

The Effect of Group Identity on Sabotage Induced by Relative Performance Information

by

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Abstract

Organizations commonly provide relative performance information (RPI) as part of their management control systems to motivate employees. Despite the benefits of RPI that have been well-documented in the literature, RPI can lead to unhealthy competition where employees sabotage their co-workers' performance so as to outperform, and thus be ranked higher than their co-workers. Organizations could strengthen group identity, an informal management control, to reduce sabotage. However, there is limited previous evidence that strengthening group identity actually reduces sabotage. This study aims to fill that gap. Additionally, this study investigates whether the effect of strengthening group identity depends on the type of compensation contract assigned. I used an experiment in a laboratory setting because it is difficult to observe incidences of employee sabotage behavior in real organizations since sabotage is often conducted covertly and concealed carefully. I manipulate compensation type at two levels (piece rate versus flat wage), and group identity at two levels (strong versus moderate). Both sabotage and effort are measured as dependent variables. I find evidence that strengthening group identity increase sabotage. In addition, I predict and find that employees sabotage co-workers to a greater extent under a piece-rate contract than under a flat wage contract. However, my results do not support the arguments that the effect of strengthening group identity on sabotage depends on compensation type. In addition, although I find that suspicion of having been sabotaged by others increases the frequency at which employees sabotage others, I find mixed evidence on whether the suspicion of having been sabotaged affects employees' effort.

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Chapter 1

Introduction

Organizations often use relative performance information (RPI) as part of their management control and incentive systems (Hannan et al., 2013a; Luft, 2016; Nordstrom et al., 1990). One example of the use of RPI is a forced ranking system for employee performance evaluations, adopted by many large corporations. Under forced ranking systems, relative (not absolute) performance serves as the basis of performance evaluation. Literature has shown that providing employees with relative performance information that is not linked to performance evaluation can increase competition among employees who care about their ranking status (Hannan et al., 2008b). Linking relative performance to compensation also fosters further competition among employees (Luft, 2016), motivating employees to increase productive effort and hence performance. As such, the value of the firm is improved (Kerr et al., 2007; Tafkov, 2013).

However, the “dark side” of RPI-induced competition is that it may spark hostile rivalry among employees (Charness et al., 2014). As a consequence of this hostile rivalry, employees may sabotage the performance of their co-workers to increase their own performance rank. I adopt Lazear’s definition of sabotage as “...any (costly) actions that one worker takes that adversely affect output of another” (Lazear, 1989, pp.563). For example, until 2013, Microsoft used a performance evaluation system where highly ranked employees received bonuses and promotions, whereas employees with low rankings feared losing their jobs. This system encouraged employees to improve their rankings by sabotaging others. According to Carlson (2015, pp.12), “Because someone would have to be ranked worst even on teams full of all-star

performers, Microsoft's most talented employees refused to work together. Because employees were not judged on their own work, but on how well they did relative to their peers, they would actively seek to undermine each other." Indeed, an engineer from Microsoft reported that "people responsible for features will openly sabotage other people's efforts"(Chowdhury and Gürtler, 2015, pp.136). In organizational settings, employees may sabotage others to maximize their chances of winning a tournament to receive valuable resources or promotions.

Sabotage can be classified into two categories: passive sabotage and active sabotage. According to Decision Wise research, 4% of a typical work force are active saboteurs, and 28% are passive saboteurs (Maylett, 2017). Passive sabotage refers to those actions that should be taken, but are not taken by a worker, and the worker's inaction negatively affects the output of another worker. For example, passive saboteurs may withhold important information from their colleagues or refuse to share knowledge with others. In contrast, active sabotage refers to actions that should not be taken, but are taken by a worker, and these actions are harmful to the output of another worker. For example, an active saboteur may actively gossip about a co-worker, steal or hide a co-worker's tools or destroy a co-worker's work output (Robinson and Bennett, 1995). Passive sabotage has been examined by psychologists studying organizational citizenship and by management accounting researchers in settings where passive sabotage takes the form of a lack of cooperation including failure to help or share information (Berger et al., 2017; Kelly, 2010; Podsakoff et al., 2000). In contrast, active sabotage has been examined much less often in these two streams of literatures. It is important to investigate active sabotage although it is rarer in practice than passive sabotage because active sabotage sometimes causes more severe

consequences to co-workers or organizations (Laabs, 1999).¹

The focus of this dissertation is active sabotage behavior. Sabotaging coworkers, although not directly targeted at the organization per se, can diminish firm value by decreasing the productivity of co-workers. If sabotaging each other becomes part of the organization's culture, good workers may leave, incurring a talent loss to the organization. It is therefore important to examine how to attenuate sabotage activities. The majority of existing literature on active sabotage has used experimental methods or theoretical models to study sabotage behavior during tournaments where RPI is linked to compensation (See Amegashie, 2013 for review). A few recent studies have examined tournament settings and find that active sabotage also occurs when RPI is not linked to compensation (Charness et al. 2014; Wang 2016).

Various policies have been proposed to reduce sabotage behavior. In a labor tournament, sabotage activities can be decreased by carefully designing certain characteristics of the tournament such as the use of a smaller prize spread (i.e., through wage compression) between winners and losers (Harbring and Irlenbusch, 2008, 2011; Lazear, 1989). In a promotion tournament, sabotage activities among employees can also be attenuated by including candidates outside of their organization, who are too distant from other candidates within the organization to be sabotaged by them (Amegashie, 2013; Chen, 2003). The inclusion of external candidates, especially those deemed competent, reduces all internal candidates' chance of winning a promotion, and therefore employees (i.e., internal candidates) may find it less beneficial to

¹ For example, active (passive) physical sabotage may take the form of spreading false rumors (not coming to meetings scheduled). Using cyber sabotage as another example, active cyber sabotage may be the execution of malicious code to delete critical files, while passive cyber sabotage may take the form of not submitting online reports in a timely manner. (Theis, 2017)

expend resources to sabotage other internal candidates. These policies mentioned above, namely the use of a smaller prize spread in a labor tournament and the inclusion of external candidates in a promotion tournament, are essentially part of a formal management control system. Firms can implement a control system to prevent, detect, and penalize saboteurs (Cappelli et al., 2006). However, it may be infeasible or too costly to use formal controls to decrease sabotage activities that are covertly conducted and carefully concealed. Alternatively, organizations may use an informal management control that might be more effective (Ouchi, 1977, 1992).

Group identity is one informal management control that may affect sabotage behavior. Organizations often strengthen group identity of employees as an informal control to foster coordinated behaviors among group members. Organizations can affect employee's group identity with a variety of policies such as "job rotation, work group composition, the layout of the work space, and sponsored activities (e.g., sports teams, company gatherings, and retreats)" (Akerlof and Kranton, 2008, pp 212). Prior empirical results indicate that strengthening group identity interacts with formal control systems to influence employees' actions (Kelly and Presslee, 2017; Towry, 2003). However, the effect of strengthening group identity on employee sabotage is rarely studied and not well understood.

One exception is Charness et al. (2014) although they did not specifically set out to study the effects of group identity on sabotage and they made no predictions about the effect of group identity on sabotage behavior. However, these authors found that participants tended to sabotage their group members less if they were students at the same school than if they were students from a different school, and speculated that strengthening group identity may discourage sabotage.

According to social identity theory, strengthening group identity shortens psychological distance between group members such that group members are more likely to perceive others' outcomes as their own, and are less likely to engage in sabotage behavior which hurts other's outcomes. However, a competing argument would suggest the opposite. Strengthening group identity can increase perceived similarity among group members such that social comparison is heightened and sabotage is increased. To formally and directly examine the relationship between group identity and sabotage, my study directly manipulates and measures the level of group identity, and investigates how group identity can affect sabotage activities. Given competing arguments, I make a null hypothesis that strengthening group identity will not affect sabotage activities.

Previous literature suggests that the effects of group identity may depend on the nature of the formal control systems employed. For example, Towry (2003) examined how group identity and two types of mutual monitoring incentive systems (either vertical or horizontal monitoring) jointly impacted employee effort. She found that strong group identity enhanced (weakened) the effectiveness of a horizontal (vertical) mutual monitoring system on employee effort. This finding suggests that the effects of strengthening group identity depend on the type of formal control system employed. In my study, I investigate whether the effect of group identity on sabotage depends on another formal control system element—the type of compensation contract. Specifically, I examine two different types of compensation contracts (i.e., flat wage and pay-for-performance piece rate). According to social comparison theory, people desire to be compared favorably to others, especially on those dimensions that are relevant to their self-esteem. Unlike those under a flat wage contract, individuals under a pay-for-performance

contract may compare their compensation to others and are more likely to sabotage others to achieve a higher relative income. I hypothesize that there will be more sabotage under a piece rate contract than under a flat wage contract. In addition, I predict that compensation type moderates the effect of group identity on sabotage. Specifically, the difference in sabotage between strong group identity and moderate group identity condition would be greater under a piece rate contract than under a flat wage contract. Previous literature has shown that when a financial incentive is provided, individuals are less relational, more psychologically distant from others, and more focused on self-interest. Therefore, it is less likely for those under a piece rate contract (i.e., a form of financial incentive) to perceive others' outcome as own, a perception through which strengthening group identity may reduce sabotage.

I test my predictions with an experiment that uses groups with three participants. Participants individually work on a task and receive RPI—the performance ranking of all three participants in their group. I use a 2 (*Compensation type*) x 2 (*Group Identity*) between-subjects design. *Compensation Type* is manipulated at two levels, piece rate (PR) versus flat wage (FW),² and *Group Identity* is manipulated at two levels, strong versus moderate. Two dependent variables, employees' total sabotage and effort, are then measured. I do not find evidence that strengthening group identity reduces sabotage behavior. Instead, I find that strengthening group identity increases sabotage behavior. Moreover, I predict and find that participants working under a PR contract sabotage group members to a greater extent than those working under an FW

² Although other types of pay-for-performance contracts exist in practice including merit pay, commission and bonuses, I use the simplest form of pay-for-performance contract because theory suggests that the effect I am predicting does not depend on the type of pay-for-performance contract.

contract. However, I did not find evidence supporting the prediction that the effect of strengthening group identity on sabotage depends on compensation type.

In addition to the effects on sabotage, I also examine the effects of group identity and compensation type on effort. People's willingness to put in effort may be related to their suspicion of being sabotaged (Carpenter et al., 2010), and therefore it is interesting to look at effort as well. My results provide mixed evidence that employees' suspicion of having been sabotaged by others can motivate more effort.

My study contributes to the literature in several ways. First, my study is part of a recent, but relatively small, stream of management accounting literature investigating employee sabotage behavior (Wang, 2016). Sabotage is common in organizations, and sometimes causes significant damage to organizational performance (Laabs, 1999). For example, Wang (2016) found that non-pecuniary recognition (e.g., recognizing top performers in company newsletters or public announcements) can motivate both productive and counterproductive effort (i.e., sabotage). In addition, she found that recognition motivates more sabotage from those individuals who measure high on "Dark Triad" personality characteristics.³ While Wang (2016) identifies how public recognition program and personal characteristics can increase sabotage behavior, my study examines how an informal control (i.e., group identity) and a formal control (i.e., compensation contract) affect sabotage behavior. To my knowledge, prior to my study, only Charness et al. (2014) have discussed a possible connection between group identity and

³ These include Machiavellianism (a manipulative attitude), narcissism (excessive self-love), and psychopathy (lack of empathy) (Jones and Figueredo, 2013).

sabotage. Charness et al. (2014), in interpreting their results, speculate that strengthening group identity would reduce sabotage. My study contributes to the stream of literature by directly examining this relationship.

Second, my study contributes to the literature on informal management control by studying the effect of group identity on sabotage. Previous literature has documented positive and negative effects of strengthening group identity (Akerlof and Kranton, 2008; Bandiera et al., 2005; Kelly and Presslee, 2017; Towry, 2003). For example, Towry (2003) examined how group identity interacts with mutual monitoring systems to impact employee effort. She found that strong group identity enhanced (weakened) the effectiveness of a horizontal (vertical) mutual monitoring system. Kelly and Presslee (2017) investigated in a tournament setting whether group identity interacted with the proportion of tournament winners to impact employee effort. They predicted and found that strengthening group identity led to less employee effort when the winner proportion was large, but it had no effect when the winner proportion was small. My study contributes to the literature by presenting direct evidence of the link between group identity and sabotage, a relationship which has not been previously studied directly.⁴ My results indicate that strengthening group identity does not reduce sabotage but it increases sabotage, an interesting result as it is contrary to the speculation of Charness et al. (2014) relying on indirect evidence.

Finally, my study contributes to the formal control system literature considering the

⁴ Previous literature has studied positive effects of group identity on organizational commitment, discretionary effort from employees, and helping behaviour (e.g. Dawes et al. (1988)). Although these behaviours may be correlated with sabotage reduction, they are not direct evidence of sabotage reduction.

impact of different compensation types on employee motivation and behavior. Recent literature documents that in settings where RPI is provided, but is not explicitly contracted on, employees sabotage co-workers to achieve a better performance rank when they are paid under a flat wage contract (Charness et al., 2014) and under a piece rate contract (Wang, 2016), both of which are contract types commonly used in organizations. In Charness et al. (2014) where employees receive a flat wage, they sabotage others in the hope of achieving higher performance ranking. In Wang (2016) where employees receive a piece rate contract, they reduce other's production to increase their own chances of being a top performer so that they can be publicly or privately recognized. A recent psychology study finds that pay-for-performance contract, specifically a lump-sum bonus payment contract, interacts with individuals' competitiveness to affect individuals' interpersonal deviance behavior (i.e., active harming behavior toward coworker) (Gläser et al., 2017). However, prior research has not compared the degree of sabotage behavior between these two types of compensation contracts. My study identifies that greater sabotage is observed under a piece-rate contract than under a flat wage contract. This result is important to firms who are considering the various consequences of different compensation type. Although a piece-rate contract may increase effort relative to a flat wage contract, it also has the potential to increase sabotage. So firms may wish to consider how to counteract this potential increase in sabotage if they decide to implement pay-for-performance contracts.

The remainder of the paper is organized as follows. Chapter 2 develops my hypotheses. Chapter 3 and Chapter 4 describe my experimental design and results, respectively. Chapter 5

concludes with a discussion of the findings and the limitations of the study.

Chapter 2

Literature Review and Hypothesis Development

I will begin this chapter by first introducing the research setting and the predictions under economic theory. After this introduction, I will present two literature reviews on identity and sabotage, which are then followed by hypotheses development under psychology theory.

