Behavioural Public Policy (2025), **9**, 192–211
doi:10.1017/bpp.2022.9

CAMBRIDGE UNIVERSITY PRESS

ARTICLE

Having a voice in your group: Increasing productivity through group participation

Sherry Jueyu Wu[1]* and Elizabeth Levy Paluck[2]

[1]Anderson School of Management, University of California Los Angeles, Los Angeles, CA, USA and [2]Department of Psychology & Princeton School of Public and International Affairs, Princeton University, Princeton, NJ, USA
*Correspondence to: E-mail: sherry.wu@anderson.ucla.edu

(Received 3 October 2021; revised 1 February 2022; accepted 23 February 2022)

Abstract

Participatory work structure is a popular concept but its causal impacts in real-world work groups have heretofore been unquantified and research has been Western-centric. We test the hypothesis that participatory group structure increases productivity for blue-collar workers in a context where participation is not a normative default. We conducted a pre-registered longitudinal 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 6 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 and set goals, workers listened, and a researcher observed. We found that a participatory versus a hierarchical structure led to a 10.6% average increase in individual treatment workers' productivity, an increase that endured for 9 weeks after the experiment ended. The brief participatory meetings also increased treatment workers' retention rate (an 85% vs. 77% retention rate in treatment vs. control groups) and feelings of empowerment such as job satisfaction and sense of control. We found no evidence of informational gains or new worker goals; instead, evidence suggests that the increase in frequency of workers' voicing opinions may have driven higher productivity. These findings provide rare causal evidence in a setting where participation is not a normative default, indicating the benefits of direct group participation for changing and sustaining behavior and attitudes.

Keywords: group dynamics; behavioral change; productivity; voice; field experiment

Introduction

Ideas about 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 (Casey et al., 2011; Mansuri & Rao, 2014; Bandiera et al., 2020), organizational scientists

in whether participatory groups are more efficient at their work (Shetzer, 1993; Hackman, 2002; Ichniowski & Shaw, 2009), and political scientists in the democratic effects of participation in civic groups (Arnstein, 1969; Pateman, 1976; Mansuri & Rao, 2014). Participation has generally been defined as a process in which influence or decision power is shared between hierarchical superiors and their subordinates (Arnstein, 1969; Wagner & Gooding, 1987a).

The present article investigates whether increasing participation for a short period of time on a regular basis will impact worker productivity over the long term in a context where participation is not a normative default. To test this, we modified the dynamics of work meetings weekly in a Chinese textile manufacturing factory, transforming the meetings into participatory events where workers are encouraged to talk and supervisors mandated to listen. These participatory meetings took place once per week for 20 minutes at a time, over the course of 6 weeks (Wu & Paluck, 2020). We randomly assigned this participatory meeting schedule to some work groups and not others, and compared workers' piece-rate output and attitudes during and after the intervention. Unlike previous research, this approach allows us to quantify the causal impact of increasing participation and voice within a local work group in the short run on tangible behavioral outcomes such as productivity and retention rate over the long term.

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 (Bunderson & Reagans, 2010; Greer et al., 2017). Second, participation may boost performance and increase effective cooperation through amplified information sharing or perspective-taking (Locke & Latham, 2002; Muradova, 2020). Lastly, participation increases opportunities to voice one's perspective in decision-making processes (Vroom & Yetton, 1973; Harju et al., 2021). The experience of having one's voice heard by group members may be a motivational force for behavior change (Hirschman, 1970; Tyler & Blader, 2003).

Meanwhile, a cluster of factors explain the cost of participatory practices (Jensen & Meckling, 1976; Bloom et al., 2013; Hanushek et al., 2013). One commonly cited explanation is the misalignment of incentives between principals (e.g., employers) and agents (e.g., employees) in organizations (Jensen & Meckling, 1976; Dessein, 2002; Bandiera et al., 2020). Allocation of authority to the agents might exacerbate opportunistic behavior, responsibility shirking, and agency conflict (Jensen & Meckling, 1976). Second, participation can cost time and even involve financial losses (Mansuri & Rao, 2014). Furthermore, it might enable workers to coordinate and protest for demands such as a fair wage and better working conditions, which employers might not value to the equal extent. Lastly, while there seems to be a consensus on the benefit of participation on worker morale (Miller & Monge, 1986; Foels et al., 2000), the effects of participation on worker productivity are far from established. We surveyed American full-time employees on their predictions regarding participation and productivity (also see Wu et al., 2022). Over half (55.3%) indicated a high-participation group structure in which 'workers discuss work strategies in an open discussion and set goals for themselves' would be *less productive* compared with a

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low-participation group structure in which 'a supervisor talks about work strategies in a lecture and set goals for each worker', while the majority did predict that the high participation group would be happier at work.

