An Experimental Investigation of the Effects of Insulating and Non-Insulating Cost Allocations

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ABSTRACT: Firms allocate shared costs for many decision-making, control, and reporting purposes. One important choice firms face with regard to any allocation is whether it should be insulating or non-insulating in nature. Non-insulating allocations follow ability-to-bear principles and base allocated cost on relative performance measures, creating an interdependency between managers. On the other hand, insulating allocations are independent of relative performance in the period. In an experiment, we predict and find that, compared to participants in an insulating cost allocation condition, participants in a non-insulating cost allocation condition chose capital projects with greater risk, developed stronger group identification, and perceived their allocation method to be less fair. We also find that, as posited, both group identification and perceptions of fairness have positive effects on cooperation. We do not, however, find overall differences in cooperation between cost allocation conditions – essentially, the effects of cost allocation condition on cooperation operating through group identification and fairness perceptions offset each other. Collectively, our study and findings have important implications regarding the design and use of cost allocations to motivate desired attitudes and behaviors.

Keywords: Cost allocations; risk taking; group identification; fairness; cooperation

I. INTRODUCTION

Cost allocations are an integral part of managerial accounting. While textbooks often suggest shared costs should not be allocated to segments or divisions because certain decisions related to these costs may be outside individual managers' control, firms regularly allocate these costs as a way of encouraging efficient use of resources and for other decision-making and control purposes (see, e.g., Zimmerman 1979; Datar and Rajan 2018; Zimmerman 2019). Given the prevalence of allocations in practice, it is important to understand how different allocation methods used may affect managers' perceptions and behavior.

One significant decision that firms need to make when allocating any cost is whether to use an insulating allocation or a non-insulating allocation. Under a non-insulating allocation scheme, the cost allocated to each division is based on the relative operating performance in the period of all divisions sharing the cost, with greater performance leading to a greater share of allocated cost. In contrast, under an insulating allocation scheme, the cost allocated to each division is independent of the relative performance of the divisions and is instead based on such factors as floor space, occupancy, or simplified equal splits of costs. The terms "insulating" and "non-insulating" are used to describe these types of cost allocations because the allocation method either insulates (protects) or does not insulate (does not protect) the amount of the allocation from the action of others (See Zimmerman (2019) for additional discussion of these terms).

For example, assume a firm has two divisions, A and B, and wishes to allocate common costs of $100 between the two divisions. One approach would be to employ an insulating allocation in which the cost allocated to each division is independent of performance, perhaps splitting the common costs evenly and thus allocating $50 to each division. Alternatively, the firm could employ a non-insulating allocation in which the cost allocated to each division is based on the relative performance of the two divisions in that period, as measured by division revenue. If divisions A and B had revenues of $200 and $300, respectively, then the firm would allocate [($200 / ($200 + $300)) × $100] = $40 to division A and $60 to division B.

Despite the widespread use of both insulating and non-insulating cost allocations in practice, we are unaware of any empirical research that reports on the benefits and costs of each approach, and there are reasons to expect allocations to affect managers in several important ways. As illustrated in the example above, the use of a non-insulating cost allocation creates an interdependency between two or more managers wherein their performance – and likely also then their compensation – is linked together. One potential difference between this interdependency and interdependencies created by other accounting controls such as relative performance evaluation contracts (e.g., Frederickson 1992; Tafkov 2013) and group or profit-sharing incentives (e.g., Luft and Shields 2009; Kelly 2010) is that, with a non-insulating cost allocation, there is a competing disincentive to attain greater performance: an increase in relative performance results in the allocation of greater cost, essentially shifting profitability and compensation to lower relative performers.[1] Thus, this interdependency – which is not present with an insulating allocation – may affect managers' perceptions and behavior in the following ways.

First, in a risky investment context, the coupling of outcomes in a non-insulating cost allocation creates a natural risk-sharing mechanism between managers that can serve as a shock absorber. If managers recognize that the potential downside of their risky choices can be at least partially off-loaded or absorbed by the other managers in the group, and/or that the variation in their profits from period to period will be reduced, theory suggests this risk sharing could lead

[1] Consider the example above with divisions A and B. Suppose in period 2, division B's revenue increases to $400, division A's revenue is unchanged at $200, and common costs remain at $100. With a non-insulating cost allocation, division B is allocated [($400 / ($400 + $200)) × $100] = $67, while division A is allocated $33. As compared to period 1, $7 of common cost has been shifted to division B from division A due to division B's increased performance.

managers to pursue increased levels of risk (Zimmerman 2019). Therefore, we predict that managers operating under a non-insulating cost allocation will make riskier investment choices than managers operating under an insulating cost allocation.

Next, linking manager outcomes via a non-insulating cost allocation should increase the salience of overall group outcomes to each manager as compared to if such a linkage does not exist. Not only is more attention drawn to peer outcomes in this situation, but managers will naturally have greater concern and desire for *positive* peer outcomes since an increase in peer performance means that peer will absorb an increased share of costs. Social Identity Theory suggests that such increased awareness of, and concern for, the goals and outcomes of others in a group should result in each group member viewing their own individual outcomes and those of the group as less separable – leading to stronger group identification (Tajfel and Turner 1979; Hornsey 2008). As such, we predict that managers operating under a non-insulating cost allocation will develop stronger group identification than managers operating under an insulating cost allocation.

Insulating and non-insulating cost allocations are also likely to be perceived differently by managers with regard to fairness. Since the interdependency created by a non-insulating allocation leads to one's performance being impacted by the actions of others, it violates the controllability principle, which states that managers should only be evaluated for things under their direct control (Antle and Demski 1988). In addition, non-insulating allocations may lead to unequal allocations between managers, even when all other conditions (e.g., the size of the managers' divisions, their resource bases, etc.) are equal. Relative to insulating allocations, non-insulating allocations are therefore likely to generate both procedural and distributive fairness concerns, and thus we predict that managers operating under a non-insulating cost allocation will perceive allocations to be less fair than managers operating under an insulating cost allocation.

The effects discussed to this point suggest that the different cost allocation types may affect subsequent cooperation between managers, though the direction of that influence is not immediately clear. Theory and prior research consistently find that stronger group identification increases within-group cooperation (e.g., Tajfel and Turner 1979; Ashforth and Mael 1989), and so we predict that stronger group identification in our setting will increase cooperation between managers. Conversely, prior research suggests that individuals perceiving themselves to be treated more fairly by others and their institution(s) are more likely to reciprocate or cooperate with others in that environment (e.g., Fehr and Schmidt 1999; De Cremer and Tyler 2007), and so we predict that managers' perceptions of the fairness of allocations in our setting will be positively related to their cooperation with another manager. Taken together, the preceding predictions suggest that the use of a non-insulating cost allocation, relative to an insulating cost allocation, will generate both positive (through stronger group identification) and negative (through decreased perceptions of fairness) effects on cooperation. Given these competing effects, we examine as a research question the overall effect of cost allocation type on cooperation.

To test our hypotheses and examine the effects of insulating and non-insulating cost allocations on the four important variables discussed above, we conduct a two-stage experiment in which participants assume the role of a division manager within a firm comprised of two divisions. In the first stage, participants are tasked with making a (risky) capital investment decision across fifteen independent periods. Each participant is randomly assigned to a group of two with another individual – the firm's other division manager – who faces the same investment choices. For each decision, participants are presented with a pair of projects, A and B, that have the same expected return but differ in risk. We manipulate between groups the manner in which the firm's common costs are allocated to each division. In the insulating cost allocation condition, the firm's common costs of $100 are split equally between the two divisions in each period. In the non-insulating cost allocation condition, the firm's common costs are allocated to each division based on the relative return generated by the project each participant selected in the period.

After each decision-making period of stage one, participants learn the results of their project selection, their partner's project selection, the costs allocated to each division, and the profit of each division. Participants are compensated for this portion of the experiment based on the profitability of their division in one randomly selected period. We measure participants' risk-taking as the number of periods (out of 15) in which they select the riskier of the two project options. Participants conclude stage one by completing a brief questionnaire to measure their identification with their group and their perceptions of the fairness of the cost allocation scheme.

In stage two, participants remain paired with the same individual from stage one and play a public goods game in which they choose to keep or contribute tokens to a public good whose proceeds are split evenly between the pair. Each participant has 50 tokens and receives $0.04 for each token kept. Each token contributed to the group pot is worth $0.06 ($0.03 per participant). Following prior research (e.g., Ledyard 1995; Chaudhuri 2011), we measure cooperation as the number of tokens each participant contributes to the group pot.

