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The Effects of Pair Budget Goal Difficulty and Pair Identity on Decision-Making and Performance

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THE EFFECTS OF PAIR BUDGET GOAL DIFFICULTY AND PAIR IDENTITY ON DECISION-MAKING AND PERFORMANCE

by

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ABSTRACT

Mixed incentive compensation structures have been widely studied in the accounting literature (e.g., Tian et al. 2017; Dekker et al. 2012, Rothenberg 2011; Hwang et al. 2009). However, the findings in the literature as to the effectiveness of mixed incentives are not consistent. The inconsistency in the mixed incentives literature may be due to the various levels of social dilemma embedded in the research setting of the studies. Therefore, I experimentally investigated two factors that may reduce the embedded social dilemma issue and improve the effectiveness of mixed incentive compensation. In this study, student participants were assigned to pairs to complete a computerized letter-decoding task in which I manipulated (1) pair budget goal difficulty (easy vs. difficult) and (2) pair identity (strong vs. weak). I found that when given a difficult pair budget goal, pair members cooperated more and sabotaged less than when given an easy pair budget goal. Furthermore, I found that assigned a difficult goal, participants in highly identified pairs sabotaged less than those in weakly identified pairs. However, this difference was not found in the easy goal condition. Also, I found that when the goal was easy, strong pair identity enhanced productivity through inducing additional participant effort. When the goal was difficult, strong pair identity enhanced productivity through the suppression of sabotage. The results have implications for understanding individuals' strategic behaviors when they face conflicts of interest and provide practical insights for the design of mixed incentive compensation systems.

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DEDICATION

To my family.

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CHAPTER 1

INTRODUCTION

Teamwork is increasingly seen as an important factor for business success (Mueller, Procter, and Buchanan 2000; Cohen and Bailey 1997). For example, in his article published in The Economist in 2016, Schumpeter argues that teams "have become the basic building-blocks of organisations." In addition, in a survey conducted in 2013, EY (Ernst & Young) report that about 90% of the respondents agree that teams are essential to provide effective solutions for the problems companies currently face.

However, applying proper incentives for teams appears to be one of the most challenging tasks for many companies (Irlenbusch and Ruchala 2008; Hamilton, Nickerson, and Owan 2003; DeMatteo, Eby, and Sundstrom 1998; Main, O'Reilly, and Wade 1993). In general, team members are often rewarded based on the team's output and not individual contributions because absolute individual contributions cannot be easily measured or are often difficult to verify (Irlenbusch and Ruchala 2008)[1]. However, this compensation scheme introduces an opportunity to free ride, which leads to suboptimal effort levels. Individual-based compensation can solve such issues because they often motivate competition. However, competition not only motivates employees invest more effort but could also create sabotage issues. Therefore, providing

[1] In this study, I used individual relative information for performance evaluation instead of absolute individual performance.

a mixed-incentives scheme which contains both an element of group-based compensations and individual-based compensations is considered an effective way to align employees' interest with the interest of the organization.

Mixed incentive structures can alleviate issues arising from individual- or team-based compensation structures because the issues of one type of incentive are neutralized by the aspects of the other type of the incentives (Welbourne and Mejia 1995). As such, the mixed incentive scheme is commonly used in practice. For example, Lawler et al. (2003) report that the percentage of companies using mixed incentives increased by 29 percent from 1990 to 2002. However, evidence on the effect of the mixed incentive structure is mixed. For example, Kozlowski and Ilgen (2006) document a positive effect of mixed incentives on motivating effort and increasing output. Other studies, however, show that mixed incentives lead to subprime output levels through increased competition and less cooperation when teamwork is essential (Libby and Thorne 2009; Irlenbusch and Ruchala 2008; Quigley et al. 2007). The inconsistent findings in prior research may be due to social dilemmas embedded their research settings. For example, the mixed incentive in Pearsall et al. (2010) motivates participants to compete with individuals in other groups and cooperate within one's own group. In Blazovich (2013), piece rate pay is used for both group and individual compensation in a mixed incentives setting. Thus, the two incentives motivate participants to invest effort in the same direction and toward the same ends. Therefore, the social dilemma issue is trivial in such settings because there are no conflicts of interest. However, in many other study (e.g., Tian et al. 2017; Libby and Thorne 2009; Irlenbusch and Ruchala 2008), the mixed incentives in the settings

create various levels of social dilemmas where participants face a tension between allocating effort for individual interests or group interests.

In this study, I investigate two factors to reduce the social dilemma issues present in mixed incentives environments. The formal research questions are how pair budget goal difficulty and pair identity affect individual decision-making and performance in a mixed incentives compensation scheme environment.

The goal setting literature documents a positive relation between goal difficulty and individual effort and performance (Hirst and Lowy 1990; Hirst 1987; Locke et al. 1981). However, the effect of goal setting on performance arrives differently at the individual level and the group level. Unlike in the individual setting where goals induce effort and persistence, in the group setting, the role of task strategy development is critical in that groups face a constant need for cooperation due to the nature of interdependence embedded in group tasks (Van Mierlo and Kleingeld 2010; Kozlowski and Bell 2003). In addition, goal difficulty affects individuals' risk-taking preference. When they perceive the group goal as difficult to achieve, I expect them to choose a low risk strategy to ensure goal achievement (e.g., cooperating more and sabotaging less). As such, I hypothesize that there will be more cooperation and less sabotage when the pair budget goal is difficult than when is easy.[2]

Group Identity, an informal internal control mechanism, can affect individual behaviors. Organizations often attemot to enhance group identity to foster cooperation among group members (Liu 2016). Prior literature also finds that enhancing group identity has a positive effect on employees' cooperative behavior and performance

[2] The term "pair" is used in this study. A pair is a special case of groups where a pair consists of only two members.

(Ellemers, De Gilders, Haslam 2004; Towry 2003; King 2002; De Cremer and van Dijk 2002; Kramer and Brewer 1984). Such relation is achieved through a self-categorization process. Through this process people perceive themselves as the representatives of the group rather than unique individuals. Therefore, people should perform in a way benefiting the group. In addition, high group identity increases the concern for others in a group, and this concern reduces competitiveness among group members. As such, I predict that participants will sabotage less when pair identity is strong than when pair identity is weak.[3] However, I expect this effect will only exist when pair budget goal difficulty is easy.

To eliminate or reduce the effect of other possible variables on my findings, I investigate my research questions using an experiment in which I manipulate pair budget goal difficulty (easy vs. difficulty) and pair identity (high vs. low). I manipulate goal difficulty using a fixed number of budgeted pair output and manipulate pair identity using a slogan guessing game. Specifically, participants were randomly assigned into pairs, each of which decoded letter combinations to numbers for five rounds. Each participant in a pair was provided with a list of numerical keys different from the ones provided to the other participant in the pair. Each participant determined the number of keys to share with their teammate (cooperation) and the number of the teammate's output he/she would like to reduce (sabotage) at the start of each round. Participants also determined whether they would like to work extra time on the decoding task at the start of each round. They were compensated on two performance metrics: pair performance and relative individual performance. When a pair's budget goal was achieved, each participant in the pair would

[3] Pair Identity in the paper is equivalent to group identity in the literature.

receive 5 U.S. dollars. In addition, the person with a higher individual output would receive an additional 7 U.S. dollars as an individual bonus. The person with a lower individual output would receive an additional 3 U.S. dollars as an individual bonus. When the pair budget goal was not achieved, both participants in the pair earned zero U.S. dollars.

The results show that participants who were assigned difficult pair budget goals shared more of their keys than those who were assigned easy pair budget goals. That is, participants were working more closely with each other when the pair goal was difficult. In addition, participants sabotaged less when assigned a difficult pair budget goal than when assigned an easy pair budget goal. Further, pair budget goal difficulty is positively associated with productivity. That is, when assigned difficult pair budget goals, participants decoded more combinations.

I also find a main effect for pair identity on sabotage. Specifically, participants in the strong pair identity condition sabotaged less than those in the weak pair identity condition. However, the main effect of pair identity on sabotage appears to be driven by the pair identity effect on sabotage in the difficult pair budget goal condition. That is, the relation between pair identity and sabotage is significant in the difficult pair budget goal condition but not in the easy pair budget goal condition. When assigned a difficult pair budget goal, participants in highly identified pairs sabotaged each other less than those in weakly identified pairs. The relation between pair identity and cooperation is not significant.

Moreover, I find that pair identity has a significant effect on pair effort. Specifically, highly identified pairs worked longer than weakly identified pairs on the

decoding task. I also find that pair identity is positively associated with productivity when pair budget goals are easy. However, the relation between pair identity and productivity is not significant when pair budget goals are difficult.

Finally, I test the causality between pair identity and productivity. The results indicate that the positive effect of pair identity on productivity was obtained through different mechanisms in the easy pair budget goal condition than in the difficult pair budget goal condition. Specifically, in the easy pair budget goal condition, participants in highly identified pairs worked longer to increase productivity. Whereas, in the difficult pair budget goal condition, participants in highly identified pairs increased productivity by reducing sabotage activity.

This study makes the following contributions. First, a large body of literature has focused on the use of incentives to motivate employee effort and performance in team settings. This study contributes to this stream of literature by providing evidence that the effectiveness of incentives depends on both economic and psychological factors. Specifically, when individuals face conflicts of interest, pair budget goal difficulty and the strength of pair identity play an important role in aligning individual interests with the interests of an organization.

Second, this study contributes to the goal setting literature by investigating goal difficulty at the pair level. Prior goal setting literature has focused on the effect of individual goal difficulty on effort and performance. The studies on goal setting at the group level have ignored the effect of goal difficulty on individual strategic behavior when group members face conflicts of interest. This research adds to the literature by providing evidence that when a difficult pair budget goal is provided, the pair goal

becomes more important than the individual goal. Therefore, group members behave cooperatively to achieve the pair goal.

Third, this study extends the group identity literature by examining the effect of group identity on cooperation and sabotage. Prior literature shows that individuals in a highly identified group value their group more than other groups. Individuals in a highly identified group have concern for other group members and behave cooperatively. However, the literature overlooks the detrimental effect of social dilemmas. That is, it is not clear that when group members face conflicts of interest whether strong group identity can induce cooperation or sabotage activity within the group. This study adds to the literature by showing when group identity is effective in motiving cooperative behavior in a group.

Finally, a body of research shows that providing mixed incentives which include both group-based incentives and individual, tournament incentives can, first, reduce the free-riding issue embedded in group-based incentives and, second, enhance competitiveness within groups. This study shows that the effectiveness of mixed incentives depends on other factors. Hence, organizations planning to use mixed incentives to maximize the effectiveness of group work may use them with caution because using mixed incentives alone may cause detrimental effect to the organizations. This study shows that enhanced group identity or setting a difficult group budget goal shifts focus from individual interests to group interests.

The remainder of this dissertation is organized as follows. Chapter 2 provides a review of the relevant literature. Chapter 3 develops the hypotheses. Chapter 4 describes the research methodology used to test the hypotheses. Chapter 5 discusses the results of

the data analysis. Chapter 6 specifies the conclusion, limitations, and future research. Reference and appendices are provided thereafter.

CHAPTER 2

LITERATURE REVIEW

In this chapter, I review the literature on performance-based incentives and discuss the issues related to these incentives.

Performance-based Compensation

Group-based Compensation, Motivation, and the Issue of Free-riding

Current research increasingly underscores the value of teams for business success as organizations use more and more teams as central work units (DeMatteo et al. 1998; Cohen and Bailey 1997; Guzzo and Dickson 1996). For example, Lawler, Mohrman, and Ledford (1995) report that 68% of Fortune 1000 companies used work teams in 1993 compared to 28% in 1987. Work teams are groups of individuals who work interdependently and are mutually responsible for group outcomes (Kirkman and Shapiro 2000). Because of the increased use of teams, organizations need to consider how to compensate employees in a group environment (DeMatteo et al. 1998). In a group environment, individual performance is not easy to measure. Therefore, rewarding agents based on absolute individual outcomes is not appropriate (Zingheim and Schuster 1997)

and may be costly in such settings.[4] Hence, group-based compensation is usually deemed an effective incentive strategy for teamwork.

According to DeMatteo et al. (1998), the popularity of using group-based compensation in modern organizations is attributed to the following factors. First is a change in the nature of many jobs. To adapt to the demand of development and growth and to enhance the competitiveness in the market in the modern economy, organizations have changed the way work is organized such that lots of companies have changed their organizational structure from a vertical hierarchy to a horizontal hierarchy (i.e. a flat organizational structure). On the one hand, this flattened structure promotes employee involvement in decision-making. On the other hand, it changes jobs to be more and more interdependent. For example, in a manufacturing plant, assembly workers' performance is partially affected by the performance of materials purchasing department and/or the performance of a machine maintenance team. Using a medical group sample, Pizzini (2010) empirically shows that the degree of task interdependence is positively associated with the probability of group-based compensation incentives. Specifically, physicians who were involved in more task interdependent specialties were more likely to use group-based compensation incentives.

Second is the demand for cooperation within an organization. Since several jobs within an organization are interdependent, agents need to cooperate with each other to complete tasks and achieve the ultimate organizational goals. An incentive system is one of the effective strategies companies use to shape employees' behavior and align

[4] In this study, I examine a mixed incentives scheme which contains both a group-based incentive and a tournament incentive. Tournament incentives are different from individual incentives based on absolute individual performance in that tournament incentives compensate individuals based on their relative performance to each other. It is less costly than absolute individual incentives and easier to measure.

employee actions with organizational goals. Unlike individual rewards, which are intended to motivate and enhance individual effort and performance and sometimes encourage competition among employees, group-based compensation has been shown to motivate cooperation among employees. For example, Hwang, Erkens, and Evans (2009) find that when the value of sharing knowledge increases, the probability of firms' implementing group-based compensation in their sample of manufacturing companies increases. Although Hwang et al. (2009) do not examine the relation between group-based compensation and cooperation, their study suggests that group-based compensation motivates cooperation which enhances knowledge sharing among employees. Such cooperative behavior is believed to smooth organizational operations and ultimately enhance organizational effectiveness (Geber 1995; Tiosvold 1986). In fact, research has documented the positive correlation between group-based compensation and cooperation among group members (Wageman 1995).

In an experimental study, Beersma et al. (2003) measure performance as speed and accuracy. They find that group-based rewards enhance accuracy while individual-based rewards enhance speed. In their setting, accuracy is driven by task-relevant knowledge. To increase accuracy, team members who had more knowledge shared information with team members with relatively less knowledge. Using this shared knowledge, the team members can perform higher quality work than otherwise. Hence, their finding shows that group-based rewards enhance cooperation among team members. Moreover, they show that such performance improvement is realized through enhancing the accuracy of the teams' poorest performers.

Using complementary theory, Drake et al. (1999) provide evidence that group-based compensation induces cooperation among team members in an experimental setting where participants were asked to assemble products using LEGO™ blocks. Cooperative innovation was measured in the experiment as the agreement between team members to preassemble parts for each other and the number of workers who were involved in changing work orders to facilitate team members' assembling work. Their results show that participants engaged in more cooperation innovation in the group-based compensation condition than in the individual tournament condition. They also find that such cooperation is likely to save costs and avoid excess inventory.

Extending the literature, Bamberger and Levi (2009) experimentally examine the effect of incentive structure on helping, a prosocial behavior partially based on consideration and cooperation (Dyne and LePine 1998). They find that the greater the extent to which group-based pay is allocated on individual relative performance, the less the amount of requests for help to which participants agreed. Specifically, the level of helpful responses are significantly lower in the equity condition than in the equality condition[5]. However, the level of response for requests for help is not significantly different between the equality condition and the mixed condition. Furthermore, they provide evidence that in the equality condition and the mixed condition, participants provided significantly more self-directed help than in the equity condition. However, such differences were not observed between the equality condition and the mixed

[5] They used a 3 by 2 experiment in which compensation was manipulated at three levels. In the equity condition which was a tournament incentive rewards were based on participants' relative performance to others in the group. In the equality condition which was a group-based incentive rewards were equally divided among all group members. In the mixed condition, a part of the rewards was allocated based on individual relative performance to others' in the group and the other part of the rewards were equally divided among all group members.

condition. Additionally, they document that the effect of reward allocation on help is moderated by incentive intensity. That is, under conditions of high incentive intensity, participants provided more help in the equality condition and the mixed condition than in the equity condition. And yet such difference is not found in the condition of low incentive intensity.

Libby and Thorne (2009) find that in a team production environment, participants assembled more products in the group incentive condition than in the individual incentive condition or the mixed incentives condition. Similarly, using the data obtained from a Fortune 500 company's manufacturing plant, Román (2009) finds that providing plant incentive bonuses for meeting quarterly plant goals increased productivity and also enhanced production quality. Particularly, he shows that the productivity increased and the product defection rate declined after adopting the new incentive plan.