2.1 Research Setting and Prediction under Economic Theory

In my research setting, I manipulate two variables: group identity and compensation type, with each variable at two levels. As a result, I create 4 between-subjects experimental conditions. Across all conditions, the economic benefit of sabotage is zero, and the economic cost of sabotage is held constant. Therefore, the prediction under economic theory would be no sabotage behavior in any of the conditions. In my study, groups of three individuals receive RPI in the form of performance rankings of all three members in their group. The ranking is based on net performance—the difference between performance and performance loss. Each member can lose a fixed amount of performance with a varying likelihood that depends on a random act of nature and the sabotage choices of other group members. Sabotage behavior takes the form of the choice made by individuals to increase their group members' likelihood of performance loss. By sabotaging others, individuals may achieve better relative performance, but gain no economic benefit (i.e., earnings). In this setting, an individual's pay is either based on individual performance (under a PR contract) or fixed (under a FW contract) instead of being tied to

relative performance.⁵ Since individuals cannot increase their pay by sabotaging others, the economic benefit of sabotaging others is zero in this study.⁶ Instead, there is an economic cost of sabotaging that is held constant across all conditions. As such, the economic motivation for/against sabotage is held constant (the same cost and zero benefit) in all conditions. By holding the economic motivation for/against sabotage constant, my research setting allows me to focus on the psychological motivations for/against sabotage that are of primary interest in this study.⁷

Indeed, psychology theory predicts that sabotage activities may occur in my setting even though mainstream microeconomic theory would predict no sabotage based on the assumption that individuals are rational and always maximize their wealth and leisure. Prior research has challenged the assumption that individuals always behave rationally (Ariely, 2008; Simon, 1993). For example, using a multi-task setting, Hannan et al. (2013a) found that individuals did not maximize their earnings by choosing the optimal allocation of their effort between two tasks. Instead, they irrationally allocated more effort to the task in which they expected to do better than others. More direct evidence against the prediction under economic

⁵ A large stream of the literature on employee sabotage has focused on settings where employees' relative performance (not absolute performance) is tied to their earnings (e.g., only employees whose performance is in the top percentile can receive a reward) (Amegashie, 2012; Falk et al., 2008; Harbring and Irlenbusch, 2011).

⁶ It is possible for individuals to indirectly increase their pay by sabotaging others under the PR contract. The act of sabotage in response to sabotage by others may serve as a tool to ward off further attacks that reduce one's performance (and hence economic benefit under the PR contract). However, this concern may be mitigated by my research design because participants never learn definitively whether they have been sabotaged or who the saboteur might be.

⁷ Zero economic benefit from sabotaging others is not necessarily mapped into real world settings. Even so, I expect my results to generalize to real world settings where there are likely economic benefits to sabotage because the economic benefit is likely to have a main effect on sabotage. However, it is possible that the presence of economic benefits to sabotage may limit the effect of group identity under both PR and FW contracts. I acknowledge that this may be a limitation of my study which future research can examine.

theory comes from Charness et al. (2014). Charness et al. (2014) found evidence that people were willing to bear economic costs for sabotaging others in pursuit of a better performance ranking. Both studies clearly indicate that when RPI is provided, individuals may sabotage others for higher performance rank, even when doing so is economically costly with no associated economic benefits.

2.2 Literature Review on Group Identity

The concept of identity is described by social psychologists as beliefs, values, norms, and personalities of a single person or a group. Identity can be grouped into two broad categories: core (or individual) identity and periphery (social) identity. Social identity emphasizes the effect of a social context on an individual's beliefs, motivations and behavior. Depending on the social context, social identity can be further classified as professional identity, organizational identity, functional identity, group identity, cultural identity, societal identity, and so on. Social identity has been a popular topic in social psychology and organizational and industrial psychology (Dawes et al., 1988; Postmes et al., 2005). Accounting literature, in particular, has examined the effect of professional identity on auditors' behavior and decision-making (Bauer, 2015; King, 2002) as well as the effect of group identity on group members' behavior and performance (Kelly and Presslee, 2017; Mahlendorf et al., 2014).

Group identity refers to an individual's sense of belonging and affiliation towards a group (Tajfel and Turner, 1986; Turner, 1982). Group identity can be affected by office policies such as job rotation and team building activities. Strong group identity is indicated by a perception of belonging to the group, a feeling of a close relationship with group members, and interdependent

actions (Aron et al., 1992; Tesser and Campbell, 1982). Literature has documented both positive and negative effects of strengthening group identity (Bandiera et al., 2005; Hannan et al., 2013b; Kelly and Presslee, 2017; Towry, 2003). Management accounting literature, in particular, has documented that group identity may moderate the effectiveness of formal management control systems in regulating employees' behavior and performance (Kelly and Presslee, 2017; Towry, 2003). For example, Towry (2003) examined how group identity impacted the effectiveness of mutual monitoring systems in motivating employees to exert effort. In the mutual monitoring system, the two agents in a group could observe each other's effort choices (either "work" or "shirk"), but the principal could not. The two types of incentives examined in the study were a vertical incentive and a horizontal incentive. Under both incentive systems, the goal of the principal was to ensure that both agents chose to work, not to shirk. In the vertical incentive system, the principal asked each agent to report independently about the other agent's choice, and investigated only those reports about shirking. The principal rewarded (penalized) agents for their true (false) report of the other's shirking. However, in this setting, collusion occurred when both agents chose to shirk, but cover for one another by lying to the principal about the other agent's choice. Towry (2003) predicted and found that strengthening group identity facilitated inter-agent cooperation, and their cooperation manifested itself via their collusion in this setting. As such, strengthening group identity weakened the effectiveness of the vertical mutual monitoring system. In contrast, in the horizontal incentive system, the principal paid agents based on the level of group output. The best (worst) personal outcome was achieved for each agent when one agent shirked and the other agent worked (shirked). The horizontal incentive

system was most effective from the principal's perspective when both agents coordinated with each other by each choosing to work. The author found that strengthening group identity enhanced the effectiveness of the horizontal mutual monitoring system, because strengthening group identity facilitated inter-agent coordination.

Kelly and Presslee (2017) investigated in a tournament setting how group identity affected tournament competitiveness and performance when tournament winner proportion varied.⁸ They predicted and found that strengthening group identity led to a lower level of tournament competitiveness and performance when the winner proportion was large, but had no effect on the level of tournament competitiveness and performance when the winner proportion was small. Their result is attributed to the fact that strengthening group identity increased individuals' perceived overlap between self and others, which is the degree of psychological closeness between self and others (Gino and Galinsky, 2012). Greater self-other overlap raised individual's concern for others to the extent that they were willing to lower their own effort to increase other group members' chances to win.⁹

2.3 Literature Review on Sabotage

Sabotage occurs in many contexts including political campaigns, wars, sports tournaments, and organizations. Given the variety of definitions of sabotage that exist in

⁸ The tournament winner portion refers to the number of tournament winners as a percentage of total number of tournament participants

⁹ Strong group identity results in greater self-other overlap because as one feels more affiliated with a group, one would feel psychologically closer to others in the group. However, self-other overlap can also occur in a non-group setting where there are only two people. For example, two persons' self-other overlap will increase when they learn that both were born on the same date in the same year, and they are from the same city. I indirectly measure self-other overlap by asking whether they perceive other's outcome as their own in this study.

different contexts, I follow Lazear (1989, pp. 563) to define sabotage as “any (costly) actions that one worker takes that adversely affect the output of another.” In business organizations, sabotage can be targeted at other employees (horizontal sabotage) or at management or the organization (vertical sabotage). Although both types of sabotage are observed in practice, this dissertation focuses on horizontal sabotage.¹⁰

Organizations typically consider sabotage activities to be highly undesirable and would punish saboteurs if they were discovered (Analoui, 1995). Therefore, these activities are often undertaken covertly and concealed carefully. It is extremely difficult for researchers to collect reliable data concerning sabotage in actual organizational settings. Only a few researchers have surveyed and /or interviewed employees to collect data about their sabotage behavior in the work place (Ambrose et al., 2002; Harris and Ogbonna, 2006, 2012). Researchers who are interested in sabotage behavior have proposed theoretical models to make predictions about sabotage (Chen, 2003; Konrad, 2000), or conducted experiments to capture sabotage behavior in a lab setting (Harbring and Irlenbusch, 2008, 2011; Harbring et al., 2004, 2007), or analyzed sports tournaments where sabotage behavior can be directly and clearly identified (Balafoutas et al., 2012; Deutscher et al., 2013).

A large stream of analytical and experimental literature has examined sabotage behavior in various types of tournaments (Amegashie, 2013; Chowdhury and Gürtler, 2015).

Tournaments, which are commonly used in organizations, refer to incentive systems where

¹⁰ Vertical sabotage has been examined extensively in prior literature in organizational behavior (DiBattista, 1991). Vertical sabotage takes the form of employees’ collusion against superiors in the accounting literatures (e. g., Guo et al. (2017))

individuals (or teams) compete for a limited number of rewards such as bonus and promotion opportunities (Berger et al., 2013b). Tournament incentives are essentially contracts linking employees' compensation to their relative performance (i.e., their performance relative to other employees). Literature has documented both positive and negative effects of tournament incentives on employee's performance (Berger et al., 2013b; Hannan et al., 2008b). Employees under a tournament incentive can be motivated to exert effort to improve their absolute performance (positive effect), and/ or reduce their competitors' performance by sabotaging them (negative effect) (Chen, 2003; Deutscher et al., 2013; Gürtler and Münster, 2010).

Existing theoretical models and experimental studies of sabotage in tournaments, proposed and conducted by economists, focus on the economic reasons for sabotage; that is, sabotage can bring economic welfare to saboteurs by increasing their chance of receiving a favorable outcome. The size of the benefit (cost) of sabotage is positively (negatively) correlated with the level of sabotage behavior. The greater the benefit, the more sabotage behavior is observed. For example, in a repeated tournament setting with three persons competing for a bonus (i.e., the difference in pay between one winner and two losers), a larger bonus (i.e., greater benefit of sabotage) leads to more sabotage effort (Harbring and Irlenbusch, 2011). On the other hand, if the benefit of sabotage is sufficiently small, sabotage behavior may even disappear. In a lobbying tournament setting used by Konrad (2000) where multiple lobbying groups compete for a prize (i.e., a favorable policy outcome), sabotage effort directed toward a lobbying group reduces that group's chance of winning, thereby increasing all other groups' chances of winning. This means that the benefit of sabotage is similar to a public good, shared by all other groups.

Therefore, when the number of lobbying groups (i.e., the tournament size) is sufficiently large, the benefit of sabotaging a specific lobbying group approaches zero to the saboteur. As a result, a potential saboteur will not choose to sabotage others when the tournament size is sufficiently large. Unlike Konrad (2000) where the benefit of sabotage is shared by all groups, Harbring and Irlenbusch (2008) propose a model where the benefit of sabotage is only received by a saboteur and remains constant regardless of the tournament size (i.e., the number of competitors in the tournament). The authors predict and find that in such a setting, the tournament size does not affect sabotage behavior. These studies consistently show that the economic benefit of sabotage is positively associated with the level of sabotage behavior.

Contrary to the benefit of sabotage, economic theory suggests the cost of sabotage is negatively correlated with sabotage behavior. When the cost of sabotage is reduced (increased), more (less) sabotage would be expected. Balafoutas et al. (2012) used a sports tournament—the Judo world championships—to study how sabotage is related to the change in sabotage cost structure. Effective in 2009, a change in the Judo rules “provided fighters with an opportunity for one costless act of sabotage” (Balafoutas et al., 2012, pp. 427). They found more sabotage effort in 2009 (post-change) than in 2007 (pre-change), suggesting that sabotage increased after the cost of sabotage was lowered with the change in the rules. Because sabotage effort is closely related to the benefit and cost of sabotage, literature has suggested sabotage-reducing policies that decrease the benefit of sabotage, and / or increase the cost of sabotage (Chowdhury and Gürtler, 2015).

While economists have assumed that individuals are economically rational and mainly have a preference for wealth (i.e., economic benefits) and leisure, psychologists have consistently demonstrated that individuals also have a preference for social status (Festinger, 1954; Garcia et al., 2013; Hagerty, 2000; Suls and Wills, 1991). In addition to monetary benefits, individuals may sabotage others to gain social status such as receiving public recognition (Wang, 2016) and higher performance rank (Charness et al., 2014; Hartmann and Schreck, 2015). Wang (2016), although not directly referring to the term “sabotage”, studied a setting where participants were provided with a costless opportunity to undermine the performance of their group members by taking away points from their group members. She found that employees sabotaged others more when there was a public program recognizing top performers than when there was not. Similarly, Charness et al. (2014) documented that individuals sabotaged group members to a greater extent when they received the performance ranking of all group members than when they did not. Note that in both studies, economic benefits of sabotage were zero, as neither public recognition nor performance ranking status was linked to compensation in these studies.

The form of sabotage cost is not limited to just monetary costs (such as time, money, effort, etc.). Psychology literature has shown that individuals have a preference for conformity with social norms of honesty and fairness (Colquitt et al., 2001). When sabotage activities are perceived by a saboteur as a violation of social norms, the saboteur may feel guilty or have a negative self-image after sabotaging others. Such unfavorable feelings or other psychological effects experienced or anticipated by a saboteur as a form of psychological cost may stop a

potential saboteur from sabotaging in the first place. Therefore, one potential way to reduce sabotage is to increase the psychological cost of sabotage. For example, sabotage behavior can be mitigated by using language that clearly labels destructive activities as sabotage (Harbring and Irlenbusch, 2011). Labeling destructive activities with the negative term “sabotage” increases the psychological costs associated with these activities as the term “sabotage” highlights that the activity is undesirable and violates societal norms. Another form of sabotage cost arises from revenge or retaliation from victimized individuals. When a saboteur’s identity is revealed, the likelihood of retaliation and the cost of sabotage increase, therefore sabotage effort is reduced (Harbring et al., 2004).

2.4 Hypothesis Development under Psychology Theories

2.4.1 Main Effect of Group Identity on Sabotage¹¹

An individual’s sense of belonging and affiliation towards a group is an indicator of the individual’s group identity. Strong group identity can increase the psychological closeness between self and others in the group, conceptualized as self-other overlap (Aron et al., 1992; Aron et al., 1991). Individuals with greater group identity are also more likely to perceive themselves as similar to others in their group (Ashforth and Mael, 1989; Suls et al., 2002). Higher perceived similarity increases social comparison, because people compare themselves more with others who are more similar to themselves and considered as a good gauge of their own ability (Festinger, 1954). Increased social comparison leads to more competition where

¹¹ A summary of the psychologic based theories and predictions and the reasoning behind each prediction can be found in Table 8.

people strive to do better than others (Garcia et al., 2013). Therefore, strengthening group identity may increase competition and therefore sabotage behavior of employees.

However, a counter argument exists that individuals with greater self-other overlap are more likely to feel the outcomes of other group members as their own (Gino and Galinsky, 2012), and therefore they are also more likely to protect others' outcomes by not sabotaging others. This counter argument is supported by Charness et al. (2014) who find that people sabotage group members to a lesser extent if the group members are from the same school than if they are from a different school. They speculate that group identity is the reason for the reduced sabotage, but they did not hypothesize this relationship.

As it is uncertain which of the two competing forces mentioned above would dominate, I make the following null hypothesis:

H1 (Null form): *In the presence of RPI, strengthening group identity has no impact on sabotage.*

2.4.2 Main Effect of Compensation Type on Sabotage

Empirical evidence supports that individuals may sabotage their coworkers to achieve a better performance rank when they are under the PR contract (Wang, 2016) or under the FW contract (Charness et al. (2014). I predict that there is more sabotage under the PR contract than under the FW contract and this difference is driven by the following three mechanisms.