Our results are consistent with our hypotheses and make several important contributions. Specifically, we find that non-insulating cost allocations improve risk sharing and motivate managers to make riskier investment choices as compared to insulating allocations. Given that firms actively search for ways to encourage risk taking from risk-averse managers (e.g., Jensen and Meckling 1976) and that "One of the toughest problems a CEO faces is convincing managers that they should take on risky projects if the expected gains are high enough" (Thaler, 2015, p. 22), understanding how the use of different cost allocation schemes may lead managers to take more or less risk is of significant practical importance for firms.

We also find that the use of non-insulating cost allocations can build stronger group identification as compared to insulating allocations which, in turn, increases cooperation in our public goods game. Since stronger identification has been shown to help resolve other social dilemmas in organizations, such as motivating helping and other-regarding behaviors (e.g., Brewer and Kramer 1986; Ashforth, Harrison, and Corley 2008; Kelly and Presslee 2017; Brown, Sprinkle, and Way 2020), our results suggest that non-insulating allocations may be one way for firms to improve performance without the need for additional controls or incentives geared toward these behaviors. Conversely, this result also suggests that firms using insulating cost allocations are more likely to need to use other mechanisms to enhance group identification – such as some form of group incentives or group recognition, or providing groups with increased decision rights (e.g., Ashforth et al. 2008; Luft and Shields 2009) – to achieve similar outcomes.

We find that non-insulating cost allocations are perceived to be less fair than insulating cost allocations, even after controlling for realized allocations, and that in turn, the decreased (increased) fairness perceptions under the non-insulating (insulating) cost allocation decrease (increased) cooperation in our public goods game. Similar to group identification, perceptions of fairness may spill over to other organizational behaviors, either exacerbating or mitigating agency problems. This may lead organizations to prefer insulating allocations and, when using non-insulating allocations, firms may need to find additional ways to make employees feel that they are being treated more fairly. Firms could bolster fairness perceptions by emphasizing, for example, that "non-insulating methods act like shock absorbers for random events and reduce the variability of all managers' performance measures" (Zimmerman 2019, p. 298), thereby emphasizing the *ex-ante* equity associated with ability-to-bear cost allocations.

Finally, we find no overall differences in cooperation as a function of cost allocation type. Essentially, the positive and negative effects of non-insulating cost allocations operating through group identification and perceived fairness, respectively, offset each other in our setting. This result sheds additional light on the overall costs and benefits of the two allocation types by suggesting that one type of cooperation may be no different regardless of the allocation type employed and thus, firms can base allocation choices on how allocations are likely to affect other perceptions and behavior by their managers – as highlighted in our other results.

II. BACKGROUND AND HYPOTHESES DEVELOPMENT

Insulating and Non-Insulating Cost Allocations

Firms allocate shared costs across products, services, and divisions for numerous purposes, including external reporting, taxes, reimbursement, decision making, and control (Zimmerman 1979; Zimmerman 2019). Given their impact on profitability, cost allocations carry implications for the evaluation of managers' performance which, in turn, often impacts managers' compensation and/or future career success (Zimmerman 2019). As such, the choice of an appropriate cost allocation method is an important one that may influence managers' behavior.

While cost tracking and tracing mechanisms have improved over time, firms still incur significant levels of shared costs – such as those for human resources and technology support – that often cannot be allocated to segments or divisions based on clear cause-and-effect drivers. Firms wishing to allocate these costs therefore need to determine appropriate allocation bases and methods, and one major decision firms need to make for any allocation is whether to employ an insulating cost allocation or a non-insulating cost allocation. As discussed previously, the key difference between the two types is that non-insulating methods base allocations on the relative performance of those sharing the cost, thereby creating an interdependency between two or more managers. On the other hand, insulating cost allocations are independent of relative performance and thus insulate or protect each manager's realized allocation from the actions of other managers.

Both insulating and non-insulating cost allocation methods are frequently used by firms. Survey evidence suggests some popular insulating drivers include measures such as floor space and occupancy rates, while non-insulating drivers include measures such as revenue or (pre-allocation) gross profit (Ernst & Young, LLP 2017; McKinsey & Company 2019). For example, Amazon employs an insulating allocation for certain facilities costs, charging segments based on square footage use (Amazon.com Inc. 2019).[2] Conversely, IBM allocates advertising expenses to its business segments based on segment gross profit (a non-insulating allocation), and allocates other shared costs without appropriate usage drivers on a "financial basis" (The International Business Machines Corporation 2019). Despite the widespread use of both types of allocations, we are unaware of any empirical research that reports on their benefits and costs.[3] In this paper, we specifically examine the effects of insulating and non-insulating cost allocations on four important variables that theory and research suggest may be impacted by differences in cost allocation types: risk taking, group identification, perceptions of fairness, and cooperation.

Risk Taking

We first examine how cost allocations affect managers' willingness to invest in risky projects. In decision theory, risk reflects the variation in the distribution of possible outcomes related to a decision or choice – i.e., there is uncertainty about which outcome in a distribution of

[2] Square footage usage between segments or divisions could change over time. However, its assignment is not very likely to change during a period. Thus, managers would know prior to any period what their share of allocated costs would be, and these shares would not fluctuate with other divisions' performance in the same period – meaning the use of square footage or similar drivers would be insulating in nature (Zimmerman 2019).

[3] Limited theoretical work in the area has been conducted and suggests that the type of allocation chosen could affect the efficiency of transfer pricing and intra-firm trade (Arya, Glover, and Mittendorf 2017), as well as the efficiency of capital budgeting processes when divisions share specific project costs (Johnson and Pfieffer 2015).

outcomes will occur. However, the distribution of outcomes and the probability of each outcome's occurrence are known (Knight 1921). For example, when a coin is flipped, risk represents the uncertainty as to whether the coin will land on heads or tails. Nevertheless, it is known that the coin can only land on one of these two possible outcomes and each possible outcome has a fifty percent likelihood of occurring.[4]

Early studies examining managers' risk tolerance find that managers are generally risk averse (e.g., Cyert and March 1963), and agency theory highlights why this risk aversion is potentially problematic for a firm's owners (e.g., Jensen and Meckling 1976; Thaler 2015; Brickley et al. 2016). While owners can typically diversify the risk associated with their investment in a firm, the firm's managers are less able to diversify any risk associated with the negative effect of the firm's poor performance on their compensation (Fama 1980; Jensen and Murphy 1990). This leads to managers choosing less risky projects than firms would prefer (Lambert 1986).[5] Pay-for-performance incentive compensation is one common mechanism that firms utilize to address the agency problem and encourage managers to make risky investments but, despite this better aligning of incentives, firms often struggle to induce managers to make investments that are optimal from the firm's perspective.

Prior research in accounting and other disciplines has examined whether performance benchmarks (Chow, Kohlmeyer, and Wu 2007; Sprinkle, Williamson, and Upton 2008; Chen, Kim, Li, and Zhu 2020) and equity and bonus incentives (e.g., Coles, Daniel, and Naveen 2006; Drake and Kohlmeyer 2010) affect managers' risky investments. Recent studies have also begun to investigate to what extent the reporting of accounting information affects capital investment

[4] Risk typically is measured by using either a non-linear utility function for money or through the variance of the probability distribution of possible gains and losses associated with an alternative (Pratt 1964; Arrow 1965).
[5] Managers' reluctance to invest in risky projects may also be due to the fact that managers typically have a shorter horizon than owners, which may cause them to underinvest in risky long-term projects (Holmström 1999).

(e.g., Roychowdhury, Shroff, and Verdi 2019). We complement this literature by examining how managers' risky decisions are affected by the methods used to allocation shared costs.

There are several reasons why insulating and non-insulating cost allocations may differentially affect managers' risky decisions. As discussed previously, non-insulating allocations create an interdependency between managers by basing allocations on relative operating performance. It is possible that this interdependency could lead to less risky investment choices if managers view the linking of allocations to relative performance as a significant enough disincentive to pursuing greater risk (and greater outcomes). That is, if a manager chooses riskier investments than a peer manager and those investments "pay off," the manager is allocated more cost relative to the peer manager, meaning the return to that risk is reduced or dampened. In addition, extant research finds that when individuals make risky decisions that can affect others, they may make less risky decisions so as not to impose negative externalities on those others – an effect that tends to increase as one's concern for the other individual(s) increases (e.g., Charness and Jackson 2009; Bolton, Ockenfels and Stauf 2015). In the context of a non-insulating cost allocation, a manager pursuing greater risk whose investment choices do not pay off saddles their peer(s) with higher allocated costs and, for these reasons, it is possible that non-insulating cost allocations could lead to less risky investment decisions as compared to insulating cost allocations.

