$; $\beta_{\text{non-production}} = 294.03$, $CI = [-30.37, 618.44]$, $SE = 156.42$, $t = 1.88$, $p = .07$).

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 ($\beta = 48.13$, $SE = 24.49$, $t = 1.97$, $p = .05$). In the negative direction, group leaders' interruption in the discussion (discouragement of voice) negatively predicted group performance during the intervention ($\beta = -46.36$, $SE = 21.15$, $t = -2.19$, $p = .03$). The positive pattern extended to productivity findings six weeks following the intervention; group leaders' frequency of encouragement significantly predicted greater group productivity ($\beta = 1244.97$, $SE = 391.26$, $t = 3.18$, $p = .004$). 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.

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

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

$$P_t = \beta_0 + D_t\beta_1 + \mathbf{H}_t\boldsymbol{\gamma}_1 + g_t + \mu_t. \quad (2)$$

where for group t , β_1 represents the average causal effect of the treatment on group average productivity, as measured by group average productivity P_t during and after the 6-week period of the experiment. D_t refers a binary variable of experimental manipulation randomly assigned to groups (1 = treatment participatory meetings, 0 = control observer meetings), and $\mathbf{H}_t$ denotes a vector of baseline controls for pre-treatment group productivity, broken up into 6-week averages. g_t 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 323.71 Yuan (\$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 S2).

Table S2. Productivity at the average group level.

	<i>Dependent variable:</i>							
	Experimental period				Long term			
	Gross salary (1)	Gross salary (2)	Market value (3)	Market value (4)	Gross salary (5)	Gross salary (6)	Market value (7)	Market value (8)
Participatory meetings	772.9* (296.5)	561.3* (258.3)	505.5* (210.6)	323.7+ (180.0)	704.6** (240.9)	617.1** (212.9)	487.9* (185.3)	407.0* (162.2)
Baseline productivity (first 6-week)		0.3* (0.2)		0.2 (0.2)		0.3 (0.1)		0.2 (0.1)
Baseline productivity (second 6-week)		0.1 (0.1)		0.2 (0.1)		0.3* (0.1)		0.3* (0.1)
Constant	5,947.0*** (447.0)	4,506.1*** (772.1)	4,525.4*** (317.4)	3,671.7*** (577.2)	7,113.7*** (363.1)	5,433.4*** (636.2)	5,352.1*** (279.4)	4,054.6*** (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 S3).

Table S3. Productivity at the total group level.

	<i>Dependent variable</i>							
	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 (17,162.4)	18,180.0* (7,074.2)	21,198.9 (12,722.3)	12,097.4* (5,078.5)	26,855.0 (14,207.8)	15,786.7** (5,881.5)	19,550.0 (11,065.0)	10,949.7* (4,355.9)
Baseline productivity (first 6-week)		0.9*** (0.1)		0.9*** (0.1)		0.6*** (0.1)		0.6*** (0.1)
Baseline productivity (second 6-week)		-0.1 (0.2)		-0.02 (0.2)		0.2 (0.1)		0.2 (0.1)
Department fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Constant	120,516.7*** (25,869.7)	45,685.6*** (12,433.8)	91,827.5*** (19,176.9)	32,460.7*** (9,324.0)	153,655.1*** (21,416.1)	97,884.4*** (10,337.6)	115,382.7*** (16,678.9)	68,627.3*** (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 S4).

Table S4. Robustness check – worker productivity with 62 groups.

	<i>Dependent variable</i>							
	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 E – Survey materials

Table S5. 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?	

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 S6. Descriptive statistics for survey constructs.

		Wave 1				Wave 2			
		Treatm ent	N	Control	N	Treatme nt	N	Control	N
	Job satisfaction	4.473 (0.340)	665	4.286 (0.345)	685	4.062 (0.294)	685	3.842 (0.309)	640
Individual empower- ment	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

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 ($M_{PM} = 4.05$, $SD = 0.29$; $M_O = 3.84$, $SD = 0.25$; $\beta = 0.21$, $CI = [0.08, 0.33]$, $SE = 0.06$, $p = .001$), and more sense of control at work ($M_{PM} = 3.77$, $SD = 0.32$; $M_O = 3.56$, $SD = 0.35$; $\beta = 0.25$, $CI = [0.09, 0.41]$, $SE = 0.08$, $p = .002$), compared with workers in the observer condition. One exception was happiness and well-being, where there was no difference between treatment ($M_{PM} = 3.91$, $SD = 0.21$) and control workers ($M_O = 3.84$, $SD = 0.18$, $p = 0.06$).