Consistent with people's ambivalent intuitions, previous research has shown mixed evidence for the benefits of participation across domains of economic and political life (Wagner, 1994; Karpowitz et al., 2009; Mansuri & Rao, 2014). Extant research has produced debates and conflicting findings: from economics about worker representativeness and labor unions (Ichniowski & Shaw, 2009; Harju et al., 2021), from cognitive psychology about particular forms of participation in goal-setting (Latham & Yukl, 1976; Locke & Latham, 2002), and from social psychology about the structure of groups in relation to participation and productivity (Halevy et al., 2011; Greer et al., 2018). In some cases, research finds positive effects of participation, broadly defined, on group members' behavior or attitudes (Latham & Yukl, 1976); in others, null and even negative effects (Richter & Tjosvold, 1980; Schuler, 1980). For example, recent research on mandated forms of worker voice at work, such as shared governance and worker representativeness, reveals little to null effects on firm performance (Jäger et al., 2019; Harju et al., 2021). Other research has evaluated the efficacy of a bundle of workplace innovations and finds suggestive evidence that a comprehensive system of innovation that incorporates worker participation promotes productivity, while firms that adopt a narrower definition of participation do not observe such benefits (Ichniowski & Shaw, 1999, 2009; Gant et al., 2002). However, this line of work says little about whether direct participation alone would causally impact productivity.

The mixed evidential base is compounded by the lack of experiments to study causal effects with real-world work groups (McGrath et al., 2000; Ilgen et al., 2005; Kozlowski & Ilgen, 2006). According to meta-analyses, some of the inconsistent findings for the effects of participation on behavior can be attributed to methodological variations. Strong correlations between participation and behavior seem to rely on individuals' self-reports only: $r = 0.39$, while studies that measure participation or behavior with multiple methods reveal a small average correlation of $r = 0.12$ (Wagner & Gooding, 1987b; Crampton & Wagner, 1994). While a large theoretical literature exists to analyze the question, empirical evidence and in particular experimental evidence has been sparse (Kala, 2019).

The current research uses an original field experiment to overcome the limitations from past studies and advance knowledge about the value of direct participation and voice. Theoretically distinct from the prior work, our experiment focuses on having a voice as an intervention on the group level. We investigate questions about direct participation – to workers being able to participate directly and have a voice, as a group – rather than participation as firm governance (Jäger et al., 2019; Harju et al., 2021) or having more individual autonomy (Kala, 2019; Bandiera et al., 2020). The current research represents one of the few well-powered, cluster randomized field experiments testing the causal relationship between the participatory structure of a group and the group members' productivity and attitudes toward their work. Without a causal test of long-term behavioral change in the real world, theory on the topic will be difficult to advance.

The present work implemented a longitudinal randomized experiment with existing work groups in a large multinational textile factory in China. To increase participation, we adopt a classic participatory meeting paradigm (Lewin, 1947aa) in which

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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.

Following political theories of participatory democracy (Pateman, 1976) and psychological theories of group dynamics (Lewin, 1947b), we predicted 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. 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 (Kelley, 1952; Hackman, 2002; Locke & Latham, 2002), or improve the quality or number of workers' production goals (Locke & Latham, 2002; Bargh et al., 2010), or increase the frequency with which workers voice their individual thoughts or opinions ('voice'), which has known motivational benefits (Kelley, 1952; Lind & Tyler, 1988; Karpowitz et al., 2009). 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.

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 the 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 a strict hierarchy, and the factory's young female workers have little experience with participation (see Supplementary material Section B for qualitative findings). 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.

Below, we report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. We pre-registered all survey items, item groupings, and analyses at the Open Science Framework (https://osf.io/d9fnh/).

Participatory meeting experiment

Our field experiment sampled all 65 sewing groups (1752 workers, 93.6% female; mean age = 32.5 years, ranging from 18 to 53; see Supplementary Table S2 for worker demographics)[1] in the China branch of a multinational apparel manufacturer. Sewing workers' gross salary is 100% performance pay. They are incentivized to work hard

[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.

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since their productivity directly translates into their earning 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 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; see Supplementary Table S1 for a balance test). Once per week for 6 weeks during the *status-quo* 20-minute morning meeting slot, Chinese research assistants (RAs; all female) who were blind to hypotheses 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 obtrusively observed and took notes, as supervisors led the *status quo* morning meetings in which workers were not invited to speak. Supervisors lectured the workers on effective work strategies, such as how to prepare piecework or the best way to pass finished pieces to the next worker in group, and set production goals for individual workers at the end of the meeting. 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 (Levitt & List, 2011)). 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. RAs were trained to redirect any non-work-related conversation to production-related issues (see Supplementary material Sections A–B for a training protocol and qualitative observation). Supervisors were informed in advance that they should refrain from speaking during the discussion.

We administered the weekly treatment participatory meetings and control observer meetings for a total of 6 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 Supplementary Table S3 for results using market value). We also recorded the number of hours at work for each worker during normal working hours (workdays) and overtime hours (weekends and evenings) from the factory's daily record (see Supplementary material).

To measure self-reported attitudes, 1 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 3 weeks later, a full month after the intervention ended. The first survey that all workers took 1 week after the end of the intervention measured multiple work-related

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attitudes and preferences (survey completion rate = 83.8%; 93.8% female; completion rates did not differ between conditions; see Supplementary Table S10).

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. A second survey was implemented to all workers 4 weeks after the end of the intervention (survey completion rate = 84.07%; 93.49% female; completion rates did not differ between conditions; see Supplementary Table S10) to assess whether any attitudinal effect would sustain over a longer period of time.

