

Ploner, Matteo; Ziegelmeyer, Anthony

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## The hidden costs of control: an unsuccessful replication study

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# JENA ECONOMIC RESEARCH PAPERS



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## **The Hidden Costs of Control: An Unsuccessful Replication Study**

by

**Matteo Ploner  
Anthony Ziegelmeyer**

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Kahlaische Str. 10  
D-07745 Jena  
[www.econ.mpg.de](http://www.econ.mpg.de)

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# The Hidden Costs of Control: An Unsuccessful Replication Study\*

Matteo Ploner and Anthony Ziegelmeyer<sup>†</sup>

October 2007

## Abstract

This note reports a replication study of Falk and Kosfeld's (2006) medium control treatment. In the experimental game, an agent has an endowment of 120 experimental currency units and decides how much to transfer to a principal. For every unit that the agent gives up, the principal receives two units. Before the agent decides how much to transfer voluntarily, the principal decides whether or not to control the agent by imposing a compulsory transfer of 10 units. Like the original study, we observe that control entails hidden costs. Unlike the original study, we do *not* observe that the hidden costs of control outweigh the benefits and we observe that most of the principals decide to control the agent.

KEYWORDS: Control, Experimental Economics, Incentives, Intrinsic Motivation, Trust.

JEL CLASSIFICATION: C91, M52.

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\*We are indebted to Michael Kosfeld who provided us with the software source code, instructions and questionnaires of Falk and Kosfeld's (2006) study. We are also grateful to Petra Hagemann, Andreas Ortmann, Birendra Kumar Rai and Wendelin Schnedler for helpful comments.

<sup>†</sup>Ploner: Max Planck Institute of Economics, Strategic Interaction Group, Kahlaische Strasse 10, D-07745 Jena, Germany. Email: ploner@econ.unitn.it. Ziegelmeyer: Max Planck Institute of Economics, Strategic Interaction Group, Kahlaische Strasse 10, D-07745 Jena, Germany. Email: ziegelmeyer@econ.mpg.de.

The folk wisdom among experimental economists is that an empirical regularity becomes credible when it is replicated with three different groups of subjects, preferably from different pools and in different laboratories.

Friedman and Sunder (1994, page 99)

### 1 Introduction

A core principle of economics is that individuals respond to incentives. Following the standard economic view, employers implement monitoring and incentive pay policies since the imposition of extrinsic incentives invariably leads to profitable increases in employees' effort. Some empirical studies on the effects of incentive pay on performance confirm that employees respond to extrinsic incentives just as economic theory predicts (Lazear, 2000; Bandiera, Barankay, and Rasul, 2007). However, since the work by Deci (1971), psychologists and sociologists have argued that providing extrinsic incentives for employees can be counterproductive, because it may reduce the employees' intrinsic motivation. Not only do many economists consider that the idea of motivation crowding-out effects holds some intuitive appeal, but several economic explanations have been suggested for the phenomenon and economists have demonstrated that these effects are empirically well-founded (Frey and Jegen, 2001). A broader view of human motivation therefore suggests that, in many employment relationships, the imposition of extrinsic incentives is likely to have two opposite effects on the employees' performance: a disciplining effect and a crowding-out effect. Whether imposing extrinsic incentives is beneficial to the employer depends on the relative size of the two countervailing effects. This paper contributes to the emerging literature on the interaction of explicit and implicit incentives.

Falk and Kosfeld (2006) provides experimental evidence on the interaction between control and motivation by implementing the following principal-agent game in the laboratory. An agent has an endowment of 120 experimental currency units (ECUs) and chooses a transfer of  $x$  ECUs to the principal. For every ECU that the agent gives up, the principal receives two ECUs. Before the agent decides how much to transfer voluntarily, the principal decides whether or not to impose a compulsory transfer of  $\underline{x}$  ECUs. Falk and Kosfeld (henceforth F&K) consider a low ( $\underline{x} = 5$ ), a medium ( $\underline{x} = 10$ ), and a high ( $\underline{x} = 20$ ) control treatment (referred to as C5, C10 and C20 respectively) and make use of the strategy method to elicit agents' transfers in each of these three treatments. Concretely, agents are asked to choose  $x^C \in \{\underline{x}, \underline{x} + 1, \dots, 120\}$  in case their principal controls them, and to choose  $x^{NC} \in \{0, 1, \dots, 120\}$  in case their principal trusts them. The two main findings of F&K's study are (i) the average transfer by agents is higher when agents are trusted than when they are controlled ( $\bar{x}^{NC} > \bar{x}^C$ ), and (ii) most of the principals anticipate the adverse effect of control and therefore choose to leave transfers unrestricted. Interestingly enough, principals earn more when they trust their agents than when they control them, especially in the low and medium control treatments, which implies that the hidden costs of control outweigh the benefits.<sup>1</sup>