Theory suggests that group-based incentives induce more effort than individual incentives (Devine et al. 1999; Fisher 1994) because group-based incentives promote information sharing among team members (Fisher et al. 2008). Such effort then results in higher group performance (Libby and Thorne 2009; Che and Yoo 2001). However, group-based incentives are not free from issues of their own. Since individual performance is difficult to measure in a teamwork environment, it is possible that people may try to acquire a share of team profits from others' effort, also known as the free-riding issue. For example, using a non-real effort experiment in which group members decided the amount of effort s/he would like to invest between their own task and providing help to other group members, Rankin (2004) shows that when there is an opportunity to do so, people tend to take advantage of others' effort. He finds that when

teammates cannot coordinate with each other, group-based compensation results in better performance than does individual-based compensation. However, when they can coordinate, the level of performance is higher in the individual-based compensation condition than in the group-based compensation condition. These results indicate that when people are, at least partially, compensated based on others' work, they tend to exert less effort.

Consistent with Rankin (2004), Heijden, Potters, and Martin (2009) find a similar result. They examine the supervision effect on group performance. In the experimental setting, in the condition where there was no leader in a group, all team members received an equal share of team output, which was similar to the group-based compensation discussed above. In the condition where a leader was present, the leader could monitor the effort of each team member in order to allocate team profit. Participants in groups of four decided the amount of effort they would like to exert in two options, A and B. Each choice of B increased group performance in a nonlinear function, representing working. If participants chose option A, then the group performance would not change, but participants would receive an additional 120 points besides their share of group output. Hence, option A represented shirking in the task. They find that average team output is significantly lower in the profit-sharing condition than in the leader-determined condition. In addition, their results show that the variance in the output is due to less effort exerted in the profit-sharing condition. Heijden et al. (2009) explicitly show that group-based incentives create free-riding issues in team working environments, which reduce ultimate team performance.

Though group-based incentives create free-riding problems, they are considered appropriate incentive schemes for organizations in which cooperation is a critical factor in business success because economic incentives have a stronger effect on influencing individual behavior (Bonner and Sprinkle 2002).

Tournament and Sabotage

If the economic incentives are effective in shaping individual behavior, then an intuitive approach to reducing the free-riding problem is to reward individuals based on their relative individual performance (Rynes et al. 2005; Heneman and Von Hippel 1995). The most common example of relative rewards within teams are bonuses such as "employee of the month" rewards or job promotion. The reason why relative rewards are commonly used in practice is that it is less costly to measure relative individual performance than absolute individual performance (Irlenbusch and Ruchala 2008). Furthermore, when common uncertainty increases relative performance becomes more informative than absolute individual performance (Frederickson 1992). For example, after hurricane Harvey passed Houston, TX in 2017, thousands of vehicles were flood damaged. If we compare car dealers' 2017 car-sale performance to prior years' performance, it is easy to conclude that their 2017 sales performance is better. However, this result may solely be due to a larger market demand after the hurricane but not the dealers' marketing strategy. Thus, it is hard to say if they were doing a good job. It is even harder to tell which dealer was doing a better job based on their absolute sales information. Instead of comparing their performance vertically, comparing the dealers' 2017 performance horizontally, to compare dealers' relative performance to each other, allows an observer to more easily pinpoint the best dealers in the area.

Relative reward incentives are also known as tournaments (Lazear and Rosen 1981). Tournament incentives alleviate the free-riding problem in that such incentives motivate individuals to compete for higher rank with higher compensations. The competition induces individuals to exert more effort, aligning individual interests with organizational goals. However, since only relative performance is compared among employees, working hard is not the only means to earn bigger rewards. Individuals may engage in counter-productive behavior such as sabotage (Harbring and Irlenbusch 2011) to achieve such goals. That is, if an employee is motivated to outrank a competitor, this is not only achievable by improving one's performance, but also by weakening the performance of their competitors. In this study, I examine one of the most common forms of sabotage: covertly reducing coworkers' output. It is attractive because this type of sabotage in organizations is less observable in that it often takes more implicit forms such as talking bad about colleagues or withholding useful information from peers. Hence, it is challenging to align employee behavior with the interests of organizations in tournament schemes.

Motivations behind sabotage vary from social incentives to economic incentives (Ambrose, Seabright, and Schminke 2002). For example, sabotage increases as the prize spread increases (Vandegrift, Yavas, and Brown 2007; Harbring and Irlenbusch 2008; Harbring and Irlenbusch 2011; Amegashie 2012, Lazear 1989). Furthermore, Charness, Masclet, and Villeval (2014) show that social-comparison factors can also motivate participants to sabotage. In their setting, the participants were matched in groups of three and asked to do a decoding task under a flat wage scheme. Providing rank information

motivated the participants to invest in costly sabotage to improve their rank. Such unethical behavior results in a substantial detrimental effect on ultimate performance.

The target of sabotage is also various, from high performers to low performers. For example, Chen (2003) and Münster (2007) theoretically show that in a tournament, employees sabotage the most able peer because s/he is considered the greatest threat to others. However, Amegashie and Runkel (2007) analytically show that the employee with the most ability may be the only person who engages in sabotage. Unlike previous models of sabotage, contestants in Amegashie and Runkel (2007) model cannot sabotage their current opponents but instead potential future opponents in the next stage of the contest. Given the most able contestant has a higher probability of advancing to the next stage of the contest, there is an equilibrium in which s/he engages in sabotage while others do not.

Since workplace sabotage adversely affects both individual financial health and the financial health of the organization as a whole (Jeter 2010), researchers have examined many remedies. Some have suggested external recruitment in tournaments because someone who has not yet join the company is hard to sabotage (Chen 2005, 2003; Lazear 1989). Using a two-stage contest experiment, Gürtler, Münster, and Nieken (2013) show that eliminating relative performance information in the first stage can mitigate the destructive effect of sabotage. Mujumdar, Price, and Doleh (2016) suggest using alternative incentives as a performance-enhancing device rather than tournament incentives. In addition, Smith (2016) shows that having employees certify a code of conduct can reduce sabotage against coworkers. However, these solutions are not without drawbacks. Though recruiting people from outside of the organization can reduce

sabotage, the outsiders possess less knowledge about the organization than those insiders, potentially resulting in less performance efficiency. Concealing relative performance information not only reduces the destructive effect of sabotage but also may reduce the positive effect of competition. In addition, these solutions are studied at the individual level, which is based solely on individual relative performance.

Mixed Compensation and Social Dilemma

Based on the discussion above, researchers argue that a compensation scheme that incorporates elements of both individual incentives and group incentives is more effective in motivating performance at both the individual level and the group level (Kozlowski and Ilgen 2006; DeMatteo et al. 1998; Pearce and Ravlin 1987). They argue that the advantages of one type of incentive offsets the disadvantages of the other type of the incentive (Welbourne and Mejia 1995). There is evidence that mixed incentives are used in practice. For example, in the internal audit department of Ameritech, employees of audit teams are compensated for both their relative performance rankings and the team's performance (Parker et al. 2001). In fact, a survey by Lawler et al. (2003) shows that in 1990, 33 percent of the surveyed companies used mixed incentives to compensate their employees. This percentage increased to 62 percent by the year 2002 (Table 2, p13)[6].

Though the previous argument indicates the advantages of mixed incentives over both individual incentives and group incentives, the evidence in the literature is mixed.

[6] There were five possible types of incentives covered in the survey: individual incentives, profit sharing, gainsharing, employee stock ownership, and work group or team incentives. The percentage using mixed incentives is the percentage of companies using more than one incentive to compensate employees.

Pearsall et al. (2010) find that mixed incentives lead to a higher level of group performance than group incentives or individual incentives. Further, they provide evidence that a) participants in the mixed incentives condition shared more information than those in the individual incentive condition; b) participants in the mixed incentives condition exerted more effort than those in the group incentive condition. In conclusion, mixed incentives appear to induce cooperation and reduce free-riding compared to individual incentives and group incentives, respectively.

Extending Pearsall et al. (2010), Barnes et al. (2011) compare the effect of group incentives and mixed incentives on group performance ion a war game setting. They find that mixed incentives lead to higher speed than do group incentives and that participants identified and attacked more targets in the mixed incentives condition than in the group incentive condition. However, mixed incentives lead to lower accuracy and less cooperation (e.g., backing up support received from other team members) than do group incentives.

In contrast, in a study of service technician performance at Xerox Corporation, Wageman (1995) finds that mixed incentives lead to poorer performance and lower employee satisfaction than do group incentives and individual incentives. Additionally, mixed incentives are detrimental to helping behavior.

Using a decision-making experiment, Quigley et al. (2007) find that the level of information shared in the mixed incentives condition and the individual incentive condition was lower than that in the group incentive condition. In addition, there is no significant difference in the level of information shared between the mixed incentives condition and the individual incentive condition.

Irlenbusch and Ruchala (2008) use teams of four and a computer-based non-real effort experiment to examine the effect of three types of performance-based compensation on group performance (group-based compensation, group-based compensation with a higher relative reward, and group-based compensation with a lower relative reward.) In the experiment, participants decided the level of effort input. The computer calculated the payoffs of the four group members based on effort levels. They find that group-based compensation induces more cooperation while group-based compensation with a higher relative reward induces more effort. They further provide evidence that the competition introduced by relative rewards "crowd out" voluntary cooperation within the experimental teams.

Using groups of three in two production environments (assembly line and teams), Libby and Thorne (2009) examine worker performance under three compensation systems (individual, group, and mixed). The experimental task required participants to build "toy castles" using LEGO^{TM} blocks. The experiment setting was similar to the one in Drake et al. (1999). However, in the assembly line environment, participants were not allowed to communicate or work together. In the team environment, participants were allowed to communicate and move to others' workstations. That is, in the team environment, participants were able to cooperate in the task but were not in the assembly line environment. They find that in the group environment, group performance was better in the group incentive condition than in the individual and the mixed condition. There was no significant difference in group performance among the three incentive conditions in the assembly line environment. They argue that negative effects may exist in the mixed

incentives condition because this incentive may send a confusing signal to participants regarding where to direct their effort.

The contradictory evidence of mixed incentives effects on performance in the literature may be due to the social dilemma issue embedded in the compensation scheme. A social dilemma is a situation where there is a conflict between individual and collective interests. Facing a social dilemma, each party is better off individually by defecting instead of cooperating, but all individuals are worse off if they all choose to defect rather than cooperate (Dawes 1980). That is, if a group is successful, then defectors can share the group rewards at no individual cost, and if the group is unsuccessful, then they do not lose any cooperative contributions (Probst, Carnevale, and Triandis 1999). If all individuals choose not to cooperate, then everyone receives an unfavorable outcome.

Greed and fear are the essential determinants of defection (Coombs 1973). Greed is the motivation of maximizing personal interests and fear is the motivation of noncooperation which is based on the lack of trust and the feeling of hopelessness (Yamagishi and Sato 1986). Even if group members are able to cooperate, the expectation that other group members may not cooperate leads to the fear that the cooperative behavior will be taken advantage of. Furthermore, when one's compensation is based on his/her performance relative to others', such incentives create competition.

That said, group members are often motivated more by the tournament incentive than the group incentive when both incentives are present (Dawes 1980). Hence, social dilemmas motivate individuals to focus more on maximizing self-interests than maximizing group interests through more competition and less cooperation.

CHAPTER 3

HYPOTHESES DEVELOPMENT

In this chapter, I introduce goal setting theory, social identity theory, and develop six hypotheses regarding individual behaviors and performance in a mixed-incentives setting.

Research Setting

I conducted an experiment to test the hypotheses in this chapter. In the task, participants were formed into pairs working on a decoding task, in which they were assigned different level pair goals, easy vs. difficult. Their compensation was based on two criteria. First, if the pair output met the pair budget goal, each participant would be paid an equal amount of money. Further, the participant with a higher output would earn a bigger individual bonus, and the other participant would earn a smaller individual bonus. Therefore, my setting required both cooperation and competition, because it may be difficult for participants to achieve the pair goal alone. Meanwhile, there was motivation for earning the bigger bonus. To allow for cooperation and competition, I incorporated several options in the experiment. Specifically, the first option was sharing. Participants could use this option to share their decoding keys. By design, the more keys they had, the more codes they could decipher. The other option was sabotage. Participants could use this option to reduce the teammate's output to provide a greater

chance of winning the bigger bonus. To avoid the concern that providing only two options would force participants to cooperate or sabotage, I added a third option, extra time. By choosing this option, participants would work given a longer period of time on their decoding task. The experimental design is discussed thoroughly in Chapter 4.

Budget Goal Difficulty

Goal setting theory suggests that goal difficulty is positively correlated with performance and that goals regulate individual behavior (Hisrt and Yetton 1999; Hirst and Lowy 1990; Locke and Latham 1990; Hirst 1987; Locke et al. 1984; Rockness 1977). For example, Webb, Williamson, and Zhang (2013) find that the productivity of individuals assigned a challenging goal is higher than those assigned an easy goal. They suggest that assigning challenging targets is effective to motivate productive effort. However, this positive relation exists until individuals exceed the limit of their ability, the point beyond which the linear relation does not hold true (Locke 1982).

Since the positive relation between goal difficulty and performance only holdes in the relevant range of individuals' ability, assigning goals of different difficulty level can also affect individuals' risk-taking preference. For example, Sprinkle, Williamson, and Upton (2008) report that when a budget goal is difficult, individuals tend to increase their effort and choose low risks, compared to when a budget goal is easy.

In addition to individual goals, group goals are considered an important source of motivation for individuals in groups (Zhang 1998; Locke and Latham 1990; Zander 1980). The role of task strategy development is critical at the group level in that groups face a constant need for cooperation due to the nature of interdependence embedded in group tasks (Van Mierlo and Kleingeld 2010; Kozlowski and Bell 2003). Hackman and

Oldham (1980) define task strategy in groups as the choices group members would like to choose to achieve the group goals. An important difference in task strategies lies between competitive strategies and cooperative strategies (Van Mierlo and Kleingeld 2010; Tauer and Harackiewicz 2004; Crown and Rosse 1995). Hence, a difficult group goal improves performance in that it not only induces more effort but also motivates group members to develop more efficient strategies and promotes cooperation among group members (Weldon and Weingart 1988). For instance, the experimental results in Seijts and Latham (2000) suggest that a difficult goal leads to more cooperation than does a modest goal (Figure 4, p112).

As discussed above, the literature provides evidence that individuals invest more effort and cooperate more toward achieving a difficult goal. Many studies discussed here focuses mainly on either individual goals or group goals per se. However, in practice, individuals in an organization are continually facing multiple goals. These goals are sometimes conflicting. As to the effectiveness of mixed incentives, Mitchell and Silver (1990) find that performance was higher in the mixed goal condition than in the individual goal condition. More directly related to the current study, they find that cooperative strategies were significantly more likely to occur in the mixed goals, the group goal, and the no specific goal conditions than in the individual goal condition. The study suggests that when mixed goals are difficult, individuals are likely to choose cooperative strategies to improve both individual and group performance.[7]

[7] Mitchell and Silver (1990) did not directly measure participants' cooperative strategies. Instead, they used a self-reported questionnaire to measure the "cooperation feeling" such that they asked participants to indicate the extent to which "you and your coworker felt like a team" on a 7-point Likert scale.

However, Weldon, Jehn, and Pradhan (1991) find that there is no significant difference in cooperation between easy goals and difficult goals. In their study, cooperation was measured as the number of times help was offered or requested by group members. However, their results may not be generalizable for two reasons. First, they used a narrowed operationalization of cooperation (Weldon and Weingart 1993) because the amount of help requested only indicates the possibility of cooperation. It does not directly reflect the true cooperative behavior. Second, group members might help each other without even talking about it. Hence, in the current study, I measure an explicit form of cooperation.

Consistent with Mitchell and Silver (1990), Van Mierlo and Kleingeld (2010) find that participants ranked highest on competition and lowest on cooperation and performance in the individual goal condition. However, they also report that performance and cooperation were highest in the nonspecific goal condition, whereas Mitchell and Silver (1990) report that there is no difference in performance and cooperation across the group goal, the mixed goal, and the nonspecific goal conditions.[8]

The literature only suggests the positive effect of goal difficulty on cooperation and performance in the mixed goal setting. Therefore, the current study extends the goal-setting literature by directly exploring the impact of group goal difficulty on individual strategies and performance in a mixed goal setting.

[8] Similar to Mitchell and Silver (1990), Van Mierlo and Kleingeld (2010) measured competition and cooperation using 7-point Likert scales but not a direct measure of cooperation.