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 ($M_{PM} = 4.68$, $SD = 0.23$; $M_O = 4.55$, $SD = 0.30$; $\beta = 0.13$, $CI = [0.01, 0.26]$, $SE = 0.07$, $p = 0.042$). Treatment workers also felt less lonely ($M_{PM} = 2.98$, $SD = 0.45$; $M_O = 3.32$, $SD = 0.34$; $\beta = -0.33$, $CI = [-0.52, -0.14]$, $SE = 0.10$, $p < .001$) and reported that the factory cared about and respected them to a greater extent than workers in the observer condition ($M_{PM} = 3.65$, $SD = 0.41$; $M_O = 3.11$, $SD = 0.61$; $\beta = 0.53$, $CI = [0.29, 0.78]$, $SE = 0.13$, $p < .001$).

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 ($M_{PM} = 2.44$, $SD = 0.20$; $M_O = 2.22$, $SD = 0.27$; $\beta = 0.22$, $CI = [0.12, 0.32]$, $SE = 0.05$, $p < .001$).

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

Treatment workers continued to feel that the factory cared about and respected them ($M_{PM} = 3.47$, $SD = 0.39$) to a greater extent than the control workers did ($M_O = 3.13$, $SD = 0.55$; $\beta = 0.38$, $CI = [0.17, 0.58]$, $SE = 0.11$, $p < .001$). 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 ($M_{PM} = 4.19$, $SD = 0.28$; $M_O = 4.10$, $SD = 0.32$; $\beta = 0.07$, $CI = [-0.07, 0.21]$, $SE = 0.07$, $p = 0.31$) or feelings of loneliness ($M_{PM} = 3.10$, $SD = 0.46$; $M_O = 3.24$, $SD = 0.39$; $\beta = -0.16$, $CI = [-0.33, 0.02]$, $SE = 0.09$, $p = .075$).

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 ($M_{PM} = 4.46$, $SD = 0.29$; $M_O = 4.29$, $SD = 0.28$; $\beta = 0.16$, $CI = [0.03, 0.29]$, $SE = 0.06$, $p = .013$), and more sense of control at work ($M_{PM} = 3.94$, $SD = 0.26$; $M_O = 3.70$, $SD = 0.27$; $\beta = 0.24$, $CI = [0.14, 0.34]$, $SE = 0.05$, $p < .001$), compared with workers in the observer condition. One exception was happiness and well-being, where there was no difference between treatment ($M_{PM} = 4.06$, $SD = 0.27$) and control workers ($M_O = 3.93$, $SD = 0.34$, $p = 0.052$).

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 ($M_{PM} = 4.66$, $SD = 0.18$; $M_O = 4.55$, $SD = 0.26$; $\beta = 0.11$, $CI = [0.01, 0.22]$, $SE = 0.05$, $p = 0.029$). Treatment workers also felt less lonely ($M_{PM} = 3.02$, $SD = 0.41$; $M_O = 3.28$, $SD = 0.39$; $\beta = -0.25$, $CI = [-0.41, -0.09]$, $SE = 0.08$, $p = .002$) and reported that the factory cared about and respected them to a greater extent than workers in the observer condition ($M_{PM} = 3.56$, $SD = 0.35$; $M_O = 3.15$, $SD = 0.54$; $\beta = 0.40$, $CI = [0.21, 0.59]$, $SE = 0.10$, $p < .001$).

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 ($M_{PM} = 2.44$, $SD = 0.17$; $M_O = 2.25$, $SD = 0.24$; $\beta = 0.18$, $CI = [0.09, 0.27]$, $SE = 0.04$, $p < .001$).

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

Treatment workers continued to feel that the factory cared about and respected them ($M_{PM} = 3.40$, $SD = 0.36$) to a greater extent than the control workers ($M_O = 3.14$, $SD = 0.51$; $\beta = 0.26$, $CI = [0.09, 0.43]$, $SE = 0.09$, $p = .002$). 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 ($M_{PM} = 4.18$, $SD = 0.24$; $M_O = 4.09$, $SD = 0.28$; $\beta = 0.09$, $CI = [-0.02, 0.21]$, $SE = 0.06$, $p = 0.11$) or feelings of loneliness ($M_{PM} = 3.09$, $SD = 0.42$; $M_O = 3.23$, $SD = 0.29$; $\beta = -0.13$, $CI = [-0.28, 0.01]$, $SE = 0.07$, $p = .074$).