On the other hand, when allocated costs are independent of relative performance in the period, managers know *ex ante* that they will be responsible for a certain amount of costs and, as such, insulating cost allocations act as fixed costs. Higher levels of fixed costs (higher operating leverage) make performance more sensitive to fluctuations in demand/revenue and therefore increase risk (e.g., Datar and Rajan 2018; Zimmerman 2019), which may lead to managers choosing less risky investments to increase the likelihood that they are able to cover costs and generate smoother profits. Relatedly, when costs are allocated based on one's performance relative to others in the period as they are in a non-insulating allocation, the interdependency between managers' outcomes creates a setting where risk is essentially shared between all those sharing the cost. For example, when using a non-insulating, profit-based allocation method, when Division A's profitability increases (decreases) relative to Division B, Division A will bear more (less) of the allocated cost. As such, these non-insulating cost allocations can act as variable costs, which are less risky when profits are lower than anticipated. This absorption of negative outcomes and reduced variation in profits through risk sharing may lead managers to make riskier project choices when operating under a non-insulating cost allocation – an assertion made in managerial accounting textbooks but that, to our knowledge, has not been tested empirically (Datar and Rajan 2018; Zimmerman 2019). Based on the preceding discussion, we therefore predict the following:

> **H1:** Managers operating under non-insulating cost allocations will make more risky investment decisions than managers operating under insulating cost allocations.

Group Identification

Research finds that certain features of accounting settings can enhance an individuals' identification with a group, affecting subsequent behavior. For example, Rowe (2004) finds that aligning accounting and team structure properly can promote cooperation and prevent free riding. Towry (2003) finds that stronger team identity leads to increased coordination, which increases the effectiveness of a horizontal incentive system but decreases the effectiveness of a vertical incentive system, while Kelly and Presslee (2017) find that other-regarding preferences are improved by stronger group identity even when individuals operate under a competitive tournament incentive.

These and other related studies draw primarily on Social Identity Theory (SIT), a well-established theory from psychology, which suggests that an individual's self-concept includes the attitudes, beliefs, and behaviors of the groups with which the individual identifies (Tajfel and Turner 1979). SIT posits that the identification process shifts an individual's perspective to the group level, increasing the salience and importance of group outcomes. As identification strengthens, individuals view themselves more as interchangeable members of the group, and the interests of the group become inseparable from the interests of the individual (Oakes 1987; Turner, Hogg, Oakes, Reicher, and Wetherell 1987; Oakes and Turner 1990).

Given that non-insulating cost allocations create interdependence between manager outcomes, these allocations should make the outcomes of peers more salient to managers as compared to insulating allocations where no interdependence exists. Not only that, but managers should naturally be more concerned about peer outcomes being positive than they would otherwise, since the greater performance of peers helps ensure that the manager is not burdened with a greater share of the allocated costs. Pursuant to SIT, this increased salience of, and concern for, the outcomes of others in the group create a situation where joint outcomes become less separable from the manager's individual outcomes, which should lead to stronger group identification as compared to insulating allocations:

> **H2:** Managers operating under non-insulating cost allocations will have stronger group identity than managers operating under insulating cost allocations.

Fairness

While we posit that non-insulating cost allocations will increase group identification relative to insulating allocations due to the interdependency created between managers, the same interdependency may have a downside in the form of decreased perceptions of fairness. Specifically, with an interdependency between managers, the amount of costs allocated to a manager depend not only on the actions of that manager, but also on the actions of other managers. This violates the "controllability principle," which suggests that managers should only be held responsible for variables under their control (Antle and Demski 1988). Because managers are held responsible for activities outside of their control when allocations are based on relative performance, they will likely question the procedural fairness of non-insulating cost allocation methods regardless of realized cost allocations (e.g., Alexander and Ruderman 1987; Ambrose and Arnaud 2005).

Moreover, non-insulating allocations based on relative performance could frequently lead to uneven cost allocations between divisions, regardless of whether the divisions are "alike" along all other dimensions (i.e., size, headcount, capital, etc.). Although division managers may benefit from the uneven cost allocations at times when they suffer negative performance shocks, there may be other times when they are allocated more costs than other divisions because of the other division's relatively lower performance. Since individuals generally have preferences for even outcomes, non-insulating allocations may result in distributive fairness concerns as well (e.g., Alexander and Ruderman 1987). For these reasons, we expect that managers will perceive non-insulating cost allocations to be less fair than insulating cost allocations:

> **H3:** Managers will perceive non-insulating cost allocations to be less fair than insulating cost allocations.

Cooperation

Finally, we examine how non-insulating and insulating cost allocations affect subsequent behavior outside the context of the allocation setting – specifically, cooperation in a public goods game. As discussed in our development of H2, stronger group identity is associated with increased salience and perceived importance of group outcomes, which in turn is associated with increased concern for others in the group (e.g., Tajfel and Turner 1979; Oakes 1987; Oakes and Turner 1990; Hornsey 2008). Consistent with these principles, prior research consistently finds that stronger identification lead to more cooperation within the group (e.g., Brewer and Kramer, 1986; Wit and

Kerr, 2002; Ashforth et al. 2008; Brown et al. 2020), and so we propose the following hypothesis:

> **H4a:** Individuals' perception of group identity will be positively related to their willingness to cooperate.

Regarding the link between perceptions of fairness and cooperation, intuitively, if individuals believe that the processes and/or outcomes to which they are subjected are fairer, then they would be more satisfied in general and would be more likely to cooperate with another individual in that environment than if they believe the processes or outcomes to be unfair. There is considerable research that examines individuals' perceptions of fairness and how it affects their subsequent behavior (e.g., De Cremer and Tyler 2007).[6] A finding from this literature is that if an action or outcome is deemed fair, then individuals tend to reciprocate or cooperate, but if an action or outcome is deemed unfair, then individuals tend to act in their self-interest or attempt to punish the offender if possible (e.g., Fehr and Schmidt 1999; Fehr and Gächter 2000a, 2000b; De Cremer and Tyler 2007). In the current context, this suggests that managers perceiving their cost allocations to be less fair are likely to demonstrate more self-interested behavior when given the opportunity to cooperate with another manager, and we therefore propose the following hypothesis:

> **H4b:** Individuals' perception of fairness will be positively related to their willingness to cooperate.

Based on the arguments proposed in the development of H2 and H4a, we would expect non-insulating cost allocations to increase cooperation. However, the combination of H3 and H4b suggest that non-insulating cost allocations will decrease cooperation. Given these opposing predictions, it is unclear whether the increase in cooperation from stronger group identification will be greater than the decrease in cooperation due to lower perceptions of fairness. Accordingly,

[6] See Fehr and Schmidt (2006) for a review.

we examine the following research question:

> **RQ:** Will non-insulating cost allocations lead to greater cooperation than insulating cost allocations?

III. METHOD

Participants

As discussed in detail below, we conduct a two-stage mixed factorial design experiment. Two hundred and thirteen individuals from Amazon's Mechanical Turk (MTurk) internet marketplace were recruited for our experiment through a publicly announced Human Intelligence Task (HIT).[7] MTurk workers were eligible to participate as long as they had a historical HIT approval rating of 98 percent or higher and were based in the United States.[8] Participants were paid a $2.00 participation fee, as well as additional compensation based on their decisions in both stages, to complete the experiment. Total compensation averaged $6.26.[9]

Stage One

In stage one of the experiment, participants act as a division manager for a hypothetical firm and choose between two capital projects, "A" and "B," to implement in their division, repeating this decision across fifteen independent periods with fifteen unique project pairs. Each project has two possible outcomes and, for any given pair (period), the same expected value but differing risk.[10] The expected value of both projects, each project's risk, and differences in project risk are varied across the fifteen pairs (periods). Appendix A contains two project pairs actually

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[7] One participant in the non-insulating allocation condition did not complete stage two and, as a result, we excluded their data from all analyses. We did, though, retain this participant's matched-partner's data (excluding the matched-partner's data leaves all inferences unchanged).
[8] The web application was programmed using the oTree platform (Chen, Schonger, and Wickens, 2016).
[9] The average compensation in our study of $6.26 equates to more than $12.00 per hour for the slower-moving participants, which exceeds conservative estimates of MTurk effective wage rates (Paolocci, Chandler, and Ipeirotis, 2010; Farrell, Grenier, and Leiby, 2017).
[10] Projects were created in the vein of prior research on risky choice (see, e.g., Lopes 1984; Schneider and Lopes 1986; Holt and Laury 2002).

presented to participants.

Participants are informed that their firm has a second division, equal in size to their own, that is managed by another participant with whom they will be paired for the task – creating a group of two managers. Participants are further informed that their manager-partner will face the same project selection decisions and that the outcome of the project chosen by each division manager will be randomly determined based on the presented likelihoods of each outcome. While participants within each group face the fifteen project pairs in the same sequence, the sequence of project pairs is randomly determined between groups. Moreover, the order and labeling of each project in each pair ("A" vs. "B") is randomly determined between groups.