Analysis Strategy

As pre-registered, we tested the effects of participatory meetings, on worker productivity during the intervention and up to 12 weeks after, and survey responses 1 week and 4 weeks following the intervention. Linear regressions used fixed effects for the seven departments in which the 65 groups were nested, a dummy variable indicating treatment, and a vector of pre-treatment individual covariates to improve efficiency (including pre-treatment productivity, work experience, and education). Robust standard errors clustered by group accounted for residual covariance on the group level. Thus, to estimate the average productivity for an individual worker i of group j,

$$P_{ij} = \beta_0 + \beta_1 D_{ij} + \mathbf{g_1 Z_{ij}} + \mathbf{g_2 H_{ij}} + g_j + \mu_{ij}. \quad (1)$$

The regression coefficient β_1 represents the average causal effect of the treatment on worker productivity, as measured by P_{ij} (averaged over the first 6 weeks following the start of the intervention). D_{ij} refers to a binary variable of experimental manipulation randomly assigned to the participants, in which $D_{ij} = 1$ refers to the participatory meeting condition and $D_{ij} = 0$ refers to the control condition. $\mathbf{Z_{ij}}$ is a vector of individual-level worker characteristics that are unaffected by the treatment such as work experience and education. $\mathbf{H_{ij}}$ denotes a vector of controls for pre-treatment productivity, broken up into 6-week averages. g_j denotes a departmental fixed-effect, and μ is a zero-mean error term, assumed to be mutually independent across (but not within) groups. We conducted a number of robustness checks, detailed in Supplementary material Sections D1–D6 and F1–F3. These sections report: estimated productivity outcomes using group averages ($N = 65$) and group sums ($N = 65$), all analyses described with the original model conducted using randomization inference, and analyses conducted using corrections for missing values including multiple imputation and inverse probability weighting. All results are substantively and statistically consistent with those reported below.

Results

Effects of participatory meetings on behavioral productivity

Before the intervention, the treatment and control-observer groups did not differ in measured pre-treatment variables, including productivity ($\beta = -48.24$, $p = 0.88$;

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control *mean* = 6743.06, *SD* = 808.81; see Supplementary Table S1 for the full balance check and Supplementary Table S2 for the demographic breakdown across conditions). During the 6 weeks of the intervention, participatory meetings were successful at increasing worker earnings to a substantively and statistically significant degree above control worker earnings (see Table 1 and Figure 1). Treatment workers earned on average 592.30 Yuan ($87.74) more than the control workers (*CI* = [142.50, 1042.10], *SE* = 229.31, p = 0.010), representing a 10.63% increase in average gross salary relative to control workers over the 6-week experimental period. This productivity increase is robust to different measures of productivity – both worker piece-rate earnings and the firm's raw production value – and model specifications (see Supplementary material Sections D1–D6 and Tables S3–S8). It is important to distinguish the finding as a productivity effect rather than a labor supply effect: there was no significant difference between treatment workers and control workers in normal working hours during or after the intervention (see Supplementary Table S15), and treatment workers' output per hour on a daily basis was significantly higher than the control workers ($\beta = 0.70$, *CI* = [0.06, 1.34], *SE* = 0.32, $p = 0.031$).

Since there were 6 weeks in the experimental period, we pre-registered a 6-week post-intervention data collection to test whether the effect endured. 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 (*CI* = [180.22, 885.22], *SE* = 179.70, 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 (consistent with archival analyses and ethnographic work): 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. Following our pre-registered 6-week analysis of productivity, we obtained more data so as to understand how long the treatment difference endured in total. Comparing workers' weekly productivity up to 12 weeks following the end of the intervention, we found that the statistically significant treatment difference sustained for 9 weeks after the intervention ended (see Supplementary Table S29).

Upon receiving unanticipated data on worker retention, we also compared retention rates between conditions. Control workers were 53.3% more likely to quit their jobs than treatment workers ($p < 0.001$). 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. We analyzed whether workers dropping out of their groups contributed to productivity declines or increases – in one case, when the best worker drops out, productivity could decline, or the opposite could happen when a weaker worker leaves the group. We did not find an association between group productivity and worker retention during the course of the entire intervention and 12 weeks following (see Supplementary Table S18). Thus, we view greater worker retention as a relatively unrelated positive outcome of the participatory treatment, alongside of increased productivity.

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Table 1. Productivity change during the 6-week experiment period and sustained productivity change after the experiment.

	Productivity per 6-week (in Chinese Yuan)			
	Experimental period (6 weeks during intervention)		Long-term (6 weeks post-intervention)	
	(1)	(2)	(3)	(4)
Participatory meetings	584.39* (259.12)	592.30** (229.31)	491.17* (206.21)	532.72** (179.70)
Work experience		42.87 (30.78)		63.72** (23.63)
Education		184.19 (118.97)		−109.21 (180.72)
Baseline productivity (first 6-week period)		0.44*** (0.06)		0.33*** (0.06)
Baseline productivity (second 6-week period)		0.04 (0.05)		0.13* (0.05)
Departmental fixed effects	YES	YES	YES	YES
Constant	6,310.16*** (466.48)	4,043.36*** (411.36)	7,656.74*** (279.19)	5,860.00*** (379.50)
N (clusters)	65	65	65	65
N (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. For workers who did not show up on any given day, their productivity was counted as zero for that day. See Supplementary Table S8 for substantively and statistically consistent results using missing data imputation to account for those who did not provide demographic information or who left their positions.
*p < 0.05; **p < 0.01; ***p < 0.001.