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<sup>1</sup>F&K ran several test treatments for which treatment C10 served as the main basis of comparison. First, F&K checked whether their results were an artifact of the strategy method by applying the specific response method in treatment SR10 (agents decided only after knowing the principal's decision). Their results do not indicate any effect of using the strategy method versus the specific response method in the considered principal-agent relationship. Second, they established that control only hurts the agent's motivation when the principal has a choice whether to impose control or not. Indeed, in treatment EX10 which is similar to treatment C10 except that control is exogenously imposed meaning that the agent always has to choose a transfer of  $x$  ECUs in the set  $\{10, 11, \dots, 120\}$ , the negative

F&K's experimental results are difficult to reconcile with an economic model. Indeed, most theoretical models confirm the conventional economic view that the principal's ability to restrict the agent's choice set makes her better off. As F&K explain in their paper, payoff-maximizing principals will force agents to transfer at least  $\underline{x}$  ECUs if all agents are payoff-maximizers but also if some agents are fair in the sense that they have a concern for equity and/or efficiency. Distributional theories of social preferences lead therefore to the same predictions as the standard economic case. Even some of the psychological-games based applications which take players' intentions into account rule out the possibility that, in equilibrium, the principal leaves transfers unrestricted and the agent responds positively to the principal's signal of kindness (Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006). However, two recent signalling models provide an economic explanation for the motivation crowding-out effects observed in F&K's experiment. Sliwka's (2007) explanation rests on the assumption that there is some uncertainty about norms of behavior whereas Ellingsen and Johannesson's (2007) explanation is driven by individuals' desire for social esteem. Though these two models exhibit a separating equilibrium in which some principals trust their agent and some agents react negatively to the principal's implementation of control, they do not rule out the standard economic prediction (see also Levine, 1998 and Bénabou and Tirole, 2006).

Given the weak theoretical support for F&K's observed behavioral patterns, it seems necessary to assess the reproducibility of their striking results. In this note, we report a replication study of F&K's medium control treatment whose results largely conflict with those of the original study. Though our replication reproduces as faithfully as possible the conditions of the original study (see Section 2) and confirms the existence of hidden costs of control, its main results support the basic premise of economics that incentives work (see Section 3). Indeed, we find that (i) the average transfer by agents is higher when controlled than when trusted (though not significantly) with a variance of transfers reduced by one-half when the principal controls, and (ii) a large majority of the principals chooses the more rewarding (in monetary terms) and safer strategy of controlling the agent. Section 4 completes the note with concluding remarks.

## 2 Experimental design and procedures

### Experimental design

We implemented F&K's medium control treatment where the principal either leaves transfers unrestricted or forces the agent to transfer at least 10 ECUs. The agent, who is endowed with 120 ECUs, chooses a transfer for both possible cases, i.e., without knowing the principal's actual decision. We therefore used the strategy method to elicit agents' choices. Given the number of ECUs transferred by the agent to the principal ( $x$ ), the agent receives  $120 - x$  ECUs while the principal receives  $2x$  ECUs. From now on, we refer to the two principal' choices as the no-control condition and the control condition.

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effect of control vanishes. Third, they explored the validity of their results in a more general economic setting by implementing a gift-exchange treatment (GE10) where the principal not only determines the agent's minimum level of  $x$ , but also pays the agent a wage. They found that the reciprocal relationship between wages and effort is weaker in the presence of control in treatment GE10.

### Practical procedures

The two sessions of the computerized experiment were conducted at the Experimental Laboratory of the Max Planck Institute of Economics in Jena (Germany). The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007) and we used a slightly modified version of the code employed by F&K.<sup>2</sup> Subjects were invited using an Online Recruitment System (Greiner, 2004). All 58 subjects were undergraduate students from various disciplines at the University of Jena, in each session the gender composition was approximately balanced, and no subject participated in more than one session. Some subjects had participated in earlier economics experiments, but all were inexperienced in the sense that they had never taken part in an earlier session of this type. Subjects interacted only once, each session lasted on average 40 minutes and the average earnings per subject were about 9.50 euros (about \$13), including a 2.50 euros show-up fee.<sup>3</sup>

At the beginning of each session subjects randomly drew a cubicle number. Half of the subjects were assigned the role of a principal and the other half the role of an agent, depending on their cubicle number. Once all subjects sat down in their cubicles, instructions were distributed. Principals and agents were given different sets of instructions. We used the exact same instructions as F&K but modified them slightly to account for the change of currency and show-up fee (see Appendices A and B).<sup>4</sup> Cubicles were visually isolated from each other and communication between the subjects was strictly prohibited.

Subjects first read the instructions silently and then listened as the monitor read them aloud (the monitor was a native German speaker). Questions were answered privately. Understanding of the payoff functions was assured by a control questionnaire. Subjects had to calculate both the principal and the agent's payoffs in three exercises with hypothetical decisions. After all subjects had answered correctly the control questionnaire, subjects played the principal-agent game once. At the end of the one-shot interaction, subjects' payoffs were displayed on their screens.

Before leaving the laboratory, subjects were asked to complete a questionnaire in which they had to state their work motivation in five hypothetical scenarios.<sup>5</sup> Different versions of the questionnaire were administered in the two sessions. Indeed, for each scenario, there is a condition in which the principal trusts the agent and a condition in which the principal controls the agent and each subject went through only one of the two conditions for a given scenario (see Appendices E and F). We administered the same questionnaires as F&K did in their questionnaire study. Answering the questionnaire was mandatory but not incentivized and subjects were told that their answers to the questionnaire would not affect their previous earnings. After completion of the questionnaire, subjects privately retrieved their final earnings (including the show-up fee).