First, social comparison theory suggests that people often evaluate themselves by comparing “self” with others on certain dimensions. A favorable comparison can enhance self-esteem, especially if the comparison dimension such as income, ability, and academic

performance is important and relevant to one's self-esteem.¹² One's income level can be a relevant comparison dimension because it represents social status. Solnick and Hemenway (1998) used survey data to demonstrate that people care about their income relative to others' income (i.e., relative income). They found that half of surveyed respondents preferred to earn more money than others (i.e., better relative income status), even though this better relative income status was obtained at the cost of half of their absolute income. Hagerty (2000) showed that income comparison within a community affects community members' assessments of life satisfaction. Experimental research demonstrates that people who have anti-social preferences may reduce another's income to increase their own relative income (Fehr et al., 2008). Social comparison on the income dimension may occur under the PR contract where people receive varying levels of income proportional to their individual performance. The performance-based ranking they receive is essentially their income ranking. In contrast, social comparison on the income dimension cannot occur under the FW contract, simply because people earn the same level of income, that is, the flat wage. In other words, the PR contract provides an additional comparison dimension (income) that may be personally relevant to one's self-esteem. Therefore, I expect that the intensity of social comparison will be stronger under the PR contract.

In addition to the income dimension, the ability dimension is also relevant to one's self-esteem. Tafkov (2013) found that the intensity of social comparisons on performance is stronger under a PR contract than under a FW contract. Participants were asked to solve

¹² I recognize that comparison dimensions that are relevant to one person may not be relevant to another person (Major et al., 1991). For example, some people care about their academic ability relative to others, while others do not.

multiplication problems with three digit numbers in their heads. Performance in this complex task was jointly determined by participants' ability and effort. Therefore, performance differences could be attributed to either an ability difference or an effort difference or both. Tafkov (2013) argued that when participants were all motivated by the PR contract to work hard (i.e., the effort difference across individuals was relatively small), they would be more likely to attribute any performance difference to ability, believing that performance-based ranking better reflected their ability level. In contrast, under the FW contract where participants were less motivated to exert effort, they were more likely to attribute relative performance to an effort difference. Because ability is important and relevant to one's self esteem, the intensity of social comparison is stronger under a PR contract where ability is more likely to be compared than under a FW contract where effort is more likely to be compared. I expect that this argument also holds in my setting; that is, the intensity of social comparison on the ability dimension will be stronger under the PR contract than under the FW contract. Overall, I expect that social comparison intensity is stronger under the PR contract than under the FW contract. Thus, I predict that there will be more sabotage under the PR contract than under the FW contract because sabotage can be used to improve one's relative status.

Second, victims of sabotage may experience negative feelings such as anger, and may feel disadvantaged in their rank status. They may sabotage others as a way to vent their negative feelings and/or to narrow the disadvantageous rank position. For example, Bushman et al. (2001) find that people have the tendency to behave aggressively toward others to improve their mood. Kahneman and Miller (1986) show that people hold strong norms about fair allocation of

resources and will take actions to correct inequity. People who are sabotaged and therefore experience production loss bear economic loss under a PR contract, but not under a FW contract. Therefore, I expect that people working under a PR contract will experience greater negative feelings, have greater motivation to vent such negative feelings, and are therefore more likely to sabotage others than those under a FW contract. Similarly, I expect that people working under a PR contract feel greater disadvantage in relative rank and earnings, and have greater motivation to reduce the disadvantageous relative rank and earnings by sabotaging others than those working under a FW contract.

Third, a small percentage of people have an antisocial preference and derive pleasure simply from being nasty (Abbink and Sadrieh, 2009; Zizzo and Oswald, 2001). Assuming that their pleasure level is positively associated with the level of damage they cause to others, I predict that these antisocial individuals may gain more pleasure from sabotaging under the PR contract where they can cause greater damage (including loss of both earnings and rank). Therefore, individuals who are motivated by deriving pleasure from being nasty may be more likely to sabotage under the PR contract than the FW contract. The three mechanisms consistently predict more sabotage under the PR contract than under the FW contract.

However, it is still possible that there is more sabotage under a flat wage contract than under a piece rate contract. Because sabotage under a PR contract has a negative effect on victim's economic payoff, a potential saboteur may feel more guilt and have a higher psychological cost associated with sabotage under a PR contract, therefore engaging in less sabotage. Another possibility predicting more sabotage under a flat wage contract is that an

individual can only distinguish him or herself under a flat wage contract via a higher performance rank (as opposed to a higher performance rank and higher earnings under a PR contract), and s/he may be more motivated to sabotage others. Despite these possibilities, I make the following prediction based on the three mechanisms mentioned above:

H2: In the presence of RPI, there will be more sabotage under a piece rate contract than under a flat wage contract.

2.4.3 Interaction Effect between Compensation Type and Group Identity on Sabotage

I argued a null hypothesis in H1 that strengthening group identity does not change sabotage behavior because it increases “perceived similarity” and “self-other overlap” that have opposite effects on sabotage, and the net effect cannot be determined. I next predict that strengthening group identity is more likely to increase sabotage under the PR contract than under the FW contract. Unlike the FW contract, the PR contract links pay to individual performance. Financial incentives can lead people to increase their focus on themselves rather than on others. Ma-Kellams and Blascovich (2013) found that people were less relational when receiving financial incentives. In their study, people made inferences about the emotions experienced by others in a videotape, and their inferences were less accurate when accuracy was linked to financial incentives. Vohs et al. (2006) documented that people who were primed with money were more likely to put more physical distance between self and other, and were less likely to seek help from others, or help others. Therefore, when group identity is increased, individuals under the PR contract may experience a smaller increase in self-other overlap than those under the FW contract. In other words, the effect of group identity reducing sabotage through increased

self-other overlap) is weaker under the PR contract than the FW contract, such that group identity is more likely to increase sabotage through increased perceived similarity under the PR contract than the FW contract. I make the following formal prediction:

H3: In the presence of RPI, strengthening group identity increases sabotage more under a piece rate contract than under a flat wage contract.

2.4.4 Main Effect of Group Identity on Effort

In parallel with H1, the null hypothesis of H4 predicts that strengthening group identity does not have impact on effort. Similar to my arguments for H1, individuals with greater group identity are more likely to perceive themselves as similar to other group members (Ashforth and Mael, 1989; Suls et al., 2002). According to social comparison theory, people are more likely to compare themselves with more similar (as opposed to dissimilar) others who are considered as a better gauge of their own ability (Festinger, 1954). Therefore, higher perceived similarity increases social comparison (Festinger, 1954), leading to more in-group competition where people aims at performing better than others (Charness et al., 2014; Garcia et al., 2013). Therefore, strengthening group identity may increase competition and therefore effort behavior of employees (Charness et al., 2014).

However, a counter argument exists that individuals with strong group identity have greater self-other overlap and are more likely to feel the outcomes of other group members as their own (Gino and Galinsky, 2012). Their self-esteem is less threatened (enhanced) if their outcomes are unfavorable (favorable) relative to group members' outcomes (Gardner et al., 2002). This literature suggests that group members who identify more with their group will

engage less in social comparison and therefore effort.

As it is uncertain which of the two competing forces mentioned above would dominate the relationship between group identity and effort is unclear. In addition, the organizational psychology literature provides insight about how group identity affects effort. For example, prior research has shown that group identity is a predictor of workers' job satisfaction (van Dick et al., 2008), but the link between workers' job satisfaction and job performance is less clear (Iaffaldano and Muchinsky, 1985). I formally state the following null hypothesis:

H4 (Null form): *In the presence of RPI, strengthening group identity has no impact on effort.*

2.4.5 Main Effect of Compensation Type on Effort

I predict that effort level will be higher under the PR contract than under the FW contract for the following two reasons. First, individuals may be motivated by monetary incentives to exert effort. Bonner and Sprinkle (2002) argue that monetary incentives can motivate effort and performance. The PR contract provides a stronger monetary incentive (i.e., pay for performance) to exert effort than the FW contract. Therefore, effort should be higher under the PR contract than FW contract. Second, in a setting where RPI is provided, I expect that the intensity of social comparison is stronger under the PR contract than FW contract, as I have argued for H2. The stronger intensity of social comparison would translate into more effort under a PR contract than a FW contract. The hypothesis is formally stated as follows:

H5: *In the presence of RPI, there will be more effort under a PR contract than under a FW contract.*

Most prior research finds that effort is higher under a PR contract than under a FW contract in settings where individuals' performance depends only on their own effort and ability, not on the actions or choices of their peers. This hypothesis replicates prior research, in a setting where individual's performance is negatively impacted by the sabotage actions or choices of their peers.¹³

2.4.6 Interaction Effect between Group Identity and Compensation Type on Effort

In H4, I argued that strengthening group identity will increase self-other overlap which reduces competition, and / or induces stronger perceived similarity that increases competition.¹⁴ The effect of group identity on competition and hence effort depends on the relative strength of the two opposing effects associated with increased “self-other overlap” and increased “perceived similarity.” When the effect associated with increased “self-other overlap” is weaker than the effect associated with increased “perceived similarity,” strengthening group identity can increase competition and hence effort. On the other hand, when the effect associated with increased “self-other” overlap is stronger than the effect associated with increased “perceived similarity,” strengthening group identity can decrease competition and hence effort.

The strength of the competition-reducing (competition-increasing) effect may depend on the degree of self-other overlap (perceived similarity). The lesser the degree, the weaker the

¹³ There is also prior research about how helping and cooperative behavior improve individual performance (Tyler and Blader, 2003), but this is beyond the scope of my study that focuses on sabotage.

¹⁴ Unlike self-other overlap, perceived similarity captures one's perception on whether another person is similar. Perceived similarity may or may not increase self-other overlap. For example, two persons of the same racial origin will feel psychologically closer to each other (i.e., greater self-other overlap) when they met in a country where persons of their race is rare than in a country where the persons of their race is common.

effect is. In H3, I argue that strengthening group identity increases self-other overlap to a smaller extent under a PR contract than under a FW contract. Therefore, I predict that the competition-reducing effect associated with increased “self-other” overlap is weaker under a PR contract than under a FW contract. In H5, I argue that a PR contract motivates more effort than a FW contract because a PR contract offers a monetary incentive and a more intense social comparison than a FW contract. Consequently, I predict that the competition-increasing effect associated with increased “perceived similarity” is no different under a PR contract than under a FW contract. As a result, strengthening group identity is more likely to increase competition and hence effort under a PR contract than under a FW contract. Thus, I expect the effect of group identity on effort is more likely to be more positive under the PR contract than under the FW contract, and I make the following prediction:

H6: In the presence of RPI, strengthening group identity increases effort more under a piece rate contract than under a flat wage contract.

Chapter 3

Method

3.1 Experiment Design

I employed a 2 (*Compensation Type: Piece Rate versus Flat Wage*) x 2 (*Group Identity: Moderate versus Strong*) x 8 (*Rounds*) mixed-factorial experiment to test my predictions.¹⁵ *Compensation Type* and *Group Identity* were manipulated between-subjects at the group level, while *Rounds* was manipulated within-subjects. In addition, I used a baseline condition where participants received the treatments of *Moderate Group Identity* and *Flat Wage*, but they were not provided with the opportunity to sabotage group members. The purpose of the baseline condition was to establish the benchmark for effort level when there was no sabotage opportunity. I conducted 12 experimental sessions where participants were randomly assigned by the computer into groups of three. Session 1, 7 and 12 were for the baseline condition. Each of the other 9 sessions was randomly assigned to one of the two *Group Identity* conditions. Within each of the 9 sessions, groups received one of the two *Compensation Type* treatments. Participants competed in performing a real-effort task (i.e., letter-decoding) against the other two participants in their assigned group for eight sequential rounds (*Rounds*). Participants remained in the same group and the same experimental condition for all eight rounds. In total, 120 undergraduate students in 40 groups of three participated in my study. Table 1 indicates how the forty groups were distributed across sessions as well as across the experimental conditions.

[Insert Table 1 here]

¹⁵ This study has been approved by Office of Research Ethics at the University of Waterloo.

3.2 Tasks

I used Z-tree software (Fischbacher, 2007) to develop a program allowing participants to perform the main letter-decoding task on computers. Participants worked individually on the task for eight rounds and each round was two minutes long. All participants in an experimental session started each round at the same time. Using a decoding key provided onscreen, participants decoded a letter into a number. Once participants accurately decoded a letter, the computer program provided them with another letter. Each letter correctly decoded was counted as one production unit. During a round, participants' cumulative production units (i.e., the number of correct decodes) for that round and the time remaining for that round were shown onscreen in real-time. Participants had the option to spend their time reading brain teaser questions instead of decoding letters, although they were explicitly told that they were only paid for working on the decoding task. I provide participants with the option to read brain teaser questions rather than work on the decoding task to ameliorate the concern that participants in a lab setting may continue to exert effort on the decoding task to pass time despite a lack of motivation for the decoding task if they lack an alternative task.

The task included the likelihood of a production loss of 11 units. In each round, each participant could lose 11 production units with a likelihood of 15% due to a random act of nature. Participants could not change their own likelihood of production loss, but could choose to increase the likelihood of production loss for their group members.¹⁶ At a cost of 1 cent, a

¹⁶ I operationalize the sabotage behavior using participants' decision to increase others' likelihood of experiencing loss. A detailed review of other methods of operationalizing sabotage and why I chose this method is provided in Appendix D.

participant could choose to increase by 10% the likelihood of a group member experiencing the 11 production unit loss. All participants made these choices simultaneously before each production round started. Therefore, the likelihood of any participant experiencing a production loss in any round was 15%, 25% or 35%, depending on whether zero, one, or two fellow group members, respectively, chose to increase the participant's likelihood of a production loss in that round. In the baseline condition where participants could not increase group members' likelihood of a production loss, the likelihood was always 15% (due to only a random act of nature). After the two-minute production time elapsed in each round, participants were informed of their amount of production loss (i.e., either 11 or 0 units), but they did not learn their actual likelihood of a production loss for that round.¹⁷ In addition, they learned the amount of the production units they generated (i.e., the number of letters that had been correctly decoded for that round), and their final production units (final production units = production units – production loss). However, participants did not learn any production-related information about their group members except the performance ranking of all three group members. The ranking was based on the final production units of the three participants in the same group. Participants could influence their performance rank in two ways: by working hard to increase their own production units and by choosing to increase the likelihood of the other two group members losing production units. Before each round, participants were shown all the ranking information of previous rounds. In addition to production-related information, they also learned, at the end of

¹⁷ The computer program randomly selects a number between 0 and 1 (distribution is uniform). The participant loses production units if the random number drawn is smaller than the likelihood of production loss for that participant in that round. For example, if the likelihood of production loss is 15% and the number drawn is smaller than 0.15, the participant will lose production units, but if it is greater than 0.15, no production units are lost.

each round, information about their earnings including the beginning balance, earnings of that round, costs of that round, and the ending balance. They did not know the earnings of fellow group members.

Before starting their decoding rounds, participants were required to answer correctly some information check questions to ensure that they had common knowledge of the task setting. These questions tested participants' knowledge of the potential reasons for a production loss, the basis on which they were ranked, the costs associated with their choice to increase the likelihood of fellow group members experiencing a production loss, and how their pay was calculated.