Hypotheses 1 and 2 – The Effect of Pair Budget Goal Difficulty on Individual Strategies

When individuals face pair budget goals, as discussed in the previous chapter, they develop strategies to achieve those goals. However, I argue that this strategic development depends on an individual's perception of risk about meeting the goals.

In general, participants in the current study earn a pair bonus for meeting the pair budget goal. If the goal is achieved, then the person with a relatively higher output will receive a bigger personal bonus, and the person with a relatively lower output will receive a smaller personal bonus. If the pair budget goal is not met, neither participant earns anything.

In the easy pair budget goal condition, the pair goal can be achieved easily by one team member. Thus, participants should not cooperate by sharing personal keys with each other in that sharing personal keys can not only increase the pair output but also reduce the individual's probability of winning the bigger individual bonus.[9] Personal keys are critical to generating output in the task. Hence, when meeting the pair goal is certain, participants should try to maximize their wealth by earning the bigger individual bonus. Sharing can increase the risk of losing the big bonus. Hence, they may not choose to share their keys but rather prefer relatively risky alternative, sabotage, to outperform the teammate to win the bigger individual bonus.[10]

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[9] Note that in the task, participants have two options to increase absolute output and one option to increase relative output (the research design is discussed in detail in chapter 4). Sharing personal keys with the teammate can increase the pair absolute output and working extra time can increase personal absolute output. Sabotage can increase participants' relative output compared to that of their teammate.

[10] Sabotage is a risky alternative to maximize personal payoff because there are chances that participants will not achieve the group goal if they sabotage each other too much. In addition, there is a 5 percent chance that the system may misrecord 20 units output for each participant in a pair. Therefore, they could miss the group goal by sabotaging and earn nothing.

In the difficult pair budget goal condition, the pair goal cannot be achieved by a single team member. Sharing personal keys, in this case, will increase the pair's probability of achieving the pair goal. Hence, participants in this condition should cooperate more than those in the easy pair budget goal condition. In addition, I expect in this condition that participants will sabotage less because any reduction of the teammate's output could prevent the pair from meeting the pair goal in which case the participants will not earn any bonus. In summary, the first two hypotheses are stated as follows in the alternate form.

H1: The difficult pair budget goal will induce more cooperation than the easy pair budget goal.

H2: The difficult pair budget goal will induce less sabotage than the easy pair budget goal.

Social Identity Theory

Social Identity Theory posits that a person's self-concept is based on his/her group membership within a social category (Tajfel and Turner 1979).[11] Through a process of social comparison, individuals differentiate between in-group members and outgroup members. Social identification occurs through the perception of belongingness to a particular group. Tajfel (1978) describes identity as the "part of an individual's self-concept which derives from his knowledge of his membership of a social group together with the value and emotional significance attached to that membership" (P.63). Thus, individuals are emotionally and psychologically connected with ingroup members. Therefore, social identity can be distinguished from personal identity, which refers to

[11] In a group setting, the terms social identity and group identity are synonymous.

self-concept that derives from unique personal attributes (Turner 1982). To secure a positive self-concept, group members are motivated to behave in the way that favors one's group over outgroups (Tajfel 1978).

Social identification is activated through a psychological self-categorization process through which individuals group themselves with others and make decisions that favor their own groups (Tajfel and Turner 1986). The self-categorization process is a depersonalization transition through which individuals do not perceive themselves as complex, unique persons but rather as representatives of a group. When social identity is adopted, the decision-making process shifts from an individual perspective to a group perspective (Tajfel and Turner 1986), and individuals favor ingroup members over outgroup members.[12] To the extent that the group identity is positively valued, the self-categorization process increases mutual attraction among ingroup members, resulting in a cohesive ingroup environment (Turner 1987). However, social identity and group cohesion are not the same concepts. The key difference between social identity and group cohesion is that social identity is an attraction to the group itself, but cohesion is a personal attraction (Towry 2003). When group identification is salient, ingroup members are perceived as more heterogeneous than outgroup members (Hogg 1992). Hence, the salience of group membership changes how decisions are made (Lembke and Wilson 1998). For example, Brewer and Kramer (1986) find that the level of cooperation was higher when participants highly identified with their groups in the common dilemma condition. However, in the public good condition, strong group identity led to less cooperation.

[12] Social identity theory was initially applied to understanding inter-group processes. Different behaviors are directed toward ingroup members and outgroup members (Tajfel and Turner 1979).

Wit and Wilke (1992) find that in the three social dilemmas examined (prisoner's dilemma, chicken dilemma, and trust dilemma), strong group identity leads to a higher level of cooperation. However, participants were not allowed to interact with one another. In addition, their experiment was a one-shot game involving no decision-making over time.

A handful of studies address the effect of social identity in accounting settings. King (2002) shows that strong group identity reduces auditors' tendency to over rely on clients' noncredible communications. Specifically, King (2002) investigates the interaction between auditors and their clients and finds that clients use "cheap talk" to build trust in the auditors, which creates a "self-serving bias." Then the clients can commit greater fraud. King (2002) reports that the self-serving bias can be reduced by increasing the salience of the auditors' group identity and by developing social norms.

Towry (2003) experimentally examines the interaction effect of group identity and incentive systems on performance in a team setting. She reports that strong group identity increases coordination in teams. However, this effect can either enhance or weaken the effectiveness of incentive systems. Specifically, it degraded the effectiveness of a vertical incentive system. In the vertical incentive system, agents colluded against the principal. They chose a low level of resources and reported falsely. However, it increased the effectiveness of a horizontal incentive system. In the horizontal incentive system, compensation was based on team output. There were no opportunities to collude. Hence, the strong group identity helped teams reach a cooperative solution.

Kelly and Presslee (2017) find that the performance of strongly identified groups was lower than that of weakly identified groups. They argue that the effect of group

identity on performance is mediated by other-regarding concerns, i.e., concerns for others and competitiveness. Increasing group identity reduces competitiveness. However, such an effect is only observed in the large winner portion condition but not in the small winner portion condition. This indicates that enhancing group identity can only reduce competitiveness to a certain extent. Participants in their experiment were compensated based on a competitive tournament incentive. This compensation creates a lose-or-win condition. It does not change the participant's focus in the task, to win the tournament.

The key difference between these studies and the current study is that the current study is based on mixed compensation incentives where conflicts of interest are embedded. It is not clear whether the effect of group identity can shift individual focus to group incentives from individual incentives. If so, will the advantages of the two incentives suppress the disadvantages of each other or will one type of incentive with its (dis)advantages completely dominate the other? The answer is not clear.

Blazovich (2013) investigates the interaction effect of group identity and performance-based compensation on performance. He finds that regardless of group identity, performance is higher in the mixed incentive condition than in the individual incentive and the group incentive conditions. Therefore, firms appear to be better off offering a combination of group and individual performance-based compensation.

However, the results of Blazovich's (2013) study are not directly applicable to the current study. The incentive system investigated in the current study is the combination of a group performance-based compensation and a tournament-based compensation. The compensation design in Blazovich (2013), both for the group and for the individual, is a piece-rate incentive. Therefore, though two compensation schemes presented, there were

no conflicts of interest in his design. The tournament component is different from the piece-rate incentive in that the tournament competition can result in destructive behavior among teammates. This effect was not investigated in Blazovich (2013). The purpose of offering the combination of a group-based compensation and an individual-based compensation is to alleviate free riding and encourage effort input. However, his design did not allow for competition among teammates.

I am aware of only one study indirectly addressing the effect of group identity on sabotage. Charness et al. (2014) find that introducing group identity can discourage sabotage among teammates while maintaining in-group competition. More specifically, they show that participants from the same school were less likely to sabotage against their teammates than participants from different schools. Group members from the same school were more likely to increase their rank through effort investment. However, in a group of more than two individuals, sabotage can only be directed to one of the rivals, whereas increasing effort level allows the participant to increase his/her rank relative to the other participants. Hence, the finding is not generalizable due to the issue of relative cost. In the current study, I use groups of two to examine the effect of group identity on sabotage. This setting allows me to isolate the issue of relative cost, which can increase the external validity of the findings.

Hypothesis 3 – The Effect of Pair Identity on Individual Strategies

When individuals are compensated on multilevel goals, they face conflicts of interests. The mixed incentives in the current study compensate individuals not only for achieving a pair budget goal but also based on their relative performance when the pair

goal is achieved.[13] Hence, it is difficult for individuals to decide whether to cooperate with or compete against their teammates to maximize their personal benefit.

Although prior literature shows a positive relation between pair identity and cooperation, no prior research investigates whether and how pair identity influences individual behavior in a mixed incentives scheme where sabotage is allowed. I predict that participants in the weak pair identity condition will sabotage more to increase their personal payoff. However, I expect this effect will occur only when the pair budget goal is easy.

Individuals in highly identified groups cognitively categorize themselves with their teammates through a self-categorization process. This depersonalization process creates social attraction to the highly identified groups (Hogg 1992). The social attraction, in turn, creates a positive feeling that one individual has about his/her teammates (Hogg 1992). In addition, stronger group identification can also increase an individual's concerns for others in their groups and such concerns can reduce the degree of competitiveness (Kelly and Presslee 2017). Consequently, a strong group identity can mitigate the disadvantages of the tournament incentive. More specifically, it can reduce sabotage in a pair. However, I expect this effect will occur only in the easy pair budget goal condition. This is because the low risk-taking behavior induced by the difficult pair budget goal motivates participants in a pair to cooperate with each other. Any sabotage activity can prevent the pair from achieving the pair goal in which case neither participant will earn anything. Hence, in the difficult budget goal condition, regardless of pair identity, participants should share more of their personal keys with each other and

[13] A pair is a special case of groups where a pair has only two members. Pair Identity in the paper is equivalent to group identity in the literature.

sabotage less. On the other hand, in the easy pair budget goal condition, the pair goal is easy to achieve such that a team member's self-output is enough to achieve the pair goal. In this case, earning the bigger individual bonus becomes salient. In the strong pair identity condition, the social attraction and concern for others should motivate participants to sabotage less. In fact, Charness et al. (2014) report that in the groups where participants with strong group identity sabotaged less than those with weak group identity. This hypothesis is summarized in the alternate form.

H3: When the pair budget goal is easy, strong pair identity will induce less sabotage than weak pair identity.

Hypothesis 4 – The Effect of Pair Identity on Extra Time

In the Easy Pair Budget Goal condition, since one participant can easily meet the pair goal by himself or herself, sharing personal keys will reduce his or her chance of winning the bigger personal bonus. In this condition, when the pair is highly identified, participants should sabotage less, hence spending extra time to produce more output should increase their chance of winning the bigger personal bonus. However, when the pair budget goal is easy, participants in the weak pair identity condition will likely sabotage more. Such destructive activity may prevent the pair from achieving the pair goal. Thus, the participants should spend extra time to produce more output to offset the sabotage effect on meeting the pair goal. In summary, when the pair budget goal is easy, in both the strong and the weak pair identity condition, I expect that participants will invest a similar amount of extra time to work on the task. As it is uncertain which of the two competing arguments above would dominate, I make the following null hypothesis:

H4 (null): In the Easy Pair Budget Goal condition, enhancing pair identity will have no impact on Extra Time.

I did not predict the effect of pair identity in the Difficult Pair Budget Goal condition because the difficult stretch goal motivates participants to work at their highest effort level to earn the compensations. This motivation could lead participants to spend a similar amount of extra time on the decoding task. Therefore, I expect in the Difficult Pair Budget Goal condition, there will be no difference in spending extra time between strongly identified pairs and weakly identified pairs.

Hypothesis 5– The Effect of Pair Budget Goal Difficulty and Pair Identity on Performance

As discussed above, if a difficult pair budget goal can lead to more cooperation and less sabotage, then performance in the difficult pair budget goal condition should be higher than that in the easy pair budget goal condition. In addition, as predicted, strong pair identity should result in less sabotage. Thus, performance should be higher in the strong pair identity condition than in the weak pair identity condition. Hence, difficult pair budget goal and/or strong pair identity could result in high pair output. These hypotheses are summarized in the alternative form.

H5: Output will be higher in the Strong Pair Identity condition than in the Weak Pair Identity condition.

H6: Output will be higher in the Difficult Pair Budget Goal condition than in the Easy Pair Budget Goal condition.

CHAPTER 4

RESEARCH METHODOLOGY

I use a 2 x 2 between-subjects experiment, manipulating Pair Identity (strong vs. weak) and Pair Budget Difficulty (easy vs. difficult) as the independent variables. The dependent variables include Sharing (cooperation), Extra Time (extra effort), and Sabotage (Competition), as well as Individual Output and Pair Output, which are referred to as participant performance. In the experiment, participants complete a computer-based decoding task. Experiment sessions lasted approximately 90 minutes and took place in a computer lab.

Experimental Task and Participants

Experimental Task

In the task scenario, Beta company designs computer programs and participants act as program testers for Beta company. Specifically, participants decode letters into numbers in pairs to test part of a newly designed program for five rounds.[14] I used an adapted version of a real effort decoding task similar to the one used in Arnold and Tafkov (2015). The task was carried out using the z-Tree program (Fischbacher 2007).

In each work round, each participant in a pair was given a different list of five numerical keys to decode two-letter combinations. The keys were valid only for the

[14] In this chapter, the term "pair" and the term "team" are used interchangeably.

current round. The letter combinations were randomly generated from the key lists provided to the participants in each pair. The key list was displayed on the screen throughout the task. Participants in a pair were not able to see each other's keys if they did not share. That is, each participant in a pair can only decode half of the letter combinations appearing in the task if keys were not shared. During the task, participants received real-time feedback about their current task output. The pair output goal set by the company was also displayed on the screen during the task. The output goal was the same throughout the five work rounds. Each work round lasted between 3 minutes and 4 minutes and 40 seconds, depending on each participants' task strategy, which is explained in the next paragraph. At the end of each work round, participants received feedback about their performance in the round.

The task allowed for cooperation, working overtime, and sabotage. Specifically, at the start of each work round, each participant in a pair was given ten points to allocate among these three alternatives. The points represent the limited resources people possess in real life (i.e., energy). The points could not be carried forward to future rounds and participants had to use all of their 10 points in each round. The first alternative was sharing. That is, each participant in a pair could share their personal keys by allocating points to alternative one at the rate of two points for each of their personal keys. If they wanted to share all their five personal keys, then they could allocate the 10 points to this alternative. The second alternative was working overtime. Each work round started with three minutes. By allocating points to alternative two, participants could work longer on their decoding task, one point for working ten extra seconds on top of the initial three minutes. To allocate all ten points to this alternative, participants could spend a total of 4

minutes and 40 seconds on the task in a round. There was a clock on the screen to help them track the time remaining in each round. The third alternative was sabotage. By allocating one point to this alternative, participants could reduce their teammate's correctly decoded combinations by two units. If participants allocate all points to this alternative, then they could reduce their teammate's output by 20 units. Since participants were assigned in pairs, to reduce the reciprocal effect of sabotage I introduced a noise factor into the task. I designed a system error rate of final output in the task. In the task, participants were told that there was a 5% chance that they might lose up to 20 units output in each round. In addition, the system design allowed participants to lose at most 20 units output each round from sabotage. Hence, it is difficult for participants to be certain whether the unit loss was due to the system error or teammate sabotage. The output was called recorded output in the task and was reported in the feedback at the end of each round. Instead of calling them cooperation, working overtime, and sabotage, I used a neutral word "alternative" to avoid the framing effect on participant points allocating strategies.

My setting also provided participants with an opportunity to shirk. In the decoding stage, there was an "I am done with the period" button on the screen. They could finish the round early by clicking the button and not do any work until the next round starts. An example of the task screen is shown in Appendix D.

Participants

Student participants were recruited for the study at a public university in the U.S. It is important to match participants with an experimental task (Bonner et al. 2000). Ball and Czech (1996) shows that higher-educated or more experienced participants perform

effort-sensitive tasks similar to less-educated participants. Hence, college students are appropriate participants in this task given the feature of the decoding task.

Manipulated Independent Variables and Dependent Variables

Manipulated Independent Variables

I manipulated two independent variables: Pair Identity (strong or weak) and Pair Budget Difficulty (easy or difficult).

The first independent variable was Pair Identity. Following Kelly and Presslee (2017), I manipulated this variable using a slogan guessing game. Half of the participants were assigned to the Strong Pair Identity condition, and the other half were assigned to the Weak Pair Identity condition. Pair Identity was manipulated between sessions at the pair level. That is, all pairs in the same session experienced the same pair identity manipulation. Each pair wore T-shirts of the same color. Each pair was asked to create and write down a unique pair name on a piece of paper. Then the pairs played the slogan guessing game in which each pair guessed the company or product names that they believed were associated with various slogans (e.g., "What can Brown Do For You" - UPS). The pairs competed against other pairs to identify the most correct company or product names. The winning pair received a bag of candy (valued at 10 dollars) as the award. The slogan guessing game helped build strong pair identity through pair collaboration and communication, sharing common results, and competing against other teams (Kelly and Presslee 2017; Eckel and Grossman 2005; Friedkin and Simpson 1985). Pairs guessed 16 slogans. Losing the slogan guessing competition may adversely affect the pair identity manipulation. For example, participants may blame their teammate for

losing the competition. Therefore, the winning pair was announced at the end of the session to avoid the effect of performance in the slogan guessing game on pair identity manipulation (Kelly and Presslee 2017).