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<sup>2</sup>We enlarged the fonts in order to facilitate subjects' reading of the computer screens and we added a questionnaire (see below).

<sup>3</sup>ECUs were converted to euros in the calculation of subjects' final earnings at a conversion rate of 10 ECUs to 1 euro. F&K used roughly the same conversion rate but paid their subjects a 6 euros show-up fee. In almost all sessions conducted at the Experimental Laboratory of the Max Planck Institute of Economics, subjects are paid a 2.50 euros show-up fee in addition to their earnings in the experiment. We decided to follow the usual practice and therefore put more emphasis on the performance-contingent earnings compared to F&K.

<sup>4</sup>Additionally, we modified the first sentence in F&K's instructions which reads as follows "You are now participating in an economic experiment which has been funded by various research support foundations."

<sup>5</sup>Subjects did not know at the beginning of the session that they would have to answer a questionnaire.

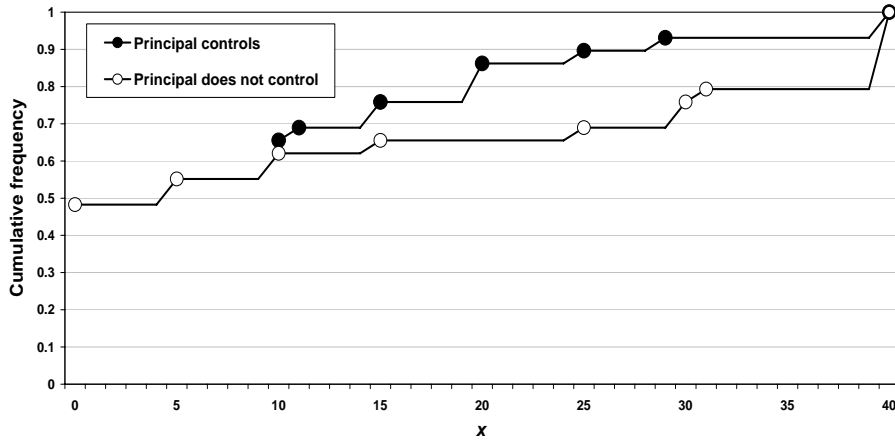


Figure 1: Cumulative distribution of agents' transfers.

### 3 Results

In this section, we first present our main findings concerning the behavior of the agents and the principals in the one-shot interaction. Second, we discuss the subjects' answers to the questionnaire.<sup>6</sup>

Our first result concerns the hidden costs of control and is qualitatively in line with F&K's first result.

**Result 1:** *We observe hidden costs of control.*

*Support:* Figure 1 shows the cumulative distribution of agents' transfers given the decision of the principal. For each value of  $x \geq 10$ , there are always strictly more agents who transfer at least  $x$  if the principal leaves transfers unrestricted than if the principal forces the agent to transfer at least 10 ECUs. In order to test whether the difference between the two distributions is statistically significant, we follow F&K's procedure and modify the distribution of transfers in the no-control condition such that any transfer strictly lower than 10 is set equal to 10. We reject the null hypothesis that the modified distribution is the same as the one in the control condition (Wilcoxon signed ranks test,  $p$ -value = 0.02).

Our second result establishes that the benefits of control outweigh the hidden costs. This result is in contradiction with F&K's second result.

**Result 2:** *The average number of ECUs transferred by the agent to the principal is (non-significantly) higher in the control condition than in the no-control condition.*

*Support:* Both the average and the median number of ECUs transferred by the agents to the principals are slightly higher in the control condition (14.7 and 10.0, respectively) than in the no-control condition (13.8 and 5.0, respectively), but not significantly so (Wilcoxon signed ranks test,  $p$ -value = 0.31). Interestingly enough, the variance of transfers is considerably higher in the no-control condition than in the control condition (16.8 vs. 8.7). Finally, agents' transfers in our sample

<sup>6</sup>We report the results of two-sided tests throughout the note and acceptance or rejection of the null hypothesis is always based on a 5 percent level of significance.

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are significantly lower than agents' transfers in F&K's sample in the no-control condition (13.8 vs. 23.0, Mann-Whitney test,  $p - value = 0.02$ ) whereas, in the control condition, agents' transfers do not statistically differ among the two samples (14.7 vs. 17.5, Mann-Whitney test,  $p - value = 0.28$ ).<sup>7</sup>

Given the average number of ECUs transferred and the variance of transfers in both conditions, forcing the agent to transfer at least 10 ECUs is at least as rewarding (in monetary terms) and safer than leaving the transfers unrestricted. Our third result shows that a large majority of our principals understood this. This result is the opposite of what F&K observed.