3.3 Participants

I recruited 120 undergraduate students from a large Canadian public university to participate in one of twelve experimental sessions. Each session consisted of three to fifteen participants resulting in one to five groups, as illustrated in Table 1. The mean (standard deviation) age of these participants was 18.1 years (0.81) and the number (percentage) of males who participated was 53 (44.17%). The number (percentage) of students in their first, second, third and fourth year of study was 110 (91.67%), 7 (5.83%), 3 (1.67%) and 1 (0.83%) respectively. In total, 88 (73.33%) participants were majoring in business, whereas 32 (26.67%) were majoring in Science and Business.

3.4 Procedures

Upon arrival for an experimental session, participants were greeted and seated at a computer. The Z-tree program randomly assigned each participant a Group Number, a Group Member ID (i.e., *A*, *B*, or *C*) in the randomly assigned group, and a unique Participant ID.

Participants transitioned to another section of the room to experience their *Group Identity* manipulation. Then, participants returned to their computers and responded to the three-item group identity questionnaire adapted from Kelly and Presslee (2017). Specifically, participants indicated on a seven point Likert scale (1-strongly disagree to 7-strongly agree) if they were happy to be a part of their group (*Happy*), if they felt that they were members of their group (*Belong*), and if they liked their group members (*Like*). After answering the questionnaire, participants began to read task instructions onscreen to learn about the letter-decoding task. Before beginning each round, participants were asked whether they would like to increase the likelihood of each of their two fellow group members losing production units in that round. At the end of each round, participants received private information about their own performance and earnings as well as the ranking of all group members. After completing the eight production rounds, participants responded to the same three statements about their group identity (*Happy*, *Belong* and *Like*) and other post-experimental questions. The program then told participants how much they earned for all eight rounds, and they collected their earnings as they left the room.

3.5 Independent Variables

My first independent variable, *Group Identity*, was manipulated between sessions and at the group level; that is, all groups in the same session experienced the same manipulation, which I adopt from Kelly and Presslee (2017). Participants in the *Strong Group Identity* condition were provided with more opportunities to interact and cooperate with their fellow group members. Each group was instructed to sit at the table on which a tent card displayed the matching group number. The color of the tent card was unique to the group. Each group received a booklet of

team game sheets, and the color of the booklet matched the color of the tent card. Once seated, group members were asked to generate and record a group name on the cover page of the team game booklet. Groups then played a slogan guessing game where each group recorded the names of companies/products they guessed were related to 16 company/product slogans (e.g., “Zoom! Zoom!” - Mazda). The groups competed against other groups to get the highest number of correctly guessed company/product names and the winning group(s) claimed a basket of chocolate bars (valued at \$15) to be shared between all group members. Playing a group game helps foster strong group identity through interacting and cooperating on a task, sharing a common outcome (i.e., the shared prize), and battling together against other groups (Eckel and Grossman, 2005; Friedkin and Simpson, 1985). Groups guessed 10 slogans and then returned to their computers to individually perform the letter-decoding task for the eight production rounds. To maintain the saliency of the *Group Identity* manipulation throughout the production rounds, I used the group's unique name when displaying performance ranking of each production round. Finally, once the eight rounds were finished, the groups returned to their group-game table and continued guessing the remaining 6 slogans.¹⁸

Participants in the *Moderate Group Identity* condition experienced little interaction and cooperation with their fellow group members. Group members sat together at a table with three

¹⁸ Four experimental sessions were assigned to the strong identity manipulation. The number of groups (winning groups) were 3 (1 winning team), 5 (2 winning teams), 4 (1 winning team) and 4 (1 winning team) respectively. Overall, 5 out of 16 (close to 1/3) groups who experienced the manipulation of strong group identity were winners. The slogan guessing game is used to manipulate the level of group identity before the letter-decoding task. The outcome of the game can affect group identity differently. Group identity may be enhanced in the winning team, but weakened in losing teams. To prevent the game outcome from affecting group identity, I split up the slogan-guessing into two periods, which allowed me to manipulate group identity before the letter-decoding task, and to announce the game outcomes only at the end of the experiment

booklets of white-colored individual game sheets, one for each group member. All tent cards on the tables were in white. Therefore, there was no unique color for each group. Participants took part in the same slogan guessing game as in the *Strong Group Identity* condition except that they competed as individuals instead of as a group. That is, participants competed against all other participants in the room (including those in their group) for rewards. The top one-third of individuals in an experimental session each won a reward of chocolate bars valued at \$5. Participants guessed 10 slogans before returning to the computers to perform the eight production rounds. After the eight production rounds, they moved to the designated section of the lab again to continue guessing the remaining six slogans.

My second independent variable is *Compensation Type*. In each session, groups were randomly assigned by computer to either a *Piece Rate* contract or a *Flat Wage* contract for all eight production rounds. This manipulation was applied after the *Group Identity* manipulation. Under a *Flat Wage* contract, participants received fixed pay of \$2 dollars per round. In contrast, under a *Piece Rate* contract, participants earned 5 cents for each final production unit they generated for that round.

3.6 Dependent Variables

My two main dependent variables are *Sabotage* and *Effort*. *Sabotage* is the participant's choice of increasing group members' likelihood of experiencing a production loss measured as "0", "1" or "2" corresponding to the number of group members whom the participant sabotages. *Effort* was measured using two proxies (1) as the number of letters correctly decoded in a round

by a participant (i.e., production units before deducting production loss)¹⁹ (2) as related to the amount of time each participant spent on reading brain teaser questions in each round, with more time spent reading brain teaser questions representing less effort.

¹⁹ Unlike production units, final production units are not fully controlled by participants. Both a random act of nature and the choices made by fellow group members can affect final production units. The focus of this study is on production units, which are fully controlled by participants.

Chapter 4

Results

4.1 Manipulation Checks

To evaluate the effectiveness of the between-subjects manipulation of *Group Identity*, I adopted the group identity measure used by Kelly and Presslee (2017). Participants responded to three questions (see Section 3.4 Procedures for the questions), first immediately before the start of the letter-decoding task (the pre-task measure) and then again after the end of the letter-decoding task (the post-task measure). Participants were asked whether they agreed or disagreed with three items using a 7-point Likert-type scale with the end points labeled “Strongly disagree” (1) and “Strong agree” (7).²⁰ Confirmatory factor analysis indicated that the three questions captured a unidimensional construct in both the pre-task and the post-task measures, with all loadings greater than 0.78 and both eigenvalues (variances explained) greater than 2.45 (81.58%). Further, both the pre-task and the post-task measures had Cronbach alphas greater than 0.88. Therefore, I averaged a participant’s responses to the three questions as a measure of *Group Identity*. Both the pre-task *Group Identity* measure and the post-task *Group Identity* measure in the *Strong Group Identity* condition were significantly higher than those in the *Moderate Group Identity* condition (Pre-task: 6.06 vs. 4.55, $t=8.41$, $p<0.001$; post-task: 6.03 vs. 4.79 $t=6.02$, $p<0.001$)²¹. The manipulation of group identity appears to have been successful.

²⁰ Unless otherwise indicated, this 7-Likert point agreement scale is used for the questions in the post-experimental questionnaire. The levels from 1 to 7 correspond to the labels “Strongly disagree”, “quite disagree”, “slightly disagree”, “neither agree nor disagree”, “slightly agree”, “quite agree” and “strongly agree”.

²¹ I created a variable of *Difference* by taking the difference between the post measure of group identity and the pre-measure of group identity. I found that the average of *Difference* is 0.11, marginally greater than 0 ($Z=1.47$, $p<0.1$). This suggests that the group identity has increased after interacting with other group members in the letter-decoding

To manipulate the compensation types, the task instructions explained to participants how their earnings (i.e., compensation) would be determined. Participants under a *Flat Wage* (FW) contract received a fixed amount of earnings per round, whereas those under a *Piece Rate* (PR) contract are paid \$0.05 for every final production unit (Note: final production units = production units - production loss units) that they generated in a round. I used a multiple-choice question to test participants' understanding of their compensation type prior to them starting the decoding task.²² Right after submitting their answer to the question, participants received a feedback message telling them whether their answer was correct or incorrect, and revealing the correct answer to those participants whose answers were incorrect. Participants had to answer this question again until the correct answer was submitted. The result showed that 52.5% of participants answered the question correctly at their first attempt, and 46.5% of participants answered the question correctly on their second attempt. This suggests that 99% of participants understood their compensation type after they were tested by this question. Therefore, it is reasonable to conclude that my manipulation of compensation type was successful. I had other comprehension check questions to test if participants understood the key features of the setting.

task. I ran a linear regression using *Difference* as a dependent variable and group identity and compensation type as two independent variables. I found that group identity has a significant negative effect on *Difference* (Coef. =-0.49, $t=-2.22$, $p<0.05$). I found no main effect of compensation type on *Difference*. Further tests show that group identity has increased by 0.24 ($z=2.11$, $p<0.05$) in the MI condition, and remained the same (Coef. =-0.02, $z=-0.29$, $p=0.62$) in the SI condition.

²² The multiple-choice question was stated as: "Which of the following statements correctly describes your earnings?" a) "My earnings is fixed for each round, regardless of my production units. I earn 40 ECUs each round". b) "My earnings are based on my rank in the group. The higher is my rank, the more I earn". c) "My earnings are based on my final production units (i.e., production units – lost production units). I earn 1 ECU for 1 final production unit." d) "My earnings are based on my production units. I earn 1 ECU for 1 production unit." e) "None of the above statements is true."

Participants understood that they would work on the same task as the other participants in their group (i.e., the same decoding template, and the same sequence of letters to be decoded), as evidenced that 93.33% of participants answered the related question correctly at their first attempt. 94.17% participants understood that the final production units are the difference between production units and production loss units on their first attempt, and 90.83% participants understood that the ranking is based on final production units on their first attempt. 84.17% of participants knew what factors affect the probability of experiencing production loss (i.e., a random act of nature and the sabotage decisions made by their group members.) on their first attempt, and 80.80% understood the cost associated with increasing the likelihood of a group member experiencing production loss on their first attempt. Overall, it shows that participants have a reasonable understanding of the features in my setting.

4.2 Descriptive Statistics and Tests of H1 and H2 (*Sabotage*)

Before the beginning of each round, each participant chose whether to increase the likelihood of each of his or her two group members experiencing a production loss. I proxy a participant's level of *Sabotage* in a round as the number of group members whose likelihood of experiencing a production loss has been increased by the participant in that round. The level of *Sabotage* of a participant in a round can be 0 (neither of the participant's two group members' likelihood has been increased by the participant), 1 (one of the participant's group members' likelihood has been increased by the participant), or 2 (both of the participant's group members' likelihood have been increased by the participant). In Figure 1, the mean *Sabotage* in each round is contrasted between the *Piece Rate* (PR) and the *Flat Wage* (FW) conditions (Panel A), and

between the *Strong Identity* (SI) and *Moderate Identity* (MI) conditions (Panel B). In Figure 1 Panel A, mean *Sabotage* levels are higher in all 8 rounds in the PR condition than in the FW condition. Similarly, in Figure 1 Panel B, mean *Sabotage* is higher in the SI condition than in the MI condition in all rounds except round 7. Statistical significance of these differences is tested and reported in subsequent paragraphs.

[Insert Figure 1 here]

Using *Sabotage* as the dependent variable, I next performed a multilevel mixed-effect ordered logistic regression to control the random effects of individual differences as well as group differences with multiple individuals nested in each group. I included the following control variables in the regression: *PriorLoss*, *PriorRank*, and *PriorSabotage*. The variable *PriorLoss* takes the value of “1” if a participant lost production units in the prior round. I expect that participants experiencing a production loss in the prior round are more likely to sabotage their group members in the current round because they are retaliating. The variable of *PriorRank* is a participant’s rank (either 1, 2, or 3) achieved in the prior round. I predict that participants who ranked second are more likely to sabotage than those who ranked third, because those ranked third have a lower expectancy for achieving the first rank through sabotage and thus, the incremental utility of sabotage is lower for third-ranked individuals. The variable *PriorSabotage* refers to a participant’s level of sabotage in the prior round. I expect that participants who sabotaged in the prior round are more likely to sabotage in the current round because these participants may innately be more prone to sabotaging others. In addition, I control the individual differences in concerns over economic cost and violation of personal codes, both of which can

impact a person's tendency to sabotage irrespective of my experimental manipulations. The variable of *Concern of Economic Cost* is the level of agreement with the statement "In the study, I hesitated about increasing the probability of my fellow group members losing production units because it would cost me ECUs and reduce my earnings." The variable is measured on a 7-likert scale with "1" representing "Strongly disagree" and "7" for "Strongly agree". On the same scale, the variable of *Concern of Violation of Personal Codes* captures the level of agreement with the statement "In the study, I hesitated about increasing the probability of my fellow group members losing production units because it would be against my personal code of conduct, irrespective of how others regard such behavior." I expect that individuals with higher level of concern over economic cost and violation of personal code are less likely to sabotage others.

I used a subsample of 85 participants without including the 21 participants from the baseline condition who had no opportunity to sabotage group members and 14 participants who had opportunity to sabotage, but did not demonstrate their understanding of what factors affect the likelihood of experiencing production loss.²³ The results are shown in Table 2. The odds of employees sabotaging others in the SI condition was 5.20 times that in the MI condition ((95% CI, 0.89 to 30.46)), $Z=1.83$, $p<0.1$, marginal significance).²⁴ This result rejects the null hypothesis

²³ Before participants started their task, they were tested on their understanding and knowledge of this study. One of the questions was to test whether they understood what impacted the probability of a production loss. It is stated as follows: "In each round, what is the probability of a person losing 11 production units?" Four answers were provided (a) always 15% (b) always 25% (c) always 35% (d) 15%, 25%, or 35%, depending on the choices made by the person's fellow group members. The correct answer is (d). 85 out of the 99 participants answered this question correctly on their first attempt. Using a sample including only the 85 participants, I find that the odds of employees sabotaging others in the SI condition was 5.20 times that in the MI condition ((95% CI, 0.89 TO 30.46), $Z=1.83$, $p=0.067$).

²⁴ When using the full sample of 99 participants who had opportunity to sabotage, the result is weaker with $p=0.110$ (the odds ratio is 3.95, 95% CI, 0.73 to 21.31, $Z=1.60$).

H1, suggesting that strengthening group identity increases sabotage. As to H2, the odds of employees sabotaging group members in the PR condition was 7.90 times that in the FW condition ((95% CI, 1.53 to 40.66), $Z=2.47$, $p < 0.05$). Consistent with H2, this result indicates that there was more sabotage under a PR contract than under a FW contract. In addition, consistent with my expectation, the odds of employees sabotaging group members after experiencing a production loss in the prior round was 2.69 times the odds of those who experienced no production loss in prior round ((95% CI, 1.38 to 5.24), $Z=2.90$, $p < 0.01$). This result also confirms that the level of sabotage in the prior round predicts sabotage behavior in the current round. Specifically, the odds of employees sabotaging group members after sabotaging one group member in the prior round was 1.91 times the odds of those who did not sabotage group members at all in the prior round ((95% CI, 0.97 to 3.74), $Z=1.87$, $p < 0.1$, marginal significance). Similarly, the odds of employees sabotaging group members in the current round after sabotaging two group members in the prior round was 3.21 times the odds of those who did not sabotage group members at all in the prior round ((95% CI, 1.43 to 7.20), $Z=2.83$, $p < 0.01$). Finally, as predicted, the result shows that employees' prior rank can affect their decision to sabotage in the current round. Specifically, the odds of employees sabotaging group members in the current round after they were ranked second in the prior round was similar to the odds of those who were ranked first in the prior round (odds ratio=0.88, (95% CI, 0.43 to 1.82), $Z=-0.34$, $p=0.735$) (i.e., participants ranked second in the prior round are just as likely to sabotage others as participants ranked first). Consistent with my expectation, the odds of employees sabotaging group members in the current round after they were ranked last in the prior round was 0.54 times the odds of those who were ranked second in the

prior round ((95% CI, 0.27 to 1.11), $Z = -1.67$, $p < 0.1$, marginal significance).²⁵ (i.e., participants ranked last in the prior round are less likely to sabotage others than those ranked second in the prior round).