After completing the slogan guessing game, participants in the Strong Pair Identity condition remained in the same pairs and used the same pair name they created before to work on the decoding task. Participants in the Weak Pair Identity condition were reassigned into new pairs and given new pair names by the experiment administrators before they began to work on the decoding task. That is, pairs were formed by pairing two participants wearing different color T-shirts. Hence, participants in the Strong Pair Identity condition had more opportunities to interact with their teammate. Participants in the Weak Pair Identity condition had little interaction with their newly paired teammate. To make the pair identity manipulation stronger, I used the words "team" and "teammate" in the Strong Pair Identity condition, and the words "pair" and "counterpart" in the Weak Pair Identity condition.

The second independent variable was Pair Budget Difficulty. Through extensive pilot tests, the easy goal for a pair was to successfully decode 50 combinations, and the difficult goal was to successfully decode 110 combinations.[15] Pairs were randomly assigned between the Easy Pair Budget Goal condition and the Difficult Pair Budget Goal condition.

[15] The mean pair output in the pilot study was about 80 combinations. The easy goal of 50 combination is two standard deviations below the mean. The difficult goal of 110 combination is two standard deviations above the mean

Dependent Variables

There were five dependent variables in this study. Sharing was the number of points allocated to alternative one in each round. Extra Time was represented by the number of points allocated to alternative two in each round. Sabotage was measured as the number of points allocated to alternative three in each round. Individual Output was measured as a participant's actual number of letter combinations successfully decoded in each round subtracting the number of combinations sabotaged by the teammate.[16] Pair Output was the sum of Individual Output of the two participants in a pair. That is the sum of the two participants' successfully decoded letter combinations in each round minus the units sabotaged by each other in each round in a pair.

Experimental Procedures

Upon arrival, participants read and signed consent forms, which provided general information regarding the purpose of the study. Then, each participant was given a unique worker ID number which was used throughout the entire experiment so that responses could not be tied to specific individuals. They were randomly assigned into one of the four experimental conditions.

An experiment administrator then explained the task procedures. First, for the pair identity manipulation, participants played a slogan guessing competition. After the slogan guessing competition, participants answered three questions regarding pair identity.

[16] Individual Output is different from participant recorded output, which is provided in the round-end feedback. Participant recorded output is the number of letter combinations successfully decoded by a participant minus the units sabotaged by the teammate and the units mis-recorded by the system error. The experimental task is discussed from page 34 to page 36.

Second, after they answered all three questions and the experiment administrator collected the answer sheet, the decoding task began. For Weak Pair Identity condition, participants were formed into new pairs to work on the decoding task. For the Strong Pair Identity condition, the same pairs formed in the slogan guessing competition continuously worked on the decoding task.

Before the decoding task started, the experiment administrators read the instructions and explained the task. A sample of the task was demonstrated on the computer screens. To ensure that all participants understood the task, they were required to answer nine pre-task questions. The decoding task did not begin until all participants answered all questions correctly.

Before the five experimental rounds started, participants completed two three-minute practice rounds. At the start of each experimental round, each participant in a pair was provided with a unique list of five numerical keys and ten points to allocate between three alternatives. After they completed allocating points, the experiment task began. The original five numerical keys plus the keys shared by the teammate were shown on a participant's screen. Participants used keyboards to decode the combinations. Participants received real-time feedback about their current outputs. The pair name and the worker ID were continuously displayed on the screen throughout the task. When the pair completed a round, participants were provided with feedback. In addition to their pair name and worker ID, participants were informed about the pair budget goal, whether their pair output achieved the pair budget goal or not, individual recorded output, and how much they would be paid if the round was selected as the payment round. After they reviewed

the feedback, they clicked on the “Proceed” button on the screen, and the next round started.

Third, after participants finished the decoding task, they were asked to answer the same three questions regarding pair identity and completed the post-experiment questionnaire.

Fourth, after they completed the post-experiment questionnaire, one of the five rounds were randomly selected as the payment round. Participants were compensated for the round. Then the winning pair for the slogan guessing competition was announced. The award of a bag of candy (10 U.S. Dollars) was paid immediately. The participants were then thanked for participating and left the experiment site.

The compensation scheme in this experiment is a mixed incentive structure. Participants were paid not only for pair performance but also for individual relative performance. When the pair recorded output was at or above the pair budget goal, each one in a pair would be paid five U.S. Dollars. On top of that, the one with the higher final recorded output would be paid an additional seven U.S. Dollars. The one with the lower final recorded output would be paid an additional three U.S. Dollars. If the pair output was below the pair budget goal, then the participants in a pair would be paid zero U.S. Dollars. One of the five experiment rounds was randomly selected as the payment round at the end of the task.

CHAPTER 5

RESULTS

Descriptive Statistics and Manipulation Checks

I conducted 12 experimental sessions where participants were randomly assigned into pairs. In total, 104 students in 52 pairs participated in my study. One participant responded one on all post-questionnaire items, so the data for this participant's pair was removed from the analysis (demographic summary is reported in Table 1).[17] 93 percent of the participants were business majors. Males accounted for 47 percent of the data. Participant age ranged from 18 to 27 with an average age of 21. On average, participants had 1.3 years of work experience. Participants were paid on average 10.50 U.S. dollars.

I adopted the measures used by Kelly and Presslee (2017) to examine the effectiveness of the between-subjects manipulation of Pair Identity. Pair Identity was measured first immediately before the start of the letter-decoding task (the pre-task measure) and, second, at the end of the letter-decoding task (the post-task measure) using three items: are you happy to be a part of your team ("pair" for the weak pair identity condition); do you feel that you are a member of team; do you like your teammate ("counterpart" for the weak pair identity condition). Participants were asked whether they agreed or disagreed with the three items using a 7-point Likert scale with endpoints

[17] The results of using the uncleaned data are consistent with the results reported.

labeled “Strongly disagree” (1) and “Strongly agree” (7). Confirmatory Factor Analysis (CFA) indicated that the three questions captured a unidimensional construct in both the pre-task and post-task measures. The loadings of the items were at least 0.62 in both the pre-task measure and the post-task measure. In addition, both the pre-task and the post-task measures had Cronbach’s alpha greater than 0.86. Hence, I averaged the participants’ response to the three questions as a measure of Pair Identity. Both the pre-task and post-task Pair Identity measures were significantly higher in the Strong Pair Identity condition than in the Weak Pair Identity condition (Pre-task: 6.67 vs. 4.79, $t = 13.76$, $p < 0.01$; post-task: 6.02 vs. 4.93, $t = 4.62$, $p < 0.01$). Therefore, the manipulation of Pair Identity appears to be successful.

Table 1. Demographic Summary

		Weak Pair Identity		Strong Pair Identity	
		Easy Pair Budget Goal	Difficult Pair Budget Goal	Easy Pair Budget Goal	Difficult Pair Budget Goal
Age	Min	19	19	18	18
	Max	27	22	26	25
	Mean	21	20	21	21
	SD	2	1	2	2
	n	21[a]	24	30	26
Work Experience	Min	0	0	0	0
	Max	4	6	4	4
	Mean	1.45	1.56	1.35	0.85
	SD	1.65	1.68	1.28	1.29
	n	22	24	30	26
Gender	Male	11	17	13	13
	Female	11	7	17	13
	n	22	24	30	26
Major	Business	16	17	27	25
	Other	6	7	3	1
	n	22	24	30	26
Ethics Class	Taken	5	6	15	8
	Not Taken	17	18	15	18
	n	22	24	30	26

a. One participant did not disclose age.

I used three items in the post-experiment questionnaire to evaluate the success of the between-subjects manipulation of Pair Budget Goal Difficulty. Specifically, participants indicated on a 7-point Likert scale (1, “strongly disagree”, to 7, “strongly agree”) if they felt that the team output goal was hard to achieve, if they felt that they had to work hard to meet the team output goal, and if they felt that it was difficult to meet the team output goal. CFA indicated that these three items represent well the construct of Pair Budget Goal Difficulty. The loadings of all three items were greater than 0.73. Further, Cronbach’s alpha of the construct was 0.91. Therefore, I averaged the participants’ responds to the three questions as a measure of Pair Budget Goal Difficulty. The measure of Pair Budget Goal Difficulty was significantly higher in the Difficulty Pair Budget Goal condition than in the Easy Pair Budget Goal condition (5.55 vs. 3.29, $t = 8.93$, $p < 0.01$). Thus, the manipulation of Pair Budget Goal Difficulty was successful.

Nine questions were asked before the decoding task started to test the participants’ understanding of the task. The decoding task did not start until all the participants in a session answered all the questions correctly. In addition, two questions were asked in the post-experiment questionnaire to examine the effectiveness of the cooperation strategy (sharing keys) and the sabotage strategy (sabotage teammates). The questions were “Alternative 1 in the decoding task can be used to increase the team (‘pair’ for the weak pair identity condition) output” and “Alternative 3 in the decoding task can be used to decrease my teammate’s (‘counterpart’s’ for the weak pair identity condition) final output” with “1” indicating strongly disagree and “7” indicating “strongly agree”. The mean of the questions was 5.70 and 5.38 respectively and was significantly greater than “4”, the indicator of “neither agree nor disagree” ($t = 11.73$, p-

value <0.01; t = 8.73, p-value <0.01, respectively). The mean of the items indicated that the strategies worked effectively and were consistent with the experimental design.

Tests of Statistical Assumptions

The effects of Pair Identity and Pair Budget Goal Difficulty were examined on five dependent variables: Sharing, Extra Time, Sabotage, Individual Output (sabotaged), Pair Output. The primary statistical methods used in my dissertation, Analysis of Covariance (ANCOVA) and multilevel linear regression, assume that dependent variables are normally distributed. The Shapiro-Wilk (S-W) test was conducted to examine the normality of the dependent variables because it is the most powerful normality test (Razali and Wah 2011). The results for normality test are reported in Table 2. Sharing and Extra Time were normally distributed in three of the four experimental conditions but were not normally distributed in the High Identity Difficult Goal condition. Sabotage and Individual Output (sabotaged) were significantly different from a normal distribution in all four conditions. Pair Output was not normally distributed in two of the four conditions. Therefore, I used different regression analysis to check the robustness for the resutls. The results are reported in the following subsections.

Tests of H1 (Cooperation)

H1 predicted that participants assigned a difficult pair budget goal will share more than those assigned an easy pair budget goal. The dependent variable is Sharing. This variable is operationalized as the participants' points allocated to sharing personal keys with the teammates (ranged from 0 to 10). In the statistical analysis, I controlled for three variables, OutputNumberTotal, PreShared, and PreEarning. OutputNumberTotal is the

number of letter combinations generated for a participant in each round, including the combinations a participant had a key for and the combinations the participant did not. A participant who is more capable of doing decoding task may allocate fewer points to add extra time to the decoding task than a participant who needs more time to decode an equivalent amount of combinations, resulting in the former allocating more points in Sharing or Sabotage than the less capable participants. PreShared is the number of keys shared with a participant by the teammate in the previous round multiplied by two. That is the points used by the teammate to share keys with a participant in the previous round. I expect a participant to share more keys when the teammate shared keys with him/her in the previous round. PreEarning is the amount of cash earned by a participant in the previous round if the round is selected as payment round. I expect that participants who earned less in the previous round will share less. Since I controlled lag-round effect, first round data was not included in the statistical analysis.

Table 3 Panel A reports the aggregate 4-round mean of Sharing for the four conditions (Strong Pair Identity and Easy Goal, Strong Pair Identity and Hard Goal, Weak Pair Identity and Easy Goal, Weak Pair Identity and Hard Goal). Figure 1 presents graphical results, and table 3 Panel B provides the results of the 2 X 2 ANCOVA. The main effect of pair budget goal difficulty was highly significant ($F = 8.99$, p-value < 0.01, one-tailed). As shown in figure 5.1, participants assigned a difficult pair budget goal shared more than those assigned an easy pair budget goal. The difference in the mean of sharing between the Easy Pair Budget Goal condition and the Difficult Pair Budget Goal condition is 0.39. That is, on average, facing a difficult pair budget goal, participants

shared 9.7 percent more of their resource (keys) with their teammate than those facing an easy pair budget goal.

Table 2. Normality Test

Experimental Condition	Shapiro-Wilk W	P-value (two-tailed)
Strong Identity, Easy Goal		
Sharing[a]	0.98	0.08
Extra Time[b]	0.99	0.68
Sabotage[c]	0.80	<0.01
Individual Output[d]	0.95	<0.01
Pair Output[e]	0.97	0.21
Strong Identity, Difficult Goal		
Sharing	0.96	<0.01
Extra Time	0.94	<0.01
Sabotage	0.78	<0.01
Individual Output	0.92	<0.01
Pair Output	0.94	0.01
Weak Identity, Easy Goal		
Sharing	0.98	0.12
Extra Time	0.99	0.46
Sabotage	0.86	<0.01
Individual Output	0.89	<0.01
Pair Output	0.96	0.10
Weak Identity, Difficult Goal		
Sharing	0.99	0.89
Extra Time	0.98	0.32
Sabotage	0.86	<0.01
Individual Output	0.85	<0.01
Pair Output	0.89	<0.01

a. Sharing is measured as the points allocated to share decoding keys with the teammate.
b. Extra Time is measured as the points allocated to add additional time to own decoding task.
c. Sabotage is measured as the points allocated to reduce the teammate's decoding output.
d. Individual Output is measured as the difference between the actual number of combinations decoded and the number of output units reduced by the teammate.
e. Pair Output is the sum of individual output in each pair.

Table 3. ANCOVA Test
for H1 (Cooperation)

Panel A: Four-round Aggregate Mean for Sharing

	Weak Pair Identity	Strong Pair Identity	Marginal
Easy Pair Budget Goal	4.18 (3.26) n=88	3.90 (2.57) n=120	4.02 (2.88) n=208
Difficult Pair Budget Goal	4.31 (3.03) n=96	4.50 (2.77) n=104	4.41 (2.89) n=200
Marginal	4.25 (3.14) n=184	4.18 (2.67) n=224	

Panel B: ANCOVA Results for Sharing

Source	Type III Sum of Squares	df	Mean Square	F-Statistic	p-value
Model	1066.74	6	177.79	30.64	<0.01
Intercept	1627.63	1	1627.63	280.47	<0.01
GI[a]	0.02	1	0.02	0.00	0.95
Goal[b]	52.15	1	52.15	8.99	<0.01[g]
GI * Goal[c]	0.08	1	0.08	0.01	0.91
OutputNumberTotal[d]	865.20	1	865.20	149.09	<0.01
PreShared[e]	0.58	1	0.58	0.10	0.75
PreEarning[f]	15.53	1	15.53	2.68	0.10
Error	2327.13	401	5.80		
Total	10628	408			

a. GI refers to Pair Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.
g. The p-value is one tailed.

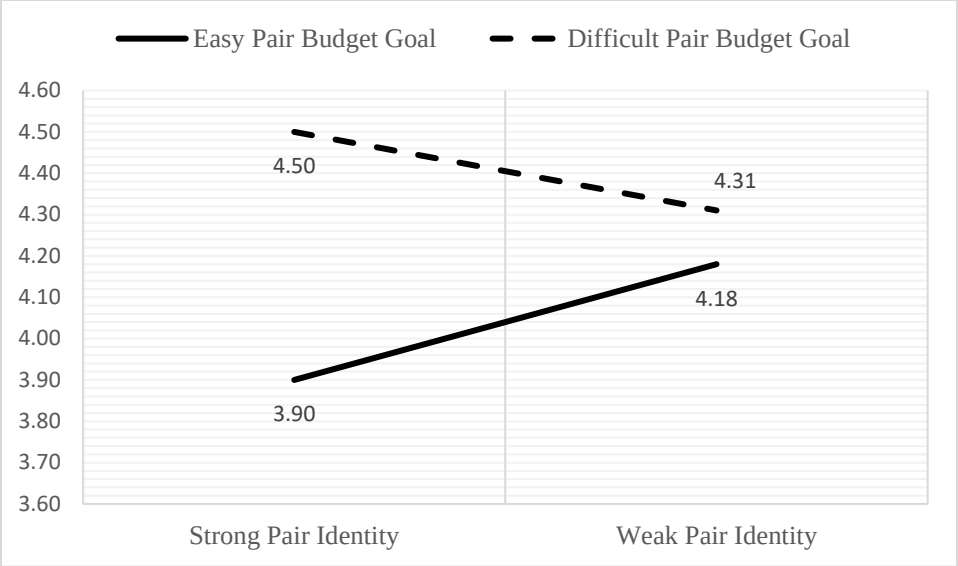

Figure 1. Sharing Means Plot

Multilevel linear regression was used to test H1. The multilevel linear regression method is designed for analyzing multilevel hierarchical data (Field 2017). In my experimental design, participants were randomly assigned into pairs. Therefore, individual observations (level 1) were nested within pairs (level 2). Hence, this method is suitable to test the robustness of the ANCOVA results in that it controls not only for individual variances but also for pair variances. In addition, the experiment for my dissertation was a 2 X 2 with 5 rounds design (a mixed design). This method also allows me to control for the round effect. The results of multilevel linear regression are presented in Table 4. This analysis confirmed the ANCOVA results, finding a significant difference in the goal difficulty effect ($t = 2.3$, p-value = 0.01, one-tailed).