**Result 3:** *A large majority of the principals chooses to control.*

*Support:* 83% of our principals force the agent to transfer at least 10 ECUs. Judging by a binomial test, the proportion of principals who leave transfers unrestricted is significantly lower than the proportion of principals who force the agent to transfer at least 10 ECUs ( $p - value < 0.01$ ). Clearly, a large majority of our principals correctly anticipated that the benefits of control outweigh the hidden costs and chose the optimal strategy. In F&K's medium control treatment, 71% of the principals leave transfers unrestricted which is the most rewarding decision since average transfers are 31% higher in the no-control condition. In both experiments, principals' decisions suggest that most of them correctly anticipated the agents' behavioral reaction to control and chose the most rewarding strategy. According to a  $z$ -test for two independent proportions, we cannot reject the null hypothesis that the two proportions of principals' most rewarding decisions are identical in the two samples ( $p - value = 0.21$ ).<sup>8</sup>

### Questionnaire results

Like in F&K's questionnaire study, our subjects had to indicate their work motivation on a five-level scale ranging from "very low" to "very high" for each of five hypothetical scenarios. Qualitatively, our subjects' answers are very similar to the subjects' answers in F&K's sample: for all scenarios, the cumulative frequencies of subjects indicating that they have at most a medium motivation are

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<sup>7</sup>The relative frequency of agents who react positively (respectively neutrally and negatively) to the implementation of control equals 58.6% (respectively 13.8% and 27.6%). The behavior of the first group of agents is roughly in line with standard economic predictions since their average transfers equal 10.4 ECUs in the control condition and 1.2 ECUs in the no-control condition. Control-averse agents transfer on average 33.2 ECUs in the no-control condition but only 16.8 ECUs in the control condition. The group of agents who do not react to the principal's decision transfer on average 28.7 ECUs in both conditions. Interestingly enough, F&K observed in their medium control treatment similar agents' average transfers in both conditions *for a given behavioral reaction to control*. Hidden costs of control outweigh the benefits in F&K's medium control treatment because the majority of agents are control-averse (57% which corresponds approximately to the proportion of our agents who react positively) and only 25% of the agents transfer roughly 10 if controlled and 0 otherwise (this proportion corresponds approximately to the proportion of control-averse agents in our experiment).

<sup>8</sup>After having made their decision, principals were asked to state their expectation about the number of ECUs transferred by the agent (expectations were not incentivized). We find that principals who force the agent to transfer at least 10 ECUs have lower expectations about the agent's transfer than principals who leave transfers unrestricted (17.2 vs. 28.0) though the two distributions do not statistically differ (Mann-Whitney test,  $p - value = 0.10$ ). Note that there are only 5 expectations in the control condition. Interestingly enough, principals who force the agent to transfer at least 10 ECUs correctly estimate the agent's transfer (Mann-Whitney test,  $p - value = 0.74$ ) whereas principals who leave transfers unrestricted overestimate the agent's transfer (Mann-Whitney test,  $p - value < 0.05$ ). In F&K's medium control treatment, principals' expectations and agents' transfers do not statistically differ in both conditions though principals' expectations are slightly higher than agents' transfers. Note that since expectations were elicited after decisions in both studies, stated expectations could be mere rationalizations for behavior after the fact, i.e., the expectation might be induced *by* the decision rather than reflecting the reasons *for* the decision.



always higher in the control than in the trust condition. When regressing the self reported motivation level on the control condition of the scenarios (control=1, trust=0), an ordered probit regression employing robust estimation of the variance and allowing for clustering at the subject level indicates the significant negative impact of control on the motivation level. In summary, our questionnaire data are qualitatively similar to F&K's questionnaire data even though subjects' behavior in our experiment differs significantly from subjects' behavior in F&K's medium control treatment (see Appendices C and G). This last observation suggests that results motivated by hypothetical incentives should be interpreted with caution.

## 4 Concluding remarks

In assessing the reproducibility of F&K's experimental findings, we have confirmed the existence of hidden costs of control but we have also shown that these costs might not be substantial enough to undermine the effectiveness of economic incentives.<sup>9</sup> The observed difference between the agents' behavior in our experiment and the agents' behavior in F&K's medium control treatment is explained by the observed difference in the composition of agents' types in the two samples (for a given type, the average transfer in both conditions is almost identical in the two samples; see Appendix D). F&K observe that slightly more than half of the agents react negatively to control, about a quarter of the agents behave selfishly, and the remaining agents do not react to control. We observe that slightly more than half of the agents behave selfishly, about a quarter of the agents react negatively to control, and the remaining agents do not react to control. A remarkable result in both experiments is that most principals seem to have a good estimation of the proportion of agents who react negatively to control.

Most experimental economists probably agree with Ariel Rubinstein's claim that replications are too often conducted when the experimentalist has a new point to prove and needs to confirm the original study (Rubinstein, 2001, page 626). Our unsuccessful replication study might help experimental economists remember that scientific findings rest upon replication and uncorroborated studies provide a weak foundation for the development of economic theory.

## References

- BANDIERA, O., I. BARANKAY, AND I. RASUL (2007): "Incentives for Managers and Inequality Among Workers: Evidence From a Firm-Level Experiment," *Quarterly Journal of Economics*, 122(2), 729–73.
- BÉNABOU, R., AND J. TIROLE (2006): "Incentives and Prosocial Behavior," *American Economic Review*, 96(5), 1652–78.
- DECI, E. L. (1971): "Effects of Externally Mediated Rewards on Intrinsic Motivation," *Journal of Personality and Social Psychology*, 18, 105–15.