In addition, when the *Concern for Economic Cost* is one level higher, the odds of employees sabotaging group members is 0.78 times less ((95% CI, 0.59 to 1.02), $z = -1.80$, $p < 0.1$, marginal significance). This result suggests that employees' concern about the costs associated with sabotage had a significantly negative effect on their sabotage behavior. Similarly, when the *Concern for Violation of Personal Code* is one level higher, the odds of employees sabotaging group members is 0.53 times less ((95% CI, 0.37 to 0.75), $z = -3.59$, $p < 0.001$). This result indicates that employees' concern about violating their personal code had a significantly negative effect on their sabotage behavior.

[Insert Table 2 here]

4.3 H3 Interaction Effect (*Sabotage*)

To study potential interaction effects and for the convenience of discussion, I label the 4 treatment conditions using the variable “*Cell*” with 4 categories: FM (Flat Wage/Moderate Identity), FS (Flat Wage/Strong Identity), PM (Piece Rate/Moderate Identity) and PS (Piece Rate/Strong Identity). H1 takes a form of null hypothesis: strengthening group identity does not change sabotage. H3 predicts that unlike a FW contract, a PR contract limits individuals' self-

²⁵ Further tests show that this result is mainly driven by the Piece Rate condition. The odds ratio of employees sabotaging group members are the same in the FW condition regardless of whether they were ranked 1st, 2nd, or third in the prior round. This confirms with my argument for H2 that ranking status are more likely to induce sabotage in the PR condition than in the FW condition.

expansion to include others as part of self, and therefore strengthening group identity should have a more positive effect on sabotage under a PR contract than under a FW contract. This prediction of an additive interaction can be expressed using the odds ratio of sabotage as follows: Odds ratio [FS]-Odds ratio [FM] < Odds ratio [PS] – Odds ratio [PM] or equivalently Odds Ratio [PS] - Odds Ratio [PM]-Odds Ratio [FS] +Odds Ratio [FM] >0, where Odds Ratio [FM] =1 because FM is the reference condition in my analysis such that its odds ratio is 1. Therefore, the direct test of H3 is to examine whether the value of λ is significantly positive, where $\lambda =$ Odds Ratio [PS] - Odds Ratio [PM]-Odds Ratio [FS] +1(VanderWeele and Knol, 2014). After running the multi-level ordinal logistic regression discussed in session 4.2, I ran a direct test to see whether λ is significantly greater than zero. I found no evidence to support H3 ($\lambda= 1.10$, 95% confidence interval [-15.89, 18.09], $z=0.13$, $p=0.90$).

4.4 Additional Analyses on Reasons for Sabotage

To better understand participants' motivation for sabotage, I listed in the post-experiment questionnaire five potential reasons for sabotaging, and asked participants to indicate their level of agreement with each reason on a 7-point Likert agreement scale (see Appendix C for details). I received responses from 50 participants who had sabotaged other group members at least once during the study.²⁶ I considered that participants agreed with a reason if their response is between “5” and “7” inclusive indicating “Somewhat agree” and “Strongly agree” respectively. As shown in Table 5, the most prevalent reason was “I wanted to improve where I rank in terms of final production units” (33.3% for FW, 57.4% for PR, 49.0% for MI, and 43.8% for SI),

²⁶ This question is not applicable to those applicants who have never sabotaged during the study.

whereas the least prevalent reason was “I believed my fellow group members had increased my probability of losing production units, and I was angry at them” (6.67% for FW, 13.0% for PR, 11.8% for MI, and 8.3% for SI)²⁷.

Consistent with my expectation, results support my arguments for H2 that the intensity of social comparison is stronger under a PR contract where people care about how their earnings is compared to others’ earnings. 57.4% of participants in the PR condition have sabotaged others because they wanted to improve their rank in terms of final production units, a percentage that is significantly greater than 33.3% in the FW condition ($\chi^2 (1) = 5.72, p < 0.05$). Moreover, 40.7% of participants in the PR condition have sabotaged others to improve their rank in terms of earnings even though ranks are based on final production units. This percentage is significantly greater than 17.8% in the FW condition ($\chi^2 (1) = 6.13, p < 0.05$). In addition, also supported is my argument for H2 that people are more likely to sabotage others under a PR contract where their concerns of outcome fairness is stronger. 46.3% of participants in the PR condition sabotaged others to make the final outcomes fairer as they believed that their fellow group members had sabotaged them. In contrast, the percentage for the FW condition (28.9%) is marginally less than that (46.3%) in the PR condition ($\chi^2 (1) = 3.14, p < 0.1$).

[Insert Table 5 here]

To explore thoroughly the reasons for sabotage, I also considered as a continuous variable their level of agreement with each of the five reasons listed in Appendix C, and ran a

²⁷ As argued in H2, I expect that Piece Rate contract should generate more negative feelings such as anger. Although the predicted direction is right (PR > FW), the percentage difference (PR: 13.0% vs. FW 6.67 %) is not statistically significant ($\chi^2 (1) = 1.07, p = 0.3$).

linear regression to see how the dependent variable (i.e., the level of agreement with a reason) is affected by *Group Identity* and *Compensation Type*. I argued in Chapter 2 that individuals are more likely to sabotage others because they are motivated to improve their earnings status in the PR condition vs. in the FW condition. I asked participants' response to the following potential reason for sabotage: "*I wanted to improve where I think I would rank in terms of earnings even though ranks are based on final production units.*" I expected that participants in the FW condition would disagree with this reason because they all earned the same amount of wage and there was no difference in rank of earnings. On the contrary, I predicted that participants in the PR condition would agree with this reason because they received different amount of earnings depending on their performance and cared about making more earnings relative to others. Consistent with my expectation, the results show that participants' level of agreement in the PR condition vs. the FW condition is 1.90 higher ((95% Conf. Interval [0.54, 3.27], $t=2.80$, $p<0.01$). In addition, I tested if the mean of participants' level of agreement in the FW and PR conditions is significantly different from "4" – "Neither Disagree or Agree". I found that the mean of agreement level in the FW condition is 4.12, not significantly greater than 4.0 ($z=0.27$, $p=0.39$). In addition, the mean of agreement level in the PR condition is 5.06, significantly greater than 4.0 ($z=3.96$, $p<0.001$). These results support my expectation that participants are more likely to engage in earnings comparison and therefore sabotage under a PR contract than under a FW contract.

4.5 Additional Analyses on Reasons against Sabotage

I also listed eight potential reasons for why participants may have hesitated to sabotage others. All participants were required to indicate the level of agreement with each of the eight potential reasons (See Appendix C). In H1, I argued that strengthening group identity would increase participants' self-other overlap, and it is possible that participants with more self-other overlap were less likely to sabotage others because hurting others is essentially hurting themselves. To capture participants' feeling of "others' outcome as their own," I framed one reason for hesitation as "*hurting my fellow group members is like hurting myself.*" I expected that participants in the SI conditions would be more likely to agree with this reason than those in the MI conditions. Consistent with my expectation, a significantly higher percentage of participants who never sabotaged others agreed with this reason in the SI conditions than in the MI conditions (79.2% vs. 44.0%, $\chi^2(1) = 6.38, p < 0.05$).

[Insert Table 6 here]

4.6 Descriptive Statistics and Tests of H4, H5 and H6 (*Effort*)

4.6.1 Using Performance (Production Units without Production Loss) to Proxy for Effort

In addition to the set of hypotheses on employees' sabotage, I have also in Chapter 2 made hypotheses on employees' effort. I presented a null hypothesis (H4) that strengthening group identity will not change employees' effort. In addition, I predicted more employee effort in the PR condition than in the FW condition (H5). I used the number of letters correctly decoded in each round (i.e., prior to deducting any production loss) as a proxy for employee effort, and ran a multi-level mixed effect linear regression using the same subsample of 99 participants to test my

hypotheses H4 and H5. I have included *Rounds* as a continuous variable to control for participants' performance improving due to learning.

In addition, I control for participants' intrinsic motivation in my regression because participants who are interested in the task and intrinsically motivated would be more likely to exert effort and achieve greater performance regardless of treatment conditions. To capture intrinsic motivation, I first asked for participants' level of agreement on my 7-point Likert scale with the statement "In this study, I worked hard in decoding letters" (*Hard Work*). Those participants whose level of agreement to the *Hard Work* statement was 5 or more (94 of 99 participants) were asked to indicate their level of agreement with the following reason for working hard: "I was interested in the decoding task" (Question A). The rest of the participants who indicated a degree of agreement on the Hard Work question of less than 5 (5 of 99 participants) were asked to indicate their level of agreement with the following potential reasons for not working hard "I found the decoding task boring" (Question B). The responses to this question were reverse coded.²⁸ Using the responses to Question A and reverse coded responses to Question B, I created a continuous variable of *Intrinsic Motivation*. I also control for the effect of the rank of an individual receives in previous round on his or her effort in the current period by including the variable *PriorRank* (defined under the section 4.2), because high ranking may motivate participants to work hard to sustain their ranking status, while low ranking can discourage participants from exerting future effort. Moreover, I control for the effect of whether

²⁸ Only 5 out of 99 participants have claimed that they have not worked hard, and therefore only the five persons were asked to answer question B while the rest was given with question A.

a production loss occurred in previous round on current round's effort by including the variable *PriorLoss* (defined under the section 4.2), because prior loss may motivate participants to take more effort to recover from their loss from previous round.

I consider participants' sabotage behavior in a round may affect their effort level for that round. To that end, I included *Sabotage* (defined under section 4.2) to control this effect. Theoretically, it is unclear whether sabotage behavior will increase or decrease productive effort. If sabotage behavior and productive behavior are deemed as substitutes toward achieving better rank status, one may expect that participants would exert less effort after they engaged more sabotage. However, if sabotage behavior and productive behavior are deemed as complementary, participants would exert more effort after engaging in more sabotage. In addition to the inclusion of the main effect of *Sabotage*, I have included two way interactions (*Group Identity* × *Sabotage*) and (*Compensation Type* × *Sabotage*), as well as a three-way interaction (*Group Identity* × *Compensation Type* × *Sabotage*).

The results of the analysis are shown in Table 3. Consistent with my expectations, I cannot reject the null hypothesis H4, because employee effort is similar in the SI condition and the MI condition (Coefficient = -2.43, 95% Conf. Interval [-6.34, 1.48], $z=-1.22$, $p=0.22$). Similarly, employee effort is not statistically different in the PR condition than in the FW condition (Coefficient = -0.39, 95% Conf. Interval [-4.10, 3.30], $z=-0.21$, $p=0.83$). This result does not support hypothesis H5, which predicts a significantly higher level of effort in the PR condition than in the FW condition. However, I found a marginally significant interaction effect between group identity and compensation type as expected (Coefficient=4.78, 95% Conf.

Interval [-0.57, 10.12], $z=1.75$, $p<0.1$). This suggests that H6 is supported. As shown in Figure 2, under a PR contract, the performance in the SI condition appears to be greater than that in the MI condition. Interestingly, under a FW contract, the opposite relationship is observed. That is, the performance in the SI condition appears to be less than that in the MI condition.

Consistent with my expectation, I found that *Intrinsic Motivation* had a statistically significant positive effect on employee effort (Coefficient = 0.84, 95% Conf. Interval [0.11, 1.56], $z=2.27$, $p<0.05$). This result suggests that employees can decode 0.84 more letters when their measured degree of intrinsic motivation increases by 1 level. In addition, as predicted, there is a statistically significant positive effect of *Rounds* on effort (Coefficient = 0.98, 95% Conf. Interval [0.82, 1.13], $z=12.51$, $p<0.001$). Additionally, in consistent with my prediction, individuals who received 1st rank in previous round are motivated to decode 1.43 more letters than those who were ranked 2nd in current round ((95% CI, 0.50 to 2.37), $z=2.99$, $p<0.01$), while individuals who received 3rd rank in previous round performed significantly worse than those who received 2nd (coefficient=-2.25, (95% CI, -3.23 to -1.28), $z=-4.54$, $p<0.001$). Interestingly, experiencing a production loss in previous round can motivate individuals to decode 0.95 more letters to numbers ((95% CI, 0.00 TO 1.90), $Z=1.97$, $p<0.05$) than experiencing no production loss in previous round.

I find a significant two-way interaction effect between *Group Identity* and *Sabotage*, and a significant three-way interaction effect between *Group Identity* and *Compensation Type* and *Sabotage* as shown in Table 3. To further investigate on these interaction effects, I divided my sample into two sub pools based on Group Identity and ran the analysis again within each sub

pool. In the SI condition, participants under a PR contract decoded 4.28 more letters than those under a FW contract (95% CI, -0.50 to 9.05, $z=1.76$, $p=0.08$, marginal significance). In addition, I found that sabotaging behavior is positively associated with productive effort under a FW contract, but not under a PR contract. This finding is consistent with the idea that under a FW contract, higher performance ranking is the underlying mechanism driving both sabotage and effort, and therefore sabotage and effort are positively associated. However, under a PR contract, financial incentives become a major part of the forces driving effort behavior, but not sabotage behavior, because sabotage behavior does not bring financial benefits. In the MI condition, participants under a PR contract performed no better than those under a FW contract (coefficient=-0.30, 95% CI, -3.39 to 2.79, $Z=-0.19$, $p=0.849$). Additionally, sabotage behavior is not associated with productive effort).

[Insert Table 3 here]

4.6.2 Using Time Spent on Brain Teaser Questions to Proxy for Effort

To further explore evidence in support of H4, H5 and H6, I use a second proxy for employee effort. This proxy is related to the amount of time participants spent on reading brain teaser questions. At any time during a production round in this study, participants could read brain teaser questions for entertainment purposes at their own discretion. The amount of time spent on brain teaser questions by a participant is an indirect indicator of his or her level of effort on the letter-decoding task. As shown in Table 7, 20 out of 120 (16.67%) participants chose to read the brain teaser questions, and the cumulative amount of time they spent over 8 rounds ranged from 1.4 sec to 384 secs (or 6.4 minutes). A higher percentage of participants read the

brain teaser questions in the FW condition (22.73%, or 15 out of 66) than in the PR condition (9.25%, or 5 out of 54), $p(1\text{-sided}) = 0.04$ (Fisher's exact test). Participants who read the brain teaser questions spent on average 4.14 seconds (standard deviation=2.14) in the PR condition which is less than the average 118.67 seconds (standard deviation= 128.02) in the FW condition. An independent t-test shows that the difference is significant ($t=3.46$, $p(2\text{-sided}) < 0.01$). These results suggest that participants were more motivated to work on the decoding task in the PR condition than in the FW condition, which is consistent with H5.

