



**THE EFFECTS OF PERCEIVED FAIRNESS AND COMMUNICATION ON  
HONESTY AND COLLUSION IN A MULTI-AGENT SETTING**

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Submitted to the Graduate Faculty of  
the Katz Graduate School of Business in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy

University of Pittsburgh

2006

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UNIVERSITY OF PITTSBURGH  
KATZ GRADUATE SCHOOL OF BUSINESS

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Agents who perform interrelated tasks or work in similar local conditions often observe each other's actions and local signals. However, such information is often costly for the principal to obtain. Analytical models show that in such a situation, a peer reporting system with a verification mechanism (using one agent's information to verify the other's) and a reward for truthful whistle blowing can induce agents to report honestly and thereby help the principal achieve the first-best outcome. However, behavioral research suggests that the agents' perception regarding the fairness of the principal as well as cheap talk among agents may affect both how honestly agents report and how willing they are to blow the whistle on their peers. The results of the experiment show that under a peer reporting system, the agents' perception regarding the fairness of the principal positively affects the agents' reporting honesty and negatively affects the agents' rate of collusion. Communication between agents decreases their honesty and their whistle blowing when the principal is perceived as unfair, but not when the principal is perceived as fair.

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## PREFACE

With my most sincere gratitude, I acknowledge my committee members: Jacob Birnberg, Harry Evans, Vicky Hoffman and Donald Moser from the University of Pittsburgh and Kristy Towry from Emory University. Together, they gave me tremendous guidance, encouragement and advice during my journey as a Ph.D. student. Thank you, Harry, for your timely feedback, for being such an inspiring scholar and for opening your door to everyone all the time. Thank you, Vicky, for going out of your way to help your students and for being a role model to me. Thank you, Don, for your professionalism, your enthusiasm for research, your patience with me and your generous help throughout the years. Thank you, Kristy, for your wonderful influence on me and my dissertation and for your consistently great comments and suggestions. I am very lucky to know someone like you. Finally, thank you, Jake, for always being there for me, for believing in me even at times I did not believe in myself, and for being the greatest mentor and chair in the world. Jake, I cannot imagine how I would have survived all of these years without you.

I appreciate George Loewenstein from Carnegie Mellon University for his exceptionally helpful suggestions during the early stage of my dissertation. Without his influence, my dissertation would have taken a very different perspective.

I also thank the following people at the Katz school: Carrie Uzyak-Woods, for being an angel to all the doctoral students and for always being kinder than necessary. Joan Ballas, for

having the sweetest smile all the time. Steven Onaitis, for being a wonderful officemate and the best big brother. I also appreciate the help and support from those who went through or partially went through the Ph.D. program with me, especially Jonathan Pinto, Tom Zagencyk and Mengxin Zhao.

Personally, I appreciate my sister Yan and my cousin Leilei who have brought me so much joy and comfort and kept me posted of the news from home. I especially thank my boyfriend Fang who came into my life at a very difficult time and made me happier ever after.

This dissertation is dedicated to my grandmother, who passed away in April 2005 without me by her side, and to my parents, whose unconditional love made everything possible.

## CHAPTER 1: INTRODUCTION

A considerable body of experimental accounting research has focused on how different incentive contracts and various contextual factors affect agents' honesty in managerial reporting. Research in this area typically focuses on a one-principal, one-agent setting in which the agent possesses local information that is unknown to the principal. However, in practice, budgeting often takes place in multidivisional firms and involves interactions among many agents (Arya, Glover and Young 1996). In addition, due to job rotations, interrelated tasks, social interactions, similar environmental conditions or adjacent work locations, etc., agents often are aware of each other's local production information. In other words, there often is low information asymmetry among these agents, although the degree of information asymmetry between the agents and the principal may be high.