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<sup>9</sup>Hagemann (2007) and Schnedler and Vadovic (2007) replicate and extend F&K's medium control treatment. Both experimental studies confirm our experimental findings in their replication treatments: i) control entails significant hidden costs; ii) the distributions of agents' transfers in the two control conditions do not differ significantly; and iii) most principals control (only the second study reports on the principals' behavior). However, the two replication treatments do not follow F&K's experimental procedures as closely as our experiment.

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- DUFWENBERG, M., AND G. KIRCHSTEIGER (2004): "A Theory of Sequential Reciprocity," *Games and Economic Behavior*, 47(2), 268–98.
- ELLINGSEN, T., AND M. JOHANNESSON (2007): "Pride and Prejudice: The Human Side of Incentive Theory," Manuscript. Stockholm School of Economics.
- FALK, A., AND U. FISCHBACHER (2006): "A Theory of Reciprocity," *Games and Economic Behavior*, 54(2), 293–315.
- FALK, A., AND M. KOSFELD (2006): "The Hidden Costs of Control," *American Economic Review*, 96(5), 1611–30.
- FISCHBACHER, U. (2007): "z-Tree: Zurich Toolbox for Ready-made Economic Experiments," *Experimental Economics*, 10(2), 171–8.
- FREY, B. S., AND R. JEGEN (2001): "Motivation Crowding Theory," *Journal of Economic Surveys*, 15, 589–611.
- FRIEDMAN, D., AND S. SUNDER (1994): *Experimental Methods: A Primer for Economists*. Cambridge University Press.
- GREINER, B. (2004): "An Online Recruitment System for Economic Experiments," in *Forschung und wissenschaftliches Rechnen 2003.*, ed. by K. Kremer, and V. Macho, pp. 79–93. GWDG Bericht 63. Ges. für Wiss. Datenverarbeitung, Göttingen.
- HAGEMANN, P. (2007): "What's In a Frame: On Demand Effects and Trust in Experimental Studies," Manuscript. University of Cologne.
- LAZEAR, E. P. (2000): "Performance Pay and Productivity," *American Economic Review*, 90(5), 1346–61.
- LEVINE, D. K. (1998): "Modeling Altruism and Spitefulness in Experiments," *Review of Economic Dynamics*, 1, 593–622.
- RABIN, M. (1993): "Incorporating Fairness into Game Theory and Economics," *American Economic Review*, 83(5), 1281–1302.
- RUBINSTEIN, A. (2001): "A Theorist's View of Experiments," *European Economic Review*, 45, 615–28.
- SCHNEDLER, W., AND R. VADOVIC (2007): "Legitimacy of Control," University of Heidelberg, Department of Economics, Discussion Paper No 450.
- SLIWKA, D. (2007): "Trust as a Signal of a Social Norm and the Hidden Costs of Incentive Schemes," *American Economic Review*, 97(3), 999–1012.

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Supplementary material (for referees' use)

The following appendices are not meant for publication but could be made available on a web repository. Appendices A and B contain translated versions of the instructions (originally in German). Appendix C contains the raw data of the principal-agent game and appendix D summarizes agents' behavioral reaction to control in our experiment and in Falk and Kosfeld's (2006) medium control treatment. Appendices E and F contain translated versions of the questionnaires (originally in German). Note that for each scenario, we indicate whether the condition is "control" or "no-control". Obviously, this was not indicated in the original questionnaires. Appendix G summarizes the questionnaire data.

## Appendix A. Instructions for the agents (participants A)

You are now participating in an economic experiment which has been funded by the Max Planck Institute of Economics.

Please read the following instructions carefully. The instructions will provide you with all the information you require for participation in the experiment. Please ask for assistance if there is something that you do not understand. Your question will be answered at your workplace. There is a strict prohibition of communication during the experiment.

You will receive an initial endowment of 2.50 euros at the beginning of the experiment. You can earn additional money over the course of the experiment by collecting points. All of the points which you accrue over the course of the experiment will be converted to euros at the end of the experiment. Please note that:

<b>1 point = 0.10 euros</b>
-----------------------------

At the end of the experiment, you will receive the income which you earned over the course of the experiment plus the 2.50 euros of initial endowment in cash.

### The experiment

In this experiment, each participant A is associated with a participant B in a group of two. No participant knows with whom he is associated, meaning that all decisions are made anonymously.

#### You are a participant A.

Participant A receives an amount of 120 points at the beginning of this experiment. Participant B receives no points.

#### Participant A's decision:

Participant A can decide how many points he wants to transfer to participant B. The experimenter doubles each point which A transfers to B. Thus, each point which A transfers to B reduces A's income by one point and increases B's income by two points.

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The formula for calculating income is as follows:

<b>Participant A's income: <math>120 - \text{transfer}</math></b>
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<b>Participant B's income: <math>0 + 2 \times \text{transfer}</math></b>
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The following examples will clarify the income formulas:

Example 1: A transfers 0 points to B. The incomes are then 120 for A and 0 for B.

