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Abstract

Companies typically control various aspects of their workers' behaviors. In this paper, we investigate whether the hierarchical distance of the superior who imposes such control measures matters for the workers' ensuing reaction. In particular, we test, in a laboratory experiment, whether potential negative behavioral reactions to imposed control are larger when they are implemented by a direct superior rather than a hierarchically more distant superior. We find that hierarchical proximity indeed magnifies such control aversion and discuss several potential channels for this result.

JEL-Codes: C920, D230, M120.

Keywords: control aversion, hierarchies, delegation, principal-agent-problem.

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1 Introduction

Companies typically exert some level of direct control over the behaviors of their workers. For example, many companies set a minimum amount of working hours, decide where work should be conducted, or enforce a dress code. In practice, such control decisions can be taken by different layers of the corporate hierarchy. For example, following the recent surge in home office work due to the COVID-19 pandemic, many companies are now requiring their workforce to return to the office. In some companies, e.g., several financial institutions, like Goldman Sachs, that control decision is taken by the top management and implemented across the whole workforce.¹ Amazon CEO Andy Jassy, on the other hand, has delegated that control decision to the individual team managers.²

Hence, the question arises which layer of the hierarchy *should* exert control. This question is especially relevant as previous research in the economics literature has shown that control decisions can have adverse effects on worker behavior: If some workers have non-pecuniary motivation in the absence of control, controlling them may crowd out this part of their motivation and reduce their performance.³ In some cases, such control aversion can even lead to an overall negative effect of control (Falk and Kosfeld, 2006). Therefore, we ask whether or not workers' reactions to imposed control differ conditional on whether control is implemented by a direct superior rather than a hierarchically more distant superior. The answer to this research question has two direct and important implications for applied managerial decisions: First, it could provide a reason for top management to retain or delegate controlling decisions. Second, it could provide an additional rationale for why companies design multi-layer hierarchies.

To study our research question, we designed and conducted a laboratory experiment. Using a laboratory experiment allows us to establish a causal link between hierarchical distance in control and control aversion: The exogenous allocation of the controlling decision within the hierarchical structure of the (experimental) organization enables a clean identification of a potential causal effect. By contrast, establishing causality is nearly impossible using observational real-world data, given that the allocation of controlling decisions within the hierarchy is endogenous.

¹See <https://fortune.com/2022/03/11/goldman-sachs-return-to-work-workers-david-solomon>.

²See <https://www.aboutamazon.com/news/workplace/amazon-offering-teams-more-flexibility-as-we-return-to-office>.

³Such non-pecuniary motivation could stem from, for example, an individual's desire to perform the task for its own sake (Bénabou and Tirole, 2003; Cassar and Meier, 2018), a social norm (Sliwka, 2007), pride and self-esteem (Ellingsen and Johannesson, 2008), or reciprocity (Von Siemens, 2013).

Our experimental design builds on Falk and Kosfeld (2006), but extends the setup to emulate organizations with a three-layer hierarchy in which participants assume one of three randomly assigned roles: CEO, supervisor, or worker. An organization consists of one CEO who manages two teams, each consisting of a supervisor-worker pair. Each worker receives an endowment of 120 points and can decide to transfer part of their initial endowment to the organization. Each point transferred to the organization increases the payoff of the CEO by one point and the payoff of the paired supervisor by two points, making the transfer efficient. In each organization, the CEO can decide to exert control or to delegate the decision to the supervisors. Independent of whether control is implemented by the CEO or the supervisors, it implies that a minimum transfer requirement of five points is imposed on the worker. If both choose not to control, the worker is free to choose any transfer, including transfers of less than five points. Our main outcome of interest is whether the workers' transfers differ depending on whether control is exerted by the CEO or by the supervisor.

Our results show that workers indeed react differently conditional on who controls them. If control is exerted by the CEO, workers on average transfer 24.3 points, which is significantly more than the average transfer of 22.4 if control is exerted by the supervisor. If uncontrolled, workers on average transfer 29.8 points. Thus, we find negative effects of control, and these negative effects are mitigated by retaining the control decision in higher levels of the hierarchy.⁴

Our results contribute to the literature on the trade-offs involved in the decision to centralize or delegate decision-making in firms. This literature has so far highlighted, among other things, the importance of information and incentives (Aghion and Tirole, 1997, Fehr, Herz and Wilkening, 2013), the need for coordination (Dessein, 2002, Hart and Moore, 2005, Alonso, Dessein and Matouschek, 2008), the diffusion of new technology (Acemoglu et al., 2007), or preferences for power (Dessein and Holden, 2022, Bartling, Fehr and Herz, 2014). Previous studies have also shown that principals can profit from delegating self-serving decisions that can hurt third parties. This is because delegation effectively reduces blame (Bartling and Fischbacher, 2012), punishment (Coffman,

⁴Our finding of negative effects of control is in line with Falk and Kosfeld (2006), who also find hidden costs of control in their two-layer hierarchy. Note that this finding is partially a consequence of the very ineffective control device that we have implemented. Control only forced the workers to implement a minimum transfer of five points. This design choice was on purpose, as we aim to identify differences in the adverse effects of control conditional on hierarchical distance of the controlling party, and are less interested in whether or not control on average is profitable for the organization.

2011, Coffman and Gotthard-Real, 2019), and feelings of accountability for undesirable outcomes (Hamman, Loewenstein and Weber, 2010). By contrast, our results highlight a potential advantage of centralization: Retaining controlling decisions at the top of a vertical hierarchy is beneficial in that it mitigates the subordinates’ negative reaction to control.

