Ceding control: An experimental analysis of participatory management (Online appendix)

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January 13, 2017

Abstract

To accompany our paper, in this appendix we present a more thorough literature review, the experimental instructions and robustness checks for our results.

1 Related Literature

Before turning to the specifics of our experimental design and some additional analysis of our results, we first provide an abbreviated review of literature on the relationship between participative management and firm performance. It is a literature that has evolved along two dimensions, a theoretical one that focuses on the behavioral rationales for changes in firm performance and an empirical one that assesses such first order questions as the moderating effects of context, scale of participation and other complementary factors.

The *sine qua non* of most discussions surrounding participatory management is its effect on the performance or competitiveness of firms. Given the extensive list of possible mechanisms by which participative management possibly releases "energies and enthusiasms which ordinarily lie dormant" (Patchen,

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1964) mixed empirical findings fuel a recurring line of research that aims to evaluate if, when, and how participative management is successful. A partial list of theoretical claims linking participatory management to greater firm performance include: (1) the notion that participation leads to a different set of firm goals reflective of the needs and objectives of those included in the decision-making process (Latham et al., 1988); (2) that participation in decision-making fosters the "self-actualization" of employees (e.g., Argyis, 1955); (3) that participation fosters a culture of mutual cooperation and support among employees (e.g., Likert, 1961); (4) that the invitation to participate in decision-making by management could be reciprocated with higher effort in a manner similar to gift-exchange (Ohana et al, 2013); (5) that the employee, now partially responsible for the organization's objectives through their participation, feels a sense of personal success or failure when the goals are reached or not reached (Porter et al., 1975; Straw & Ross, 1978); (6) that participation helps reveal and disseminate private information that employees hold about themselves, lowering moral hazard (Baiman and Evans, 1983); or that (7) participation improves communication among employees fostering mutual monitoring (Bowles et al., 1993). Indeed, the intuition linking employee involvement in decision-making and performance is so strong that other theoretical models such as that of Freeman and Lazear (1995) take these productivity increases among labor as given.

It is also true, however, that some theorists have drawn attention to the challenges and possible adverse consequences of participatory management, a topic that our study does not address. At the most basic level, personnel may not be willing and/or able to seek productivity improvements (Levine, 1995). Workers may also simply be less informed than managers. Jenson and Meckling (1979) also point out that the value of a worker sharing an idea could be larger than the value of the idea itself. They also note that the transaction costs associated with fostering participation could be prohibitively high. Williamson (1980) similarly worries that managerial talent may be wasted under democratic management while Webb and Webb (1920) claim that worker-elected managers would have more difficulty supervising workers than con-

ventional managers because of the threat of removal. It might also be that once participation in decision-making is established, that the firm loses organizational flexibility since it could become difficult and risky for the firm to revert to a more autocratic management style (Levine, 1995). Finally, Kremer (1997) suggests that democratic management might lead to inefficient personnel incentives and Alchien and Demsetz (1972) claim that it would result in inefficiencies under team production.

The empirical research investigating the effects of participation in decision-making on performance is large with several excellent meta-studies, including those of Levine and Tyson (1990), Spector (1986), Doucouliagos (1995) on the effects of labor-managed firms, Pereira and Osborn (2007) on quality circles, and Subramony (2009) on human resource management bundles. When read as a whole, a few common elements emerge. First, and most importantly, management that includes employees in the decision-making process appears to be weakly associated with higher firm performance, though no causal link has been established. Second, a glance at the results from the studies sampled within these meta-analyses shows wide and mixed variation. Again, we suspect that there are several reasons that complicate the clean identification of a relationship. First, to quote Lawler et al. (1995) once more, "[o]btaining reliable data on the extent of employee involvement... is difficult. No standard definitions of what is to be counted have been devised, determining the proportion of employees involved is problematic, and many defunct programs are still reported as active." Further, measuring the impact of managerial practices (or concepts) such as employee participation in decision making is difficult because of the variation in participation, the number of people involved, the issues at stake, the actual amount of power that each worker has to affect different aspects of the job, the gap between the degree of formal participation as described in firm by-laws and the actual level of influence workers have, the presence/absence of dominant or passive personalities in the group, and so on. These and other confounding issues, such as the possibility that participatory management could be disproportionately adopted by firms for unidentifiable reasons (i.e. non-random assignment), will bias the estimation of the true

effect of participation.

Although the context is often focused on social dilemmas, there is a small related behavioral literature that demonstrates the power of experiments to identify the effects of participation, specifically voting. For example, considering cooperation in an induced value framework, Sutter et al. (2010) find that punishment regimes are much more effective in the voluntary contribution context when they are voted on and Markussen et al. (2014) show that intergroup competition can increase the efficiency of public goods provision when implemented by a vote but that veto power by those unlikely to benefit much from the outcome can undermine this effect. Except for the few studies to which we compare our results in the main text of the paper (including Fehr et al., 2013; Bartling et al., 2014 and Mellizo et al., 2014), there are, to our knowledge, no experiments that specifically address the exogenous identification of participation on real effort in a principal-agent context, our focus.