Example 2: A transfers 20 points to B. The incomes are then 100 for A and 40 for B.

Example 3: A transfers 80 points to B. The incomes are then 40 for A and 160 for B.

### Participant B's decision:

Before A decides how many points he wishes to transfer to B, B can determine a minimum transfer. In particular, B can constrain his associated participant A to transfer him at least 10 points. However, he can also decide not to limit participant A and thus leave his transfer decision completely free.

Therefore, there are two cases:

**Case 1:** Participant B constrains participant A to transfer at least 10 points to him. In this case, participant A can transfer any (integer) amount **between 10 and 120** to B.

**Case 2:** Participant B allows participant A to decide on his transfer freely and does not constrain him to transfer at least 10 points to him. In this case, participant A can transfer any (integer) amount **between 0 and 120** to B.

Therefore, the experiment consists of two stages:

#### Stage 1:

In stage 1, B decides if he will constrain A to transfer at least 10 points to him, or if he will allow A to decide freely.

#### Stage 2:

In stage 2, A decides which amount he will transfer to B. This amount lies

- between 10 and 120, if B constrains A to transfer at least 10 points;
- or
- between 0 and 120, if B does not constrain A to transfer at least 10 points.

The experiment is completed as soon as A has decided how many points he will transfer to B.

Please note that you, as participant A, must decide which amount you will transfer to B **before you know whether or not B will constrain you to transfer at least 10 points**. This means that you must make two decisions. You can make your entries with the help of this monitor:

Remaining Time (sec): 134

You are Participant A

You have 120 points. participant B has 0 points  
You can transfer points to participant B.  
The experimenter will double each point you transfer.

Case 1: Assuming that participant B constrains you to transfer at least 10 points.  
How many points will you transfer in this case ?

Case 2: Assuming that participant B allows you to decide freely.  
How many points will you transfer in this case ?

Therefore, you indicate how many points you transfer to B when B constrains you to transfer at least 10 points (case 1) and how many points you will transfer when you are free to decide (case 2).

Which of the decisions is relevant for you depends on what B decides. If he constrains you to transfer at least 10 points, the decision you give under case 1 applies. If he leaves you free in your decision, the point amount which you indicate under case 2 applies.

A final income monitor will inform you of the decisions and the resulting incomes.

Your point income will be converted to euros and paid out in cash to you together with your initial endowment.

Do you have any questions?

Please solve the following control questions. They have no consequence on your income and only serve to check if all participants in the experiment have understood the rules.

Question 1: Assume that participant B allows A to decide freely. A transfers 22 points. What are the incomes?

Income for A:

Income for B:

Question 2: Assume that participant B constrains A to transfer at least 10 points. A transfers 12 points. What are the incomes?

Income for A:

Income for B:

Question 3: Assume that participant B allows A to decide freely. A transfers 6 points. What are the incomes?

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Income for A:

Income for B:

Please raise your hand when you have solved the control questions.

### Appendix B. Instructions for the principals (participants B)

You are now participating in an economic experiment which has been funded by the Max Planck Institute of Economics.

Please read the following instructions carefully. The instructions will provide you with all the information you require for participation in the experiment. Please ask for assistance if there is something that you do not understand. Your question will be answered at your workplace. There is a strict prohibition of communication during the experiment.

You will receive an initial endowment of 2.50 euros at the beginning of the experiment. You can earn additional money over the course of the experiment by collecting points. All of the points which you accrue over the course of the experiment will be converted to euros at the end of the experiment. Please note that:

<b>1 point = 0.10 euros</b>
-----------------------------

At the end of the experiment, you will receive the income which you earned over the course of the experiment plus the 2.50 euros of initial endowment in cash.

#### The experiment

In this experiment, each participant A is associated with a participant B in a group of two. No participant knows with whom he is associated, meaning that all decisions are made anonymously.

#### You are a participant B.

Participant A receives an amount of 120 points at the beginning of this experiment. Participant B receives no points.

#### Participant A's decision:

Participant A can decide how many points he wants to transfer to participant B. The experimenter doubles each point which A transfers to B. Thus, each point which A transfers to B reduces A's income by one point and increases B's income by two points.

The formula for calculating income is as follows:

<b>Participant A's income: <math>120 - \text{transfer}</math></b>
---

$\text{Participant B's income: } 0 + 2 \times \text{transfer}$
--

The following examples will clarify the income formulas:

Example 1: A transfers 0 points to B. The incomes are then 120 for A and 0 for B.

Example 2: A transfers 20 points to B. The incomes are then 100 for A and 40 for B.

Example 3: A transfers 80 points to B. The incomes are then 40 for A and 160 for B.

### Participant B's decision:

Before A decides how many points he wishes to transfer to B, B can determine a minimum transfer. In particular, B can constrain his associated participant A to transfer him at least 10 points. However, he can also decide not to limit participant A and thus leave his transfer decision completely free.

Therefore, there are two cases:

**Case 1:** Participant B constrains participant A to transfer at least 10 points to him. In this case, participant A can transfer any (integer) amount **between 10 and 120** to B.