This richer setting presents the principal with a control opportunity. If the principal can successfully elicit information possessed by one agent about the other, the principal can greatly improve his/her contractual position at a relatively low cost. Several analytical modeling papers have investigated control issues in a multi-agent setting (see Demski and Sappington 1984; Demski et al. 1988; Ma 1988; Arya and Glover 1996; Fisher and Hughes 1997). While the assumptions and forms of these incentive systems vary, the general model is one in which each agent observes the other agent's action or private information and truthfully reports it to the principal. The agents are compensated based on their peer's report. In this dissertation, this type

of incentive system is labeled as "the peer reporting system". Ma (1988) is a typical example of a peer reporting system. Ma (1988) is particularly appealing since it demonstrates conditions under which the principal can achieve the first-best result when agents are able to perfectly observe each other's efforts. Ma (1988) originally investigates a moral hazard problem. By logical extension, the model can also be applied to a multi-agent, information asymmetry setting and facilitate the principal to enforce truthful budgetary reporting from agents.

Ma's (1988) peer reporting system is based on the assumption that agents are wealth maximizers. Therefore, agents are assumed to always prefer to convey to the principal any information they gather about their peers given the financial reward for doing so. In addition, Ma (1988) assumes that agents will choose their strategies without communicating with each other (Towry 2003). However, it is often socially and psychologically costly to blow the whistle on others, and agents may prefer not to reveal their peer's information to the principal despite the financial reward. In addition, agents constantly interact with each other in practice, the interactions and communications among agents can allow them to form collusive agreements in cases where lying and covering for each other is economically beneficial to them.<sup>1</sup> Conventional economic theory and behavioral decision theory make different assumptions regarding whether the above issues can undermine the effectiveness of the peer reporting system. Conventional economic theory assumes wealth maximization and thereby assumes away the social/psychological costs of whistle blowing and the potential impact of these costs on the effectiveness of the system. Conventional economic theory further assumes that, as long as

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<sup>1</sup> A "collusive agreement" or "collusion" refers to coordination among the agents that is not in the principal's best interest. In this study, both terms specifically refer to the case where both agents agree to overstate their budgeted costs and cover for each other.

communication is “cheap talk”, collusive communication between agents will not undermine the peer reporting system.<sup>2</sup>

In contrast to conventional economic theory, theory from social psychology and evidence from the experimental cheap talk literature suggest that depending on the situation, both the cost of blowing the whistle on others and non-binding communication between agents may reduce the deterrent effect of whistle blowing and render the peer reporting system less effective. A key situational factor advocated by the social psychology literature is agents' perception regarding the fairness of the principal<sup>3</sup>. This literature suggests that agents' perceived fairness of the principal affects both their own reporting honesty and their willingness to blow the whistle on a lying peer. In addition, agents' perceived fairness of the principal affects the relationship between agent communication and the effectiveness of the peer reporting system. In particular, under the peer reporting system, communication between agents is predicted to negatively affect their reporting honesty and their rate of whistle blowing when they perceive the principal to be unfair, but not when they perceive the principal to be fair.

This dissertation investigates whether and how the effectiveness of the peer reporting system is affected by agents' perceived fairness of the principal and agents' ability to communicate in a multi-agent budgetary reporting setting. In order to answer the research question, I conduct an experiment with triads consisting of one owner (the principal) and two managers (the agents). Undergraduate students played the role of the owners and the managers. In the experiment, the hypothetical firm uses Ma's (1988) peer reporting system to enforce truthful reports from managers. The experiment lasts eight periods. The participants are matched

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<sup>2</sup> Cheap talk refers to any costless, non-binding promise made by the players in a strategic game.

<sup>3</sup> In this dissertation, the agents' perception regarding the fairness of the principal specifically refers to the agents' perception of the fairness of the wage offered to them by the principal.

with different partners in each period. Participants in the experiment are randomly assigned into one of two communication conditions: the no communication condition and the communication condition. In both conditions, at the beginning of each experimental period, the owners are asked to choose a wage level (either 500 Liras or 1000 Liras) for the managers matched with them in that period. After learning their wages, managers in the no communication condition report their costs to the owner (in stage-one) and make a “whistle blowing” decision (in stage-two). The managers are unable to communicate with each other at any time. In the communication condition, after learning their wages, the two managers in each triad can anonymously communicate twice with each other (send a written message and make a written response) in every period, before they independently report their costs to the owner and subsequently make the “whistle blowing” decision. At the conclusion of the eighth period, participants in both conditions complete a post experimental questionnaire.