Based on the consistency in the analysis, I conclude that Hypothesis 1 is supported and that a difficult pair budget goal induces participants to share more of their personal information with their teammate than an easy pair budget goal.

Table 4. Multilevel Linear Regression Results
for H1 (Cooperation)

-2 Restricted Log Likelihood: 1885.80

Parameter	Estimate	Std. Error	df	t	p-value
Intercept	10.64	0.67	374.09	15.98	<0.01
GI[a]	-0.02	0.33	388.86	-0.06	0.95
Goal[b]	0.91	0.40	397.12	2.30	**0.01**[g]
GI * Goal[c]	0.06	0.48	388.82	0.13	0.90
OutputNumberTotal[d]	-0.09	0.01	371.24	-12.60	<0.01
PreShared[e]	-0.03	0.05	396.30	-0.71	0.48
PreEarning[f]	0.06	0.03	387.18	1.97	0.05

a. GI refers to Group Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Pair Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.
g.The p-value is one-tailed.

Tests of H2 and H3 (Sabotage)

Hypothesis 2 predicted that participants assigned a difficult pair budget goal will sabotage less than those assigned an easy pair budget goal. The variable of interest, Sabotage, was measured as the points participants used to reduce the teammates' outputs in the decoding task. Similar to the analysis for H1, I controlled for three covariables, OutputNumberTotal, PreShared, and PreEarning. The ANCOVA results are reported in table 5. As shown in Table 5 Panel B, the main effect of pair budget goal difficulty on sabotage is significant ($F = 10.74$, p-value < 0.01, one-tailed). Panel A in table 5 shows that the mean difference of sabotage between the Easy Pair Budget Goal condition and the Difficult Pair Budget Goal condition was 0.98. That is, when a difficult pair budget goal was assigned, participants sabotaged 52.97 percent less than when an easy pair budget goal was assigned. Recall that the S-W test suggested Sabotage was not normally

distributed. Therefore, a bootstrap analysis was conducted in that bootstrap method does not assume a normal distribution of the data (Garson 2012). The results are reported in Table 6. The bootstrapped results were consistent with the ANCOVA results.

Next, I conducted a multilevel linear regression on sabotage. The results are shown in Table 7. The effect of pair budget goal difficulty was significant (t = -1.88, p-value = 0.03, one-tailed). The bootstrapped multilevel results reported in Table 8 (p-value = 0.03, one-tailed) was consistent with the findings using the previous methods. Therefore, I conclude that hypothesis 2 is supported.

Hypothesis 3 predicted that in the easy pair budget goal condition, participants in a highly identified pair will sabotage less than those in a weakly identified pair. I did not predict the pair identity effect in the difficult pair budget goal condition because I expected that participants in this condition would sabotage to a similar degree across the pair identity level (high vs. low). The reason is that any significant sabotage in the difficult budget goal condition would prevent the participants from achieving their pair goal and earning any compensation.

Table 5. ANCOVA Test
for H2 and H3 (Sabotage)

Panel A: Four-round Aggregate Mean for Sabotage

	Weak Pair Identity	Strong Pair Identity	Marginal
Easy Pair Budget Goal	2.17 (2.65) n=88	1.61 (2.37) n=120	1.85 (2.51) n=208
Difficult Pair Budget Goal	1.34 (1.93) n=96	0.43 (1.03) n=104	0.87 (1.60) n=200
Marginal	1.74 (2.34) n=184	1.06 (1.96) n=224	

Panel B: ANCOVA Results for Sabotage

Source	Type III Sum of Squares	df	Mean Square	F-Statistic	p-value
Model	212.16	6	35.36	8.39	<0.01
Intercept	109.44	1	109.44	25.96	<0.01
GI[a]	52.00	1	52.00	12.33	<0.01
Goal[b]	45.26	1	45.26	10.74	<0.01[g]
GI * Goal[c]	2.72	1	2.72	0.65	0.42
OutputNumberTotal[d]	15.13	1	15.13	3.59	0.06
PreShared[e]	56.47	1	56.47	13.39	<0.01
PreEarning[f]	0.93	1	0.93	0.22	0.64
Error	1690.70	401	4.22		
Total	2666	408			

Panel C: Simple Effects for Each Goal Difficulty Condition

Effect of Pair Identity in the Easy Pair Budget Goal Condition	14.27	1	14.27	2.40	0.12
Effect of Pair Identity in the Difficult Pair Budget Goal Condition	39.82	1	39.82	17.39	<0.01

a. GI refers to Pair Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.
g. The p-value is one-tailed.

Table 6. Bootstrap ANCOVA Results
for H2 and H3 (Sabotage)

Panel A: Bootstrap Results for Sabotage					
Source	Type III Sum of Squares	df	Mean Square	F-Statistic	p-value
Model	212.16	6	35.36	8.39	<0.01
Intercept	109.44	1	109.44	25.96	<0.01
GI[a]	52.00	1	52.00	12.33	<0.01
Goal[b]	45.26	1	45.26	10.74	<0.01[g]
GI * Goal[c]	2.72	1	2.72	0.65	0.42
OutputNumberTotal[d]	15.13	1	15.13	3.59	0.06
PreShared[e]	56.47	1	56.47	13.39	<0.01
PreEarning[f]	0.93	1	0.93	0.22	0.64
Error	1690.70	401	4.22		
Total	2666	408			
Panel B: Bootstrap Simple Effects for Each Goal Difficulty Condition					
Effect of Pair Identity in the Easy Pair Budget Goal Condition	14.27	1	14.27	2.40	0.06[g]
Effect of Pair Identity in the Difficult Pair Budget Goal Condition	39.82	1	39.82	17.39	<0.01

a. GI refers to Pair Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.
g. The p-value is one-tailed.

Simple effect analysis was conducted to test H3. The results are reported in Panel C in Table 5 (ANCOVA) and Panel B in Table 6 (Bootstrapped ANCOVA), Table 7 (Multilevel Linear Regression) and Table 8 (Bootstrapped Multilevel Linear Regression). The results were inconsistent with H3. The p-value reported in all four analyses were greater than 0.05. The results showed that participants in the Easy Pair Budget Goal condition sabotaged to a similar extent across the two Pair Identity conditions. The results suggested that when participants were compensated on both the pair performance and individual relative performance to other pair members in a situation where the pair goal was easy to achieve, participants focused on maximizing their economic benefits and

their behavior was not affected by pair identity. Interestingly, however, the results suggested that pair identity was effective in the Difficult Pair Budget Goal condition. Specifically, in this condition, participants in a highly identified pair sabotaged less than those in a weakly identified pair (F = 17.39, p-value <0.01, reported in Table 3 Panel C; t = -4.42, p-value < 0.01, reported in Table 7 Panel B). Participants in a highly identified pair sabotaged about two times less than those in a weakly identified pair (the mean difference was 0.91, Table 5 Panel A). Taken together, I conclude that H3 is not supported. However, the effect of pair identity on sabotage was observed in the Difficult Pair Budget Goal condition.

Table 7. Multilevel Linear Regression Results for H2 and H3 (Sabotage)

Panel A: Mixed Linear Results for Sabotage					
-2 Restricted Log Likelihood: 1760.86					
Parameter	Estimate	Std. Error	df	t	p-value
Intercept	3.55	0.58	393.81	6.16	0.00
GI[a]	-0.56	0.29	398.80	-1.95	**0.05**
Goal[b]	-0.64	0.34	400.06	-1.88	**0.03**[g]
GI * Goal[c]	-0.32	0.41	398.62	-0.79	0.43
OutputNumberTotal[d]	-0.01	0.01	393.08	-1.94	0.05
PreShared[e]	-0.15	0.04	399.95	-3.66	0.00
PreEarning[f]	0.01	0.03	396.40	0.50	0.62
Panel B: Simple Effects for Each Goal Difficulty Condition					
Effect of Group Identity in the Easy Pair Budget Goal Condition	-0.51	0.34	192.43	-1.51	0.07[g]
Effect of Group Identity in the Difficult Pair Budget Goal Condition	-0.90	0.20	179.79	-4.42	**<0.01**

a. GI refers to Group Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Pair Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.
g. The p-value is one-tailed.

Table 8. Bootstrap Multilevel Linear Regression Results for H2 and H3 (Sabotage)

Panel A: Bootstrap Mixed Linear Results for Sabotage				
-2 Restricted Log Likelihood: 1762.06				
		Bootstrap		
Parameter	Estimate	Bias	Std. Error	p-value
Intercept	3.54	0.02	0.59	<0.01
GI[a]	-0.55	-0.01	0.35	0.11
Goal[b]	-0.66	0.00	0.35	**0.03**[g]
GI * Goal[c]	-0.33	0.00	0.42	0.43
OutputNumberTotal[d]	-0.01	0.00	0.01	0.06
PreShared[e]	-0.15	0.00	0.04	<0.01
PreEarning[f]	0.01	0.00	0.02	0.57
Panel B: Simple Effects for Each Goal Difficulty Condition				
Effect of Group Identity in the Easy Pair Budget Goal Condition	-0.53	-0.01	0.35	0.07[g]
Effect of Group Identity in the Difficult Pair Budget Goal Condition	-0.90	0.00	0.22	**<0.01**

a. GI refers to Group Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Pair Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.
g. The p-value is one-tailed.

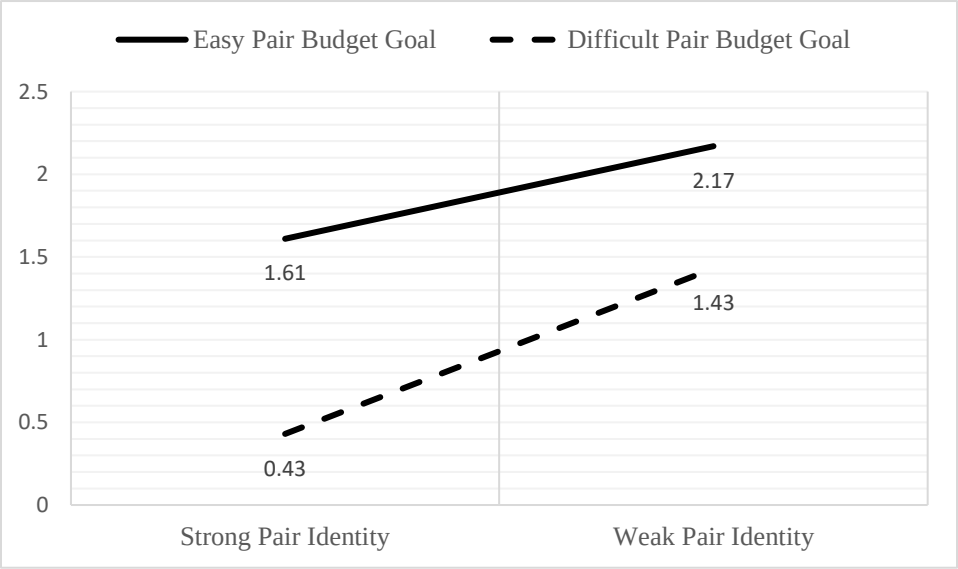

Figure 2. Sabotage Means Plot

Tests of H4 (Extra Time)

Hypothesis four focuses on the impact of pair identity on extra time in null form. The variable, Extra Time, was measured as the points allocated to adding additional time to one's own decoding task (up to 10 points and 100 seconds). The findings were consistent across the statistical methods used. Therefore, I only report the multilevel linear regression results (Table 9). The control variables were the same as the ones used in Sharing and Sabotage. I found that the difference in adding extra time was marginally significant between the Strong Pair Identity condition and the Weak Pair Identity condition ($t = 1.73$, p-value = 0.08). On average, participants in a highly identified pair added seven seconds (17.46 percent) more than those in a weakly identified pair. The difference was marginally significant in the Easy Pair Budget Goal condition (the difference was 20.82 percent, p-value = 0.08) and highly significant in the Difficult Pair Budget Goal condition (the difference was 16.82 percent, p-value < 0.01). Therefore, I reject the null hypothesis H4, as the results suggest that when the pair budget goal is easy, enhancing pair identity can motivate participants to spend more time on the decoding task.

Further, I created another variable, Constructive Effort, which was the sum of Sharing and Extra Time. This variable represented the effort participants put in to increasing output. Sabotage, on the other hand, was considered a destructive effort because it was the effort participants invested to reduce others' output, in turn reducing the total pair output. I found in a T-test that, in general, participants invested more

constructive effort than destructive effort (mean difference = 7.24, t = 33.72, p-value < 0.01).

The finding is reasonable in that if participants were motivated to earn something, then they needed to put forth effort in order to increase their performance. They would never reduce more output than they produced. The destructive effort was used as a supplemental strategy to maximize personal utility. Interestingly, I found that there were cases where participants were altruistic in that they would share keys to increase their teammate's chance of winning the bigger compensation. Specifically, one participant commented in the post-questionnaire that "I shared my keys with my teammate in order to give [him/her] a higher chance of winning."

I also found that there were some rounds in which participants both shared keys with–and sabotaged–their teammate. This finding indicated that cooperation and competition are not mutually exclusive. However, these two strategies are supplementary in maximizing personal economic utility. For example, the cases where sharing and sabotage were simultaneously observed represented 40.91% of the observations in the easy pair budget goal and weak pair identity condition, 33.67% in the easy pair budget goal and strong pair identity condition, 35.42% in the difficult pair budget goal and weak pair identity condition, and 18.27% in the difficult pair budget goal and strong pair identity condition. In particular, two participants left comments in the post-questionnaire that "… [a]llocate points in the beginning to sharing to let counterpart ease their guard, then stop doing so and focus on reducing their points to maximize individual reward." and that "… I wanted to be nice and share at least one key [with] my partner, and I

usually took at least one code away from my partner just to give me a slight chance to win the bigger prize, … .”

Table 9. Multilevel Linear Regression Results for H4 (Extra Time)

Panel A: Four-round Aggregate Mean for Extra Time

	Weak Group Identity	Strong Group Identity	Marginal
Easy Pair Budget Goal	3.65 (2.56) n=88	4.41 (2.44) n=120	4.09 (2.52) n=208
Difficult Pair Budget Goal	4.34 (2.82) n=96	5.07 (2.81) n=104	4.72 (2.83) n=200
Marginal	4.01 (2.72) n=184	4.71 (2.63) n=224	

Panel B: Mixed Linear Results for Extra Time

-2 Restricted Log Likelihood: 1761.25

Parameter	Estimate	Std. Error	df	t	p-value
Intercept	-4.11	0.58	391.51	-7.14	<0.01
GI[a]	0.50	0.29	399.28	1.73	**0.08**
Goal[b]	-0.23	0.34	399.63	-0.66	0.51
GI * Goal[c]	0.36	0.41	399.29	0.88	0.38
OutputNumberTotal[d]	0.10	0.01	388.60	16.19	<0.01
PreShared[e]	0.17	0.04	400.33	4.32	<0.01
PreEarning[f]	-0.06	0.03	387.61	-2.35	0.02

Panel C: Simple Effects for Each Goal Difficulty Condition

Effect of Group Identity in the Easy Pair Budget Goal Condition	0.49	0.28	198.03	1.75	**0.08**
Effect of Group Identity in the Difficult Pair Budget Goal Condition	0.86	0.30	194.92	2.91	**<0.01**

a. GI refers to Group Identity: Strong Group Identity vs. Weak Group Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreShared is the points used by the teammate to share keys with a participant in the previous round.
f. PreEarnings is the amount of cash earned by a participant in the previous round.