Our paper also contributes to the experimental literature studying the moderators of hidden costs of control. Since Falk and Kosfeld (2006) provided the first clean evidence for hidden costs of control, the laboratory experiments that followed Falk and Kosfeld (2006)’s original work shed light on possible mitigating factors, such as perception of legitimacy (Schnedler and Vadovic, 2011), procedural aspects (Kessler and Leider, 2016), and third-party control (Burdin, Halliday and Landini, 2018).⁵ The existence of hidden costs of control was also shown in the field (Belot and Schröder, 2016; Herz and Zihlmann, 2021). Further, it was shown that negative reactions to control are larger if the relationship is more interpersonal, either because the relationship is non-anonymous and repeated (Dickinson and Villeval, 2008) or because the interaction is online rather than in the lab (Schmelz and Ziegelmeyer, 2020). We demonstrate that hierarchical distance by itself, independent of the interpersonality of the relationship, is a relevant moderating force of hidden costs of control.

2 The experiment

In this section, we summarize our experimental design, the procedures, and our main hypothesis including the mechanisms that support it.

2.1 Design

The aim of our laboratory experiment is to study agents’ behavioral reaction to control in vertical hierarchies. Extending the principal-agent game proposed by Falk and Kosfeld (2006), we consider a three-tier hierarchy. At the beginning of the experiment, participants are randomly assigned to groups of five and to one of three roles: CEO, supervisor, or worker. Each group forms an “organization” where one CEO manages two teams and each team consists of a supervisor-worker pair.

⁵Schnedler and Vadovic (2011) show that hidden costs of control are lower when agents view the controlling decision as legitimate because it prevents selfishness or theft. Kessler and Leider (2016) find that how the way the controlling decision comes about matters for the agents’ reaction. Burdin, Halliday and Landini (2018) show that control imposed by a third party, who is neutral in that they are not directly affected by the agent’s ensuing decision, brings about more muted behavioral reactions. Some laboratory replications could not confirm the finding that the overall effect of control is negative (e.g., see Ziegelmeyer, Schmelz and Ploner, 2012).

Figure 1 illustrates the vertical structure of the organization studied in this experiment. Though simple, our design attempts to replicate the hierarchical structure of large real-world organizations, where subordinates may be monitored or controlled by relatively more distant or closer superiors.

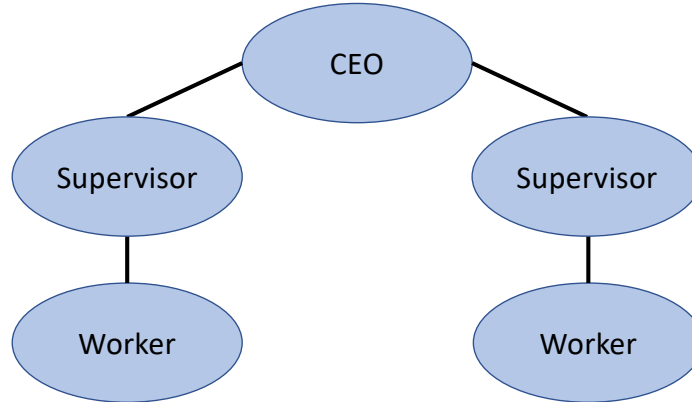


Figure 1: Organizational structure.

Each worker chooses a productive activity (or transfer) that is costly to him- or herself, but benefits both the paired supervisor and the CEO. The CEO and the supervisors do not engage in productive activities, but they may decide to impose control on the workers by mandating a minimum transfer level. The control decision is sequential and applies to all the lower layers in the organization: that is, the CEO's decision applies to both teams, whereas each supervisor's decision only applies to the paired worker.

More precisely, each worker $i \in 1, 2$ has an initial endowment of 120 points, whereas the CEO and the supervisors have no endowment. Each worker i selects a transfer $x_i \in \{\underline{x}, \underline{x} + 1, \dots, 120\}$, where $\underline{x} = 5$ if either the CEO or supervisor i imposed control, and $\underline{x} = 0$ if no control is imposed. Exerting control thus restricts a worker's choice set. The transfer entails a monetary cost $c(x_i) = x_i$ to worker i and results in a monetary benefit of $2x_i$ to the paired supervisor i and x_i to the CEO. The CEO's, supervisor i 's, and worker i 's payoff functions are, respectively, $\pi_{CEO} = x_1 + x_2$, $\pi_{SV,i} = 2x_i$, $\pi_i = 120 - x_i$. The decision process involves the following three stages:

1. The CEO decides whether to impose control, i.e., set $\underline{x} = 5$, or to delegate this decision to the supervisors. The CEO's choice is binary, i.e., $\underline{x}_{CEO} \in \{delegate, control\}$.
2. If the CEO imposes control, both supervisors have to implement the CEO's decision for their

respective worker and have no own choice to make. If the CEO delegates the decision, each supervisor independently chooses whether or not to control their paired worker. In this case, supervisor i 's choice is binary $\underline{x}_{SV,i} \in \{no\ control, control\}$.

3. Each worker i independently decides how much to transfer given their choice set, and the respective payoffs are obtained.