The instructions further explain to participants that their compensation for stage one will be based on their division's profitability in a randomly selected period, which will be calculated as the net income generated by the project selected by the participant for implementation less the participant's share of the firm's common costs. We manipulate, between groups, the manner in which the firm's common costs are allocated.

In the insulating cost allocation condition, participants are informed that the firm's common costs of 100 will always be split equally between the two divisions (50 each). As discussed earlier, insulating allocations in practice could use bases – such as square footage – that could vary between divisions or segments and thus result in allocations that are not strictly equal. In our experiment, we choose to describe to participants two divisions of equal size, and thus split costs equally in the insulating allocation condition, to maintain tighter experimental control and provide a necessary first step in examining the effects of different cost allocation types on critical perceptions and behavior. In the non-insulating cost allocation condition, participants are informed that common costs will be allocated to each division based on the portion of total firm net income generated by each division in each period. For example, suppose a participant's selected project generates net income of 80 and the project selected by the participant's partner generates net income of 120. In this case, total firm net income is 200 (80 + 120), of which the participant's division generated 40% (80 / 200). As such, the participant's division would be allocated 40% of the common costs, or 40, and their division's profitability for the period would be 40 (80 – 40). The participant's partner would be allocated 60% of the common costs, or 60, and their division's profitability for the same period would be 60 (120 – 60).

Compensation for stage one is based on, and increasing in, each participant's division profit during a randomly selected period, determined at the end of the entire experiment. Division profit is converted to compensation in increments of 10, with profit of 0-9 equating to compensation of $0.00, profit of 10-19 equating to compensation of $0.50, and so on.[11] The instructions for stage one contain several examples which outline in detail the division profit, and resultant compensation, that would be earned by the participant and their partner given hypothetical project outcomes. After reviewing this information, participants complete a brief knowledge check to ensure their understanding of the instructions and proceed to the first project selection period.

Each participant and their partner make each project selection simultaneously, receiving a "wait" screen if necessary until after their partner has finished making a selection. After both participants have made their selections, both participants receive detailed feedback that illustrates the outcomes of their project and their partner's project. This information also highlights the share of the firm's common costs that has been allocated to each division, as well as the calculation of each division's overall profitability for the period. Following the fifteenth project selection period, participants conclude stage one by completing a brief questionnaire that contains items to measure

[11] Capital projects were constructed such that in any particular period, no participant's division profit could fall below zero, regardless of whether the participant was in the insulating or non-insulating cost allocation condition.

their identification with their group and their perceptions of the fairness of the assigned cost allocation scheme.

Stage Two

In stage two, participants play a public goods game.[12] Participants are informed that they will be paired with the same individual from stage one.[13] Each participant receives 50 tokens that can, in any relative amount, be kept or contributed to a group pot whose proceeds are split evenly between the participant and their partner. Each token kept is worth $0.04, and each token contributed to the group pot is worth $0.06 ($0.03 per participant). Thus, the marginal per capita return for contributions to the public good is 0.75.

Participants are provided with several examples that illustrate their compensation if they and their partner contribute varying amounts of tokens to the public good. Participants are also informed that they will not learn the decision their partner makes until the end of the experiment. Participants then complete a brief knowledge check to ensure their understanding of the stage two task and compensation and proceed to make their token allocation decisions.

Following the stage two task, participants complete a post-experiment questionnaire that measures their perceptions of the task, the difficulty they had in making their decisions, and their motivation(s) for allocating tokens in the manner they chose. The questionnaire also asks participants to indicate their attitude toward taking risks (Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner 2005, 2011) and collects demographic information.

[12] As discussed in Tayler and Bloomfield (2011, p. 755), "Public goods games are useful ways to represent a variety of accounting settings, because they provide individuals with a social dilemma where private interests are at odds with behavior that a regulator or manager would view as desirable."

[13] Participants are paired with the same individual because we are interested in the formation of group identity and its effects on subsequent within-group cooperation. To prevent anticipation of the continued pairing from affecting behavior in stage one, participants are not made aware that their second task will involve working with the same individual until they reach stage two.

IV. RESULTS

Descriptive Statistics

Figure 1 presents participants' risky choice decisions by cost allocation condition across the fifteen periods of stage one in the experiment. As shown in Figure 1, participants in the non-insulating cost allocation condition selected the riskier of the two capital project options more frequently than participants in the insulating cost allocation condition in most of the fifteen periods of stage one.

(Figure 1)

Table 1 presents descriptive statistics by cost allocation condition. Stage one risk-taking ranges from 0-15 and is measured as the number of periods in which the participant chose the riskier of the two capital project options presented. Group identification ranges from 0-10 and is measured as the average of five post-experiment questionnaire items designed to measure this construct (see Appendix B) that have been adapted from prior literature (e.g., Mael and Ashforth 1992; Haslam 2001). Perceived fairness ranges from 0-10 and is measured as the average of two questionnaire items designed to measure this construct (see Appendix B).[14] Cooperation is measured as the number of tokens the participant contributed to the public good in stage two of the experiment, while individuals' risk preference is measured using a questionnaire item that asks individuals about their attitude toward taking risks (Dohmen et al. 2005, 2011).

(Table 1)

As shown in Table 1, we find univariate differences in risk-taking, group identification,

[14] Confirmatory factor analysis for our multi-item measures of group identification and perceived fairness suggest the presence of a single factor for each construct, with both CFAs returning a single eigenvalue > 1 and all items loading on their intended factor at > 0.70.

and perceived fairness between conditions that are in line with our expectations.[15] Additionally, we observe significant correlations (untabulated) between several of our variables that are in line with our expectations. Specifically, group identification is positively correlated with cooperation (0.13, $p < 0.05$), while risk-taking is negatively correlated with group identification (-0.13, $p < 0.05$) and positively correlated with risk preference (0.16, $p < 0.01$). Finally, perceived fairness and cooperation are positively correlated (0.14, $p < 0.05$). We further examine these relationships below in the formal tests of our hypotheses and research question.

Tests of Hypotheses and Research Question

Overall Approach and Structural Equation Model

We test our hypotheses in the following ways. For tests that involve overall differences in outcomes between conditions (H1-H3 and our research question), we first refer to the results of t-tests reported in Table 1 that compare overall means between conditions. Second, to conduct multivariate tests of all of our hypotheses and our research question and provide insight into the process through which cost allocation type affects risk-taking and subsequent cooperation, we estimate a Structural Equation Model (SEM), which is pictured in Figure 2. The model includes stage one risk-taking and stage two cooperation as dependent variables of group identification, perceived fairness, and cost allocation condition. Cost allocation condition is a binary indicator, with 0 (1) representing the insulating (non-insulating) allocation condition, while other variables are as previously defined.

(Figure 2)

[15] In untabulated results, we find, as expected, variation in realized cost allocations in the non-insulating cost allocation condition. Equal cost splits among participant pairs are attained in 31% of all periods, with the majority of periods (55%) seeing cost splits of 55%-45% or wider. We examine the potential effects of cost differences on participants' behavior in the additional analysis section.

The model includes paths from cost allocation condition to group identification and perceived fairness to examine the potential mediating effects of these variables in the relationships between cost allocation condition and both risk-taking and cooperation, and also includes the potential relationship between stage one risk-taking and stage two cooperation. Finally, the model includes individuals' risk preferences to better disentangle the effect of cost allocation type on risk-taking behavior. The model is a good fit for the data, with an insignificant ($p = 0.69$) chi-square test and all other measures of fit (error) above (below) generally accepted levels (CFI = 1.00; RMSEA = 0.00; SRMR = 0.03) (Kline 2011).