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). Workers are compensated for their overtime hours (1.5 times their normal working piece rate). Thus there are two types of working hours – normal working hours (8am – 5pm) and overtime hours (after 5pm and anytime on weekends).

There was no difference of normal working hours between treatment workers and control workers both during the intervention ($M_{PM} = 219.03$, $SD = 23.14$; $M_O = 221.77$, $SD = 19.33$) and 6 weeks after the intervention ($M_{PM} = 225.10$, $SD = 40.00$; $M_P = 224.90$, $SD = 39.71$). However, the treatment workers spent more total hours ($M_{PM} = 374.42$, $SD = 47.27$) than control workers ($M_O = 364.77$, $SD = 38.47$), $\beta = 11.02$, $CI = [2.20, 19.84]$, $SE = 4.50$, $t = 2.45$, $p = .01$. Spreading throughout the 42 days⁹ in the 6-week period, a worker who participated in participatory meetings on average spent 15 minutes more at work than control workers. It can be interpreted as treatment workers hanging around the production floors slightly later than the control workers. The difference in total working hours persisted 6 weeks after the end of the experiment ($M_{PM} = 353.71$, $SD = 65.56$; $M_O = 340.07$, $SD = 61.21$; $\beta = 14.84$, $CI = [5.34, 24.34]$, $SE = 4.84$, $t = 3.06$, $p = .002$). In other words, treatment workers on average stayed on the production floors (either at work or socialize with coworkers) 20 minutes longer than the control workers (see Table S7). No difference in working time was observed in the second 6-week period after the end of the experiment.

⁹ Workers usually work from Monday to Saturday, with Sunday off.

Table S7. Results for working hours.

	<i>Dependent variable:</i>			
	During intervention		Long term	
	Normal	Total	Normal	Total
Participatory meetings	-1.749 (0.912)	11.020* (4.499)	0.951 (2.606)	14.839** (4.842)
Work experience	0.345 (0.208)	0.591 (0.784)	2.378*** (0.451)	3.252*** (0.759)
Education	0.224 (1.751)	4.387 (3.559)	-5.278 (5.072)	-6.279 (7.590)
Baseline work hours (first 6-week)	0.067*** (0.019)	0.290*** (0.057)	0.130*** (0.036)	0.298*** (0.057)
Baseline work hours (second 6-week)	-0.018* (0.008)	-0.017 (0.017)	0.005 (0.020)	0.015 (0.030)
Department fixed effects	YES	YES	YES	YES
Constant	184.532*** (6.376)	247.709*** (19.799)	176.399*** (12.669)	286.042*** (20.596)

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

Section H – Pilot Balance Test and Archival Analysis

Table S8. Pilot balance test. 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.

	<i>Condition assignment</i>
Baseline productivity	-0.0001
(1 month prior)	(0.0001)
Baseline productivity	0.00001
(2 months prior)	(0.0001)
Constant	-0.743
	(0.756)

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

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 S9*).

4. More experience does not entail higher productivity; in fact, experienced workers tend to produce less than newer ones (see Table S9).

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 S9, 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.

Table S9. 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.

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

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

Table S10. Mean and standard deviations for RA reports for the six participatory meetings in the main experiment.

	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)

Section I. Main Results Tables.

Table S11. *Productivity Change During the Six-Week Experiment Period and Sustained Productivity Change After the Experiment.*

	<i>Dependent variable: Productivity (in Chinese Yuan)</i>							
	Experimental period				Long-term			
	Gross salary (1)	Gross salary (2)	Market value (3)	Market value (4)	Gross salary (5)	Gross salary (6)	Market value (7)	Market value (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 (first 6-week period)		0.44***		0.40***		0.33***		0.34***
		(0.06)		(0.05)		(0.06)		(0.05)
Baseline productivity (second 6-week period)		0.04		0.06		0.13*		0.14**
		(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)
<i>N</i> (clusters)	65	65	65	65	65	65	65	65
<i>N</i> (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: 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. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table S12. *Individual Quitting in the First 12 Weeks After the Experiment.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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 (first 6-week period)	-0.0003	5.7x10 ⁻⁵	-5.20	2.0x10 ⁻⁷
Baseline productivity 2 (second 6-week period)	-0.0001	5.1x10 ⁻⁵	-2.03	0.04

Note: Logistic regression with clustered standard error.