This study consists of three independent variables. The first independent variable, agent communication (yes or no), is manipulated between-subjects by assigning each participant to one of the two communication conditions. The second independent variable, wage (fair or unfair), is measured by asking owners to choose a wage for the managers matched with them and ask managers to rate their perceived fairness of their owner based on the wage. The third independent variable, experimental period, is manipulated within-subjects and consists of eight levels. The major dependent variables are agents’ reporting honesty and their percentage of whistle blowing on lying peers. Results show that despite the peer reporting system and the high reward for whistle blowing, managers report less honestly when they perceive that the owner is unfair than when they perceive that the owner is fair. As predicted, when given the opportunity to communicate, managers send more collusive messages and form more collusive agreements

when they perceive that the owner is unfair than when they perceive that the owner is fair. The managers' ability to communicate reduces both their honesty in reporting and their percentage of whistle blowing when the owner is perceived as unfair, but not when the owner is perceived as fair.

This dissertation contributes to the literature in several ways. First, it addresses the call for experimental research to investigate multi-person environments (Sprinkle 2003). Compared with a single-person setting, there are additional problems to consider in a multi-person environment such as mutual monitoring among group members, improved risk sharing, free-riding, competition, collusion, etc. This study experimentally examined mutual monitoring and collusion between agents and how contextual factors such as perceived fairness and agent communication can impact individuals' behaviors in a multi-person budgeting setting. As pointed out by Fisher (1994) and Sprinkle (2003), experimental studies examining multi-person issues across difference production settings, group incentive schemes and communication and monitoring arrangements are valuable to accounting research.

Second, this dissertation experimentally examines the effectiveness of a peer reporting system in eliciting truthful budgeting reports from agents and provides evidence that two factors, agents' perceived fairness of the principal and the ability of agents to communicate, play important roles in determining agents' honesty in reporting under a peer reporting system. By doing so, this dissertation demonstrates the importance of analyzing control systems in context. Additionally, this dissertation answers recent call for accounting research to combine theories from both economics and psychology to provide better insights into accounting issues (Luft 1997; Moser 1998; Evans and Moser 2004).



Third, this dissertation has implications for the role of agent communication in organizations. Many organizations offer costly organized leisure time activities to their employees to encourage communication and cooperation among them. The expectation is that communication leads to knowledge sharing and enhances productivity in the workplace. However, agents may also cooperate (i.e., collude) to provide low effort and to enjoy private benefits at the expense of the organization. In contrast to prior research, which typically focuses on the productive side of agent communication, this study investigates the potentially counter-productive side of agent communication, i.e., the possibility of agent collusion.

Fourth, this dissertation also provides insight into the whistle blowing practice<sup>4</sup>. This study shows that in a controlled experiment where reputation formation is precluded, people are still reluctant to blow the whistle on their lying peers despite the high reward that encourages whistle blowing. Whistle blowing on a peer's opportunistic behaviors is least likely to take place when the agents who can communicate with each other perceive the principal to be unfair.

The remainder of this dissertation is organized as follows. Chapter 2 reviews the relevant literature in accounting and economics and discusses the motivations of this dissertation. Chapter 3 presents the multi-agent managerial reporting setting of this dissertation, applies Ma's (1988) peer reporting system to this setting, and develops predictions of the agents' behavior under the peer reporting system based on the wealth maximizing assumption. Chapter 4 presents

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<sup>4</sup> Whistle Blowing is defined by Near and Miceli (1985) as "the disclosure of perceived wrongdoing by organizational members to parties who may be able to halt it." The whistle blowing phenomenon aroused more public attention nowadays. The Sarbanes-Oxley Act included a groundbreaking provision protecting employees who blow the whistle on corporate fraud. These whistle-blower provisions provide broader remedies for employees than do other whistle-blower protection laws. Public companies are now required to write a corporate code of conduct that encourages employees to report potential financial, ethical, legal or other misconduct; to include a "no-retaliation" policy and identify employees who are to receive complaints of whistle-blower retaliation; to establish a corporate compliance telephone hotline and/or name a corporate compliance or ethics officer; and to keep well-documented personnel files, disciplinary records and termination records---Forbes, June 18, 2003.