**Case 2:** Participant B allows participant A to decide on his transfer freely and does not constrain him to transfer at least 10 points to him. In this case, participant A can transfer any (integer) amount **between 0 and 120** to B.

Therefore, the experiment consists of two stages:

#### Stage 1:

In stage 1, B decides if he will constrain A to transfer at least 10 points to him, or if he will allow A to decide freely.

#### Stage 2:

In stage 2, A decides which amount he will transfer to B. This amount lies

- between 10 and 120, if B constrains A to transfer at least 10 points;
- or
- between 0 and 120, if B does not constrain A to transfer at least 10 points.

The experiment is completed as soon as A has decided how many points he will transfer to B.

The decisions of A and B will be entered on the monitors at the computers. A final income monitor will inform you of the decisions and the resulting incomes.

Your point income will be converted to euros and paid out in cash to you together with your initial endowment.

Do you have any questions?

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Please solve the following control questions. They have no consequence on your income and only serve to check if all participants in the experiment have understood the rules.

Question 1: Assume that participant B allows A to decide freely. A transfers 22 points. What are the incomes?

Income for A:

Income for B:

Question 2: Assume that participant B constrains A to transfer at least 10 points. A transfers 12 points. What are the incomes?

Income for A:

Income for B:

Question 3: Assume that participant B allows A to decide freely. A transfers 6 points. What are the incomes?

Income for A:

Income for B:

Please raise your hand when you have solved the control questions.



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Appendix C. Data of the principal-agent game

<i>ID</i>	<i>Questionnaire</i>	<i>Group</i>	<i>Principal</i>	<i>m</i>	$x_{belief}$	<i>Certainty</i>	$x^C$	$x^{NC}$	<i>Earnings</i>
1	1	1	1	10	10	6	-	-	40
2	1	1	0	-	-	-	20	30	100
3	1	2	1	10	30	4	-	-	20
4	1	2	0	-	-	-	10	0	110
5	1	3	1	10	10	5	-	-	58
6	1	3	0	-	-	-	29	31	91
7	1	4	1	0	40	7	-	-	20
8	1	4	0	-	-	-	10	10	110
9	1	5	1	10	10	5	-	-	20
10	1	5	0	-	-	-	10	0	110
11	1	6	1	10	10	6	-	-	20
12	1	6	0	-	-	-	10	0	110
13	1	7	1	10	10	7	-	-	20
14	1	7	0	-	-	-	10	0	110
15	1	8	1	10	10	6	-	-	20
16	1	8	0	-	-	-	10	0	110
17	1	9	1	10	10	7	-	-	20
18	1	9	0	-	-	-	10	0	110
19	1	10	1	10	108	7	-	-	40
20	1	10	0	-	-	-	20	30	100
21	1	11	1	10	10	6	-	-	20
22	1	11	0	-	-	-	10	40	110
23	1	12	1	10	10	6	-	-	20
24	1	12	0	-	-	-	10	0	110
25	1	13	1	10	10	6	-	-	20
26	1	13	0	-	-	-	10	0	110
27	1	14	1	0	10	3	-	-	0
28	1	14	0	-	-	-	10	0	120
29	1	15	1	0	40	2	-	-	80
30	1	15	0	-	-	-	10	40	80
31	2	1	1	10	20	5	-	-	80
32	2	1	0	-	-	-	40	40	80
33	2	2	1	10	10	6	-	-	20
34	2	2	0	-	-	-	10	0	110
35	2	3	1	10	10	6	-	-	80
36	2	3	0	-	-	-	40	40	80
37	2	4	1	10	15	6	-	-	30
38	2	4	0	-	-	-	15	10	105
39	2	5	1	10	10	6	-	-	22
40	2	5	0	-	-	-	11	5	109
41	2	6	1	10	10	5	-	-	50
42	2	6	0	-	-	-	25	25	95
43	2	7	1	10	15	5	-	-	40
44	2	7	0	-	-	-	20	40	100
45	2	8	1	10	10	4	-	-	20
46	2	8	0	-	-	-	10	0	110
47	2	9	1	0	40	3	-	-	10
48	2	9	0	-	-	-	10	5	115
49	2	10	1	10	10	5	-	-	30
50	2	10	0	-	-	-	15	40	105
51	2	11	1	10	10	7	-	-	20
52	2	11	0	-	-	-	10	15	110
53	2	12	1	0	10	3	-	-	0
54	2	12	0	-	-	-	10	0	120
55	2	13	1	10	15	2	-	-	20
56	2	13	0	-	-	-	10	0	110
57	2	14	1	10	40	2	-	-	20
58	2	14	0	-	-	-	10	0	110

*ID* = subject's unique identifier; *Questionnaire* = type of questionnaire; *Group* = matching of the players; *Principal* = 1 if subject is a principal, 0 if subject is an agent; *m* = minimum set by the principal;  $x_{belief}$  = principal's belief about the agent's transfer; *Certainty* = principal's certainty about  $x_{belief}$  (on a scale 1-7);  $x^C$  = agent's transfer if principal controls;  $x^{NC}$  = agent's transfer if principal does not control; *Earnings* = subject's earnings in ECUs.