This sequence of decisions affords us to observe workers' transfers for three separate cases: *No Control*, *Control by Supervisor*, and *Control by CEO*. Our main outcome of interest is whether workers' transfers differ after *Control by CEO* from those after *Control by Supervisor*.⁶

Although our design is based on the original design in Falk and Kosfeld (2006), there are a few important differences inherent in extending the design to multi-layered hierarchies that are worth discussing. We designed the relation between the worker and the superior such that it exactly mirrors the two-party design in Falk and Kosfeld (2006). The addition of the third layer, the CEO, who is also a recipient of payments in the organization, then necessarily implies important changes. The CEO also receives a transfer from the worker, with a multiplier of one. Thus, transferring points becomes more efficient relative to Falk and Kosfeld (2006), given that one transferred point generates a total surplus of three points in our setting. We chose a multiplier of one given that the CEO benefits from the transfers made by two workers. Thus, an important focal transfer amount remains constant relative to Falk and Kosfeld (2006): If each worker transfers 40 points, the resulting outcome is a payment of 80 points for each party.

2.2 Main hypothesis and mechanisms

Before reporting the results of the experiment, we summarize our hypothesis. Akin to Falk and Kosfeld (2006) and subsequent studies, we expect some workers to exhibit a negative reaction to control, that is, to make lower transfers when they are controlled than when they are not.

Novel in our study is the conjecture that the workers' reaction to control differs depending on

⁶Note that the outcome *No Control* can only be jointly implemented by both CEO and supervisor, whereas control can be individually implemented either by CEO or supervisor. Thus, the workers' reactions to control can be attributed to the individual decisions of either the CEO or the supervisor. While we believe that this setup is realistic in that it is often infeasible for the upper layers of a hierarchy to ensure that supervisors do not exert control, there may be cases in which CEOs can impose *No Control* directly. Studying such cases in future research constitutes an interesting research avenue for control aversion in hierarchies.

the hierarchical distance of the superior who exerts control. In particular, our key hypothesis is that workers' adverse reaction to control decreases with the hierarchical distance to the individual who imposes control. For our specific experimental setup, this hypothesis leads to the following prediction:

Prediction. *The workers' transfers are larger when control is imposed by the CEO rather than by the supervisor.*

Why would we expect a larger effect of being controlled if it is imposed by the hierarchically less distant supervisor? We believe several complementary mechanisms may contribute to a potential effect of hierarchical distance on control. First, control can trigger a negative response if it is perceived as a signal of distrust. If a supervisor controls a worker, that worker is clearly the target of his or her control and the worker might feel directly distrusted. A CEO's decision to control, on the other hand, applies to all workers in the organization, and not just to one individual worker. Thus, the signal of distrust is *diffused* if it is sent by the CEO rather than a direct supervisor, and this could lead to a reduction in control aversion. Consistent with such an argument, Hagemann (2007) finds that the benefits of controlling a team of agents are increasing in the team size.

Second, a worker could perceive the supervisor to be more *responsible* for the implemented control than the CEO, and this heightened responsibility could trigger a stronger negative reaction. For example, in the *causal responsibility* model by Engl (2018), the degree of responsibility depends on how close an action is from being pivotal for an event. In our setting, after delegation by the CEO, a supervisor's decision to control is always pivotal and, thus, s/he bears full responsibility. This is not the case for a CEO who exerts control, as the CEO's alternative choice (delegation) could also lead to control by the supervisor. Thus, control by the CEO is only pivotal with a certain probability, which reduces the CEO's responsibility for control.

Third, the positive *correlation* in the payoffs of the CEO and the supervisor, and the *asymmetry* in marginal effects of transfers by the workers on their payoffs may also play a role. Correlation implies that a worker can only punish or reward both the CEO and the supervisor simultaneously. Because of asymmetry, the worker may be more hesitant to reduce transfers if the CEO imposes control, knowing that this will hurt more the "innocent" supervisor. On the other hand, if the supervisor controls and the worker reacts negatively, the reaction also hurts the "innocent" CEO,

but to a lesser degree. This could lead to a stronger reaction to control if the supervisor imposes it.

Lastly, *distance* by itself may be a moderating factor: there are more layers of corporate hierarchy between the CEO and a worker than between the supervisor and a worker. For example, Frey (1993) argues that when there is a closer relationship with the superior, control magnifies the crowding-out effect of a worker’s intrinsic motivation.⁷

All of these factors are often naturally present in multi-layer hierarchies. The aim of our design is thus *not* to decompose the relative importance of each of these factors. Rather, our design aims at identifying whether these factors *jointly* affect the response of workers to being controlled. Together, they suggest that increased hierarchical distance can decrease control aversion and thus support our hypothesis.⁸

2.3 Experimental procedures

At the beginning of a session, participants were informed that the experiment consisted of several parts and that one of the parts would be later randomly selected to determine their payout. Participants received instructions only at the beginning of each part.⁹ We used the strategy method for roles. In Part 1, all participants made decisions taking up the role of worker, followed by the role of supervisor (Part 2), and CEO (Part 3). Lastly, all participants completed a short questionnaire (Part 4).

We adopted a within-subjects design and made use of the strategy method to elicit the participants’ choices in the role of worker and supervisor. In Part 1, each participant had to decide on the transfer x for three possible cases: (i) if neither the CEO nor their paired supervisor had restricted their choice set (*No Control*); (ii) if the CEO had left the supervisors free in their decisions, but their paired supervisor had set a minimum transfer requirement of five (*Control by Supervisor*); (iii) if the CEO had forced all supervisors to set a minimum transfer requirement of five so that

⁷Consistent with this argument, Dickinson and Villeval (2008) find that lower anonymity and repeated interaction magnify adverse reactions to control, and Schmelz and Ziegelmeyer (2020) find that participants in a laboratory experiment display stronger control aversion than participants in an internet experiment. Contrary to these experiments, our setup solely varied the proximity in the organizational hierarchy, but social proximity was held constant (members of an organization were anonymous and all participants of the same laboratory session).