behavioral theories and evidence from social psychology, accounting, the empirical whistle blowing and cheap talk literature regarding the roles of agent communication and their perceived fairness of the principal. Chapter 5 develops the behavioral hypotheses of this dissertation. Chapter 6 describes the research design and the experimental procedures. Chapter 7 presents the results and statistical analyses. Chapter 8 summarizes and concludes this dissertation. Experimental instructions and post experimental questionnaires for both experimental conditions are presented in the Appendix.

## **CHAPTER 2: BACKGROUND AND MOTIVATION**

This dissertation experimentally explores the effect of a multi-agent incentive system—specifically, the peer reporting system, on enforcing honesty in multi-agent managerial reporting. This chapter reviews studies in the incentive contracting literature that inspired this dissertation. It starts with a brief review of the relevant single agent experiments in this area, followed by a review of both the analytical and the experimental studies involving contracting with multiple agents. This chapter highlights several issues that have not been thoroughly addressed in the literature and illustrates how this dissertation may contribute to our understanding of those issues.

### **2.1 SINGLE AGENT STUDIES**

A series of managerial accounting experiments have explored the effects of incentives on agents' reporting and production decisions. An important focus of these studies has been to assess the relative merits of alternative compensation schemes for eliciting agent's private information while simultaneously using that information to provide agents with production incentives (Evans and Moser 2004). Earlier experiments typically manipulate the incentive structure or the information environment and explore the extent to which individuals create the maximum potential slack through their budgetary report as the analytical models predict (Young

1985; Chow, Cooper and Waller 1988; Waller 1988). Various contract forms have been studied including truth-inducing schemes and slack-inducing schemes in a single-agent environment. Results show that individuals create significantly less budgetary slack than the models predict. Among the explanations offered for these results are that individuals' preferences include not only wealth and leisure, but also equity or honesty (Covaleski, Evans, Luft and Shields, 2005).

Later experimental studies explore how factors other than conventional monetary incentive can systematically affect agents' reporting behavior and firm profit. For example, Evans, Hannan, Krishnan and Moser (2001) report the results of three experiments that examine how preferences for wealth and honesty together affect managerial reporting. They find that agent participants often sacrifice wealth to make honest or partially honest reports. Their level of honesty generally does not decrease as the payoff to lying increases. However, they report less honestly under the contract that provides a smaller share of the total surplus to the agent than under one that provides a larger share, suggesting that the extent of honesty may depend on how the surplus is divided between the agent and the firm. The results of their experiments indicate that a modified version of the optimal agency contract, which makes use of participants' preferences for honest reporting, yields higher firm profit than either the optimal agency contract or the contract that relies exclusively on honest reporting. The paper suggests that agent's willingness to lie is endogenous and the extent of honesty depends on the contracts they are facing and the situations they are in.

Stevens (2002) examines how reputation concern (socially mediated concern for having a positive public image) and ethical concern (internally mediated concern for doing the right thing) affect agents' budgetary reporting. Results suggest that the participants' reputation concerns are negatively related with the degree of information asymmetry between the principal and the agent,

while their ethical concerns operate equally for all levels of information asymmetry. The results show that both reputation and ethical concerns significantly reduce the level of slack agents create.

Rankin, Schwartz and Young (2003) investigate whether non-binding budgetary announcement made by principals can reduce agents' consumption of slack in a participatory budgeting setting. They find that principals use nonbinding announcement as a bluff in an attempt to convince agents that they will reject a profitable project more often than they intend. This strategy appears to be valuable to the principal. Specifically, agents do not treat the nonbinding announcements as cheap talk and reduce their level of slack accordingly. As a result, principals in the nonbinding announcement condition significantly outperform those in the no-announcement condition. The difference in principal welfare between the nonbinding announcement and the binding announcement conditions is much less than predictions made from standard game-theoretic assumptions.