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**Appendix D. Agent's Behavioral Reaction to Control**

	Positive		Neutral		Negative	
	P&Z	F&K	P&Z	F&K	P&Z	F&K
Number of agents	17	18	4	13	8	41
Relative share	0.59	0.25	0.14	0.18	0.28	0.57
Average $x$ if controlled	10.4	11.1	28.7	22.7	16.8	18.7
Average $x$ if not controlled	1.2	1.9	28.7	22.7	33.2	32.3

*Note:* P&Z refers to our experimental data and F&K refers to the data in Falk and Kosfeld's (2006) medium control treatment.

**Appendix E. Questionnaire 1**

In the following, we present several scenarios. For each scenario, please imagine how you would react if you found yourself in the described situation and answer conscientiously the corresponding question.

**Scenario 1 (no-control condition):** You began a new vacation job in a supermarket. Your task is to check the balances in the cash registers in the evening, meaning that you examine whether the amounts of money in the cash registers agree with the entries. In principle, you could easily swindle the supermarket by simply removing money from the cash registers. You examined the cash registers conscientiously and without cheating, and reported the results honestly. The manager believes that you reports are honest and does not double check the balances in the cash registers.

How high is your work motivation the next day?

Very high    High    Medium    Low    Very low

**Scenario 2 (control condition):** You have a new job. Your boss explains your tasks to you as well as the amount of work expected of you. Before starting your work, you have to sign a binding agreement. This defines your working times exactly.

How high is your work motivation at your new workplace?

Very high    High    Medium    Low    Very low

**Scenario 3 (control condition):** During a job interview, you presented your knowledge, experience, and qualifications truthfully. You provide your previous employer as a reference who could confirm your information. The new employer does not hire you until he has gathered information about you from your previous employer and confirmed the accuracy of your information.

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How high is your work motivation?

Very high    High    Medium    Low    Very low

**Scenario 4 (no-control condition):** During your studies, you start working in a small family-owned company. The head of the company explains to you that for cost reasons it is not allowed to use the photocopier or the printer for private purposes. You clearly plan to adhere to this directive. The room where the photocopier and the printer are located stands open.

How high is your work motivation?

Very high    High    Medium    Low    Very low

**Scenario 5 (control condition):** You do various administrative tasks for a small company. Recently, an Internet access has been provided on all PCs, but this access may be used only for business purposes. In order to limit potential abuses, the management installed special software, which lists all Internet sites the employees have visited.

How high is your work motivation?

Very high    High    Medium    Low    Very low

## Appendix F. Questionnaire 2

In the following, we present several scenarios. For each scenario, please imagine how you would react if you found yourself in the described situation and answer conscientiously the corresponding question.

**Scenario 1 (control condition):** You began a new vacation job in a supermarket. Your task is to check the balances in the cash registers in the evening, meaning that you examine whether the amounts of money in the cash registers agree with the entries. In principle, you could easily swindle the supermarket by simply removing money from the cash registers. You examined the cash registers conscientiously and without cheating, and reported the results honestly. You realize on the way home that you forgot your umbrella. When you enter the supermarket, you see that the manager is again examining the amounts in the cash registers.

How high is your work motivation the next day?

Very high    High    Medium    Low    Very low

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**Scenario 2 (no-control condition):** You have a new job. Your boss explains your tasks to you as well as the amount of work expected of you. Your boss asks you to follow the work times exactly.

How high is your work motivation at your new workplace?

Very high    High    Medium    Low    Very low

**Scenario 3 (no-control condition):** During a job interview, you presented your knowledge, experience, and qualifications truthfully. You provide your previous employer as a reference who could confirm your information. The new employer believes your information and hires you.

How high is your work motivation?

Very high    High    Medium    Low    Very low

**Scenario 4 (control condition):** During your studies, you start working in a small family-owned company. The head of the company explains to you that for cost reasons it is not allowed to use the photocopier or the printer for private purposes. You clearly plan to adhere to this directive. The room where the photocopier and the printer are located is locked, meaning that in general you first have to get the key from your boss.

How high is your work motivation?

Very high    High    Medium    Low    Very low

**Scenario 5 (no-control condition):** You do various administrative tasks for a small company. Recently, an Internet access has been provided on all PCs, but this access may be used only for business purposes. During a meeting, the management asks all employees to respect this rule.

How high is your work motivation?

Very high    High    Medium    Low    Very low

## Appendix G. Questionnaire data (frequency table)

Work Motivation	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	Control	Trust	Control	Trust	Control	Trust	Control	Trust	Control	Trust
Very low	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.036
Low	0.143	0.033	0.067	0.000	0.067	0.000	0.107	0.000	0.067	0.000
Medium	0.429	0.133	0.400	0.286	0.400	0.000	0.429	0.167	0.367	0.429
High	0.286	0.567	0.367	0.500	0.367	0.429	0.429	0.600	0.267	0.464
Very high	0.143	0.267	0.167	0.214	0.167	0.571	0.036	0.233	0.200	0.071
Observations	28	30	30	28	30	28	28	30	30	28