⁸Note that, in real organizations, additional mechanisms might be present that cannot be captured by our laboratory experiment. For example, a real CEO possesses more natural authority and thus his or her control decisions might be more acceptable to workers than control decisions made by lower levels of the hierarchy.

⁹The instructions and screenshots of decision-relevant stages can be found in the Supplementary Appendix.

their paired supervisor had no choice but to enforce the CEO’s decision (*Control by CEO*).¹⁰ After making these choices, the participants were asked to report their belief about the fraction of supervisors who chose to impose control when the CEOs left them free to decide whether or not to set the minimum transfer requirement.¹¹

Upon completion of all four parts, participants were randomized into roles (and therefore study parts) and matched into organizations consisting of one CEO, two supervisors and two workers. The respective decisions taken were then executed. The associated payoffs were announced at the end of the session. We applied the conversion rate of 1 point= 0.1 CHF. On average, an experimental session lasted 45 minutes and average earnings amounted to 17.2 CHF (16.5 Euros), including a show-up fee of 10 CHF.

The experiment was computerized using the software oTree (Chen, Schonger and Wickens, 2016). Details of the design, the hypotheses, and the analysis had been preregistered on AsPredicted (#78686). The experiment was conducted in the experimental economics laboratories in Fribourg (134 participants) and Bern (63 participants) in November 2021. Participants were mostly students recruited via ORSEE/Sona (Sona Systems, n.d.; Greiner, 2015). The average number of participants in each experimental session was 20.¹²

3 Results

In this section, we report the results of our experiment focusing on workers’ transfer choices and their determinants.¹³ Our main finding concerns the differential effect of control exerted by supervisors or CEOs on workers’ transfers. Table 1 summarizes the workers’ average and median transfer choices for the three possible cases.

Comparing *Control by Supervisor* with *Control by CEO*, we find that the former tends to elicit lower transfers from the workers. On average, workers transfer 22.43 points if they are controlled by

¹⁰The choices were always presented in the same order, followed by a summary screen on which all three choices were simultaneously displayed and could still be changed. Thus, all three choices were submitted simultaneously.

¹¹Specifically, a participant had to indicate how many out of ten supervisors would set the minimum transfer requirement of five points for their workers.

¹²The experiment was programmed such that sessions could also be run even when the number of participants was not divisible by five. In this case, remaining participants would be allocated to study Part 4 (the survey) after having made the decisions in all roles, and received a flat payment of CHF 7.

¹³The analysis of supervisors’ and CEOs’ choices is not part of our main research question and therefore not included for the sake of brevity. It is available to the interested reader upon request.

Table 1: Workers’ average and median transfer choices.

	Transfers	
	Average	Median
No Control	29.75	30
Control by Supervisor	22.43	15
Control by CEO	24.33	20

their supervisor and 24.33 points if they are controlled by the CEO. This difference is statistically significant (paired t-test, $p = 0.033$; Wilcoxon signed-rank test, $p = 0.022$).¹⁴ Furthermore, also the median transfer is higher after *Control by CEO* compared to *Control by Supervisor* (20 vs 15). This yields our first result:

Result 1. *Workers’ transfers are significantly higher when they are controlled by the CEO rather than by their supervisor.*

Result 1 directly relates to and confirms our prediction. When control has to be implemented, it is better to retain the control decision in the higher levels of the hierarchy and not delegate it downwards.¹⁵

Without control, workers on average transfer 29.75 points. Thus, they transfer significantly more than when control is exercised, independent of who imposes control (paired t-test, $p < 0.001$; Wilcoxon signed-rank test, $p < 0.001$). This implies that the hidden costs of control outweigh the benefits and generate an overall negative effect.¹⁶ In Table 2, we report the coefficients of OLS regressions in which the dependent variable is the size of the transfer (Columns (1) and (2)). The regressions confirm our findings: Compared to *No Control*, both types of control yield significantly negative effects. Furthermore, the negative effect is significantly smaller when control is exerted by the CEO compared to the supervisor (Wald test, $p = 0.034$). Quantitatively, Control by CEO

¹⁴All reported tests are two-sided. When applying the Wilcoxon signed-rank test, we use the Wilcoxon method to correct for ties. When the Pratt method is used to correct for ties, the p-value is somewhat higher ($p = 0.096$). Note that, while we pre-registered the Wilcoxon signed-rank test, we realized ex-post that the t-test is the more suitable test for our data, given that the Wilcoxon signed-rank test is designed for continuous data, but our data contains a substantial amount of ties (for which corrections have to be applied). In addition, the substantial sample size implies that the parametric assumptions of the t-test are asymptotically met.

¹⁵On the individual level, there exists substantial heterogeneity with respect to workers’ reaction to control. Out of 197 participants, 43 do not react to any type of control. 80 participants react to control, but don’t differentiate depending on who controls. Of the participants who differentiate their transfer depending on who controls, 43 transfer a higher amount if controlled by the CEO compared to their supervisor and 31 transfer a lower amount if controlled by the CEO.

¹⁶Thus, we replicate the findings of Falk and Kosfeld (2006). However, note that the size of the reaction is smaller than in the original study. This could be because, in our setting, a reduction of transfers always also hurt an innocent party.

reduces the adverse effect of control compared to Control by Supervisor by about 26% in our experimental setting.¹⁷ This yields our second result:

Result 2. *The hidden costs of control outweigh its benefits. Such hidden costs are significantly smaller when the CEO instead of the supervisor exerts control.*

Table 2: The differential effects of control on workers’ transfers.