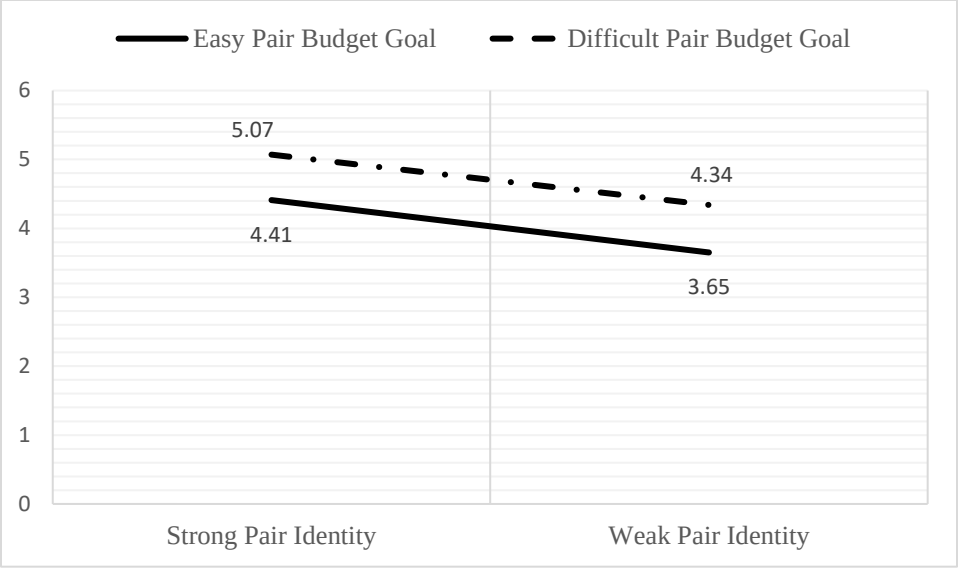

Figure 3. Extra Time Means Plot

Tests of H5 and H6 (Productivity)

Hypothesis H5 predicts that output is higher in the strong pair identity condition than in the weak pair identity condition. This hypothesis was examined at both the individual level and the pair level. At the individual level, the dependent variable of interest was Individual Output, which was measured as a participant's actual number of letter combinations successfully decoded in each round subtracting the number of combinations reduced (sabotaged) by the teammate.

The ANOVA results (Table 10 Panel B) indicates that enhancing pair identity would marginally affect participants' productivity (p-value = 0.07, one-tailed). Specifically, participants in the Strong Pair Identity condition decoded about two units (4.10 percent) more than those in the Weak Pair Identity condition. Breaking the results into a more detailed level, I found that the effect of pair identity on individual output was

significant in the Easy Pair Budget Goal condition (F = 2.96, p-value = 0.05, one-tailed, Table 10 Panel C). Specifically, in the Easy Pair Budget Goal condition, participants in a highly identified pair, on average, decoded about four units (8.11%) more than those in a weakly identified pair. However, the pair identity effect on individual output was trivial in the Difficult Pair Budget Goal condition (p-value = 0.33, one-tailed). The results were consistent with the findings in the bootstrapped ANOVA (Table 11), the multilevel linear regression (Table 12), and the bootstrapped multilevel linear regression (Table 13). The pair identity effect was not significant in the Difficult Pair Budget Goal condition. This may be because of a ceiling effect. That is, the difficult goal had made the participants reach the limit of their ability in the decoding task. Therefore, adding one other piece of incentive (pair identity) did not affect participant performance significantly.

Next, I examined the difference in productivity at the pair level using Pair Output, which is the sum of the two participants' Individual Output in each pair, the total actual number of letter combinations successfully decoded by the two participants in a pair each round minus the total units sabotaged by each other in that round. Because each participant in a pair has the same value for the variable, I used only one observation in each pair per round. To keep the analysis consistent with those outlinedabove, the first-round data was not included in the formal analysis. This process reduced the sample size to 204.

Panel A in Table 14 shows that on average pairs in the Strong Pair Identity condition decoded about 4 units (4.10 percent) more than those in the Weak Pair Identity condition. The formal ANOVA results (Table 14 Panel B) indicated that this difference

was marginally significant (F = 2.49, p-value = 0.06, one-tailed). The simple effect reported in Table 14 Panel C provided evidence that the effect of pair identity is significant in the Easy Pair Budget Goal condition (F = 3.52, p-value = 0.03, one-tailed) but not in the Difficult Pair Budget Goal condition (F = 0.21, p-value = 0.33, one-tailed). The bootstrap ANOVA provided the same results. Therefore, it was not reported. In the Easy Pair Budget Goal condition, highly identified pairs decoded, on average, about eight units (8.11%) more than weakly identified pairs.

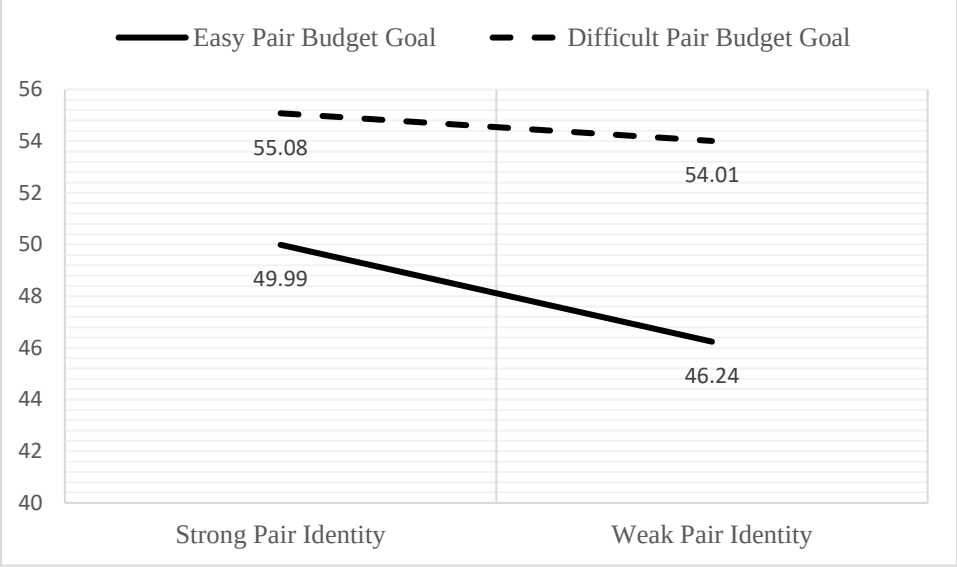

Figure 4. Individual Output Means Plot

Table 10. ANOVA Test
for H5 and H6 - Individual Level

Panel A: Four-round Aggregate Mean for Individual Output

	Weak Pair Identity	Strong Pair Identity	Marginal
Easy Pair Budget Goal	46.24 (16.16) n=88	49.99 (15.08) n=120	48.40 (15.62) n=208
Difficult Pair Budget Goal	54.01 (17.45) n=96	55.08 (16.67) n=104	54.57 (17.01) n=200
Marginal	50.29 (17.24) n=184	52.35 (16.01) n=224	

Panel B: ANCOVA Results for Individual Output

Source	Type III Sum of Squares	df	Mean Square	F-Statistic	p-value
Model	4642.29	3	1547.43	5.82	<0.01
Intercept	1061071.56	1	1061071.56	3993.85	<0.01
GI[a]	584.66	1	584.66	2.20	0.07[d]
Goal[b]	4160.77	1	4160.77	15.66	<0.01[d]
GI * Goal[c]	181.67	1	181.67	0.68	0.41
Error	107333.35	404	265.68		
Total	1190903	408			

Panel C: Simple Effects for Each Goal Difficulty Condition

Effect of Pair Identity in the Easy Pair Budget Goal Condition	715.10	1	715.10	2.96	0.05[d]
Effect of Pair Identity in the Difficult Pair Budget Goal Condition	56.78	1	56.78	0.20	0.33[d]

a. GI refers to Pair Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. The p-value is one-tailed.

Table 11. Bootstrap ANOVA Results
for H5 and H6 - Individual Level

Source	Type III Sum of Squares	df	Mean Square	F-Statistic	p-value
Panel A: Bootstrap Results for Individual Output					
Model	4642.29	3	1547.43	5.82	<0.01
Intercept	1061071.56	1	1061071.56	3993.85	<0.01
GI[a]	584.66	1	584.66	2.20	0.07[d]
Goal[b]	4160.77	1	4160.77	15.66	<0.01[d]
GI * Goal[c]	181.67	1	181.67	0.68	0.41
Error	107333.35	404	265.68		
Total	1190903	408			
Panel B: Bootstrap Simple Effects for Each Goal Difficulty Condition					
Effect of Pair Identity in the Easy Pair Budget Goal Condition	715.10	1	715.10	2.96	0.05[d]
Effect of Pair Identity in the Difficult Pair Budget Goal Condition	56.78	1	56.78	0.20	0.33[d]

a. GI refers to Pair Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. The p-value is one-tailed.

Table 12. Multilevel Linear Regression Results
for H5 and H6 - Individual Level

Panel A: Mixed Linear Results for Individual Output					
-2 Restricted Log Likelihood: 3308.47					
Parameter	Estimate	Std. Error	df	t	p-value
Intercept	14.88	3.23	366.10	4.61	0.00
GI[a]	3.04	1.94	372.26	1.57	0.06[f]
Goal[b]	11.41	2.26	367.28	5.05	**<0.01**[f]
GI * Goal[c]	-2.44	2.76	371.72	-0.88	0.38
OutputNumberTotal[d]	0.29	0.04	375.13	7.84	<0.01
PreEarning[e]	0.91	0.17	382.60	5.26	<0.01
Panel B: Simple Effects for Each Goal Difficulty Condition					
Effect of Group Identity in the Easy Pair Budget Goal Condition	3.37	1.91	185.82	1.77	**0.04**[f]
Effect of Group Identity in the Difficult Pair Budget Goal Condition	0.77	1.96	178.99	0.39	0.35[f]

a. GI refers to Group Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Pair Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. OutputNumberTotal measures the number of codes a participant was working on in each round.
e. PreEarnings is the amount of cash earned by a participant in the previous round.
f. The p-value is one-tailed.

Table 13. Bootstrap Multilevel Mixed Linear Regression Results
for H5 and H6 - Individual Level

Panel A: Bootstrap Mixed Linear Results for Individual				
-2 Restricted Log Likelihood: 3420.22				
		Bootstrap		
Parameter	Estimate	Bias	Std. Error	p-value
Intercept	55.08	0.01	1.63	<0.01
GI[a]	-1.07	-0.03	2.44	0.33[d]
Goal[b]	-5.09	0.00	2.15	**0.01**[d]
GI * Goal[c]	-2.69	0.01	3.27	0.42
Panel B: Simple Effects for Each Goal Difficulty Condition				
Effect of Group Identity in the Easy Pair Goal Condition	-3.75	-0.04	2.20	**0.05**[d]
Effect of Group Identity in the Difficult Pair Budget Goal Condition	-1.07	-0.01	2.39	0.33[d]

a. GI refers to Group Identity: Strong Group Identity vs. Weak Group Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. The p-value is one-tailed.

Table 14. ANOVA Results
for H5 and H6 - Pair Level

Panel A: Four-round Aggregate Mean for Pair Output

	Weak Pair Identity	Strong Pair Identity	Marginal
Easy Pair Budget Goal	92.48 (19.35) n=44	99.98 (20.73) n=60	96.81 (20.41) n=104
Difficult Pair Budget Goal	108.02 (21.89) n=48	110.15 (24.21) n=52	109.13 (23.03) n=100
Marginal	100.59 (22.03) n=92	104.71 (22.88) n=112	

Panel B: ANCOVA Results for Pair Output

Source	Type III Sum of Squares	df	Mean Square	F-Statistic	p-value
Model	9284.58	3	3094.86	6.59	<0.01
Intercept	2122143.13	1	2122143.13	4521.47	<0.01
GI[a]	1169.32	1	1169.32	2.49	0.06[d]
Goal[b]	8321.54	1	8321.54	17.73	<0.01[d]
GI * Goal[c]	363.33	1	363.33	0.77	0.38
Error	93869.71	200	469.35		
Total	2261009	204			

Panel C: Simple Effects for Each Goal Difficulty Condition

Effect of Pair Identity in the Easy Pair Budget Goal Condition	1430.19	1	1430.19	3.52	0.03[d]
Effect of Pair Identity in the Difficult Pair Budget Goal Condition	113.56	1	113.56	0.21	0.33[d]

a. GI refers to Pair Identity: Strong Pair Identity vs. Weak Pair Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. The p-value is one-tailed.

I used Pair Output in the multilevel linear regression model at only one level, the pair level, to avoid a round effect. The results using this method and bootstrap multilevel linear regression were similar. Because the dependent variable violated normality, I reported only the bootstrapped results in Table 15. The findings were consistent with those in Table 14 using the same dependent variable. In addition, the findings using individual output and using pair output were consistent. These results show that hypothesis H5 is marginally supported. The simple effect analysis suggests that when the

pair budget goal was easy, strengthening pair identity could improve productivity. The finding that pair identity in the Difficult Pair Budget Goal condition was trivial may be because the hard goal made the participants work at their highest ability level, reaching the upper limit of their ability. Therefore, an additional motivation for improving productivity is not effective in such scenarios.

Hypothesis H6 predicts that output will be higher in the Difficult Pair Budget Goal condition than in the Easy Pair Budget Goal condition. This hypothesis was also examined at both the individual level and the pair level. At the individual level, the ANOVA results (Table 10 Panel B) indicates that setting a difficult pair budget goal would significantly affect participants' productivity (p-value = 0.01, one-tailed). Specifically, participants in the Difficult Pair Budget Goal condition decoded about six units (12.75 percent) more than those in the Easy Pair Budget Goal condition. The results were consistent with the findings in the bootstrapped ANOVA (Table 11), the multilevel linear regression (Table 12), and the bootstrapped multilevel linear regression (Table 13).

At the Pair level, Panel A in Table 14 shows that on average pairs in the Difficult Pair Budget Goal condition decoded about 12 units (12.73 percent) more than those in the Easy Pair Budget Goal condition. The formal ANOVA results (Table 14 Panel B) indicated that this difference was significant ($F = 17.73$, p-value < 0.01, one-tailed). The non-reported bootstrap ANOVA provided the same results.

With these results I conclude that hypothesis H6 is supported, suggesting that increasing pair budget goal difficulty can enhance productivity.

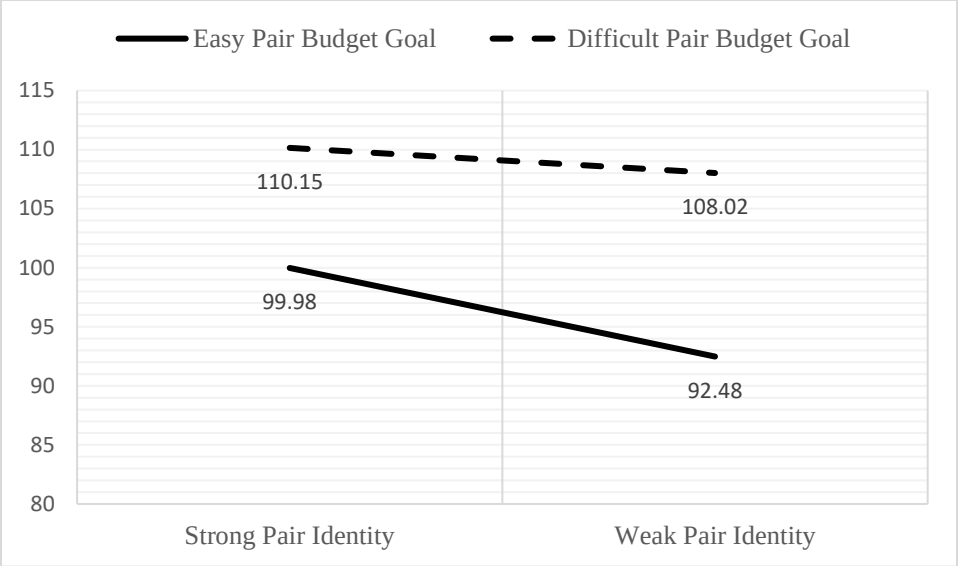

Figure 5. Pair Output Means Plot

Table 15. Bootstrap Multilevel Linear Regression for H5 and H6 - Pair Level

Panel A: Bootstrap Mixed Linear Results for Pair Output				
-2 Restricted Log Likelihood: 1762.06				
		Bootstrap		
Parameter	Estimate	Bias	Std. Error	p-value
Intercept	56.85	0.00	6.59	<0.01
GI[a]	6.29	-0.02	4.05	0.06[e]
Goal[b]	13.18	0.05	4.30	**<0.01**[e]
GI * Goal[c]	-3.29	0.05	5.80	0.58
PairTotalNumber[d]	0.23	0.00	0.04	<0.01
Panel B: Simple Effects for Each Goal Difficulty Condition				
Effect of Group Identity in the Easy Pair Budget Goal Condition	6.83	0.05	3.91	**0.04**[e]
Effect of Group Identity in the Difficult Pair Budget Goal Condition	3.47	0.06	4.10	0.20[e]

a. GI refers to Group Identity: Strong Group Identity vs. Weak Group Identity.
b. Goal refers to Budget Goal Difficulty: Easy Pair Budget Goal vs. Difficult Pair Budget Goal.
c. GI*Goal is the interaction of the two independent variables.
d. PairTotalNumber measures the number of codes a pair was working on in each round. It is the sum of OutputNumberTotal of the two participants in each pair.
e. The p-value is one-tailed.