Effects of Participatory Meetings on Workers' Feelings of Individual and Group Empowerment

We found significant changes in treatment workers' work-related attitudes 1 week and 4 weeks following the intervention's end. As depicted in Figure 2, 1 week after the end of the intervention, workers assigned to participatory meetings reported higher individual and group empowerment as measured by several indices (see Supplementary Tables S11 and S12 and Sections F1–F3 for robustness analyses). For the indices that we prespecified as indicating individual empowerment, treatment workers reported significantly more job satisfaction ($\beta = 0.17$, $p = 0.03$; $M_{(PM)} = 4.47$, $SD = 0.34$; $M_{(O)} = 4.28$, $SD = 0.34$), and more sense of control at work ($\beta = 0.25$, $p < 0.001$; $M_{(PM)} = 3.97$, $SD = 0.32$; $M_{(O)} = 3.68$, $SD = 0.30$), 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 ($p = 0.10$; $M_{(PM)} = 4.08$, $SD = 0.33$; $M_{(O)} = 3.92$, $SD = 0.40$).

Workers in participatory meetings expressed greater group-based empowerment as well, including more favorable attitudes toward their work group than workers

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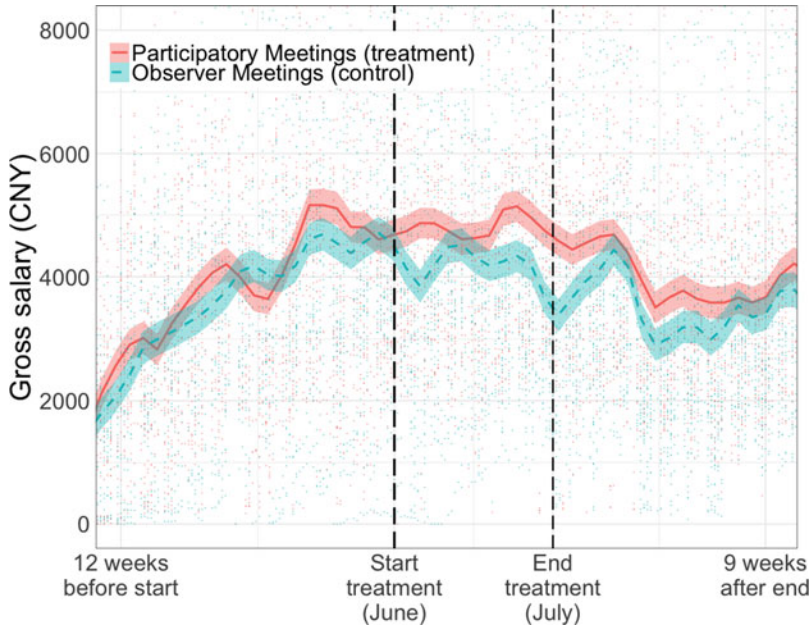

Figure 1. Worker productivity, comparing groups using participatory meetings and control-observer meetings, across a 27-week period. Note: LOESS fitted lines with 95% confidence intervals chart the complete time series of worker productivity in terms of daily gross salary for the participatory meetings (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.

in the observer condition ($\beta = 0.13$, p = 0.043; $M_{(PM)} = 4.67$, $SD = 0.23$; $M_{(O)} = 4.54$, $SD = 0.31$). Treatment workers also felt less lonely ($\beta = -0.31$, $p = 0.003$; $M_{(PM)} = 2.99$, $SD = 0.48$; $M_{(O)} = 3.31$, $SD = 0.44$) and reported that the factory cared about and respected them to a greater extent than workers in the control-observer condition ($\beta = 0.48$, $p < 0.001$; $M_{(PM)} = 3.60$, $SD = 0.41$; $M_{(O)} = 3.11$, $SD = 0.63$).

In the second survey, 4 weeks after the end of participatory meetings, these shifted attitudes endured: workers assigned to participatory meetings still reported more positive attitudes indicating individual empowerment (Supplementary Table S25). Treatment workers reported more job satisfaction ($\beta = 0.22$, $p = 0.001$; $M_{(PM)} = 4.06$, $SD = 0.29$; $M_{(O)} = 3.85$, $SD = 0.27$), and more sense of control at work ($\beta = 0.27$, $p = 0.001$; $M_{(PM)} = 3.77$, $SD = 0.33$; $M_{(O)} = 3.53$, $SD = 0.39$) 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 ($\beta = 0.34$, $p = 0.002$; $M_{(PM)} = 3.42$, $SD = 0.40$; $M_{(O)} = 3.11$, $SD = 0.58$). Even though treatment workers expressed more favorable attitudes toward group life and felt less lonely 1 week post-treatment, after 4 weeks there was no difference in attitudes toward their groups ($p = 0.41$) or feelings of loneliness