	OLS (1)	OLS (2)	Hurdle Model	
			Probability (3a)	Amount (3b)
No Control (Constant)	29.75*** (1.84)	34.28** (13.29)	0.92*** (0.10)	36.17*** (1.88)
Control by Supervisor	-7.32*** (1.47)	-7.32*** (1.48)	-0.16*** (0.10)	-4.97*** (1.83)
Control by CEO	-5.42*** (1.50)	-5.42*** (1.51)	-0.16*** (0.10)	-1.88 (1.89)
Supervisor vs CEO (p-value)	0.034**	0.034**	0.828	0.014**
Controls	No	Yes	No	No
Observations	591	591	591	423
Cluster	197	197	197	169
R-squared	0.018	0.060	0.025	0.008

Notes: The dependent variable in regressions (1), (2), and (3b) is the size of the transfer by workers, whereas the dependent variable in regression (3a) is a dummy variable that equals 1 if workers transfer more than the MTR. Probability reports the marginal effects from a Probit regression calculated at the mean. Amount is the result of the linear regression truncated at the minimum transfer. Robust standard errors are clustered at the subject level and are reported in parentheses. Row “Supervisor vs CEO (p-value)” reports p-values from Wald tests comparing the coefficients for control by supervisor and control by CEO. Control variables include age, gender, education level, major in business and economics, Swiss nationality, and whether the respective session was conducted in Bern or Fribourg.

*** denote significance at 1 percent, ** at 5 percent, and * at 10 percent.

To investigate the workers’ behavior in more detail, we next look at the underlying distribution of transfers. Figure 2 illustrates the cumulative distribution of workers’ transfers in the three cases. Several observations stand out: First, about 20% of workers in the *No Control* condition transfer less than five points. For those workers, control is effective in increasing their transfer level. Second, for all transfers above five points, the cumulative frequency of workers in the *No Control* condition is smaller than in the two *Control* conditions, implying that the number of workers that transfer less than that amount is smaller. Third, comparing transfers with control, the fraction of workers

¹⁷In line with the statistical approach proposed by Ziegelmeyer, Schmelz and Ploner (2012), Table A.1 in the Appendix reports the average differences between the workers’ transfers in the three cases along with bootstrapped confidence interval. The 95% bootstrapped confidence interval of the difference $x^{SC} - x^{CC}$ does not include zero, which lends further support to our results.

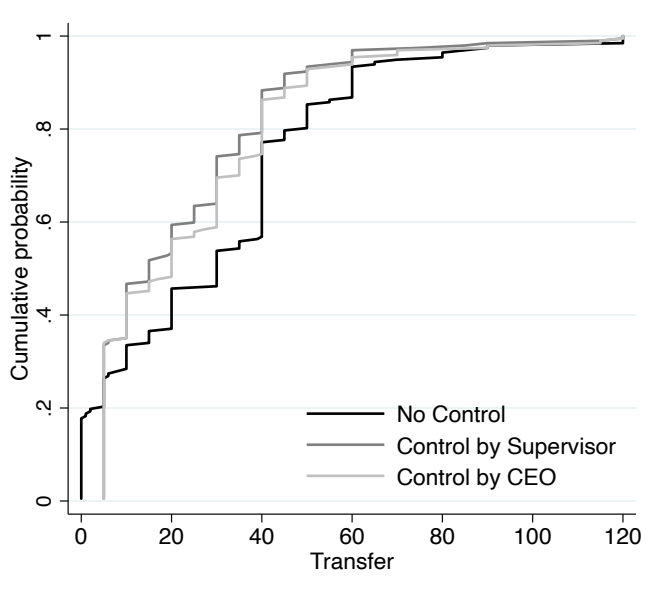


Figure 2: Cumulative distribution of workers' transfers.

who transfer exactly five points does not differ between the two conditions (CEO vs Supervisor), whereas there is a visible difference for transfers above five points.¹⁸

The last observation suggests that the difference in the reaction to control between the two conditions stems from a differential effect of control on the intensive, but not the extensive margin of transfers. To test whether this is indeed the case, we estimate a hurdle model. The model, presented in Columns (3) and (4) of Table 2, allows us to separate the extensive from the intensive margin. By extensive margin we mean whether a worker transfers more than the minimum required by the supervisor or the CEO. By intensive margin we refer to the transfer size, conditional on transferring more than the required minimum. The model highlights how the mitigating effect of control by the CEO works exclusively through the intensive margin: While control significantly decreases the probability of transferring more than the required minimum in both control conditions, there is no significant difference between the two conditions (Wald test, $p = 0.828$). Looking at the intensive margin, *Control by Supervisor* leads to a significant negative effect on the conditional amount transferred compared to *No Control*. In contrast, *Control by CEO* has no significant impact on those that transfer more than the minimum compared to *No Control*. Hence, the conditional

¹⁸Statistically, we find that the three distributions are all significantly different from each other (one-sample Kolmogorov-Smirnov tests, $p < 0.001$). This remains valid even after correcting for the fact that, in the *No Control* condition, transfers below 5 were possible but not in the other two conditions (one-sample Kolmogorov-Smirnov tests, $p < 0.001$).

transfers after *Control by CEO* are significantly greater than those after *Control by Supervisor* (Wald test, $p = 0.014$).¹⁹ We summarize these findings in our last result:

Result 3. *Workers who are controlled by their CEO are equally likely to transfer the minimum transfer level compared to those controlled by their supervisors. However, control by supervisor significantly decreases the conditional amount transferred whereas this is not the case for control by CEO.*

Result 3 shows that there are some workers who provide effort without control and who react maximally negatively when control is implemented. For those workers, it doesn't seem to matter who controls. On the other hand, there are workers who are not fully deterred by control and those workers take into account which hierarchical level implemented control.