Additional Analysis (Causality test)

The findings above indicated that pair identity improves participant performance through different vehicles. Specifically, in the Difficult Pair Budget Goal condition, the results suggested that pair identity did not affect participant performance. In the Easy Pair Budget Goal condition, the findings indicated that strong pair identity motivates participants to work longer and, in turn, increase output. However, analysis of variances only tests the mean difference across conditions. The causality between the independent variables and dependent variables is not assured. Therefore, in this section, I reported the results of a path model, which tests the causality of the variables. This analysis helps improve understanding of the mechanism through which pair identity has a positive effect on participant performance.

The test was conducted using the process macro (Hayes 2017), designed specifically for moderation and mediation effect test by Dr. Andrew Hayes. This macro is suitable for my data because it is based on bootstrapping methodology, which does not assume normality, and several variables in my data were not normally distributed. The findings were consistent with results obtained using a Structural Equation Model (SEM). Due to the limitation of nonnormality, the bootstrapped results were considered robust. Therefore, SEM results are not reported here.

To ensure consistency in my analysis, first round data was not used in the analysis. Since the effect of pair identity on individual output and on pair output were similar, I used Individual Output as the dependent variable to maintain sample size and power. The independent variable was Pair Identity (0 indicating weak identity, 1 indicating strong identity). The mediators were: 1. Shared: the points used by the

teammate to share keys with a participant; 2. Extra Time: the points used by a participant to work extra time on his/her own decoding task; 3. Sabotaged,: the points used by the teammate to reduce a participant's output in the decoding task. The analysis was conducted separately for the Easy Pair Budget Goal condition and the Difficult Pair Budget Goal condition. The results are presented in Table 17. The regression coefficients are reported in Panel A. The path effects are reported in Panel B. As shown in Panel B, the direct effect of pair identity on output was not significant (the 95% confidence interval contains zero). Therefore, there was no direct effect of pair identity on productivity. This finding was true for both the Easy Pair Budget Goal condition and the Difficult Pair Budget Goal condition.

Further, I found that pair identity increased productivity via different means in the two budget difficulty conditions. Specifically, in the Easy Pair Budget Goal condition, the only significant path was Pair Identity on Individual Output through Extra Time. This result suggested that in this condition, forming a highly identified pair would encourage participants to work longer on their own task to increase output. This finding is consistent with a prior argument that introducing pair identity effects maintains in-group competition while discouraging sabotage (Charness et al. 2014). Two post-experiment questionnaire items measured participant perception of task competitiveness. I used the average score of the two items to proxy for task competitiveness. It indicated that participants in the easy goal condition considered the task to be relatively more competitive (mean 3.57 vs. 2.93, $t = 1.67$, p-value = 0.10).

In the Difficult Pair Budget Goal condition, the only significant path was Pair Identity on Individual Output through Sabotaged. This effect meant that in a highly

identified pair, participants were sabotaged by their teammates less than those in a weakly identified pair, resulting in higher productivity. Though the findings in the previous section showed participants worked longer when pair identity was strong than when it was weak, Table 17 provided evidence that when pair budget goals were difficult to achieve, highly identified pairs improve their productivity via sabotaging less. This finding suggests that when pair goals were difficult, participants may have worked at a level close to their limits (the constructive effort), which meant it was very difficult for them to increase their output. Therefore, sabotaging less could help them preserve more output to achieve the pair budget goal. Strong pair identity simply made such a strategy more evident.

Table 16. Bootstrap Path Analysis Results for Causality Test

Panel A: Bootstrap Results for Regression Model Parameters									
Dependent Variables	Independent Variables	Easy Goal				Hard Goal			
		Coef.	SE	95% CI		Coef.	SE	95% CI	
Shared	GI	-0.28	0.42	-1.09	0.54	0.19	0.41	-0.62	1.00
Extra Time	GI	0.76	0.35	0.06	1.45	0.73	0.39	-0.03	1.51
Sabotaged	GI	-0.56	0.35	-1.26	0.12	-0.91	0.22	-1.36	-0.49
Individual Output	GI	0.92	1.95	-2.79	4.85	-2.54	2.31	-6.86	2.21
Individual Output	Shared	1.06	0.37	0.36	1.83	1.93	0.37	1.19	2.66
Individual Output	Extra Time	2.09	0.46	1.14	2.92	2.54	0.41	1.72	3.32
Individual Output	Sabotaged	-2.75	0.52	-3.79	-1.72	-1.55	0.63	-2.68	-2.16
Panel B: Analysis of Direct and Indirect Effects									
Path		Easy Goal				Hard Goal			
		Coef.	SE	95% CI		Coef.	SE	95% CI	
GI → Individual Output (Direct)		0.92	1.95	-2.79	4.85	-2.54	2.31	-6.86	2.21
GI → Shared → Individual Output		-0.3	0.47	-1.33	0.59	0.36	0.81	-1.23	1.97
GI → Extra Time → Individual Output		**1.59**	**0.84**	**0.10**	**3.37**	1.84	1.05	-0.9	4.01
GI → Sabotaged → Individual Output		1.54	1.04	-0.33	3.75	**1.41**	**0.64**	**0.19**	**2.68**

CHAPTER 6

CONCLUSION

This study focuses on the effects of pair budget goal difficulty and pair identity on ingroup member behaviors and performance. Teamwork plays an important role in modern business operations. Hence, designing an effective incentive scheme to motivate teamwork is essential to business success. The literature shows that group-based incentives lead to greater cooperation than other incentive structures. However, the downside of implementing such incentives in organizations is that it creates a free-riding issue, such that individuals benefit from other group members' effort. One way to reduce the free-riding issue is to add a tournament incentive to group-based incentive plans. That is, to compensate the group members using a mixed incentives scheme. The benefit of using mixed incentives is that the advantages of one incentive can overcome the disadvantage of the other one. However, the mixed incentives scheme creates a social dilemma such that when facing multiple goals people are confused about which goal they should pursue first. This issue can make the mixed incentives ineffective to shape individuals' behavior and effort in a workgroup setting.

This study investigates the mechanism through which people value group performance more than individual performance using an economic factor and a psychological factor, pair budget goal difficulty and pair identity, respectively. I find that when participants faced a difficult pair budget goal, they cooperated more than when

they faced an easy pair budget goal. I also find that they sabotaged less when they are assigned a difficult pair budget goal than when they are assigned an easy pair budget goal. Further, I find that assigned a difficult pair budget goal, individuals in highly identified pairs sabotaged less than those in weakly identified pairs. Additionally, assigning a difficult goal can significantly increase team performance. However, the effect of pair identity on performance is only marginally significant in the easy budget goal condition. Moreover, I find the causality of the relation between pair identity and performance is different between easy goals and difficult goals. Specifically, in the easy goal condition, strong pair identity influenced participants to increase performance through working longer. In the difficult goal condition, strong pair identity influenced participants to increase performance by reducing sabotage.

This study provides insights for both theory and practice. From a theoretical standpoint, this study investigates the interaction between psychology and economics, showing that psychological concepts and economic theories are complementary to understanding human behaviors in a social dilemma setting. This study contributes to this stream of literature by showing that economic and psychological factors may affect the effectiveness of economic incentives. Specifically, when individuals face conflicts of interest, pair budget goal difficulty and the strength of pair identity play important roles in aligning individual interests with the interests of the organization.

Second, this study extends the goal-setting literature by investigating the effect of pair goals on individual behaviors. Prior goal setting literature has provided evidence about the effect of goal difficulty on effort and performance at the individual level. However, little is known about the effects of goal difficulty on individual strategic

behaviors at the group level, especially when group members face conflicts of interest. This research provides evidence that participants focused more on the group goal than the individual goal when a difficult group budget goal is assigned, and that group members behave cooperatively to achieve the group goal first.

Third, this study adds to the group identity literature by examining the effect of group identity on cooperation and sabotage simultaneously. Prior literature provides evidence that individuals in a highly identified group value their own group more than other groups. Individuals in a highly identified group behave cooperatively because they have concern for others. However, the literature overlooks the effectiveness of group identity in a social dilemma scenario. That is, when group members face conflicts of interest, it is not known whether strong group identity can make one interest more salient than another and, therefore, induce more cooperation in the group. This study adds to the literature by showing that group identity is useful in improving performance. However, group identity cannot work alone on performance improvement. The effectiveness of group identity depends on other factors, such as goal difficulty.

Finally, the evidence is mixed that mixed incentives, which include both a group-based incentive and a tournament incentive, are effective to motivate employee behavior and promote performance. Proponents argue that the advantages of the group and individual incentive elements can overcome the disadvantages of the two elements in mixed incentive models. Opponents suggest that providing conflicts of interest create a social dilemma in which employees are not sure about which interest to pursue first. This study provides evidence that the effectiveness of mixed incentives depends on other factors and suggests that organizations who would like to use mixed incentives to

promote group work may use them with caution in that using mixed incentives alone may cause detrimental effects to the organization. This study shows that enhancing group identity or setting difficult group budget goals can increase group performance in mixed incentives settings.

Limitations and Future Research Opportunities

This study has several limitations that provide opportunities for future research. First, in this study, I examined the effects of the two factors under only one type of mixed incentives. Future research can examine the validity of the findings in different mixed incentives settings. Second, the experiment was conducted over a short period of time. The findings may not hold for a long-term effect. Third, the effect of group identity is found to be moderated by goal difficulty. Are there other factors that could moderate group identity effects on performance, e.g., prize spread? Fourth, the effects of the two factors were only investigated in a mixed incentives situation. Are mixed incentives more efficient than other incentives after incorporating the two factors? Fifth, a participant indicated that he/she wanted to help their teammate have a greater chance of winning. What caused the participant to do so? Sixth, participants in this study worked only on a single task. It is not uncommon in most workplace settings for employees to work on multiple tasks simultaneously, which may vary from individual tasks to group tasks. Will group identity affect behavior in such settings and improve productivity?

APPENDIX A

MATERIALS FOR PAIR IDENTITY MANIPULATION

Slogan Guessing Task Instrument

Slogan Guessing Competition with answers

Team Name: _____ Date: ___ Session: ___

Worker ID: _____ Worker ID: _____

#1 "Taste the Feeling"
Company/Product: Coca Cola

#2 “Designed For Driving Pleasure”
Company/Product: BMW

#3 “Breakfast of champions”
Company/Product: Wheaties

#4 “Just do it”
Company/Product: Nike

#5 “Melts in your mouth, not in your hand”
Company/Product: M&M

#6 “Save money. Live better”
Company/Product: Walmart

#7 “The best a man can get”
Company/Product: Gillette

#8 “Can You hear Me Now”
Company/Product: Verizon

#9 “Taste the one that’s forever young.”
Company/Product: Pepsi

#10 “Eat Fresh”
Company/Product: Subway

#11 “What happens here stays here”
Company/Product: Las Vegas Convention and Visitors Authority

#12 “Zoom-Zoom.”
Company/Product: Mazda

#13 “When you care enough to send the very best.”
Company/Product: Hallmark

#14 “Betcha Can’t eat just one”
Company/Product: Lay’s

#15 “Don’t leave home without it”
Company/Product: American Express

#16 “the happiest place on earth”
Company/Product: Disneyland

Scales Measure for Pair Identity Manipulation

Please circle the number to indicate your level of agreement to the following questions.

1 – – – 2 – – – 3 – – – 4 – – – 5 – – – 6 – – – 7

Definitely Definitely

No Yes

1. Are you happy to be a part of your team?
2. Do you feel that you are a member of the team?
3. Do you like your teammate?

Experimental Script – Strong Pair Identity

<Participants arrive>

Put up a sign ----- Please DO NOT communicate with other people.

"First of all, I'd like to thank you for participating today. Please read and sign the consent form in front of you and keep a copy for your records. If you have any questions about the consent form, please raise your hand. Today's session will begin shortly."

<Collect signed consent forms.>

<Explain how the information collected will be used later.>

"Today, you will be doing two tasks. Now I will let each one of you draw a number, which you will be using as your worker ID number throughout today's session. By using this number, your performance today can be kept confidential. Individual information will only be seen by the researcher and will only be released in aggregate format. If you have any questions during the instruction, please raise your hand."

<Slogan guessing game>

<High Identity – team formation>

"Now, based on the number you chose, you are going to form teams of two. Please look at the back of your worker ID. It tells you which team you are in. So please find your teammate and sit together. Once you find your teammate, please do not communicate yet. Please wait for further instructions. Thanks for your cooperation."

<Hand out the T-shirts.>

"Now, you have successfully found your teammate. Please put on the T-shirt in front of you."

"Now you need to work with your teammate to create and write down a unique team name on the paper in front of you. You will be using your individual worker ID and the team name throughout today's session."

<Slogan guessing game starts>

"Your job now is to work with your teammate to guess 16 product slogans. You and your teammate need to write down the names of companies or products you believe are

associated with the slogans. You and your teammate have to reach an agreement on the answer. Then write the answer on the line below the slogans."

<Hand out the example --- one copy for each team >

For example, if the slogan is "What's The Worst That could Happen?" you and your teammate agree that this is a slogan of Dr. Pepper, then please write down "Dr. Pepper" on the line below the slogan."

"Do you have any questions?"

<Explain the compensation of the game>

"At the end of today's session, the winning team will be announced. In this competition, the team with the highest number of correct answers is the winner. If there is a tie, then those teams will compete on guessing more slogans until one team wins out. The winning team will receive a bag of candy as the award."

"Your team has 10 minutes to complete the task. You can communicate with your teammate during this task."

"Do you have any questions about the first task?"

<Hand out the slogan-guessing materials>

"Please open the material and start the task now."

<When the slogan guessing game finish>

"Time is up. Please stop. Now please make sure you have written down your worker ID and your team name on the task sheet and wait for the helper to collect your answers."

"The helper will check the answers, and the winning team will be announced at the end of today's session."

<Hand out GI manipulation check>

"Please fill out this short questionnaire. There are no right or wrong answers. Just answer these questions honestly."

<Collect the manipulation check> <Start decoding task>

APPENDIX B

MATERIALS FOR DECODING TASK

Experimental Script ---- Decoding Task
(Strong Pair Identity)

<Decoding task>

"Please do not talk with others during this task. If you have any questions during the instructions, please raise your hand."

"In this session you will act as a program tester for Beta company."

"Beta company designs large computer programs. You have been hired as part of a team that will be testing part of a program. The program involves extensive decoding activities. To test the performance of the program, your team's job is to decode letters into numbers for a number of work periods. The goal is to correctly decode as many letters as your team can in a given period of time."

"At the end of each work period, a machine will record the number of letters correctly decoded. This amount is your recorded output for the period."

"However, because of a design flaw, there is a 5% chance that you might lose up to 20 units output each period from measurement error."

"Do you have any questions so far?"

"Please click the 'Proceed' button on the screen."

<Explain the task>

"To test the new program, you and your teammate each will be given a different list of five numerical keys to decode two-letter combinations for several work periods."

"The screen in front of you is an example of the decoding task. (Figure 1)"

"The top left corner shows your team name and your worker ID throughout today's task. The very top right corner shows the remaining time for the period. The top shows your team output goal for the period. The box on the left-hand side is the list of numerical keys to decode the combinations. The task box in the middle is where you perform the decoding task. It shows you the period, and combination to decode. The box on the right-hand side shows the number of combinations you decode correctly.

“For example, the key list has a key of 74 for the two-letter combination “CZ” and a key of 23 for the two-letter combination “RI,” and a key of 98 for the two-letter combination “TB.”

“In the task box, if you see a combination from your key list, then you type in the corresponding key in the blue box and click “OK.” If you see a combination which is not on your key list, then you click “OK” directly. If you don’t want do work on the decoding task for the period, then you can click on the “I am done with the period” button on the bottom right corner. Then you can do something else until the next period starts. However, if you do click the button, you need to remain in your seat and remain silent.”

“If you have any questions, please raise your hand.”

“Now please click the “proceed” button on the bottom left corner.”

<Explain the decision report (Figure 2)>

“Each work period lasts 3 minutes. Before you perform the decoding task, you need to make a decision about how you would like to perform the task.”