Table S13. *Relationship Between Group Quitting Rate and Group Productivity.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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 (first 6-week period)	-0.12	0.29	-0.42	0.68
Baseline productivity 2 (second 6-week period)	0.22	0.25	0.88	0.39

Table S14. *Relationship Between Unit Price and Worker Productivity.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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 (first 6-week period)	0.45	0.06	7.85	8.2x10 ⁻¹⁵
Baseline productivity 2 (second 6-week period)	0.05	0.05	0.95	0.34
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 S15. *Self-Reported Informational Difference Between Treatment and Control Workers.*

	<i>Dependent variable: Information</i>	
	Gestures	Machines
Participatory meetings	0.065 (0.109)	0.538 (0.374)
Gender	0.292 (0.226)	-0.308 (0.580)
Marital status	-0.257 (0.212)	-0.123 (1.055)
No. children	-0.071 (0.051)	-0.496** (0.184)
Lo. children	0.044 (0.129)	0.377 (0.426)
Rural	-0.113 (0.258)	-14.688*** (0.349)
Departmental fixed effects	YES	YES
Constant	2.059*** (0.298)	18.559*** (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 S16. *Group Level Problem Solving Does Not Predict Group Productivity During Intervention.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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 S17. *Averaged Group Level Problem Solving Does Not Predict Group Productivity Post Intervention.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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 S18. *No Treatment Difference in Group Level Variation in Productivity.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
Intercept	1180.31	173.43	6.81	6.7x10 ⁻⁹
Participatory meetings	74.33	115.06	0.65	0.52

mean *SD*: $M_{PM} = 1512.27$, $SD = 547.01$; $M_O = 1449.79$, $SD = 385.96$; $p = 0.52$

Table S19. *Treatment Difference in Individual Level Variation in Productivity.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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*: $M_{PM} = 64.21$, $SD = 12.70$; $M_O = 68.65$, $SD = 15.05$;

Table S20. *Relationship Between Goals and Productivity.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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 S21. *Relationship Between Weekly Goal Changes and the Following Week's Productivity.*

	Estimate	Std. Error	<i>t</i>	<i>p</i>
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	$< 2.2 \times 10^{-16}$

Note: Treatment workers' goals did not rise significantly from week to week ($\tau = -13.40$, $p < 0.01$), 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 ($p = 0.09$).

S22. *Group Level Voice Ratings Predict Group Productivity During Intervention.*

	<i>Dependent variable:</i>				
	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)
<i>Note:</i>			*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.

S23. Averaged Group Level Voice Ratings Predict Group Productivity Post Intervention.

	<i>Dependent variable:</i>				
	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** (0.156)	0.506** (0.169)	0.569** (0.179)	0.528** (0.151)	0.602** (0.178)
Departmental fixed effects	YES	YES	YES	YES	YES
Constant	3,183.878** (937.791)	3,976.597*** (896.306)	4,827.165*** (1,040.875)	2,722.698* (976.541)	5,310.315*** (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 S24. *Results for Survey Conducted One Week after the Experiment.*

	<i>Dependent variable:</i>					
	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)
<i>N</i> (clusters)	65	65	65	65	65	65
<i>N</i> (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 S25. *Results for Survey Conducted Four Weeks after the Experiment.*

	<i>Dependent variable:</i>					
	Individual empowerment			Group empowerment		
	Job satisfaction	Sense of control	Well-being	Group attitudes	Loneliness	Perceived respect
Participatory meetings	0.22*** (0.07)	0.26** (0.08)	0.07 (0.05)	-0.16 (0.09)	0.07 (0.07)	0.35** (0.11)
Male	-0.28 (0.15)	0.18 (0.17)	0.04 (0.07)	-0.07 (0.20)	-0.29* (0.13)	-0.37* (0.19)
Single	-0.16 (0.24)	-0.08 (0.30)	-0.19 (0.17)	0.93* (0.40)	-0.55* (0.27)	-0.32 (0.34)
Number of children	0.01 (0.05)	-0.04 (0.05)	0.03 (0.04)	-0.05 (0.09)	0.11* (0.05)	0.09 (0.07)
Children in city	0.09 (0.08)	-0.05 (0.10)	0.14* (0.06)	-0.36*** (0.11)	0.27** (0.09)	0.19 (0.12)
Country origin	-0.06 (0.21)	-0.33 (0.23)	0.20 (0.11)	0.16 (0.18)	0.02 (0.16)	-0.12 (0.26)
Departmental fixed effects	YES	YES	YES	YES	YES	YES
Constant	3.84*** (0.22)	3.72*** (0.27)	3.58*** (0.14)	3.45*** (0.28)	3.81*** (0.18)	2.86*** (0.35)
<i>N</i> (clusters)	65	65	65	65	65	65
<i>N</i> (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