Hannan, Rankin and Towry (2005) experimentally examine the effect of reductions in information asymmetry on managerial honesty in participatory budgeting when the information is non-contractible. The paper provides evidence that agents trade off their preferences for wealth and positive social impression (appearing honest). Results show that the effect of a reduction in information asymmetry depends on the weight the agent places on each of the two preferences and on the wealth that must be foregone in order to appear honest. The paper shows that reductions in information asymmetry can increase agent honesty, because agents care about the impressions principals have of them, and are willing to sacrifice wealth in order to appear honest. However, as the level of information asymmetry decreases, agents must give up more and more wealth in order to appear honest. If the cost of appearing honest becomes too great, agents will

simply ignore their preference for appearing honest, and report so they maximize their wealth. Importantly, a trade-off between wealth and appearing honest opens the possibility that reductions in information asymmetry might even decrease reporting honesty. This is because as the information system becomes more precise, more agents may want to abandon their goals of impression management and choose wealth-maximizing reports. This study suggests that preferences for honesty are fragile and sensitive to subtle contextual features.

All the above studies contribute to the growing literature examining the roles of psychological/contextual factors that conventional economic models do not predict will systematically influence managerial behaviors. Understanding these factors can lead to more efficient contracts which reduce the emphasis on explicit controls and focus also on intrinsic preferences and motivation (Hannan et al., 2005). By bringing together agency theory and behavioral decision theory, these studies contribute to building an improved theory of participative budgeting (Evans and Moser 2004).

## **2.2 MULTI-AGENT STUDIES**

The incentive contracting studies in the previous section focus on a single agent environment. In business practice, incentive contracting and budgeting usually involves multiple groups and multiple agents. Prior experimental research has not fully explored the multi-person nature characterizing many business situations. As pointed out in Baiman (1990) and Sprinkle (2003), compared with a single-person setting, there are additional issues to consider in a multi-person environment. These include mutual monitoring among group members, improved risk sharing, free-riding, competition, collusion, etc. None of these multi-person issues has been fully

explored in the accounting literature. We also do not know whether and how the psychological/contextual factors that can systematically influence managerial reporting in a single agent environment would have different effects in a multi-agent setting. These factors include individual's preference for honesty and fairness, communication and trust among individuals, social impression management, etc. In an attempt to improve our understanding on the above mentioned issues, this dissertation explores how two factors, namely agents' perceived fairness of the principal and agents' ability to communicate, affect mutual monitoring and colluding between agents under the peer reporting system. Next, this section presents the analytical literature on contracting with multiple agents, introduces the peer reporting model and reviews experimental research in accounting that involves multiple agents. In section 2.3, I discuss how this dissertation is distinguished from and contributes to the existing multi-agent research.

### **2.2.1 Agency Theory on Contracting with Multiple Agents**

The analytical literature has identified several ways in which the principal can improve his/her contracting position by taking advantage of the multi-agent setting. These include promoting knowledge sharing and cooperation among agents (Tirole 1988, Itoh 1991); using relative performance evaluation when agents share some common uncertainty (Holmstrom 1982); allowing risk sharing among agents when the agents are risk averse (Villadsen 1995); and encouraging peer mutual monitoring when agents can observe each other (Ma 1988). This dissertation focuses on the mutual monitoring aspect of the multi-agent environment. In practice, agents often can observe each others' actions and local signals although such information can be costly for the principal to obtain. In such a situation, encouraging mutual monitoring among

agents and eliciting information possessed by one agent about another can be very useful to the principal.