Hypotheses H1-H3

H1 predicts that non-insulating cost allocations will lead to increased risk-taking by managers as compared to insulating cost allocations. As shown in Table 1, participants in the non-insulating cost allocation condition chose riskier projects in stage one of the experiment compared to participants in the insulating cost allocation condition (7.46 vs. 6.58, $p = 0.03$), providing support for H1.[16] Figure 2 illustrates that the non-insulating cost allocation has positive direct and total effects on stage one risk-taking (direct effect = Link 1, 1.00, $p < 0.05$; total effect = Link 1 + Link 2 × Link 5 + Link 3 × Link 7 × Link 5, 0.90, $p < 0.05$). This provides additional support for H1 and suggests that, even after controlling for individuals' general risk preferences (with more risk-seeking individuals naturally choosing riskier projects – Link 10, 0.24, $p < 0.01$) and other factors discussed below, non-insulating cost allocations led to increased risk-taking.[17]

H2 predicts that non-insulating cost allocations, due to the ways in which they tie managers' outcomes together and thus generate concern for the group and its outcomes, will lead

[16] All reported p-values are one-tailed for directional predictions and two-tailed otherwise.
[17] When examining potential indirect effects of cost allocation type on risk-taking, we find no effect of perceived fairness on risk-taking (not pictured; 0.02, $p = 0.87$).

to stronger group identification as compared to insulating cost allocations. At a univariate level, results in Table 1 show that participants in the non-insulating cost allocation condition developed stronger identification with their group as compared to participants in the insulating cost allocation condition (5.04 vs. 4.40, $p = 0.03$), supporting H2. Results in Figure 2 confirm that the non-insulating cost allocation scheme strengthens group identification directly and in total (direct = Link 2, 0.59, $p = 0.065$; total = Link 2 + Link 3 × Link 7, 0.50, $p = 0.08$) after accounting for the negative indirect effect operating through perceived fairness, providing additional support for H2.[18]

Related to both H1 and H2, results in Figure 2 suggest that stronger group identification tempers some risk-taking (Link 5, -0.19, $p < 0.05$). This result is consistent with the notion discussed in the development of our hypotheses that, while non-insulating cost allocations promote risk-sharing, individuals may be hesitant to impose potential negative externalities on others by taking excessive risk – an effect that should increase as one's concern for the group or other individual increases (e.g., Charness and Jackson 2009; Reynolds, Joseph, and Sherwood 2009; Bolton et al. 2015; Pahlke, Strasser, and Vieider 2015). As noted above, however, this effect is subsumed in the positive total effect of non-insulating cost allocations on risk-taking, which suggests that, for the average individual in our setting, the risk-sharing aspect of the allocation scheme outweighs concern for potentially damaging others' outcomes by pursuing greater risk.

H3 predicts that non-insulating cost allocations, which are based on others' performance and can result in unequal splits of costs between managers, will be perceived as a less fair way of

[18] In untabulated analysis, we find that – as would be expected – participants in the non-insulating cost allocation condition express a stronger desire to see the project selections of their firm's other division manager generate high levels of income as compared to participants in the insulating cost allocation condition (6.90 vs. 6.15, $p = 0.02$, one-tailed). This further highlights how the interdependence of manager outcomes in a non-insulating allocation can lead to individual and group goals that are more closely aligned.

allocating costs as compared to insulating allocations. Results in Table 1 provide support for H3, showing that perceived fairness is lower for participants in the non-insulating cost allocation condition as compared to participants in the insulating cost allocation condition (5.87 vs. 6.83, $p < 0.01$). Moreover, results in Figure 2 illustrate that the non-insulating cost allocation scheme has a negative effect on perceived fairness after accounting for the other relations in the model (Link 3, -0.96, $p < 0.01$), providing additional support for H3.

To alleviate concerns that differences in fairness perceptions are driven strictly by differences in cost *outcomes*, we further examine the relation between these two variables. In untabulated results, we find that participants in the non-insulating cost allocation condition whose performance results led to average cost splits of between 50%/50% and 51%/49% still perceive their allocation method as being less fair when compared to participants in the insulating cost allocation condition (6.06 vs. 6.83, $p = 0.06$). This suggests that overall differences in perceived fairness may relate to procedural fairness concerns, and are not driven solely by participants who were allocated significantly higher or lower costs than their partner. We observe some differences ($p < 0.05$) in perceived fairness between participants who received an average of 47% or lower of the firm's common costs (6.06) and participants who received an average of 53% or higher of the firm's common costs (5.24) in the non-insulating cost allocation condition. However, the participants just described who were allocated significantly *less* cost than their partner, and thus benefited from the non-insulating cost allocation scheme, still view the allocation method as less fair than participants in the insulating cost allocation condition (6.06 vs. 6.83, $p < 0.05$). We further examine potential effects of cost differences in the additional analysis section.

Hypotheses H4a and H4b

H4a predicts that greater perceived fairness of cost allocations will lead to increased subsequent cooperation, while H4b predicts that stronger group identification will also lead to increased subsequent cooperation. Returning to our SEM in Figure 2, results show that perceived fairness has a positive effect on cooperation both directly and indirectly through group identification (direct = Link 8, 1.13, $p < 0.05$; indirect = Link 6 × Link 7, 0.06, $p = 0.09$).[19] In addition, group identification has a positive effect on cooperation both directly and in total (direct = Link 6, 0.69, $p < 0.05$; total = Link 6 + Link 5 × Link 9, 0.68, $p < 0.05$). These results provide support for H4a and H4b, respectively and, when combined with results for H1-H3, suggest that perceived fairness and group identification at least partially mediate the relationship between cost allocation condition and subsequent cooperation. We further examine the overall effect of cost allocation condition on subsequent cooperation in tests of our research question below.

Research Question – Cost Allocations and Subsequent Cooperation

Given the competing effects that non-insulating cost allocation methods exhibit on cooperation, we examine whether non-insulating cost allocations lead to greater cooperation between managers than insulating cost allocations. As shown in Table 1, we find no univariate differences in cooperation between participants in the non-insulating and insulating cost allocation conditions (22.10 vs. 20.18, $p = 0.44$).

As discussed in previous tests, results of our SEM in Figure 2 illustrate that the non-insulating cost allocation scheme has a positive direct effect on stage one risk-taking (Link 1, 1.00, $p < 0.05$). This does not ultimately affect cooperation, however, as risk-taking has no effect on cooperation (Link 9, 0.05, $p = 0.74$). On the other hand, the non-insulating cost allocation scheme

[19] The addition of the link tested between fairness perceptions and group identification (Link 7) is based on theory and research in psychology and organizational behavior that suggests perceptions of the group environment and the ways in which group members must interact (i.e., organizational rules in this case) can affect identification even when members of the group do not control these factors (e.g., Ashforth et al. 2008; Hornsey 2008). The positive association we observe is consistent with this research.

exhibits a positive indirect effect on cooperation through group identification (Link 2 × Link 6, 0.41, $p = 0.08$) and a negative indirect effect on cooperation through perceived fairness (Link 3 × Link 8 + Link 3 × Link 7 × Link 6, -1.14, $p < 0.05$). Moreover, the non-insulating cost allocation scheme has no significant direct effect on cooperation (Link 4, 3.48, $p = 0.18$), which when combined with the indirect effects just described, contributes to a total effect on cooperation that is positive but not significant at conventional levels (2.70, $p = 0.18$). These results suggest that the opposing effects of non-insulating cost allocations on cooperation through decreased fairness perceptions and stronger group identification offset each other, leading to no overall differences in cooperation as a function of cost allocation method. In additional analyses, we test for potential effects on cooperation stemming from differences in actual outcomes and cost allocations.

Additional Analyses

Potential Effects of Allocated Costs and Profit Outcomes

Individuals' risk-taking in stage one and cooperation in stage two could be affected by the performance of the capital projects they and their group member select in stage one (which affects compensation for the task for all participants, as well as cost allocations in the non-insulating cost allocation condition). As an example, if an individual's project selections in early periods perform poorly, then the individual may be inclined to take less future risk to feel better about their compensation prospects or may "go for broke" and take more risk going forward to try to register a large payoff with one of their remaining selections (e.g., Gächter, Johnson, and Hermann 2007; Drake and Kohlmeyer 2010; Delfino, Marengo, and Ploner 2016). Similarly, the project results attained by an individual's partner could affect future risky choices and cooperation due to individuals' concerns about equity or relative performance (e.g., Levinger and Schneider 1969; Fehr and Schmidt 1999; Delfino et al. 2016; Heinrich and Mayrhofer 2018).

To account for these potential effects, we first estimate a model similar to that pictured in Figure 2 but use participants' project selections in periods 8-15 as our measure of risk-taking. We include the following variables, all measured across periods 1-7: the individual's average project outcome, the average project outcome of the individual's partner, and the average cost allocated to the individual interacted with condition (since costs allocated are always 50 in the insulating allocation condition).[20] Our main inferences discussed above remain unchanged, and we find no evidence that any of these variables have an effect on risk-taking in periods 8-15 (all p's > 0.40).[21]

Next, we consider two additional models that add variables to the model pictured in Figure 2. Model (1) includes variables for the individual's average project outcome, average allocated cost interacted with condition, and the average project outcome of the individual's partner, across all fifteen periods. Model (2) includes a variable for the average *difference* in project outcomes between an individual and their partner. Inferences discussed earlier are unchanged in both models, and we find no evidence that any of these variables influence cooperation (all p's > 0.27), at least incrementally to the observed effects on cooperation of cost allocation condition, group identification, and perceived fairness. Moreover, we find no evidence that these variables have any effect on the mediating factors of group identification or perceived fairness (all p's > 0.31).[22]

Finally, we consider a model that is otherwise identical to Model (2) above but that uses a categorical variable to represent the difference in outcomes between an individual and their partner, with -1 representing an average difference of less than -10 (individual did much "worse"

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[20] Some research suggests that risky choice may follow mimicking or herding patterns, particularly in group contexts (e.g., van Knippenberg and van Knippenberg 2000; Bolton et al. 2015; Delfino et al. 2016). In untabulated analyses, we consider a model that includes a variable for the risk-taking exhibited by a participant's partner, and estimate its relation to the participant's own risk-taking. Partner risk-taking has no effect (all p's > 0.45) on individuals' own risk-taking in total, or when considering splits of first 7/last 8, first 10/last 5, or first 12/last 3 periods.