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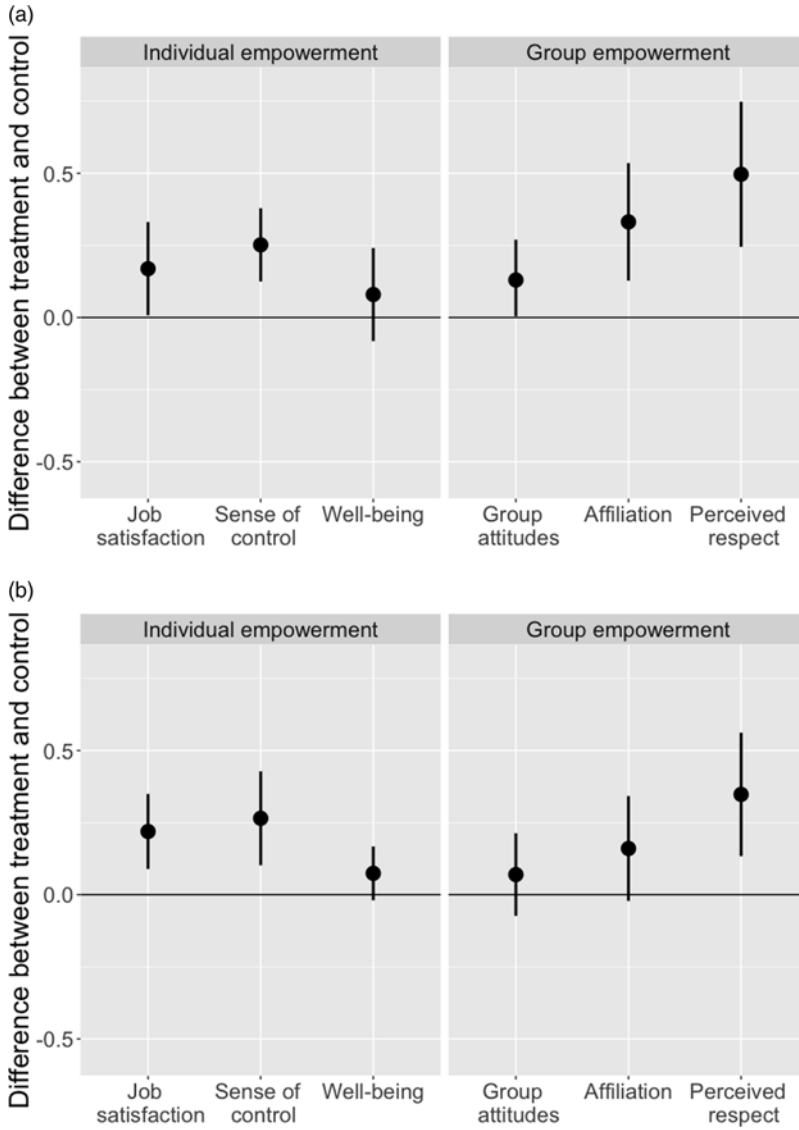

Figure 2. Difference of work-related attitudes between treatment and control workers, measured 1 week and 4 weeks following the end of the intervention. Note: Solid dots indicate the average treatment effect of the participatory meetings on each attitudinal index. Error bars represent 95% confidence intervals of the estimates.

($p = 0.13$).[2] See Supplementary Table S31 for average treatment effects on attitudinal changes with pooled data from the two survey waves.

[2]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 Supplementary material Section F). This could reflect their socialization into more productive groups; however, their small number may preclude finding a real

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Opening up the participatory 'Black Box'

Some of our survey outcome measures and our research assistant observations from the intervention address ideas about why participatory group structures might increase workers' productivity, retention, and feelings of empowerment.

One idea is that a participatory group meeting might increase workers' sharing of and access to important information about their job, including the unspoken rules and private knowledge about sewing tasks that more experienced workers can share with new workers, and the like (Kelley, 1952; Hackman, 2002; Locke & Latham, 2002). However, our first post-treatment survey showed that 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' structured qualitative meeting notes, the amount of time treatment workers spent on problem solving in their meetings did not correlate with their concurrent group productivity over the course of the intervention ($p = 0.29$), nor did it predict productivity in the 6 weeks following the intervention ($p = 0.07$; Supplementary Tables S20–S22).

Another possibility is that the participatory meetings might surface unspoken work goals and encourage a higher and more uniform productivity goal among groups (Locke & Latham, 2002; Bargh et al., 2010). We analyzed whether group-level variance in productivity became smaller over time, which we might expect if workers were strategically coordinating around shared 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 ($p = 0.006$; Supplementary Table S23). Thus, participatory meetings made individual but not group productivity more stable. Furthermore, the size of the goal, specifically the number of pieces that treatment workers stated that they aimed to complete, did not significantly correlate with workers' weekly productivity ($p = 0.07$; Supplementary Tables S25 and S26).[3]

Finally, a prevalent idea from previous work is that the experience of using one's voice or having your voice recognized in a group setting is a strong motivational and empowering experience (Hirschman, 1970; Tyler, 2006; Karpowitz et al., 2009; Wu & Paluck, 2020). Using again the structured qualitative notes from our RAs, we correlated the amount of talking time for treatment workers with their productivity. A 25% increase in the amount of time speaking up about production issues (without problem solving) among treatment workers correlated with $58 worth of group-level productivity each week during the intervention ($p = 0.01$) or $769 in the 6 weeks following the treatment ($p = 0.01$). Even voicing opinions about non-production issues predicted higher group-level productivity: a 25% increase was estimated to raise

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.