I created a dummy variable for *Effort* which takes the value of "1" if a participant did not read brain teaser questions in a round, and the value of "0" otherwise. I ran a multi-level mixed effect logistic regression to formally examine the effect of group identity and compensation type on this second proxy for *Effort*. This analysis is similar to the one I performed in Section 4.5.1 except that the dependent variable *Effort* has two levels (and hence logistic regression is used), while the dependent variable in Section 4.5.1 is a continuous variable (hence linear regression is used). I found that the model fits the data better than the intercept only model (Wald $\chi^2(5) = 9.92$, $p < 0.1$). As shown in Table 4, the odds of employees not reading brain teaser questions in the SI condition were similar to the odds of employees not reading brain teaser questions in the MI condition (Odds Ratio=0.52, (95% CI, 0.08 to 3.79), $z = -0.62$, $p = 0.53$). Therefore, I cannot reject the null hypothesis H4. The odds of employees not reading brain teaser questions in the PR condition were 12.32 times the odds of employees not reading brain teaser questions in the FW condition ((95% CI, 0.67 to 226.26), $z = 1.69$, $p < 0.1$, marginal significance), consistent with H5. A closer look at those 13 participants who actually read brain teaser questions shows that these

participants also spent more time in reading those questions in the FW condition than those in the PR condition did ($F(1,12)=3.81, p<0.1$, marginal significance).²⁹ Therefore, these results support H5. I ran the same direct test on the interaction effect as the test performed in Section 4.3. I examined whether the value of λ is significantly positive, where $\lambda = \text{Odds Ratio [PS]} - \text{Odds Ratio [PM]} - \text{Odds Ratio [FS]} + 1$ (VanderWeele and Knol, 2014). I found no evidence in support for H6 ($\lambda = -10.40$, 95% confidence interval $[-45.68, 24.88]$, $z = -0.58$, $p = 0.563$).

[Insert Table 4]

Overall, the results of my analysis show that I cannot reject the null hypothesis H4. H5 is supported when time spent on brain teaser questions is used as a proxy for effort, but not supported when the number of letters correctly decoded is used as a proxy for effort. There is some evidence to support H6 when using the number of letters correctly decoded as a proxy for effort.

4.7 The Effects of Suspicion of Being Sabotaged in a Prior Round on Sabotage and Effort in the Current Round

Participants in this research setting may experience a production loss of 11 units each round with a likelihood that depends on their group members' choices. The likelihood of experiencing a production loss is 15% due to a random act of nature. The likelihood is increased to 25% (35%) if one (both) of a participant's group members have chosen to sabotage them. Participants only learned at the end of each round whether they lost 11 units, but they were not

²⁹ Similar analysis is performed, and untabulated results show that the average time spent reading brain teaser questions by participants in the MI condition is statistically no different from the average time spent in the SI condition. Therefore, I am not able to reject the null hypothesis H4.

informed of the actual likelihood of production loss for each round so they did not know for sure whether the loss was due to sabotage. At the end of each round, participants were asked to report their estimations of the actual likelihood of a production loss in that round by allocating 100% among the three possible scenarios (i.e., 15%, 25%, or 35%). Participants' allocations capture their suspicion of having been sabotaged in the round that they had just completed. For example, a participant may assign the following likelihoods to the three scenarios: 50% to the Fifteen-percent scenario (i.e. no saboteur), 0% to the Twenty-five-percent scenario (only one saboteur), and 50% to the Thirty-five-percent scenario (two saboteurs). Their *Suspicion of being Sabotaged* is measured by the expected number of saboteurs based on their assessments of the likelihoods of being sabotaged by 0, 1, or 2 saboteurs. In this case, the expected number is 1 ($50\% \times 0 + 0\% \times 1 + 50\% \times 2$).

4.7.1 The Effect on Sabotage

I predict that participants' sabotage choices in the current round will be positively associated with participants' suspicion that they were being sabotaged in the prior round. In addition, as I argued for H2, the effect of suspicion of being sabotaged on subsequent sabotage behavior is expected to be stronger in the PR condition than in the FW condition. To test whether this is the case, I repeated the same analysis from Section 4.2 with the inclusion of a continuous variable *Suspicion of being Sabotaged* (this variable is defined in Section 4.7) and an interaction term *Suspicion of being Sabotaged* \times *Compensation Type*. I found that consistent with my expectation, when the participant's suspicion of being sabotaged by group members in the prior round increased by "1", the odds of people sabotaging others in the current round

increased by 7.9 times ((95% CI, 2.46 to 25.54), $z = 3.46$, $p < 0.001$). Contrary to this expectation, the coefficient on the interaction term *Suspicion of being Sabotaged* \times *Compensation Type* is negative (Coefficient = -2.10, (95% CI, -3.56 to -0.64), $z = -2.83$, $p < 0.01$), suggesting that for employees in the PR condition, the effect of suspicion of being sabotaged in a prior round on their decision to sabotage in the current round is weaker than for employees in the FW condition. All results discussed in Section 4.2 still hold with the inclusion of the new variables of this section.³⁰

4.7.2 The Effect on Effort

This study asked an open research question of whether participants' suspicion of having been sabotaged would affect their effort. I have two approaches to addressing this question. The first approach allows me to test the research question directly. I included one extra independent variable *Suspicion of being Sabotaged* into the model discussed in Section 4.6.1 where performance (i.e., production units before deduction of production loss units) is used as the proxy for *Effort* - the dependent variable. I found that all the results discussed in Section 4.6.1 still hold. I also found that *Suspicion of being Sabotaged* in the prior round motivated employee effort in the current round. When their level of suspicion increased by "1", employees decoded 1.23 more letters in the current round (95% CI, 0.05 to 2.42), $z = 2.04$, $p < 0.05$). Similarly, I added *Suspicion of being Sabotaged* as an additional independent variable to the model used in Section 4.6.2 where the proxy used for *Effort* is related to the time participants spent reading

³⁰ The odds of employees sabotaging others in the SI condition was 3.79 times that in the MI condition ((95% CI, 0.79 to 18.12)), $Z = 1.67$, $p < 0.1$).

brain teaser questions. The results show that participants' decision on whether to read brain teaser questions in the current round was not affected by their *Suspicion of being Sabotaged* in prior round (Odds ratio=0.54, 95% CI, 0.87 to 1.94), $z = 0.75$, $p = 0.452$). Overall, there is mixed evidence about whether suspicion of being sabotaged in a prior round motivates employee effort in the current round. However, this approach might suffer from the reverse causality concern. It is possible that individuals with higher level of effort and performance are more likely to perceive themselves as targets of sabotage. To overcome this issue, I consider using a second approach.

The second approach tests the research question by comparing effort when employees have the opportunity to sabotage others versus when employees have no such opportunity. As discussed in Section 3.1, I included a baseline condition in my experiment which was similar to the Flat Wage & Moderate Identity (FM) condition, except that participants in this condition had no opportunity to sabotage others and were therefore free of suspicion that they were sabotaged by others. Hence, participants in the baseline condition will have a zero level of suspicion of being sabotaged, whereas those in the non-baseline conditions will have some level of suspicion. I created a dummy variable *Baseline* which takes the value of "1" for participants who were assigned to the baseline condition (N=21), and assumes the value of "0" for the other participants who were assigned to one of the four treatment conditions (N=99). By comparing the effort of the baseline condition (with zero level of suspicion) and the non-baseline conditions (with some non-zero level of suspicion), I examined how varying levels of suspicion may affect employee effort. Using the full sample of 120 participants, I ran a multi-level mixed effect linear regression

to test whether there is a main effect of *Baseline* on effort. I continue to use *Rounds* and *Intrinsic Motivation* as control variables. I did not include *Group Identity* and *Compensation Type* as independent variables, because results as discussed in Session 4.5.1 showed that performance, as a proxy for *Effort*, was not statistically different across the four treatment conditions.

Results indicate that the effort of participants in the baseline condition was not significantly different from the effort of those in the non-baseline conditions (Coefficient=1.01, (95% CI, -2.44 to 4.45), $z = -0.57$, $p = 0.567$). These results suggest that participants' perception of being sabotaged have no impact on their effort. The results related to *Rounds* and *Intrinsic Motivation* discussed in Section 4.6.1 still hold. Moreover, I repeated this analysis to investigate whether results change when controlling for the treatment effects of *Group Identity* and *Compensation Type*. To that end, I compared the baseline condition (i.e., Flat Wage & Moderate Identity, with no sabotage opportunity) to only the Flat Wage & Moderate Identity condition (with sabotage opportunity). I found that the effort of participants in the baseline condition was not significantly different from that in the Flat Wage & Moderate Identity condition (Coefficient=1.34, (95% CI, -2.53 to 5.22), $z = -0.68$, $p = 0.498$). Interestingly, as shown in Table 7, there are 7 out of 21 participants or 33.33% of participants in the baseline condition had chosen to read brain teaser questions, but only 4 out of 24 or 16.67% of participants in the Flat Wage & Moderate Identity condition (with sabotage opportunity) did so, although the percentage difference is not statistically significant ($\chi^2 (1) = 1.68$, $p = 0.19$).

4.8 Additional Analysis—the Effect of Dark Triad Personality on Sabotage

Previous literature has documented that the dark triad personality (i.e., those with high levels of trait Machiavellianism, Psychopathy, and Narcissism) may interact with organizational characteristics to impact employee sabotage behavior (Wang, 2016). Before conducting this lab study, I collected data on dark triad personality from participants through the Qualtrics online survey platform. In the survey, participants were required to answer the 12-item Dark Triad Personality questionnaire (Jonason and Webster, 2010), to provide their demographic information and to work on a distractor task.³¹ Following Wang (2016), I measured the *Dark Triad Score* using the average of their responses on my 7-point Likert scale to the 12 items in the Dark Triad Personality questionnaire.³² The mean (standard deviation) of *Dark Triad Score* is 3.70 (0.82) with the minimum (maximum) score of 2 (5.58). These statistics are comparable to those in Wang (2016) where the reported dark triad score of her participants range from 1.25 to 5.83, with the mean (median) of 3.36 (3.50).

I added *Dark Triad Score*, *Dark Triad Score* \times *Group Identity*, and *Dark Triad Score* \times *Compensation Type* to the model discussed in Section 4.2. I found no main effect of *Dark Triad Score* on employee's sabotage in my setting where RPI is provided. This result is consistent with that of Wang (2016) documenting that Dark Triad personality has no main effect on employee's sabotage. I expect that there is an interaction effect between *Dark Triad Score* and

³¹ Participants' exposure to the 12-item questionnaire may affect their responses in the main task. To address this concern, I asked them to work on a distractor task right after the 12 questions so that their attention was distracted away from the 12 questions. To further distract participants, I invited to the lab only those participants who had completed the online survey a minimum of 7 days before their scheduled participation day.

³² Note that a higher score corresponds to a more dark-triad oriented personality.

Group Identity. Specifically, the effect of strengthening group identity on sabotage is weaker for employees with higher *Dark Triad Score* because *Dark Triad Score* is positively associated with their innate tendency to sabotage others, and negatively associated with their sensitivity to external factors such as the strength of group identity. Contrary to this expectation, results show that there is no interaction effect between *Dark Triad Score* and *Group Identity*.³³³⁴ In addition, there is no interaction effect between *Dark Triad Score* and *Compensation Type*.

³³ I also created a dummy variable to divide the participants into a high Dark Triad group and a low Dark Triad Group. The variable takes the value of “1” if their Dark Triad Score is greater than the median score of the sample population, and the value of “0” if otherwise. I repeated the same analysis and found that results remain the same.

³⁴ The results are inconsistent with my expectation. One possible explanation is that my sample size is small. In psychological literature studying the effect of personalities such as Dark Triad, it is often the case that several hundreds of participants are used.

Chapter 5

Discussion and Conclusion

5.1.1 Results and Discussions

Organizations often use relative performance information (RPI) as part of their management control system to motivate employees. However, the use of RPI may lead to an unintended consequence—rivalry among employees. Employees who desire to achieve better relative performance may intentionally hinder their co-workers' performance, and this sabotage behavior of employees can impact organizational performance. In this study, I examine how group identity, a form of informal management control, affects employees' sabotage behavior. Although previous literature documented indirect evidence suggesting that strengthening group identity could reduce employee sabotage (Charness et al., 2014), direct evidence collected in this study indicates that strengthening group identity increases sabotage. It is important to note that in my study, two levels of group identity are manipulated and compared: strong vs. moderate. My finding suggests that sabotage behavior does not change significantly when group identity is increased from "moderate group identity" to "strong group identity". However, the finding may not generalize to the setting where group identity is increased from a low level to the strong level. It is possible that sabotage will decrease when group identity is increased from a low level to a moderate level, a range of levels of group identity that may not increase perceived similarity and therefore competition. Future research can examine whether strengthening group identity will reduce sabotage when a low and a strong level of group identity are compared. If this is true, together with my finding in this study, it suggests that the relationship between group

identity and sabotage is not linear. My study also investigates the effect of compensation type on sabotage behavior. Consistent with my expectation, results indicate that in the presence of RPI, employees will sabotage their co-workers to a greater extent under a piece rate contract than under a flat wage contract. This result provides important insights on how to design control systems (both informal and formal) to deal with sabotage, and therefore may be useful to managers who are concerned with employee sabotage behavior.

Previous literature has consistently documented a finding that individuals exert more effort under a pay-for-performance contract than under a flat wage contract in settings where an individual's performance cannot be affected by co-workers (Bonner and Sprinkle, 2002). I expect that this finding continues to hold even in my study where individuals' performance can be influenced by co-workers. Interestingly, I find a mixed evidence that more effort is observed under a PR contract when proxy for effort is whether participants engaged in an alternative activity (i.e., reading brain teaser questions), but not when task performance is used as a proxy for effort. The discrepancy between my expectation and actual results may be due to my underestimation of the effect of sabotage behavior on effort. My findings also suggest that strengthening group identity can elicit competition for performance ranking status, especially under a FW contract where a desire for performance ranking status drives both sabotage behavior and productive effort behavior, as evidenced by a positive relationship between sabotage behavior and effort. This is less of the case under a PR contract, because the most important effort driven force is the financial incentives, which cannot be obtained through sabotaging others. As a result, effort and sabotage are not positively correlated. This may explain why in a

setting like mine where individuals have opportunity to sabotage others, more effort is not observed under a PR contract than under a FW contract. Further study can examine directly in the moderate group identity condition why effort under a PR contract is no different from that under a FW contract. Additionally, participants under a FW contract earned significantly more money than those under a PR contract, which is biased against my finding support for H5. I acknowledge this as a limitation of my study.

I also investigated how employees' suspicion of being sabotaged by co-workers can affect their effort. The results showed that the suspicion of being sabotaged has mixed effects on an individual's effort. Suspicion of having been sabotaged has a positive effect on effort if production units is used as proxy for effort, but not if time spent on alternative task is used as the proxy.