[21] For robustness, we split stage one into phases of first 10/last 5, and first 12/last 3, and again find no effects of earlier period project outcomes on later period risk-taking (all p's > 0.24).

[22] We also combine the two analyses described to examine any potential effects of earlier/later period outcomes on stage two cooperation. None reach significance (all p's > 0.45).

than their partner), 0 representing an average difference between -10 and 10, and 1 representing an average difference of greater than 10 (individual did much "better" than their partner). Results of this model indicate that individuals whose projects performed markedly better than their partner's projects, on average, cooperated more in stage two (3.08, p = 0.06), consistent with some prior research pertaining to individuals' equity concerns (e.g., Fehr and Schmidt 1999, 2006).[23] All other inferences from our original model remain unchanged.

Group Identification and Risk Preferences

As discussed earlier, there is some evidence that stronger group identification tempers risk-taking in stage one, although for the average individual the risk-sharing mechanism present in the non-insulating cost allocation outweighs potential concerns for imposing negative externalities on another individual by taking excessive risk. To further examine these results, and the ways in which group identification and cost allocation type may interact to affect risk-taking, we split participants into three groups based on the strength of their group identification. Results presented in Figure 3 illustrate that risk-taking is higher in the non-insulating cost allocation condition, as compared to the insulating cost allocation condition, for participants with the weakest group identification (8.58 vs. 6.71) and those whose identification falls in the middle of the scale (8.26 vs. 6.63). However, for those participants with the strongest group identification, there is no difference in risk-taking between conditions (6.33 vs. 6.43). This result suggests that, if group identification is sufficiently strong, concern for one's other group member (and the notion of potentially damaging that individual's outcomes by taking excessive risk) may alter the effect of

[23] In untabulated analysis, we find that there is no difference in average profitability (revenue generated by the manager's project selection less allocated cost) across conditions (p = 0.32). However, consistent with the notion that the potential risk-sharing in non-insulating allocations can serve as a shock absorber, we find that the *variation* in profitability is lower in the non-insulating allocation condition as compared to the insulating allocation condition (standard deviation, 5.96 vs. 7.28, p = 0.02 one-tailed). Such decreases in variability of performance measures are desirable for risk-averse managers (Zimmerman 2019).

the risk-sharing mechanism present in the non-insulating cost allocation method.

(Figure 3)

Given that individuals vary in their general preferences for risk (e.g., Dohmen et al. 2011), we also examine potential differences in risk-taking by participants' risk preferences within each cost allocation method. For purposes of this analysis, we again split participants into three groups by their measured risk preference. Results presented in Figure 3 demonstrate that, on average, the risk-sharing mechanism of the non-insulating cost allocation method motivates increased risk-taking for individuals who are the most relatively risk-averse (6.83 vs. 5.96) and the most relatively risk-seeking (9.5 vs. 6.63), as compared to the insulating cost allocation method. Conversely, for individuals whose risk preference falls closest to the middle of the scale, there are no differences in risk-taking between conditions (6.76 vs. 6.87). This result suggests that firms wishing to motivate increased risk-taking in managers who are on average risk-averse may benefit from using non-insulating cost allocations, while any firm whose managers pursue more risk than would be desired by the firm's owners may be able to use insulating cost allocations to rein in such behavior – even in the event that those managers have an above-average appetite for risk.

Fairness Perceptions

The strength of differences in fairness perceptions between conditions discussed above suggest that further examination of the effects of these perceptions may be fruitful. Table 2 presents information related to group identification and cooperation after splitting participants within condition on mean fairness perception, as defined previously.

(Table 2)

As can be seen in Table 2, overall differences in fairness perceptions are concentrated in participants whose fairness perceptions are above the mean within each condition (8.87 vs. 7.66,

$p < 0.01$), with no other difference observed. It is useful to note that there are no differences in average project outcomes, or average allocated costs, between conditions in either sub-sample (all p's > 0.33). This is consistent with earlier results that suggest perceptions of fairness may relate to concerns about procedural fairness in addition to distributive fairness. With regard to group identification, results in Table 2 are consistent with overall results in that group identification is stronger for participants in the non-insulating allocation condition as compared to participants in the insulating allocation condition (5.30 vs. 4.61, $p = 0.06$, and 4.78 vs. 4.14, $p = 0.09$).

Finally, results in Table 2 find that participants in the non-insulating allocation condition demonstrated greater cooperation than did participants in the insulating allocation condition for the higher fairness sub-sample (28.57 vs. 22.66, $p = 0.08$, two-tailed). Notably, this result obtains despite the differences in perceived fairness between the conditions (7.66 vs. 8.87, $p < 0.01$). Combined with the result above for group identification, this result provides some evidence that non-insulating cost allocations, due to the manner in which they bind manager outcomes together, lead to increased concern for group outcomes. Moreover, these allocations may generate increases in subsequent cooperation, provided managers do not find their determination to be too unfair. As discussed previously, firms may be able to emphasize the ex ante fairness of the shock absorbing qualities of non-insulating allocations, which may reduce the costs of decreased fairness perceptions associated with these allocations.

V. CONCLUSION

In this paper, we conduct a laboratory experiment to examine the effects of insulating and non-insulating cost allocations on individual's risk taking, group identification, perceptions of fairness, and cooperation. Our results suggest that non-insulating cost allocations promote increased risk taking. Inducing managers to undertake risky projects is important for many firms

(Brickley et al. 2016; Thaler 2015), and our findings suggest that cost allocations may be a mechanism via which organizations can promote or curtail managers' risky choices. To this end, our research complements an emerging literature that examines whether and how the reporting of accounting information affects capital investments (Roychowdhury et al. 2019).

We also find that the tying together of manager outcomes, as occurs under a non-insulating cost allocation, can strengthen group identification which, in turn, has positive effects on subsequent cooperation in our setting and may be associated with other group-friendly behavior (e.g., Ashforth et al. 2008; Hornsey 2008). However, we find that non-insulating cost allocations are perceived to be less fair than insulating cost allocations, and these lower perceptions of fairness weaken group identification and decrease subsequent cooperation. Thus, it is important for organizations to consider how fairness perceptions could affect other behaviors, as any spillover of these deleterious effects may increase the cost of using non-insulating cost allocations.

To the best of our knowledge, we are the first study to empirically examine the benefits and costs of insulating and non-insulating cost allocations, and our findings suggest a number of avenues for further inquiry. For example, future research might examine how non-insulating and insulating cost allocations affect effort and concomitant task performance. Our findings that non-insulating cost allocations are viewed as less fair than insulating cost allocations suggest that participants may withhold or reduce effort in these settings, perhaps leading to lower overall aggregate output and firm performance. Future research might also fruitfully examine cooperation within the context of the cost allocation (Arya and Glover 2004; Arya et al. 2017) and/or participants' propensities to engage in mutual monitoring.

Appendix A

Sample Capital Project Pairs

In stage one of the experiment, participants are presented with two capital projects, "A" and "B," that they can implement in their division. There are fifteen unique project pairs. Each project has two possible outcomes and, for any given pair, the same expected value but differing risk. The expected value of both projects, each project's risk, and differences in project risk vary across the fifteen pairs. The order of the fifteen pairs, and the determination of which project will be presented as "A" and which project would be presented as "B," are determined randomly between pairs of participants. Below, we provide two project pairs actually presented to participants.

Each participant's profitability in any period is determined as: realized net income from the selected project (determined randomly based on the possible project outcomes and likelihoods) less the allocated share of the firm's common costs of 100. To avoid losses, the lowest possible outcome for any project is 50.