[3]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 versus a sleeve, we found a small but nonsignificant correlation between goal content and productivity.

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group-level productivity by $32 weekly during the intervention ($p = 0.03$) or $444 in the 6 weeks following the treatment ($p = 0.05$). We examined whether supervisors' encouragement of workers' voice during the meetings similarly affected productivity. We found that supervisors' encouragement and praise of voice positively predicted subsequent group productivity during the intervention ($p = 0.047$) and 6 weeks following ($p = 0.006$). By contrast, supervisors' interruption of the discussion (discouragement of voice) negatively predicted group productivity during the intervention ($p = 0.021$; Supplementary Tables S27 and S28), 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.

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 increase productivity and retention. During the 6-week experimental period, treatment workers on average increased their productivity by 11%, or $88 in earnings above their previous productivity compared to control workers. This increase in productivity persisted for over 2 months after the cessation of the participatory meetings. Twelve weeks after the cessation of the intervention, treatment workers were significantly more likely to remain at their job (an 85% vs. 77% retention rate in treatment vs. control groups). This is worth noting that the improved retention rate from the intervention likely reduced personnel cost which firms would otherwise have spent on hiring and training new workers. 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.

Previous theory suggests that the experience of using one's voice or having your voice recognized in a group setting is a strong motivational experience (Lind & Tyler, 1988; Karpowitz et al., 2009; Wu & Paluck, 2020). For example, using the same intervention, Wu and Paluck (2020) found that participatory meetings changed workers' attitudes toward authority and justice, which have long been theorized as personality traits that are resistant to influences. We note multiple pieces of evidence linking groups with particularly high levels of participation (measured directly via worker speech and indirectly via supervisor encouragement or conversely discouragement) to the rise in productivity. Predictions about the informational and goal-setting value of a participatory meeting were not supported by this kind of correlational evidence.

It is particularly noteworthy that the increase in productivity persists across time after the removal of the meetings, even as some workers leave and new group members arrive. Another notable feature of the study is that the meetings improved productivity among workers who are in general already highly motivated[4] to earn as much money as

[4]A typical worker's monthly wage ranges from 3000 Yuan ($483.82) to more than 7000 Yuan ($1128.92) in the factory in 2016. Some reference statistics: In 2013, average monthly wage in Shanghai was 5036 Yuan. The living standard and income level of the city, where this factory is located, is close to Shanghai.

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possible to send home to their families. Maintaining their productivity gains indefinitely may require sustaining the minimal amount of participation in the workers' weekly meetings. However, given the intervention requires 20 minutes of time per week that were already devoted to morning meetings, the participatory meetings seem like a scalable solution for increasing productivity in factories like this one.

The relation between attitude and behavior change

It is tempting to assume that the immediate and long-term increases we identified in attitudes – specifically in individual and group empowerment – were responsible for workers' increased productivity, particularly the persistence of higher productivity following the removal of the participatory meetings. However, we find little evidence that attitude change, such as job satisfaction or sense of control, preceded or even correlated with behavior change (see Supplementary material Section I). The behavioral productivity increase was not, for example, 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 (see Supplementary Table S10). Additionally, workplace empowerment and productivity increased at the same time for treatment groups, but did not correlate at the level of individual workers or at the level of groups. This dissociation is consistent with accumulated evidence of a lack of correlation between morale and directly observed (not self-reported) workplace productivity (Kahn, 1960; Petty et al., 1984; Coviello et al., 2020).

In general, the current study finds little correspondence between workers' self-reported experiences and their actual experiences and behaviors. For example, workers' actual proportion of speaking time correlated with group productivity, but not workers' self-reports of their voice in the workplace and in their family life. Similarly, we also found no correlation between actual productivity increase and perceived productivity increase. Workers in both treatment and control groups self-reported increases in productivity. That workers' perceptions of their own voice do not predict behavior is somewhat surprising, given a rich literature on procedural justice that connects attitudes toward authority with individuals' perception that they have a voice in their relationship with authorities (Tyler & Blader, 2003). However, this literature offers very little evidence on the correlation between perceived voice and actual, rather than self-reported, behavior.

In sum, the self-reported attitude changes that we observe open up questions for future research to explore. It is likely that we did not capture certain individual or group-level processes that can help explain why the participatory process shifted workers' attitudes toward their workplace, their decision-making power, and their work groups. Future studies could collect more observations of individuals discussing and working in their groups. Our findings demonstrate the promise and power of this

Compared with other similar jobs, this factory pays generously and its workers mostly receive a salary that places them in the lower-middle class in the city. These statistics are consistent with the authors' prior ethnographic work – workers in this context, mostly migrant workers from rural China, were extremely motivated and had a genuine interest in working harder and bringing money home to families.

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kind of qualitative investment, for understanding more of this intervention's mechanisms and for aiding the interpretation of quantitative results as well.