4 Conclusion

In this paper, we show, using a laboratory experiment, that workers' negative reactions to imposed control are significantly reduced if the control decision is taken by a hierarchically more distant superior rather than a direct supervisor. The results of our paper are valuable to managerial decision makers. The trade-offs inherent in determining the optimal degree of centralization and the depths of corporate hierarchies are of fundamental importance for efficient organizational design. Previous research has identified several important determinants of the costs and benefits of centralization, such as information structure, the need for coordination or the desire to shift blame. Our study adds to this debate by providing a rationale for retaining decisions over the level of control in the higher levels of the hierarchy, and thus a rationale to have higher levels of the hierarchy in the first place.

Our study provides an experimental setup that can be used to further study control aversion in hierarchies. For example, in many real settings a CEO might only suggest a level of control to the supervisors, but leave the final decision to them. Relatedly, there might be organizations for which the payoff structure is different. Moreover, while we demonstrate the effects of two layers of hierarchies, it is an open question whether even more layers further mitigate the negative effects of control and potentially even erase them completely.

¹⁹Table A.2 in Appendix reports the results of the hurdle model with controls.

Finally, our results could also be relevant for applications outside the domain of managerial control decisions. For example, public authorities regulate and restrict citizen behavior—from speed limits to mask mandates during the COVID-19 pandemic. In some countries, these decisions are decentralized and delegated to lower levels of government, whereas other countries seek to retain these decisions in higher levels of government (for examples of the different approaches during the COVID-19 pandemic, see Kuhn and Morlino, 2021, Vampa, 2021). It would be an interesting avenue for further research to better understand whether our finding that individuals react less negatively if controlling decisions are taken at higher levels of the hierarchy translates to the public domain, where individual restrictions are not meant to align incentives between a principal and an agent, but rather aim to internalize externalities to foster social welfare.

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Appendix

Table A.1: Average differences between the workers' transfers.

	$x^{x^{SC}-NC}$	$x^{CC} - x^{NC}$	$x^{SC} - x^{CC}$
Average	-7.32	-5.42	-1.9
95% confidence interval	[-10.2,-4.45]	[-8.32, -2.54]	[-3.84,-0.35]

Notes: x^{NC} , x^{SC} , and x^{CC} denote transfers after *No Control*, *Control by Supervisor*, and *Control by CEO*, respectively. The second row reports the bias-corrected 95% bootstrapped confidence intervals based on 10^4 replications.

Table A.2: Hurdle model with controls

	Probability (1a)	Amount (1b)
No Control (Constant)	1.78*** (0.76)	32.24** (14.07)
Control by Supervisor	-0.17*** (0.11)	-4.82** (1.86)
Control by CEO	-0.17*** (0.11)	-1.88 (1.88)
Supervisor vs CEO (p-value)	0.833	0.022**
Controls	Yes	Yes
Observations	591	423
Cluster	197	169
R-squared	0.116	0.025

Notes: The dependent variable in regression (1b) is the size of the transfer by workers, whereas the dependent variable in regression (1a) is a dummy variable that equals 1 if workers transfer more than the MTR. Probability reports the marginal effects from a Probit regression calculated at the mean. Amount is the result of the linear regression truncated at the minimum transfer. Robust standard errors are clustered at the subject level and are reported in parentheses. Row “Supervisor vs CEO (p-value)” reports p-values from Wald tests comparing the coefficients for control by supervisor and control by CEO. Control variables include age, gender, education level, major in business and economics, Swiss nationality, and whether the respective session was conducted in Bern or Fribourg.

*** denote significance at 1 percent, ** at 5 percent, and * at 10 percent.

Supplementary Appendix
for
“Control Aversion in Hierarchies”

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A Experimental instructions and screenshots

A.1 Experimental instructions

General instructions

Welcome to this study.

You will receive 5 CHF as a show-up fee for your participation. You will receive an additional 5 CHF for completing this study. In addition, if you read the following explanations carefully, you can - depending on your decisions and/or the decisions of the other participants - earn points in the course of the study that will be later converted into CHF at the following exchange rate:

1 point = 0.1 CHF

At the end of the study, you will receive a payment in cash that includes the 5 CHF show-up fee, the 5 CHF for completion of the study and any additional CHF that you have earned during the study.

It is therefore very important that you read these explanations carefully. If you have any questions during the study, please raise your hand. We will then come to your place and answer your question.

During the study, you are not allowed to talk with the other participants or to use your mobile phone.

The study consists of four parts. At the end of the study, one part is randomly selected. The selected part will be the only one relevant for your payout. In the following, you will receive the instructions for the first part of the study. You will receive the instructions for the other parts later, at the beginning of each part.

Neither before nor after the study will you learn the identity of the other participants. Likewise, the other participants will not learn anything about your identity.