2 Experimental instructions and protocol

[Paper instructions, back-translated from Spanish] Thank you for participating in our study today. You will earn 5 euro just for showing up on time and during the experiment, you will have the opportunity to earn more money. You will be paid in cash today, at the end of the experiment. At the conclusion of the experiment, the payments that you have accumulated will be paid to you in cash.

Please note that any and all actions and decisions that you make in the exercises or responses you provide are strictly confidential and anonymous. We intend to use the data collected from our study for academic work as it relates to firm organization, strategic human resource management, and industrial relations.

A lab assistant will read the initial set of instructions aloud to you as you read them to yourselves. If you have any questions while these instructions are being read, please raise your hand and we will attempt to answer them. You are not allowed to communicate with other participants during the experiment,

even to clarify instructions. Again, if you have any questions, please raise your hand and a lab assistant will assist you. At the end of the experiment session, we will call you individually by your ID number distributed to you to give you your earnings in cash.

As a part of this experiment, you will be engaging in a simple production task that consists of adding up sets of 2-digit numbers. The use of a calculator is prohibited, but you will be allowed to scratch paper and pencil that is provided to you on your desk. The numbers that you will be adding together are randomly drawn and each problem will be presented on the computer screen in front of you in the following way:

[screen shot of addition problem effort task]

After you submit an answer on the computer, you will be given a new problem to solve. To familiarize yourself with the computer interface and also the addition task we will ask you to do in the study, please now turn to your computer screen and await further instructions.

Subjects then engage in the practice period that is managed through the computer program for 2 minutes and then read instructions for the second part of the experiment.

[Paper instructions] In this stage of the experiment, you will be randomly put into a group with 3 other people (4 total in your firm) and you will be connected with the other firm members through the computer network. The firm is comprised of 3 workers and 1 manager. All of the firm's earnings and the earning of the firm's members (i.e. your earning for today's study) are tied directly to the number of correct answers to simple math problems that workers produce. The math problems that workers will be encountered with will be presented in exactly the same manner as they were in the previous practice period. Each correct answer provided by a single worker generates 0.75 € of revenue for the firm. Workers will have 14 minutes to produce correct answers.

For example: Let us assume that Worker 1 solves 15 addition problems correctly, Worker 2 solves 30 correctly, and Worker 3 solves 45 correctly. Firm output will be 15 + 30 + 45 = 90 total correct answers. 90 correct answers (Number of Correct Answers) X 0.75 € (revenue generated by each correct answer) equals 67.50 € (Firm Revenue).

The determination of the worker's compensation is ultimately the responsibility of the manager. The manager will be able to implement 1 of 2 possible compensation schemes for workers. A description of these 2 different compensation schemes for workers and a description of how the manager is compensated will now be given to you on the computer screen. Are there any questions?

Subjects then receive the following information on their computer screens that they can go through at their own pace.

[On screen instructions] As the instructions in the handout indicated to you, you have been randomly put into a group with 3 other people (4 total). 3 of you will be randomly designated to be workers and 1 of you will be randomly designated to be the manager. You are connected though the computer network in this room and your respective identities will remain anonymous for the duration of the experiment.

The Role of Managers and Workers: the 3 workers will perform the task of adding up sets of 2-digit numbers for 14 minutes. Each correct answer provided by a worker produces 0.75 € of revenue for the firm comprised of 3 workers and 1 manager The manager receives 0.25€ for each correct answer provided by workers. The remaining 0.50 € (0.75 - 0.25) of the value produced by a correct response is used for compensation for workers in one of two ways described below.

Compensation Scheme Possibilities for Workers: Compensation Scheme 1 (CS1) for workers. Recall the value of a correct response is 0.75 € in revenue for the firm and the manager receives 0.25 € out of this value. Under CS1, the worker receives 0.50 € for each correct response provided.

Compensation Scheme 2 (CS2) for Workers Under CS2. The number of correct answers from all 3 workers in the same firm of 4 are summed together.

Managers still receive 0.25 € from the value of each correct answer but workers will split the remaining revenue as follows: The worker with the highest number of correct answers receives 60% of the remaining revenue. The worker with the second highest number of correct answers receives 30% of the remaining revenue. The worker with the lowest number of correct answers receives 10% of the remaining revenue.

The manager in each group of 3 is ultimately responsible for implementing either CS1 or CS2 for workers. If you were to be randomly allocated to being a worker, would you prefer to be paid via CS1 or CS2? If you were to be randomly allocated to being a manager, would you prefer to implement CS1 or CS2?