Given the presence of experimenters on a factory floor, some readers might associate these treatment effects with 'Hawthorne effects,' or the phenomenon that the presence of observers conducting studies can increase workers' performance. However, we think this is an unlikely explanation of our results, for a number of reasons. First, the control groups also had research assistants on site scrutinizing their meetings and work over the same period of time as the treatment groups. Research assistants obtrusively observed and took notes during the control group meetings as well. Participants in both the treatment and the control condition were given the same background about the study and filled out follow-up surveys together during the measurement period. Neither the treatment nor control groups were aware of being 'treatment' or 'control' groups and there was minimal interference. Hence, it is unlikely to be simply the presence of experimenters or the measurements that generated behavioral and attitudinal differences among workers. Second, the productivity and attitudinal changes lasted for an extended period of time after the end of the intervention, when the participatory meetings were no longer taking place and researchers had left. Finally, although 'Hawthorne effects' remain a popular concept, scholars from multiple disciplines have contested the reliable existence of this phenomenon, including studies that uncovered the data from the original Hawthorne study and demonstrated that the changes attributed to mere observation were spurious (Franke & Kaul, 1978; Adair et al., 1989; Jones, 1992; Levitt & List, 2011).

This study joins a burgeoning area of economic and behavioral science experimentation on increasing productivity among workers (Bandiera et al., 2011, 2020; Bloom et al., 2013; Breza et al., 2018; DellaVigna et al., 2020; Bessone et al., 2021; Kaur et al., 2021). The present study addresses a specific line of inquiry within this area, which focuses on productivity gains from worker participation in their workplace procedures and governance. Previous research on worker participation has examined shared governance or co-determination policies, in which a mandated proportion of workers is represented in board-level decision making. The logic of this approach is that participation in workplace governance can increase worker productivity through increased information sharing and cooperation (Harju et al., 2021). Recent studies, however, find little effects of co-determination on wages or performance (Jäger et al., 2019; Harju et al., 2021). By contrast, the present study tests a participatory strategy that implicates all workers in the context of their everyday work experience. We find some evidence to support the idea that this kind of participation can increase worker productivity through increased worker voice in their working groups. Future research would do well to test this specific logic, as well as the overall promising effect of increased participatory practices on worker productivity.

Future Directions

Our present findings suggest other important next steps, including but extending beyond future research that investigates the mechanisms of participatory group influence. Our experiment, situated in a naturalistic field context, presents a set of findings that are ultimately about change within a specific equilibrium of individual, group, and institutional forces – a particular context (Gantman et al., 2018; Wu & Paluck, 2021).

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Reflecting upon which aspects of this particular context might have facilitated or limited the influence of participatory groups leads to interesting future questions.

For example, we did not find that the information or goals shared during the workers' discussion affected worker productivity. But perhaps information sharing would matter in other workplaces, in China and elsewhere, where worker tasks are less differentiated than those in this study's factory. For groups in which all members are working on the same problem, or are discussing more general challenges like multi-tasking or workplace communication, information sharing might increase productivity. Information sharing might also be important for non-work groups discussing social problems like discrimination, where sharing strategies for recognizing and preventing negative stereotypes or using unbiased language could be broadly helpful for all. Additionally, the present sample's gender composition (93.6% female) did not allow for a test of the extent to which these treatments might be more popular or have a differential impact on individuals according to their gender identity, or whether groups with different gender compositions might be differentially influenced by a participatory style. In this most women identified sample, participants are chronically lower in status in this factory and in the society more generally and are typically not asked to participate. Future research can test whether the opportunity to use one's voice is as important a mechanism in other institutional contexts and among a wide variety of group members.

The participatory meetings positively impacted young women workers who have spent a lifetime near the bottom of their workplace and social hierarchy. Our qualitative evidence collected prior to the experiment suggests that workers were not initially interested in more participation at work. Both the institutional setting, which featured a strict hierarchical relationship between supervisors and their young women workers, and the Chinese national setting, which features discouragement of social and political dissent, present restraining forces on the workers to speak their opinions at work. Given this, the present findings may be relatively larger or smaller compared to the distribution of average effects from workplace participation interventions. On the one hand, we may observe larger effects due to the contrast between the participation invited by the intervention and workers' everyday lives. On the other hand, the effects we observe may be relatively smaller, because participation is under-appreciated by workers and actively resisted by the factory. Thus, while this study presents one of the first real-world experimental evidence for participatory groups at work, it also issues a call for more research in other settings. How do work groups in Westernized workplaces, where participation is culturally and institutionally encouraged, compare in their reactions to more participatory work structures?

Methods

The study was conducted between April 4 and August 9, 2016, after the pre-analysis plan was submitted to the Open Science Framework (https://osf.io/d9fnh/).

Experimental Procedure

Once per week for 6 weeks, during the traditional morning meeting slot, Chinese research assistants (RAs; all female) facilitated the weekly participatory meetings or served as observers. RAs were blind to the study hypotheses. Each type of meeting lasted for

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roughly 20 minutes before workers began their workday. RAs were graduate students from a local university, trained by the first author to follow a detailed experimental protocol. RAs were unaware of specific research hypotheses. By the end of the experimental period, treatment groups ($N = 31$) had experienced 6 weekly participatory meetings and control groups ($N = 34$) had experienced 6 weekly meetings with an outside observer.