Project A

Project Net Income	Likelihood
60	60%
85	40%

Project B

Project Net Income	Likelihood
50	80%
150	20%

Expected value = 70
Variance: A = 156.25, B = 5000

Project A

Project Net Income	Likelihood
98	50%
114	50%

Project B

Project Net Income	Likelihood
70	70%
190	30%

Expected value = 106
Variance: A = 64, B = 7200

Appendix B

Questionnaire Items to Measure Group Identification and Perceived Fairness

Group identification is measured using the following items, adapted from prior literature (Mael and Ashforth 1992; Haslam 2001). Each item is scored 0 (strongly disagree) to 10 (strongly agree) and captured immediately following the stage one project selection task. Confirmatory factor analysis suggests the presence of a single factor, with one factor returning an eigenvalue > 1 and all items loading on the factor at > 0.80.

1. I feel a sense of attachment to my group.
2. If given the opportunity, I would have liked to join a different group (reverse-scored).
3. I feel that the other member of my group is probably a lot like me.
4. During the first decision making task, I often thought of my group and my other group member.
5. I feel closely connected to my other group member.

Perceived fairness is measured using the following items. Each item is scored 0 (strongly disagree) to 10 (strongly agree) and captured immediately following the stage one project selection task. Confirmatory factor analysis suggests the presence of a single factor, with one factor returning an eigenvalue > 1 and all items loading on the factor at > 0.70.

1. (Non-insulating) Your firm allocated common costs based on the project net income results of each division for the period, with higher net income leading to a higher share of common costs, all else equal. How fair do you believe this manner of allocation is to each division manager?
   (Insulating) Your firm allocated common costs equally across both divisions. How fair do you believe this manner of allocation is to each division manager?
2. How much control did you feel you had over your division's profitability each period?

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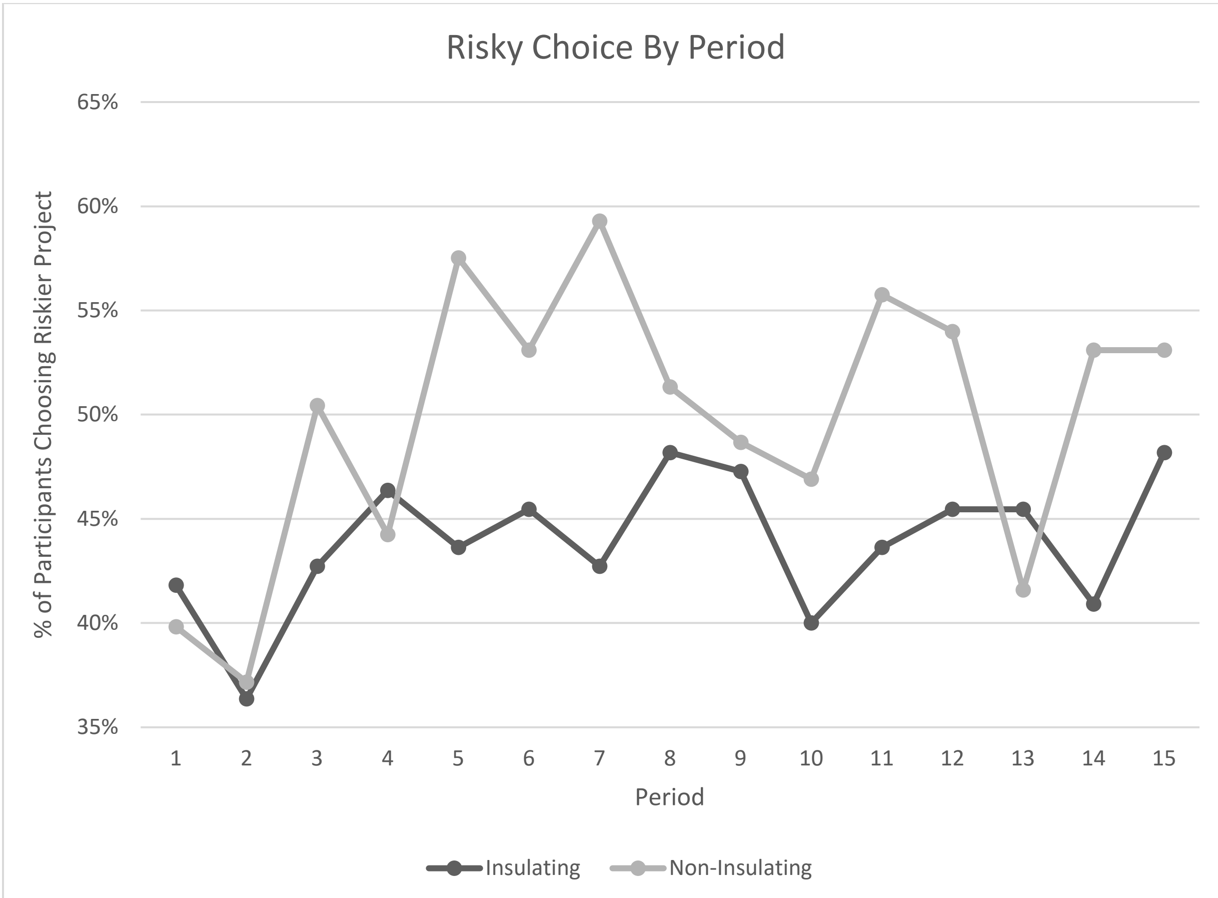
TABLE 1 Descriptive Statistics			
	Cost Allocation Condition		
	Insulating	**Non-Insulating**	**Results of t-test (one-tailed unless noted)**
n	110	113	
Risk-taking[1]	6.58 (3.39)	7.46 (3.70)	p = 0.03
Group identification[2]	4.40 (2.49)	5.04 (2.38)	p = 0.03
Perceived fairness (of allocation scheme)[3]	6.83 (2.65)	5.87 (2.26)	p < 0.01
Cooperation[4]	20.18 (18.12)	22.10 (19.15)	p = 0.44 (two-tailed)
Risk Preference[5]	4.83 (2.27)	4.79 (2.72)	p = 0.91 (two-tailed)

Notes:
[1] Mean (sd). 0-15. Represents the number of periods in which the participant chose the riskier of the two capital project options presented.
[2] Mean (sd). 0-10. An average of the participant's responses to five post-experiment questionnaire items used to measure group identification, adapted from prior literature (see Appendix B).
[3] Mean (sd). 0-10. An average of the participant's responses to two post-experiment questionnaire items used to measure perceptions of the fairness of the cost allocation scheme (see Appendix B).
[4] Mean (sd). 0-50. The number of tokens the participant contributed to the public good in stage two of the experiment.
[5] Mean (sd). 0-10. Participant's risk preference, as measured by a post-experiment questionnaire item asking participants to rate their overall willingness to take risks (Dohmen et al. 2005, 2011).

TABLE 2 **Outcomes by Condition and Fairness Perceptions**				
	Insulating Allocation Condition		Non-Insulating Allocation Condition	
	Below-Mean n = 48	Above-Mean n = 52	Below-Mean n = 57	Above-Mean n = 56
Perceived Fairness[1]	4.19 (1.44)	8.87 (1.14)	4.11 (1.44)	7.66 (1.34)
Group Identification[2]	4.14 (2.40)	4.61 (2.55)	4.78 (2.55)	5.30 (2.19)
Cooperation[3]	19.79 (18.13)	22.66 (18.39)	18.37 (19.73)	28.57 (17.60)
Average Project Outcome[4]	79.68 (7.53)	80.88 (7.09)	80.92 (7.73)	78.01 (6.72)
Average Allocated Cost[5]	50.00	50.00	50.31 (2.88)	49.68 (2.60)
Cooperation Decision Difficulty[6]	2.88 (2.68)	2.44 (2.45)	2.37 (2.59)	2.52 (2.50)
Concern for Group Pay[7]	4.29 (3.10)	5.16 (3.46)	3.81 (3.40)	5.80 (3.20)
Positive Affect[8]	3.45 (2.49)	4.10 (2.89)	3.88 (2.81)	4.11 (2.88)