Part 1

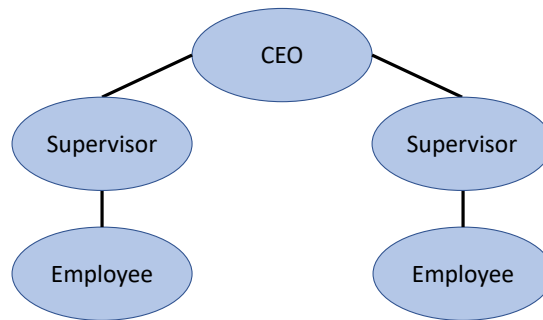
Role assignment:

You and four other randomly selected study participants make up the **five members of an organization**. The members of the organization can assume one of three roles. These are: **CEO, Supervisor, or Employee**. The roles are assigned randomly.

You are an **EMPLOYEE**.

There is only **one** CEO. In addition, there are **two** supervisors and **two** employees. Each employee is assigned to a supervisor. Thus, there are **two supervisor-employee pairs**.

The structure of the organization is displayed below:



Initial endowments:

The members of the organization will receive the following **initial amounts of points**:

- The **CEO** receives **zero points**.
- **Both supervisors** receive **zero points**.
- **Both employees** receive **120 points** each.

Your decision:

As an employee, you can decide how much **work effort** you contribute to the organization. Work effort is determined in points, which are transferred from your initial amount of points to the organization. Positive work effort decreases your income and increases the income of the supervisor that is assigned to you and the CEO.

Specifically: each point you transfer to the organization decreases your income by one point and increases the income of the supervisor that is assigned to you by two points. Additionally, each point transferred by you or the other employee increases the income of the CEO by one point. The total income of the five members of the organization are thus calculated as follows:

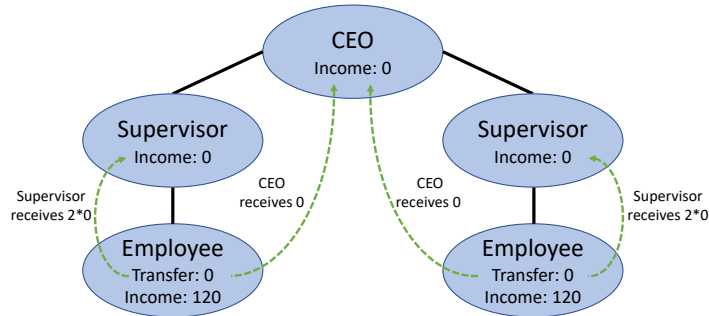
Income of an employee / your income (in points):
120 - Transfer of the employee

Income of a supervisor (in points):
2 * Transfer of the assigned employee

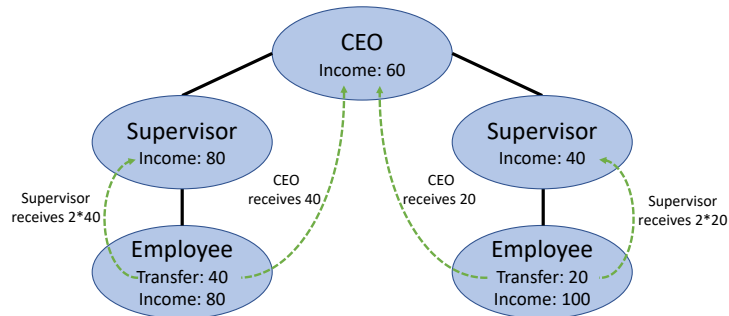
Income of the CEO (in points):
Sum of the transfers of the two employees

The following examples are intended to clarify the calculation of income:

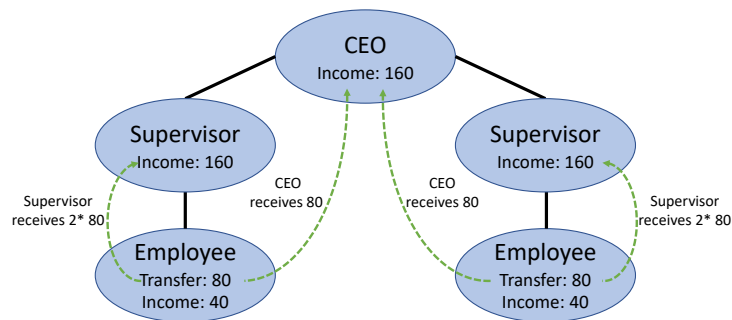
Example 1: Both employees transfer 0 points. The following figure displays the resulting incomes and transfers.



Example 2: The employee on the left side transfers 40 points, the other 20 points. The following figure displays the resulting incomes and transfers.



Example 3: Each employee transfers 80 points. The following figure displays the resulting incomes and transfers.



Before the employees decide how many points to transfer, the CEO and the supervisors can decide on a **minimum transfer**.

Decision of the CEO:

The CEO can force both supervisors to set a **minimum transfer of 5 points**. However, s/he can also **leave the supervisors free** in their decision.

Decision of the Supervisors:

What the supervisors can do depends on the decision of the CEO. Specifically, if the CEO...

- ... forced the supervisors to set a minimum transfer of 5 points, then each supervisor has no decision to make as s/he has to set the minimum transfer of 5 points.
- ... decided to leave the supervisors free in their decision, then each supervisor can independently decide **whether her/his assigned employee has to transfer at least 5 points** or whether s/he lets the employee decide completely freely about her/his transfer.

Overview of the study

To summarize, the study proceeds in **three stages**:

Stage 1

The CEO decides whether to force the supervisors to set a minimum transfer of 5 points for the employees, or s/he can leave this decision to the supervisors.

Stage 2

The supervisors can decide on the minimum transfer for their assigned employee. If the CEO has forced them to set a minimum transfer of 5 points, they have no choice to make. If the CEO let the supervisors free to decide, each supervisor decides whether to set a minimum transfer of 5 points for her/his employee or whether s/he lets the employee decide completely freely about her/his transfer.