5.1.2 Limitations and Future Research

This study examines a setting where sabotage behavior does not bring economic benefits to saboteurs. Such a setting is necessary for my study to focus on how non-economic factors of social identity and social comparison affect sabotage behavior. However, it is worth noting that in a real-world setting, sabotaging others may benefit saboteurs economically. For example, sabotaging colleagues may increase one's chance of receiving limited reward such as bonus or promotion opportunities. Future research can examine how group identity and compensation type affect sabotage behavior in a setting where people are economically driven to sabotage others.

In this study, I have successfully manipulated two levels of group identity (strong vs. moderate) by asking participants to play a slogan guess game before the main task. In a real

world setting, employees may have a low level of group identity. It is an empirical question how my results will be different in a real world setting where group identity may be at extremes (strong vs. low). Further research can examine this issue by having a stronger manipulation of group identity (strong vs. low) in an experimental study.

Due to a small number of groups used in this study (33 groups in total), most of my analysis is based at the individual level rather than at group level. Future research could examine how other group characteristics such as group size and group-level performance ranking may interact with group identity to affect the sabotage behavior at a group level. Additionally, a potential future avenue would be to examine what the effects of organizational culture, organization norms, and tone at the top may have impact on sabotage behavior.

I documented a main effect of compensation type on sabotage behavior in a lab setting where there are no repeated interactions among participants and no potential mechanism for detecting sabotage, and there is salient opportunity to sabotage others. In the real world setting, employees have repeated interactions with other co-workers, and organizations have mechanisms in place to detect sabotage. Therefore, employees may be less likely to sabotage others in general, and the effect of compensation contract might not exist or be weaker than what has been observed in this study.

Notwithstanding these limitations, my study has contributed to literature by providing direct evidence challenging the speculation that strengthening group identity reduces employee sabotage. Additionally, I have documented that sabotage behavior induced by RPI depends on the compensation type, and there is more sabotage under a pay-for-performance contract than

under the flat wage contract. My finding also has implications in non-business settings such as education and sport groups. Educators and sport coaches should be warned of this cost of strengthening group identity, namely increased sabotage. The knowledge from this study will help educators and sport coaches make better informed decision as to whether they want to work on students or players' identification with their groups.

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Appendix A

Tables

Table 1: The distribution of the number of groups over treatment conditions by session (full sample N=120)

Session No.	By Identity [M] ^a or <S> ^a	By Compensation type (PR ^a , FW ^a)	Baseline condition
1 ^b			2
2	<3>	<2,1>	
3	[5]	[3,2]	
4	[4]	[2,2]	
5	<5>	<3,2>	
6	<4>	<2,2>	
7 ^b			1
8	[4]	[2,2]	
9	<4>	<2,2>	
10	[2]	[1,1]	
11	[2]	[1,1]	
12 ^b			4
Total 40 groups	[M=17] <S=16> 33	(PR=18, FW=15) 33	7

a: M=Moderate Group Identity;
S=Strong Group Identity;
PR = Piece Rate contract;
FW =Flat Wage contract;

b: Sessions 1, 7 and 12 were for the baseline condition. Baseline=M + FW, but with no opportunity to sabotage group members.

Table 2: The effect of group identity and compensation type on the Sabotage level (N=85, No. of observations=595)

Mixed-effects ordinal logistic regression ^a		Number of observations=595		
Group	No. of	No. of Observations per Group		
Variable	Groups	Minimum	Average	Maximum
<i>Sgroup</i>	33	7	18.0	21
<i>uniqueID</i>	85	7	7	7

Log likelihood = -319.95							Wald χ^2 (10)=55.45
							Prob > χ^2 =0.0000
<i>Sabotage</i> ^b	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]	
<i>Group Identity</i> ^c	5.20	4.69	1.83	0.067	0.89	30.46	
<i>Compensation Type</i> ^d	7.90	6.60	2.47	0.013	1.53	40.66	
<i>Group Identity</i> × <i>Compensation Type</i>	0.32	0.36	-1.02	0.310	0.04	2.87	
<i>PriorLoss</i> ^e	2.69	0.92	2.90	0.004	1.38	5.24	
<i>PriorSabotage</i> ^f							
Level 1	1.91	0.66	1.87	0.061	0.97	3.74	
Level 2	3.21	1.32	2.83	0.005	1.43	7.20	
<i>PriorRank</i> ^g							
Rank 1	0.88	0.32	-0.34	0.735	0.43	1.82	
Rank 3	0.54	0.20	-1.67	0.095	0.27	1.11	
<i>Concern of Economic Cost</i> ^h	0.78	0.11	-1.80	0.072	0.59	1.02	
<i>Concern of Violation of Personal Code</i> ⁱ	0.53	0.09	-3.59	0.000	0.37	0.75	
<i>/cut1</i>	-1.50	1.01	-1.49	0.136	-3.48	0.47	
<i>/cut2</i>	-0.05	1.00	-0.05	0.960	-2.01	1.91	
<i>Sgroup</i>							
Var (_Cons)	0.00	0.00					

<i>Sgroup>uniqueID</i>	3.85	1.51	1.79	8.29
Var(_Cons)				

LR test vs. ologit model: $\chi^2(2) = 32.30$ Prob > $\chi^2 = 0.0000$

a: A multi-level mixed-effect ordinal logistic regression was run to determine the effect of *Group Identity* and *Compensation Type* on *Sabotage*. Random effects are controlled at two levels [*Group (Sgroup)*, and Individual (*uniqueID*)].

b: The level of *Sabotage* is 0 if neither of the participants' group members' likelihood has been increased), 1 if one of the participant's group members' likelihood has been increased, or 2 if both of the participant's group members' likelihood have been increased.

c: *Group Identity* is manipulated at two levels (Moderate vs. Strong).

d: *Compensation Type* is manipulated at two types (Flat Wage vs. Piece Rate)

e: *PriorLoss* takes the value of "1" if a participant lost production units in the prior round.

f: *PriorSabotage* refers to a participant's level of *Sabotage* in the prior round.

g: *PriorRank* is a participant's rank (either 1, 2, or 3) achieved in the prior round.

h: *Concern of Economic Cost* is the level of agreement with the statement "it would cost me ECUs and reduce my earnings." on a 7-likert scale with "1" representing "Strongly disagree" and "7" for "Strongly agree".

i: *Concern of Violation of Personal Codes* is the level of agreement with the statement "it would be against my personal code of conduct, irrespective of how others regard such behavior." on a 7-likert scale with "1" representing "Strongly disagree" and "7" for "Strongly agree".

Table 3: The effect of group identity and compensation type on the Effort level (N=99, No. of observations=693)

Mixed-effects linear regression ^a			Number of observations=693				
Group Variable	Groups	No. of Observations per Group	Minimum	Average	Maximum		
<i>Sgroup</i>	33	21	21	21	21		
<i>uniqueID</i>	99	7	7	7	7		

Log likelihood = -2093.15		Wald χ^2 (16)=235.34				
		Prob > χ^2 =0.0000				
<i>Effort</i> ^b		Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
<i>Group Identity</i> ^c		-2.43	2.00	-1.22	0.223	-6.34 1.48
<i>Compensation Type</i> ^d		-0.40	1.89	-0.21	0.834	-4.10 3.30
<i>Group Identity</i> × <i>Compensation Type</i>		4.78	2.73	1.75	0.080	-0.57 10.12
<i>Round</i> ^e		0.98	0.08	12.51	0.000	0.82 1.13
<i>Intrinsic Motivation</i> ^f		0.84	0.37	2.27	0.024	0.11 1.56
<i>PriorRank</i> ^g	Rank 1	1.43	0.48	2.99	0.003	0.50 2.37
	Rank 3	-2.26	0.50	-4.54	0.000	-3.23 -1.28
<i>PriorLoss</i> ^h		0.95	0.48	1.97	0.049	0.01 1.90
<i>Sabotage</i> ⁱ	Level 1	2.17	1.32	1.64	0.101	-0.42 4.76
	Level 2	-0.42	1.57	-0.27	0.788	-3.50 2.66
<i>Group Identity</i> × <i>Sabotage</i>	1 1	1.14	1.96	0.58	0.561	-2.71 4.99
	1 2	8.06	2.11	3.82	0.000	3.92 12.20
<i>Compensation Type</i> × <i>Sabotage</i>	1 1	-1.75	1.67	-1.05	0.294	-5.02 1.52
	1 2	-0.00	1.93	-0.00	0.999	-3.78 3.78

Group Identity × Compensation Type ×

Sabotage

	1 1 1	-1.45	2.50	-0.58	0.560	-6.35	3.44
	1 1 2	-6.89	2.68	-2.57	0.010	-12.15	-1.63
<i>_Cons</i>		23.93	2.35	10.20	0.000	19.33	28.53

Random-effects Parameters	Estimate	Std. Err	[95% Conf. Interval]
<i>Sgroup</i>			
Var(<i>_Cons</i>)	3.28	4.19	0.27 40.11
<i>Sgroup>uniqueID</i>			
Var(<i>_Cons</i>)	30.78	6.25	20.67 45.84
Var(Residual)	16.68	0.98	14.88 18.71

LR test vs. linear model: $\chi^2(2) = 389.59$ Prob > $\chi^2 = 0.0000$

a: A multi-level mixed-effect linear regression was run to determine the effect of *Group Identity* and *Compensation Type* on *Effort*. Random effects are controlled at two levels [Group (*Sgroup*), and Individual (*uniqueID*)].

b: The level of *Effort* is captured by the number of letters correctly decoded by a participant in each round.

c: *Group Identity* is manipulated at two levels (Moderate vs. Strong).

d: *Compensation Type* is manipulated at two types (Flat Wage vs. Piece Rate)

e: *Round* is the sequence of the period during which an observation has been recorded

f: *Intrinsic motivation* is measured by using participants' responses to questions in the post-experimental questionnaire, and the detailed explanation of how to measure intrinsic motivation can be found in Section 4.5.

g: *PriorRank* is a participant's rank (either 1, 2, or 3) achieved in the prior round.

h: *PriorLoss* takes the value of "1" if a participant lost production units in the prior round.

i: The level of *Sabotage* is 0 if neither of the participants' group members' likelihood has been increased), 1 if one of the participant's group members' likelihood has been increased, or 2 if both of the participant's group members' likelihood have been increased.

Table 4: The effect of group identity and compensation type on the Effort level (N=99, No. of observations=792)

Mixed-effects logistic regression ^a		Number of observations=792				
Group Variable	Groups	No. of Observations per Group	Minimum	Average	Maximum	
Sgroup	33	24	24	24	24	
uniqueID	99	8	8	8	8	
Log likelihood = -88.62						Wald χ^2 (5)=9.92
						Prob > χ^2 =0.077
<i>Effort</i> ^b	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
<i>Group Identity</i> ^c	0.53	0.54	-0.62	0.532	0.07	3.92
<i>Compensation Type</i> ^d	12.32	18.29	1.69	0.091	0.67	226.26
<i>Group Identity</i> × <i>Compensation Type</i>	0.22	0.40	-0.84	0.401	0.01	7.45
<i>Intrinsic Motivation</i> ^e	1.40	0.32	1.45	0.147	0.89	2.21
<i>Round</i> ^f	0.81	0.09	-1.97	0.049	0.65	1.00
_cons	70.07	106.43	2.80	0.005	3.57	1375.37
Sgroup						
Var (_cons)	0	0
Sgroup>uniqueID						
Var (_cons)	4.23	2.39			1.40	12.79
LR test vs. logistic model: chibar2(01) = 25.62 Prob >= chibar2 = 0.0000						

a: A multi-level mixed-effect logistic regression was run to determine the effect of *Group Identity* and *Compensation Type* on *Effort*. Random effects are controlled at two levels [Group (*Sgroup*), and Individual (*uniqueID*)].

b: The level of *Effort* is captured by whether a participant has read brain teaser questions in a round.

c: *Group Identity* is manipulated at two levels (Moderate vs. Strong).

d: *Compensation Type* is manipulated at two types (Flat Wage vs. Piece Rate)

e: *Intrinsic motivation* is measured by using participants' responses to questions in the post-experimental questionnaire, and the detailed explanation of how to measure intrinsic motivation can be found in Section 4.5.

f: *Round* is the sequence of the period during which an observation has been recorded

Table 5: The percentage of participants who indicated a level (no less than “5”) of agreement with reasons for sabotage (The calculation of the percentages is based on the whole population).

In the study, I chose to increase the probability of my fellow group members losing production units because:	Compensation Type		χ^2 (1)	Group Identity		χ^2 (1)
	Flat Wage (17/45)	Piece Rate (33/54)		Moderate Identity (26/51)	Strong Identity (24/48)	
(1) I wanted to improve where I rank in terms of final production units.	15/45 (33.3%)	31/54 (57.4%)	5.72 p<0.05	25/51 (49.0%)	21/48 (43.8%)	0.28 p=0.60
(2) I wanted to improve where I think I would rank in terms of earnings even though ranks are based on final production units.	8/45 (17.8%)	22/54 (40.7%)	6.13 p<0.05	16/51 (31.4%)	14/48 (29.2%)	0.06 p=0.81
(3) ... even if it did not change where I rank in terms of final production units or earnings, doing so simply made me happy (or it gave me pleasure)	13/45 (28.9%)	15/54 (27.8%)	0.01 p=0.902	14/51 (27.5%)	14/48 (29.2%)	0.04 p=0.85
(4) I believed my fellow group members had increased my probability of losing production units or would be doing so, and I did the same to make the final outcomes fairer.	13/45 (28.9%)	25/54 (46.3%)	3.14 p<0.1	19/51 (37.3%)	19/48 (39.6%)	0.06 p=0.81
(5) I believed my fellow group members had increased my probability of losing production units, and I was angry at them.	3/45 (6.67%)	7/54 (13.0%)	1.07 p=0.3	6/51 (11.8%)	4/48 (8.3%)	0.32 p=0.57

Table 6: The percentage of participants who indicated a level (no less than “5”) of agreement with the reasons for hesitance to sabotage based on the population of those who had never sabotaged at all.