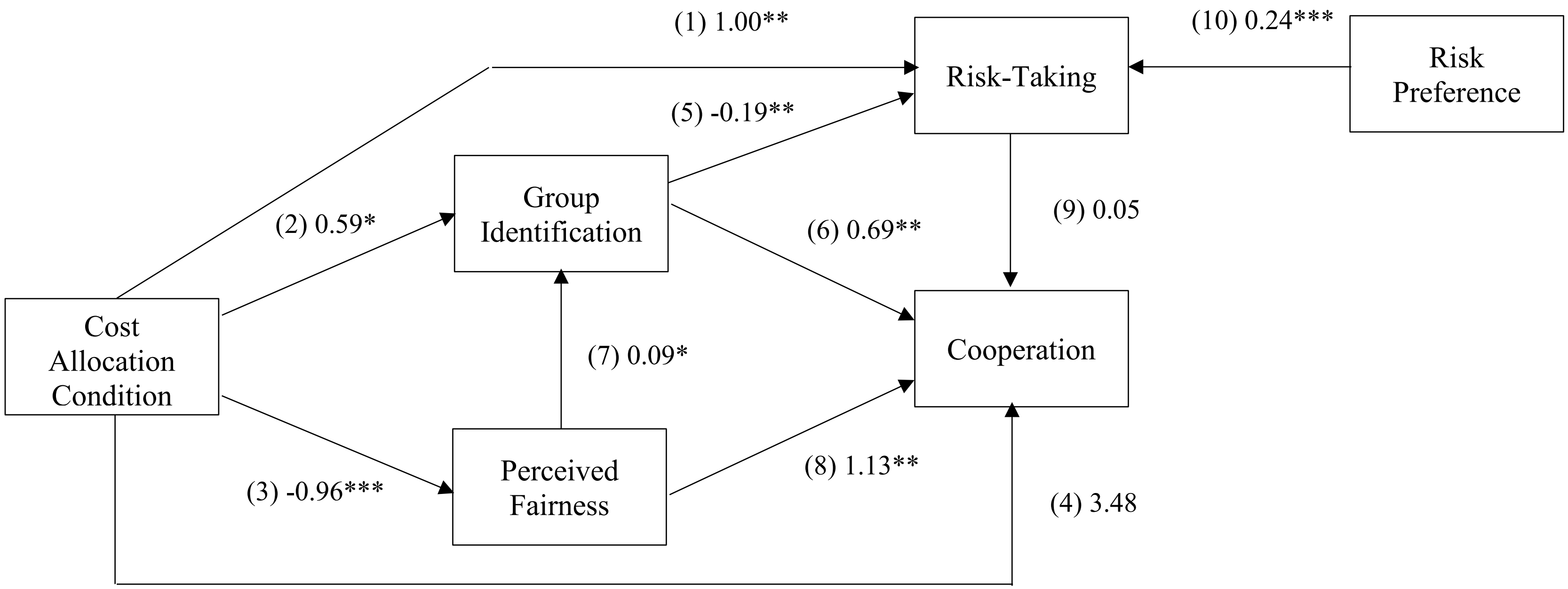
Notes:
Table 2 splits participants within condition on their response to two post-experiment questionnaire items used to measure perceptions of the fairness of the cost allocation scheme.
[1] Mean (sd). 0-10. An average of the participant's responses to two post-experiment questionnaire items used to measure perceptions of the fairness of the cost allocation scheme (see Appendix B).
[2] Mean (sd). 0-10. An average of the participant's responses to five post-experiment questionnaire items used to measure group identification, adapted from prior literature (see Appendix B).
[3] Mean (sd). 0-50. The number of tokens the participant contributed to the public good in stage two of the experiment.
[4] Mean (sd). Average return generated by the participant's capital project selections across all 15 periods of the stage one investment task.
[5] Mean (sd). Average cost allocated to the participant across all 15 periods of the stage one investment task. Note this is fixed by design in the insulating allocation condition.
[6] Mean (sd). 0-10. The participant's response to a post-experiment questionnaire item asking them to rate the difficulty of their decision to keep endowed resources or contribute them to the group pot in a public goods game.
[7] Mean (sd). 0-10. The participant's response to a post-experiment questionnaire item asking them to indicate how important maximizing group pay was to them in the public goods game.
[8] Mean (sd). 0-10. An average of three post-experiment questionnaire items adapted from prior research to measure positive affect (Watson et al. 1988).

FIGURE 1



Note: Figure 1 plots risky choice over time by cost allocation condition, illustrating the percentage of participants in each condition who chose the riskier of the two capital project options presented to them in any particular period (1-15).

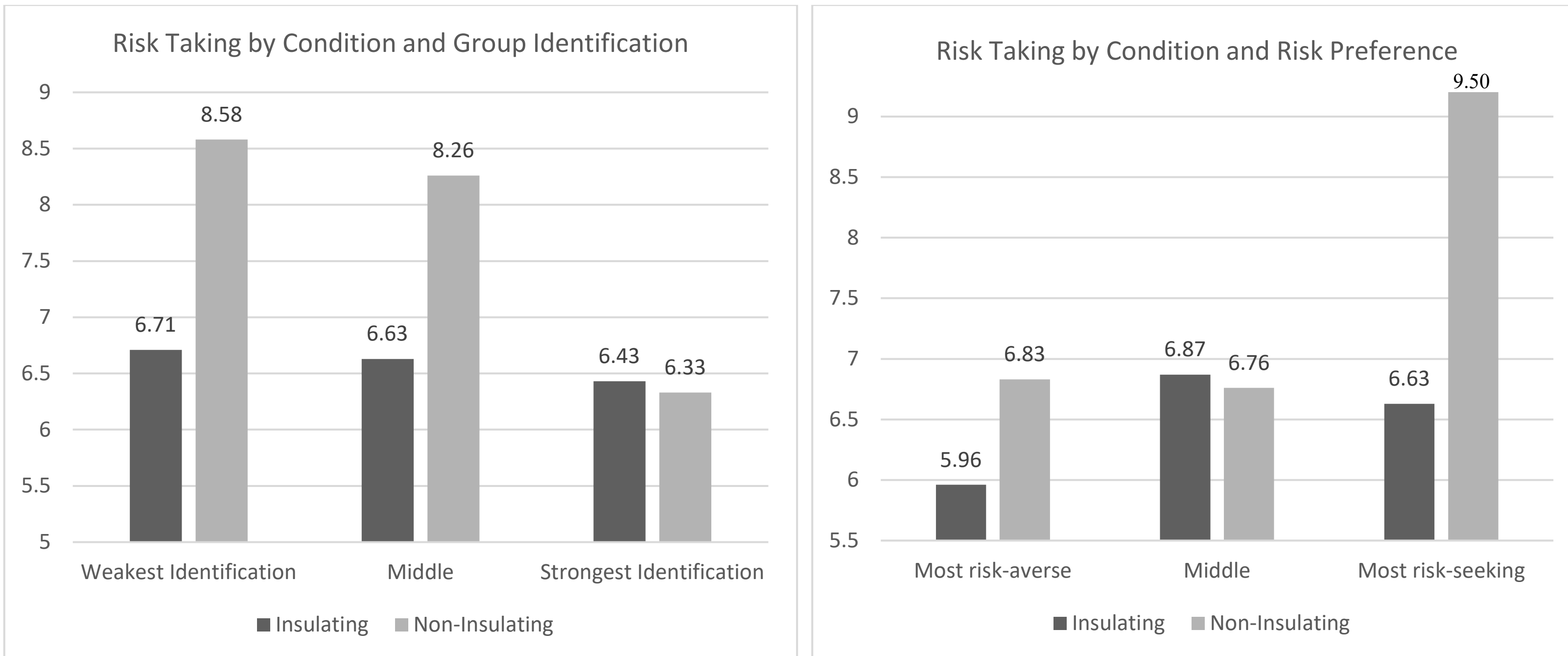
FIGURE 2
Structural Equation Model of the Effects of Cost Allocation Condition on Risk-Taking and Cooperation



Some paths omitted for clarity. *, **, *** represent significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively (one-tailed tests for directional predictions). The model fits the data well. Overall goodness of fit: $\chi 2 = 10.10$ ($p = 0.69$). CFI = 1.00. RMSEA = 0.00. SRMR = 0.03.

1. Cost Allocation Condition – 0 (1) for participants in the insulating (non-insulating) cost allocation condition.
2. Group Identification – Factor score estimated using the five post-experiment questions designed to measure participants' identification with their group.
3. Perceived Fairness – Factor score estimated using the two post-experiment questions included to measure participants' perceptions of the fairness of the cost allocation scheme.
4. Risk-Taking – 0-15 – The number of periods in stage one of the experiment in which the participant selected for implementation in their division the riskier of two capital project options.
5. Cooperation – 0-50 – The number of tokens the participant allocated to the public good in stage two of the experiment.
6. Risk Preference – 0-10 – Participant's risk preference, as measured by a post-experiment questionnaire item asking participants to rate their overall willingness to take risks (Dohmen et al. 2005, 2011).

FIGURE 3



Notes:
Figure 3 illustrates stage one risk-taking by condition, categorizing participants based on (1) group identification and (2) risk preference. Group identification (0-10) is measured using questionnaire items adapted from prior research (e.g., Mael and Ashforth 1992; Haslam 2001), while risk preference (0-10) is measured using a questionnaire item designed to capture individuals' stable risk preference or attitude (e.g., Dohmen et al. 2005, 2011). Group identification is split using composite measures of 0-3 (62 participants), 4-5 (68 participants), and 6-10 (93 participants). Risk preference is split using a measure of 0-3 (68 participants), 4-6 (100 participants), and 7-10 (55 participants).