One week after the experimental intervention had ended, a team of 11 RAs and the first author collected individual surveys from all 1752 members of the 65 sewing groups in the study. We repeated this survey procedure 3 weeks later, a full month after the intervention ended.

Since a considerable proportion of the factory worker population is illiterate, a survey administered in writing was not feasible. Prior in-depth cognitive interviews (with factory workers who were not involved in the experiment) guided the development of our survey instrument, which combined oral questioning in a group setting with workers checking boxes on individual answer sheets.

Due to workers' time constraints, we conducted the survey during the 1-hour meal time and provided a free meal as incentive. On average, 4–5 groups (not segregated by treatment assignment) gathered for a mealtime survey session. Researchers read each survey question aloud, and participants marked their responses on answer sheets (featuring places for 'yes' or 'no', or numbers from 1 to 6 on a Likert scale of agreement that was explained in advance). This procedure obviated the need to read or write Mandarin characters.

Workers were assured that there were no right or wrong answers, that the survey was confidential, and specifically that researchers would not share individual answers with the factory management. Participants did not write down their names; researchers linked survey responses to participants' factory data with a small code on the answer sheet, which corresponded to a coded sheet of names maintained by the researchers.

Researchers described the survey as 'part of a research project that investigates worker experiences in the factory'. Participants were encouraged to interrupt the researchers for question clarification, but were not allowed to look at each other's answer sheets or discuss their answers during the session. To further ensure confidentiality, participants put their completed answer sheets in a sealed envelope and put their envelope in a box with all other surveys. As agreed in advance of the study, no identifiable survey data were shared with the factory.

Productivity rates from factory data

Workers in the factory are paid by piece-rate. The factory uses advanced technology that counts each worker's finished pieces by machine in real time, providing objective, precise, and accurate measures of worker production. Piece quality is taken into account: inspected pieces that do not meet the factory's quality standards are not counted and are passed back to individual workers to repair.

Mechanism: Information, Voice, Goal-setting

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

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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*). In addition, two survey questions elicited workers' informational gain on sewing techniques (see Supplementary material Section E). 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.

To test the mechanism, we conducted correlational analyses using two models. In model (2), we used $X_{j,t-1}$, the previous week's group-level behavioral metrics on information, voice, or goal-setting during group meetings, to predict group productivity $P_{j,t}$ in the current week, controlling for each group's productivity in the previous week. The coefficient of interest is β_1. In model (3), we used the 6-week averaged group-level behavioral metrics on information, voice, or goal-setting during group meetings, to predict the 6-week averaged group productivity post-experiment, controlling for groups' baseline productivity before the experiment. The coefficient of interest is γ_1.

$$P_{j,t} = \beta_0 + \beta_1 X_{j,t-1} + \beta_2 P_{j,t-1} + \mu_{j,t}. \tag{2}$$

$$P_{j,\text{post}} = \gamma_0 + \gamma_1 \bar{X}_j + \gamma_2 P_{j,\text{baseline}} + \varepsilon_{j,t}. \tag{3}$$

Wave 1 post-intervention survey: 1 week later

The 'Wave 1' survey, 1 week after the end of the experiment, measured multiple work-related attitudes and preferences (survey completion rate = 83.79%; 93.78% female; see Supplementary Table S5 in Section E). The survey consisted of five parts: individual job-related attitudes (*individual empowerment*), individuals' attitudes and feelings toward the groups (*group empowerment*), mechanism measurement (*information gain and voice*), demographic information, and the manipulation check. Both exploratory and confirmatory factor analyses supported these pre-registered item groupings.

Wave 2 post-intervention survey: 4 weeks later

To examine whether any changes endured beyond the end of the experimental period, we repeated a shortened version of Wave 1 4 weeks after the end of the intervention with all participants, using the same procedure (we added a set of new measures

https://doi.org/10.1017/bpp.2022.9 Published online by Cambridge University Press

about authority and justice, discussed in Wu & Paluck (2020)). We selected 15 questions in total from the attitudinal constructs in Wave 1 to assess whether any attitudinal effect would sustain over a longer period of time (survey completion rate = 84.07%; 93.49% female; see Supplementary material Section E).

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/bpp.2022.9.

Authors' note. 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 (https://osf.io/d9fnh/). Study materials and additional analyses can be found in the Supplementary material. The study was approved by Princeton University Institutional Review Board.

Acknowledgements. We acknowledge support from Princeton University's Fund for Experimental Social Sciences to S.J.W. and from the Canadian Institute For Advanced Research to E.L.P., and would like to thank Dale Miller, Timothy Wilson, Eldar Shafir, P.M. Aronow, Alex Coppock, Frank Schilbach, Rebecca Littman, Ruth Ditlmann, Ana Gantman, Lee de Wit for their feedback, and all the research assistants and field partners and participants for their invaluable research support.

Competing interest. The authors declare none.

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Cite this article: Wu SJ, Paluck EL (2025). Having a voice in your group: Increasing productivity through group participation. *Behavioural Public Policy* **9**, 192–211. https://doi.org/10.1017/bpp.2022.9