“The screen in front of you now is an example of a decision-making report.”

“This screen shows your team name and your worker ID throughout today’s task. The very top right corner shows the remaining time for the period. The top shows your team output goal for the period.”

“The box in the middle of the screen is a decision-making box.”

<Alternative 1 – sharing keys>

“At the start of each work period, you will be given a list of 5 numerical keys and 10 points to allocate between 3 alternatives. For each two points you allocate to alternative 1, you will share 1 of your personal keys with your teammate.”

“For example, if you allocate 4 points to alternative 1, then you will share 2 of your personal keys with your teammate. The keys shared by your teammate will also appear on your key list under the five of your personal keys. The more keys you have, the more combinations you can decode. All keys are only valid for the current period.”

“Do you have any questions?”

<Alternative 2 ----- additional work time>

“For each point you allocate to alternative 2, you yourself will receive an additional 10 seconds to do the decoding task. That is, if you allocate 1 point to alternative 2, then you but not your teammate will have 3 minutes and 10 seconds in total to decode the combinations. If you allocate the total 10 points to alternative 2, then you have 4 minutes and 40 seconds in total to do the decoding task. If you allocate 0 points to alternative 2, then you have 5 minutes to do the decoding task.”

<Alternative 3 ------ sabotage>

“For each point you allocate to alternative 3, you will reduce your teammate’s final recorded output by 2 units. For example, if your teammate’s recorded output is 95 units for the period, and you allocated 1 point to alternative 3, then your teammate’s recorded output will be reduced to 93 units. If you allocated the total 10 points to alternative 3, then your teammate’s recorded output will be reduced to 73. However, there is no way you can be certain of your teammate’s decision, or for your teammate to be certain of your decisions, because any loss of reported output may solely to measurement error by the system. After you complete the decision report and click the “submit” button, the decoding task period begins.”

“You must use all 10 points among the three alternatives. The points may not be carried forward to future rounds.”

“You will be given a list of five new numerical keys and 10 points at the start of each period. Hence you need to fill out a decision report at the beginning of each new period.”

“The goal of the company in this task is to decode as many letter combinations as possible. At the start of each period, you will be notified of your team output goal set by the company for the period.” In each practice period and main period, the program generates only 100 combinations. That is, you will only see 100 combinations at most in each period including both the combinations on your key list and the ones not on your key list. Your period ends when you reach the 100th combination or when the time runs out, whichever comes first.”

“Do you have any questions?” “Please use this screen to practice points allocation.”

<Feedback - Figure 3>

“At the end of each period, you will receive a performance report. The report shows your team name, your worker id, your team goal, whether your team final recorded output

meets the team goal for the period, your personal final recorded output, and the amount you are paid for the period."

<Compensation>

"Your compensation for each period is based on your team total recorded output (the sum of your recorded output and your teammate's recorded output) and your recorded output relative to your teammate's recorded output. When your team final recorded output is at or above the team goal, you and your teammate each will be paid 5 U.S. dollars. In addition, the person with the higher final recorded output will receive an additional 7 U.S. dollars as a bonus. The person with the lower final recorded output will receive an additional 3 U.S. dollars as a bonus. For example, if your team for the period is to correctly decode 120 units, and your team final recorded output is 130 units, then each one of you will receive a payment of 5 U.S. dollars. On top of that, if your final recorded output is 70 units, and your teammate's final recorded output is 60 units, then you will receive additional 7 U.S. dollars, and your teammate will receive additional 3 U.S. dollars for the period. That is, when the team goal is achieved, the person with relatively higher final recorded output will be paid 12 U.S. dollars, and the person with relatively lower final recorded output will be paid 8 U.S. dollars. You can increase your personal output to earn the higher reward by either increasing your own output or decreasing your teammate's output. If your team final recorded output is 110 units, then both you and your teammate will be paid zero U.S. dollars. You can share keys with your teammate to increase your team's output."

"At the end of the session today, one of the work periods will be randomly selected as the payment period."

<Task-understanding questions>

"If you don't have any questions, please click the "proceed" button to 8 questions on the screen."

<Type in Worker ID and Team Name>

"Now please click the "Proceed" button to type in your worker ID and Team Name on the screen. Please raise your hand when you finish."

<Practice periods>

"Before the actual task, you will have two practice periods to help you understand the task. For simplicity, you are not allowed to share keys or allocate points in practice periods."

“Each practice period lasts 3 minutes. If you have any questions, please ask before each practice period starts.”

“In each practice period and main period, the program generates only 100 combinations. That is, you will only see 100 combinations at most in each period including both the combinations on your key list and the ones not on your key list. Your period ends when you reach the 100th combination or when the time runs out, whichever comes first.”

“Do you have any questions?

“Please click the “proceed” bottom” to start the practice.”

<Task completed>

“Please do not communicate with other people in any form about this study.”

<Announce the winners of the slogan guessing game. And pay the winner>

<If there is a tie in the winners, continue another round of the game (2 mins)>

<Announce the winners>

<After collecting all the materials.>

“Thank you again for participating in the study. Today’s session is over now. You all have a good day!”

Screen Shot for Decoding Task

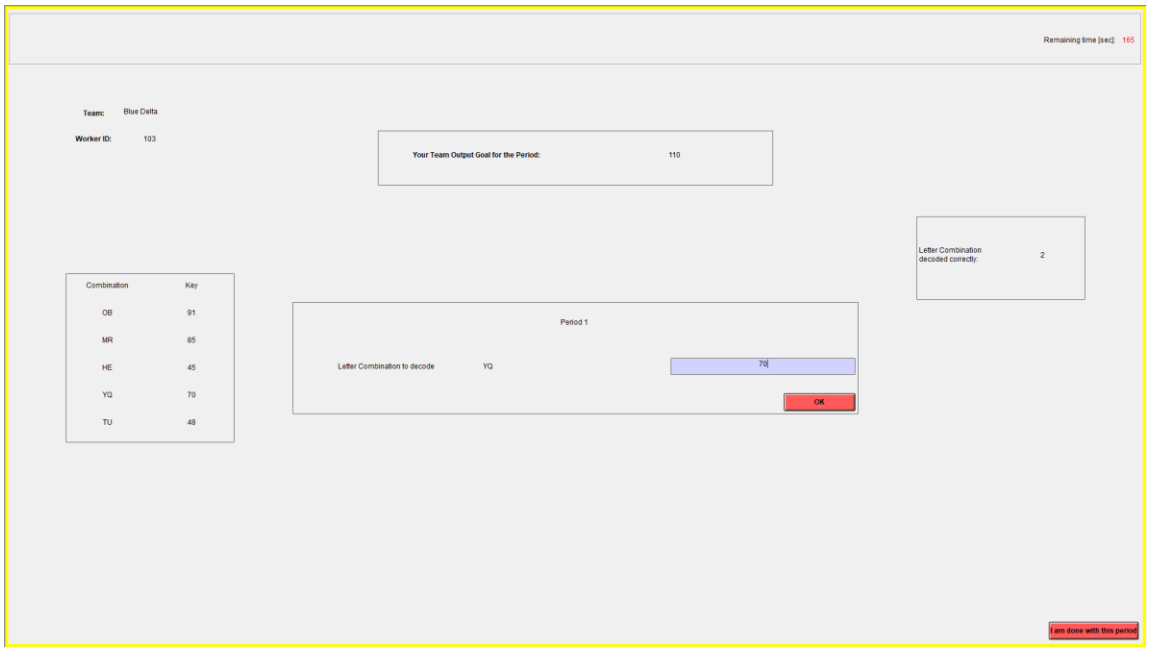

Figure 6. Sample of Decoding Task – Task Page

Figure 7. Sample of Decoding Task – Decision Making Page

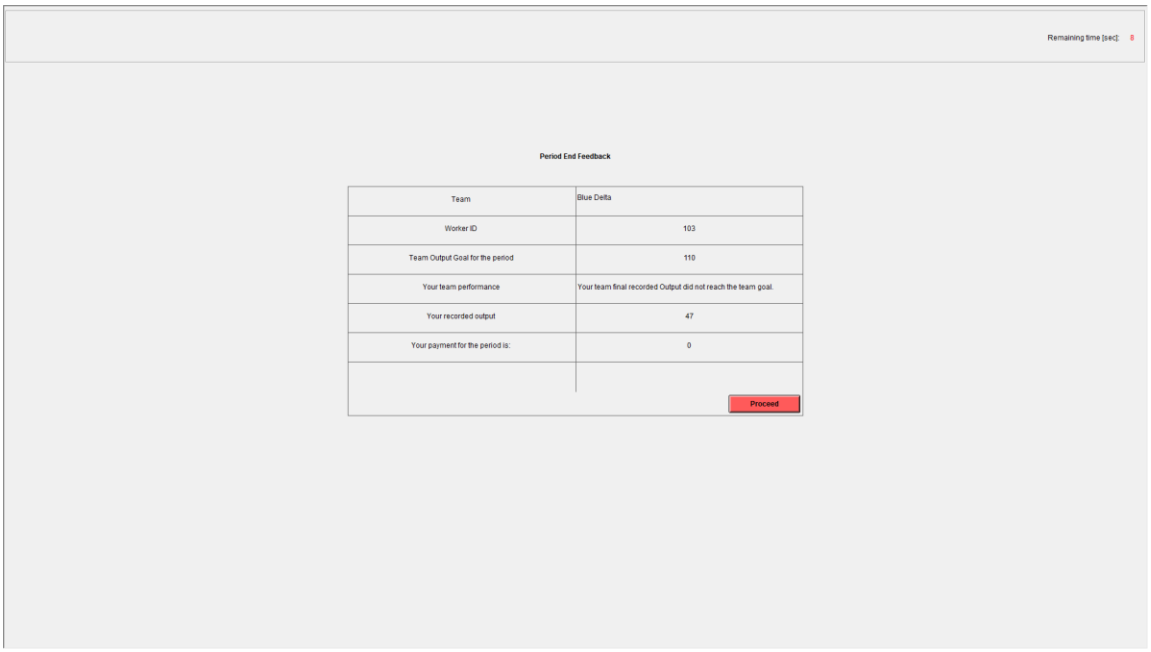

Figure 8. Sample of Decoding Task – Feedback Page

APPENDIX C

POST QUESTIONNAIRE

Please circle the number to indicate your level of agreement to the following questions.

1 – – – 2 – – – 3 – – – 4 – – – 5 – – – 6 – – – 7

Definitely No | Definitely Yes

1. I am happy to be a part of my team. [pair identity]
2. I feel I am a member of my team. [pair identity]
3. I like my teammate. [pair identity]
4. The team output goal was hard to achieve. [budget difficulty]
5. I had to work hard to meet the team output goal. [budget difficulty]
6. It was difficult to meet the team output goal. [budget difficulty]
7. Alternative 1 (sharing keys) in the decoding task can be used to increase the team output. [Cooperation manipulation check]
8. Alternative 3 (reducing teammate's final output) in the decoding task can be used to decrease my teammate's final output. [Sabotage manipulation check]
9. I know my teammate before today's session.
10. I shared keys with my teammate because my teammate shared keys with me. [reciprocity-cooperation]
11. I shared keys with my teammate because I thought my teammate would do the same to me. [reciprocity-cooperation]
12. I did not share keys with my teammate because my teammate did not share keys with me. [reciprocity – cooperation]
13. I would share keys with my teammate only if my teammate share keys with me. [reciprocity - cooperation]
14. I allocated points to alternative 3 to reduce my teammate's final output because I thought my teammate would do the same to me. [reciprocity-sabotage]
15. I allocated points to alternative 3 to reduce my teammate's final output because I knew for sure my teammate reduced my final output and I wanted to retaliate. [reciprocity-sabotage]
16. I used alternative 3 to reduce my teammate's final output more to retaliate against my teammate than to win the higher individual bonus. [reciprocity – sabotage]
17. I wasn't certain of what my teammate's decisions were.
18. I shared my keys because I wanted to show my kindness to my teammate and expected for my teammate to share his/her keys with me. Meanwhile, I reduced my teammate's final recorded output because I wanted to win the larger bonus.
19. I shared my keys and reduced my teammate's final recorded output only because I wanted to win the larger bonus.
20. I shared keys with my teammate because I wanted to be nice to my teammate.
21. Being an ethical person is more important to me than winning the higher individual bonus by reducing my teammate's final output. [ethical concern]
22. I did not use alternative 3 to reduce my teammate's final output because I thought that was not ethical. [ethical concern]
23. I was trying to win the higher bonus in each round at all cost. [competitiveness – task]

24. Winning the higher bonus in each round is more important to me than any other things in the decoding task. [competitiveness – task]
25. I find competitive situations unpleasant. [competitiveness – personality trait]
26. It's usually not important to me to be the best. [competitiveness – personality trait]
27. I often try to outperform others. [competitiveness – personality trait]
28. I don't like games that are winner-take-all. [competitiveness – personality trait]
29. I do not feel comfortable about taking chances. [risk aversion – personality trait]
30. I prefer situations that have foreseeable outcomes. [risk aversion – personality trait]
31. Before I make a decision, I like to be absolutely sure how things will turn out. [risk aversion – personality trait]
32. I avoid situations that have uncertain outcomes. [risk aversion – personality trait]
33. I feel comfortable improvising in new situations. [risk aversion – personality trait]
34. I feel nervous when I have to make decisions in uncertain situations. [risk aversion – personality trait]
35. The well-being of my co-workers is important to me. [Horizontal collectivism individualism (H-C) – personality trait]
36. If a co-worker gets a prize, I would feel proud. [Horizontal collectivism individualism (H-C) – personality trait]
37. If a relative were in financial difficulty, I would help within my means. [Horizontal collectivism individualism (H-C) – personality trait]
38. It is important to maintain harmony within my group. [Horizontal collectivism individualism (H-C) – personality trait]
39. I like sharing little things with my neighbors. [Horizontal collectivism individualism (H-C) – personality trait]
40. I feel good when I cooperate with others. [Horizontal collectivism individualism (H-C) – personality trait]
41. My happiness depends very much on the happiness of those around me. [Horizontal collectivism individualism (H-C) – personality trait]
42. To me, pleasure is spending time with others. [Horizontal collectivism individualism (H-C) – personality trait]
43. Briefly describe the strategy you used in the decoding task (open question).
44. Please note any part of the instructions you found confusing (open question).
45. Other comments (open question).

Demographic Information (6 questions)

46. Age: _____
47. Gender: _____ Male _____ Female
48. Race: _____ African American _____ Asian

    _____ White/Caucasian _____ Hispanic/Latino

49. Major: _____
50. Have you taken an ethic class? No _____ Yes _____
51. How many years of professional work experience do you have? _____

APPENDIX F

HUMAN USE APPROVAL LETTER

LOUISIANA TECH
UNIVERSITY

OFFICE OF UNIVERSITY RESEARCH

MEMORANDUM

TO: Mr. Chaoping Li and Dr. Andrea Drake

FROM: Dr. Stan Napper, Vice President Research & Development

SUBJECT: HUMAN USE COMMITTEE REVIEW

DATE: May 19, 2017

In order to facilitate your project, an EXPEDITED REVIEW has been done for your proposed study entitled:

"The Effect of Group Identity and Budget Difficulty on Group Performance"

HUC 17-110

The proposed study's revised procedures were found to provide reasonable and adequate safeguards against possible risks involving human subjects. The information to be collected may be personal in nature or implication. Therefore, diligent care needs to be taken to protect the privacy of the participants and to assure that the data are kept confidential. Informed consent is a critical part of the research process. The subjects must be informed that their participation is voluntary. It is important that consent materials be presented in a language understandable to every participant. If you have participants in your study whose first language is not English, be sure that informed consent materials are adequately explained or translated. Since your reviewed project appears to do no damage to the participants, the Human Use Committee grants approval of the involvement of human subjects as outlined.

Projects should be renewed annually. ***This approval was finalized on May 18, 2017 and this project will need to receive a continuation review by the IRB if the project, including data analysis, continues beyond May 18, 2018.*** Any discrepancies in procedure or changes that have been made including approved changes should be noted in the review application. Projects involving NIH funds require annual education training to be documented. For more information regarding this, contact the Office of University Research.

You are requested to maintain written records of your procedures, data collected, and subjects involved. These records will need to be available upon request during the conduct of the study and retained by the university for three years after the conclusion of the study. If changes occur in recruiting of subjects, informed consent process or in your research protocol, or if unanticipated problems should arise it is the Researchers responsibility to notify the Office of Research or IRB in writing. The project should be discontinued until modifications can be reviewed and approved.

Please be aware that you are responsible for reporting any adverse events or unanticipated problems.

If you have any questions, please contact Dr. Mary Livingston at 257-2292 or 257-5066.

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