In the study, I hesitated about increasing the probability of my fellow group members losing production units because (select all that apply):	Compensation Type		$\chi^2(1)$	Group Identity		$\chi^2(1)$
	Flat Wage	Piece Rate		Moderate Identity	Strong Identity	
(a) it would cost me ECUs and reduce my earnings	23/28 (82.1%)	14/21 (66.7%)	1.55 p=0.21	20/25 (80.0%)	17/24 (70.8%)	0.56 p=0.46
(b) it would be against my personal code of conduct, irrespective of how others regard such behavior	21/28 (75.0%)	20/21 (95.2%)	3.60 p<0.1	19/25 (76.0%)	22/24 (91.7%)	2.20 p=0.14
(c) it would be disapproved of by people I am close to (e.g., my family members, my close friends)	14/28 (50%)	13/21 (61.9%)	0.69 p=0.41	14/25 (56.0%)	13/24 (54.2%)	0.02 p=0.90
(d) it would be disapproved of by society in general	12/28 (42.9%)	11/21 (52.4%)	0.44 p=0.51	11/25 (44.0%)	12/24 (50%)	0.18 p=0.67
(e) it would be disapproved of by my fellow group members	17/28 (60.7%)	17/21 (81.0%)	2.31 p=0.13	17/25 (68.0%)	17/24 (70.8%)	0.05 p=0.83
(f) hurting my fellow group members is like hurting myself	15/28 (53.6%)	15/21 (71.4%)	1.61 p=0.20	11/25 (44.0%)	19/24 (79.2%)	6.38 p<0.05
(g) I was concerned that doing so would damage my reputation outside of the study	6/28 (21.4%)	6/21 (28.6%)	0.33 p=0.57	5/25 (20.0%)	7/24 (29.2%)	0.55 p=0.46
(h) I was concerned that doing so would expose myself to retaliation outside of the study	4/28 (14.3%)	4/21 (19.0%)	0.20 p=0.66	3/25 (12.0%)	5/24 (20.8%)	0.70 p=0.40

Table 7: The amount of time spent on reading brain teaser questions in the four treatment conditions and baseline condition

Total time (sec.) spent on reading brain teaser ^b	Baseline condition Flat Wage ^a Moderate	Treatment conditions				Total
		Flat Wage		Piece Rate		
		Moderate	Strong	Moderate	Strong	
.00	14	20	17	26	23	100
1.39			1 (r8)			1
2.23					1(r2)	1
2.50					1(r6)	1
3.35					1(r3)	1
4.47	1(r2)					1
5.13	1(r3)					1
5.30				1 (r4)		1
7.31					1(r1)	1
8.99		1 (r8)				1
19.53		1 (r7)				1
24.04	1(r1)					1
51.64	1(r3)					1
79.17			1(r1,4,5,6,7,8)			1
85.26			1 (r2,p3)			1
108.62	1(r2,4,5,6,7)					1
175.26		1 (r7,8)				1
252.66	1(r1,3,8)					1
263.37	1(r3,5,6,7,8)					1
316.20		1 (r6, 7, 8)				1
384.28			1(r1,6,7,8) ^c			1
Total	21	24	21	27	27	120

a: The baseline condition: Flat wage and Moderate Identity treatment, with no opportunity to sabotage group members.

b: Left column shows the amount of question-reading time accumulated over 8 rounds.

c: The information in the brackets always start with the letter `r`, a symbol for Round, followed by a number(s) indicating the round(s) during which a participant read brain teaser questions. The highest time was 385 seconds, spent by a participant in the Flat Wage and Strong Identity condition in rounds 1, 6, 7 and 8

Table 8: Summary of the psychology based reasoning behind the hypotheses

	Psychology based predictions	Reasoning behind prediction
H1 (Null hypothesis)	$S_{SI} = S_{MI}$	<p>Strengthening group identity increases self-other overlap.</p> <pre> graph TD SO[Self-overlap] -- "+" --> PO[Perceive other's outcome as their own] SO -- "+" --> PS[Perceive others as similar to self] PO -- "-" --> S[Sabotage] PS -- "+" --> S </pre>
H2	$S_{PR} > S_{FW}$	Under a PR contract, there exists an additional comparison dimension-Income dimension. As a result, social comparison and hence sabotage is stronger under a PR contract.
H3	$S_{PS} - S_{PM} > S_{FS} - S_{FM}$	A PR contract limits the perception of others. Strengthening group identity are more likely to increase sabotage
H4 (Null hypothesis)	$E_{SI} = E_{MI}$	<pre> graph TD SO[Self-overlap] -- "+" --> PO[Perceive other's outcome as their own] SO -- "+" --> PS[Perceive others as similar to self] PO -- "-" --> E[Effort] PS -- "+" --> E </pre>
H5	$E_{PR} > E_{FW}$	A PR contract is a form of monetary incentive, which motivates effort. As argued for H2, social comparison and effort is stronger under a PR contract.

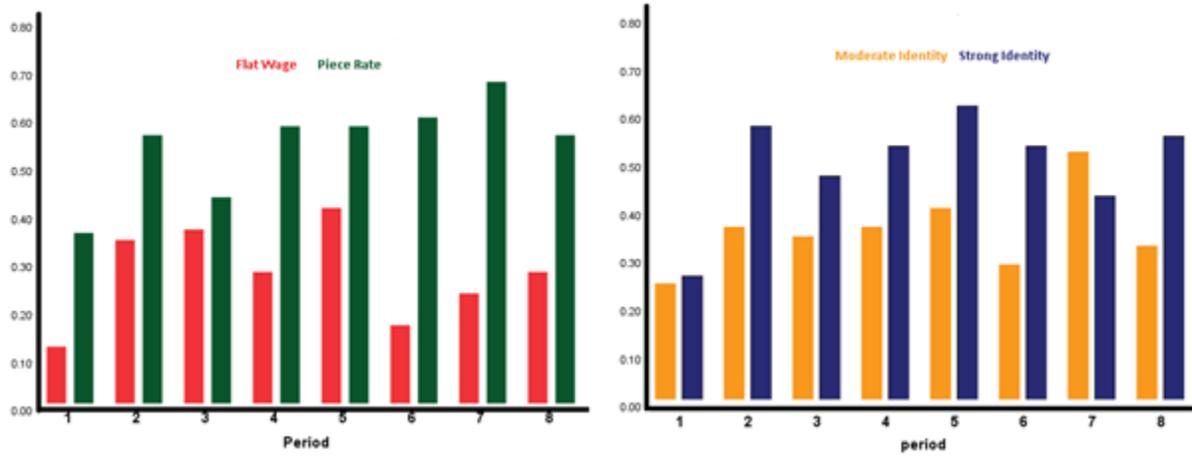
H6	$E_{PS}-E_{PM} > E_{FS}-E_{FM}$	<p>A PR contract limits the perception of others, strengthening group identity is more likely to increase competition and effort rather than decrease competition and effort.</p> <p>A FW contract limits the perceived social comparison, strengthening group identity may reduce effort.</p>
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The symbols “S” and “E” represent “Sabotage” and “Effort” respectively. The subscripts “SI” and “MI” represents “Strong Identity condition” and “Moderate Identity condition” respectively. “FW” and “PR” stands for “Flat Wage contract” and “Piece Rate contract” respectively. The PS, PM, FS and FM represents the four treatment conditions: Piece Rate & Strong Identity, Piece Rate & Moderate Identity, Flat Wage & Strong Identity, and Flat Wage & Moderate Identity respectively. Under the economic-based theory, in my setting where there is no benefit but cost associated with sabotage, the prediction would be that sabotage levels are all the same across treatment conditions. As to effort, under the economic-based theory, there would be more effort under a PR contract than under a FW contract, but effort will not depend on the level of group identity.

Appendix B

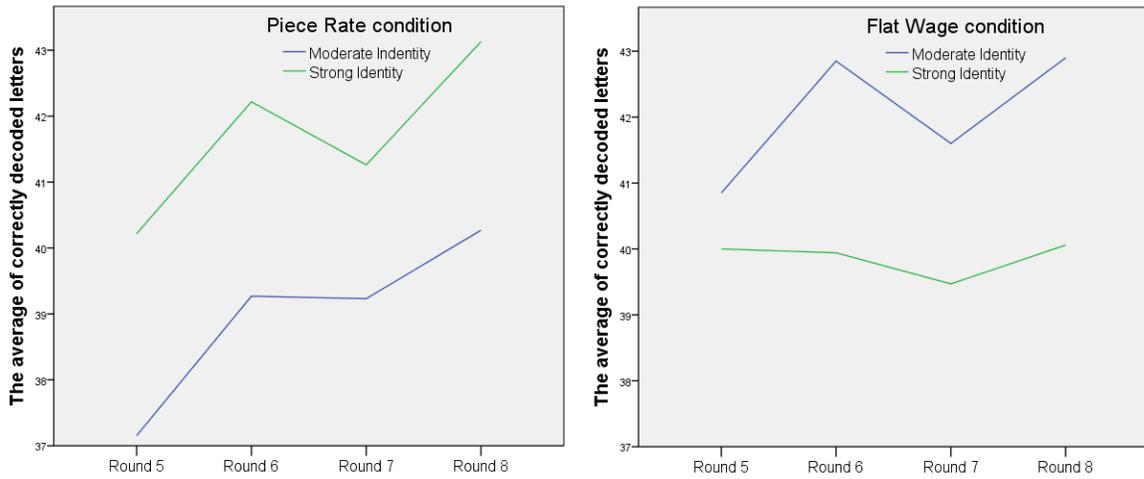
Figures

Figure 1: The mean sabotage in a round by compensation type (Panel A) and by group identity (Panel B).^a



^a For a participant, *Sabotage* in a round is the number of group members whose likelihood of experiencing a production loss has been increased by the participant in that round. *Sabotage* in a round for a participant can take on the values of 0, 1 or 2.

Figure 2: Contrasting average performance (Round 5 to Round 8) of participants with strong vs. moderate group identity (By compensation type – Left: Piece Rate condition; Right: Flat Wage condition)



Appendix C

Motivations for and against Sabotage

This appendix contains the two questions I used to capture the motivation for /against sabotage in the Post-Experimental Questionnaire.

I) Five reasons for sabotage

In the study, I chose to increase the probability of my fellow group members losing production units because:

- (1) I wanted to improve where I rank in terms of final production units.
- (2) I wanted to improve where I think I would rank in terms of earnings even though ranks are based on final production units.
- (3) ... even if it did not change where I rank in terms of final production units or earnings, doing so simply made me happy (or it gave me pleasure)
- (4) I believed my fellow group members had increased my probability of losing production units or would be doing so, and I did the same to make the final outcomes fairer.
- (5) I believed my fellow group members had increased my probability of losing production units, and I was angry at them.

II) Eight reasons for hesitating to sabotage

The question was stated as follows: In the study, I hesitated about increasing the probability of my fellow group members losing production units because:

- (1) it would cost me ECUs and reduce my earnings
- (2) it would be against my personal code of conduct, irrespective of how others regard such behavior
- (3) it would be disapproved of by people I am close to (e.g., my family members, my close friends)
- (4) it would be disapproved of by society in general
- (5) it would be disapproved of by my fellow group members
- (6) hurting my fellow group members is like hurting myself
- (7) I was concerned that doing so would damage my reputation outside of the study
- (8) I was concerned that doing so would expose myself to retaliation outside of this study.

Appendix D

Literature Review of Operationalization of Sabotage

The sabotage concept can be operationalized using the lens of a four dimensional view: namely, target, damage, sabotage actions, and the costs.

Targets of sabotage

Sabotage may be targeted at a single contestant (s) (Charness et al., 2014; Harbring et al., 2004, 2007), or toward all other contestants (Harbring and Irlenbusch, 2008, 2011).

When sabotage is directed at only chosen individuals in a multi-person tournament, a saboteur can choose to sabotage multi-persons at one time (Harbring et al., 2004, 2007), or only one person each time (Gürtler and Münster, 2010). When potential targets are inherently different in ability, the more competent target(s) may be subject to more sabotage in an individual based tournament (Chen, 2003), but the least competent target may experience greater sabotage in a collective (i.e., team-based) tournament (Gürtler, 2008). Interestingly, individuals can even sabotage themselves in early rounds of a dynamic tournament to avoid outperforming others because performing better than others in early rounds can make them become the targets of sabotage in later rounds (Gürtler and Münster, 2013).

Damage of Sabotage

In terms of the damages caused by sabotage, sabotage has been modeled to reduce the outputs of other contestants in a tournament setting (Harbring and Irlenbusch, 2008, 2011), to completely destroy the output of other contestants (Falk et al., 2008), to increase the marginal

cost of production efforts of other contestants (Amegashie, 2012; Harbring et al., 2004, 2007), to disrupt the working process of other contestants (Berger et al., 2013a; Hartmann and Schreck, 2015), or to indirectly decrease the winning chance of a potential rival (Amegashie and Runkel, 2007).

In Charness et al. (2014) and Wang (2016), a saboteur received or purchased a certain amount of points (no more than the maximum amount of point allowed) which can be used to sabotage others. Each sabotage point used by a saboteur can cause victims to lose one production unit, which reduced the victim's pay and / or decreased the victim's performance ranking. The maximum points of sabotage that can be used against a victim(s) in each round is 20 points, representing a maximum production loss of 20 units to a victim of sabotage in Charness et al. (2014). The maximum level of sabotage (i.e., 20 units) is significant to a victim, compared to the average initial production of 25 units. In Falk et al. (2008), participants were asked to decide between two options: "no sabotage" and "sabotage". If an individual decides to sabotage the other contestant from the same group, the entire output of the sabotaged contestant is destroyed. Two other studies provided participants with opportunities to interrupt others' working process by freezing their competitors' screens (Berger et al., 2013a; Hartmann and Schreck, 2015). In Hartmann and Schreck (2015), participants can freeze others' screens for 7 seconds at the cost of their own screens being frozen for 2 seconds. Similarly, in Berger et al. (2013a), participants can freeze others' screens for 20 seconds at the cost of freezing their own screen for 3 seconds.

The cost of sabotage to saboteur

Sabotage has been modeled as costly to the saboteur (Hannan et al., 2008a; Harbring and Irlenbusch, 2011) or as costless to the saboteur (Carpenter et al., 2010; Wang, 2016). For example, Carpenter et al. (2010) operationalized sabotage as a costless dishonest behavior of under-reporting other contestants' quantity and quality of production. In some treatment conditions of their experiment, the evaluations of quality and quantity of production can affect compensation, so lying can reduce others' compensation. Although lying is costless economically to liars in their experiments, they argue that "it does not appear to be costless from a psychological point of view"(Carpenter et al., 2010, pp. 507).

If the sabotage act is modeled as costly, the question arises as to the forms of cost function for sabotage. Would incremental sabotage demand higher marginal costs, in the sense that the cost functions of sabotage should be convex? An increasing marginal cost of sabotage is supported by some theoretical models (Harbring and Irlenbusch, 2008, 2011; Konrad, 2000). However, there are situations in the real world where the cost function may be concave.³⁵ Charness et al. (2014) used neither a convex nor a concave function of costs, adopting a linear function setting the cost per sabotage point at 0.5 ECUS (ECUs is experimental currency). Participants receive at the beginning of each round a fixed wage of 10ECUs (equivalent to 1 euro). The maximum sabotage points that can be used in each round is 20 points, which costs 10ECUs—the full amount of wage earned in each round.

³⁵ For example, imagine that an individual takes a lot of time and much effort to come up with a "smart" strategy of sabotage, and plans to use it against one co-worker. Because a lot of resources (e. g., time, effort, money) have been spent in developing the strategy, the cost of sabotaging the co-worker might be high. Next time when the saboteur wants to sabotage another co-worker, s/he may not have to spend resources developing a new strategy instead s/he can use the existing strategy. As a result, his or her cost of sabotaging a second co-worker would be less than the cost associated with the sabotage targeted at the first co-worker.

This suggests that participants will end up with zero net earnings (wage minus sabotage costs) if they acquire the maximum 20 points to sabotage others, and they will never end up with negative earnings at the end of each round. Falk et al. (2008) studied a two-person tournament where a person has a binary choice of “sabotage” or “not sabotage”. If sabotage is chosen, all the output of the other competitor is destroyed. The cost of the sabotage is 27 guilders,³⁶ and the wage is either 300 or 140 guilders depending on the treatment condition. As we can see, the cost of sabotage is significant, representing approximately 10% or 20% of the wage.

³⁶ Note 100 guilders = 0.12 CHF (1CHF ~ 0.9 USA dollars).