Subjects are then randomly assigned by the computer program to either be a manager or a worker. Subjects learn about their assignment on their computer screen with one of the following messages.

YOU ARE A MANAGER or YOU ARE A WORKER

Managers and Workers receive different screens reminding them of what was already outlined in the instructions at the beginning of Stage 2.

[On screen instructions] The Role of the manager: The manager of your group will now take the decision of either implementing CS1 or CS2. The manager will either implement the compensation scheme A) Unilaterally (Implementing CS1 or CS2 directly) OR B) s/he can allow workers to vote to implement either CS1 or CS2.

As the manager, you now must decide whether you would like to implement either Compensation Scheme 1 or Compensation Scheme 2 or let the vote of workers assign the Compensation Scheme. Recall that your own compensation depends on the output produced by the workers in your group. You will receive 0.25 € for every unit produced by workers.

Worker Voting: The manger is currently deciding whether to implement CS1 or CS2 unilaterally or whether to allow workers to vote for CS1 or CS2.

Recall, that the compensation of the manger depends on the output produced by the workers in your group. The manager will receive 0.25 € for every unit produced by workers. As a worker, which compensation scheme do you vote for if the manager decides to cede control?

Workers and managers are then informed of the compensation scheme implemented.

The manager decided that s/he would.... The majority vote from workers was to implement... Therefore, the Compensation Scheme to be Implemented will be... In the following screen, the manager will start the clock for the worker. The worker will have 14 minutes to solve sets of 2-digit numbers.

Workers then engage in the work task for 14 minutes while bosses work on a Sudoku puzzle.

3 Auxiliary results

We report a summary of the compensation scheme preferences that we collected from all participants in Table A1. As one can see, participant preferences depend, to a great degree on the expected role. When participants imagine being a worker, most 195 of 320 (61%) prefer the piece rate. When they think of being a manager, however, their preferences are slightly skewed towards the tournament: 165 of 320 or 52% prefer the tournament as a manager. Overall, the measure of association, Cramer's V is just 0.36 which is consistent with the larger number of off-diagonal table entries in which a person's preference is role dependent.

Table A1: Compensation preferences and role.

		As a Manager		
		Piece Rate	Tournament	total
As a Worker	Prefer Piece Rate	123	72	195
	Prefer Tournament	32	93	125
	total	155	165	320

The results of robustness checks appear in Table A2. In the first regression we control for ability, gender, math enjoyment, competitiveness and compensation preference, and cluster the standard errors at the level of the work group. This affects the main result little: the point estimate on participation remains significant at better than the 5% level. In the second column we use robust standard errors but include session fixed effects. Here the participation point estimate increases to 0.119 and is significant at better than the 1% level. In columns (3) and (4), we consider a different dependent variable, the raw number of sums produced. When the standard errors are clustered at the level of the group in column (3), we see that, on average, workers in participatory firms produce 1.6 more sums in the 14 minute work period but the coefficient is not significant at the 10% level ($p = 0.24$). However, when we include session fixed effects, instead, the point estimate increases to 1.833 and is significant at the 5% level. In sum, without controls we find a productivity boost in the participatory firms of almost 7 percentage points. When we control for observables which work against finding this difference (e.g., on average ability is a bit high in non-participatory firms), the point estimate increases to approximately 12 percentage points.

Table A2: Output Robustness Tests.

	(1)	(2)	(3)	(4)
Participation	0.116**	0.119***	1.600	1.833**
	(0.056)	(0.041)	(1.346)	(0.930)
Ability	0.307***	0.677***	6.766***	17.486***
	(0.041)	(0.070)	(0.730)	(1.565)
Male	0.018	0.051	0.863	1.751*
	(0.047)	(0.042)	(1.097)	(0.929)
Enjoy Math	0.107***	0.070***	2.554***	1.555***
	(0.024)	(0.021)	(0.495)	(0.422)
Competitiveness	0.037	0.024	0.758	0.456
	(0.025)	(0.025)	(0.515)	(0.465)
Prefers Tournament	0.088*	0.052	2.204**	1.163
	(0.050)	(0.042)	(1.113)	(0.925)
Constant	2.067***	1.089***	1.303	-27.003***
	(0.193)	(0.168)	(3.275)	(4.052)
Cluster Errors on Group	Yes	No	Yes	Yes
Session Fixed Effects	No	Yes	No	No
Observations	240	240	240	240
R^2	0.31	0.45	0.33	0.55

Notes: Dependent variable is the natural log of output in (1) & (2) and output in (3) & (4); OLS; (robust standard errors); * p<0.10, ** p<0.05, *** p<0.01;

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