Stage 3

Each employee decides on the amount to be transferred. Consequently, three different cases can occur:

An employee can...

1. ...transfer between **0 and 120 points**, if the CEO has given free choice to the supervisors and the employee's supervisor has given her/him free choice.
2. ...transfer between **5 and 120 points**, if the CEO has given the supervisors free choice, but the employee's supervisor requires her/him to transfer at least 5 points.
3. ...transfer between **5 and 120 points**, if the CEO has forced supervisors to set a minimum transfer of 5 points for all employees.

Note: As an employee, you make your decisions without knowing how the CEO and your assigned supervisor decided.

This means that **before** you observe,

- (i) whether the CEO forced the supervisors to set a minimum transfer
- (ii) and whether the supervisor assigned to you requires you to make a minimum transfer,

we ask you to indicate for **each of the three possible cases described above** how many points you will transfer to the organization. At the end of the study, if this part of the study is selected for payment, you will learn how the CEO and your assigned supervisor actually decided. Your decision for that case will then be implemented! **Any one of your three decisions can therefore determine your final payout.**

Please take sufficient time to understand these three decisions. It is important that you fully understand your options, as you will decide only once for each of the **three** possible cases and Part 1 of the study will end after that.

Do you have any questions? If so, please raise your hand. We will then come to your place and answer you. Otherwise, please answer the comprehension questions on the computer.

A.2 Screenshots of decision-relevant stages

Part 1 of the Study

You are an employee.

On the next screens, you can make your transfer decisions for the three different cases described in the instructions.

If Part 1 is selected to be payoff relevant, the case that matches the actual decisions of the CEO and the supervisor in your group will be implemented.

Next

Figure A.1: Part 1 – Intro.

Your decisions

Case 1:

Stage 1:

The CEO **decided to leave all supervisors free** in their decision whether or not they want to set the minimum transfer of 5 points.

Stage 2:

- Your supervisor **decided not to set the minimum transfer** of 5 points for you, but to let you decide completely freely about your transfer.

Stage 3:

How many points do you transfer to the organization (you can enter between 0 and 120 points)?

Confirm

Figure A.2: Part 1 – Decision as worker in Case 1.

Your decisions

Case 2:

Stage 1:

The CEO **decided to leave all supervisors free** in their decision whether or not they want to set the minimum transfer of 5 points.

Stage 2:

- Your supervisor **decided to set the minimum transfer** of 5 points for you.

Stage 3:

How many points do you transfer to the organization (you can enter between 5 and 120 points)?

Confirm

Figure A.3: Part 1 – Decision as worker in Case 2.

Your decisions

Case 3:

Stage 1:

The CEO **forced all supervisors to set the minimum transfer** of 5 points.

Stage 2:

- Your supervisor had **no choice** but to set the minimum transfer of 5 points for you.

Stage 3:

How many points do you transfer to the organization (you can enter between 5 and 120 points)?

Confirm

Figure A.4: Part 1 – Decision as worker in Case 3.

Please review your choices:

Please review your choices above. If this study part is chosen for payment, we will implement the decision that matches the actual decisions of the CEO and the supervisor in your organization. If you want to make any changes, you can do so. Otherwise, please confirm your choices to proceed.

Case 1:

The CEO **decided to leave all supervisors free** in their decision whether or not they want to set the minimum transfer of 5 points.

- Your supervisor **decided not to set the minimum transfer** of 5 points for you, but to let you decide completely freely about your transfer.

How many points do you transfer to the organization (you can enter between 0 and 120 points)?

Case 2:

The CEO **decided to leave all supervisors free** in their decision whether or not they want to set the minimum transfer of 5 points.

- Your supervisor **decided to set the minimum transfer** of 5 points for you.

How many points do you transfer to the organization (you can enter between 5 and 120 points)?

Case 3:

The CEO **forced all supervisors to set the minimum transfer** of 5 points.

- Your supervisor had **no choice** but had to set the minimum transfer of 5 points for you.

How many points do you transfer to the organization (you can enter between 5 and 120 points)?

Confirm

Figure A.5: Part 1 – Overview of decisions as worker

Part 2 of the Study

In Part 2 of the study, you are again a member of an organization, exactly similar to Part 1.

However, in Part 2 you are assigned to the role of **the supervisor**.

Thus, if the CEO decides to leave the supervisors free in their decision whether or not they want to set the minimum transfer of 5 points, you have to take the decision whether or not you want to set the minimum transfer of 5 points for your employee.

Next

Figure A.6: Part 2 – Intro.

Decision Part 2

The CEO **decided to let the supervisors free** in their decision whether or not they want to set the minimum transfer of 5 points.

Do you want to set the minimum transfer of 5 points for your employee?

- Let the employee decide completely freely about her/his transfer
- Set the minimum transfer of 5 points

Next

Figure A.7: Part 2 – Decision as supervisor.

Part 3 of the Study

In Part 3 of the study, you are again a member of an organization, exactly similar to Part 1.

However, in Part 3 you are assigned to the role of **the CEO**.

Thus, your decision is whether or not you want to force all supervisors to set the minimum transfer of 5 points.

Next

Figure A.8: Part 3 – Intro.

Decision Part 3

Do you want to force all supervisors to set the minimum transfer of 5 points?

- Yes, I want to set a minimum transfer requirement of 5.
- No, I want to leave the supervisors free in their decision

Next

Figure A.9: Part 3 – Decision as CEO.