Researchers have long noted the potential value of mutual monitoring (e.g., Fama and Jensen 1983; Kandal and Lazear 1992). Most of the analytical literature on mutual monitoring focuses on peer monitoring in teams, where the action of one agent affects the well being of other agents (Bowles and Gintis 1998, Carpenter 1999). Many mutual monitoring systems in teams tie each agent's pay to his/her team members' efforts. This provides incentives for team self-management and encourages a tit-for-tat strategy among the agents (Tirole 1988; Varian 1990; Kandal and Lazear 1992; Itoh 1993; Arya, Fellingham and Glover 1997). For example, a mutual monitoring system proposed by Arya, Fellingham and Glover (1997) provides output-based team incentives in the odd periods, meaning that each agent's compensation is increasing in team output and that each agent prefers the other agent working to the other agent shirking. In the even periods, the system works in such a way that each agent's net profit is determined solely by the other agent's decision. By doing so, the principal creates an opportunity for agents to punish the teammate in the even periods if the teammate shirks in the odd periods.

As indicated by Bowles et al. (2001), the crucial condition for agents to play a tit-for-tat strategy is that agents are residual claimants to the team's output. When this is true, shirking and/or other dishonest behaviors in the workplace by one agent impose costs on other team members. The mutual monitoring system that relies on the tit-for-tat strategy among team members (hereafter the tit-for-tat system) may fail in settings where (a) agents who share information about each other are not compensated based on joint production outcome and/or (b) agents can benefit more by colluding with each other and shirking together than by engaging in team self-management desired by the principal.



The analytical modeling literature (Demski and Sappington 1984; Demski et al. 1988; Ma 1988, Arya, Glover and Young 1996; Fischer and Hughes 1997) proposes another type of mutual monitoring system that can improve the principal's contractual position in a more general setting which does not require agents to be residual claimants of team outputs. This type of mutual monitoring system is referred to as the "peer reporting system" in this dissertation. A common theme of the peer reporting system is that when there is low (or no) information asymmetry between two agents, the principal can improve his/her welfare by encouraging peer reporting and basing each agent's compensation on the peer's report. The agents are essentially whistle blowers, who pass along to the principal any information they gather about their coworkers (Towry 2003). The principal can extract private information at a lower cost when agent B reveals agent A's private information than when agent A reveals his/her own private information.

For example, Demski and Sappington (1984) investigate contracting with multiple agents when they have correlated private local signals. They show that the principal can extract rents from these agents by requiring each agent to pick a lottery contingent on the other agent's output. By picking this lottery, the agents reveal each other's private information to the principal. Compared with treating the agents independently, this contract limits the rents that the agents might otherwise be able to command with their private information. However, there exists an equilibrium in which the agents can claim to have observed the smallest realization of the local signal. In order for the above unwanted equilibrium to be dominated, the principal can treat the agents asymmetrically. That is, the principal can pay a little more to one agent to make him both a productive agent and an information provider. This dual-role agent is induced to report truthfully as a dominant strategy. The other agent is only constrained to report truthfully as the best response.

Ma (1988) proposes a mutual monitoring contract in a setting where two agents can perfectly observe each other's actions. Specifically, Ma (1988) suggests a two-stage mechanism. In stage-one, the two agents select their own actions. In stage-two, one of the agents reports to the principal the actions taken by both agents in stage-one and the other agent verifies the report. Each agent's compensation is based on the information provided by the other agent. An important feature of this contract is that if the second agent challenges the first agent's report, the second agent is required to accept an output-based lottery which is valuable only if the first agent did in fact lie. Under this contract, as long as the agents are rational players, they always prefer to choose the principal's desired action in stage-one; in stage-two, the first agent truthfully reports and the second agent verifies the report to the principal. The model strictly improves the principal's welfare when compared with one that treats the agents independently. Ma (1988)'s model is particularly appealing because it provides a first-best solution. This is because the risk averse agents are compensated based on reports of actions, not on stochastic outcomes. The agents take no risks in equilibrium.

Fischer and Hughes (1997) extend Ma (1988)'s setting by considering the more common situation where agents privately observe imperfect signals regarding each other's actions before outcomes are realized. Similar to Ma, they assume that each agent reports on the signal they observe. Each agent's compensation is a function of the signals reported and the output produced. Since the agents are risk averse and their compensation partially depends on the output produced, the agents will take some risk and this has to be compensated by the principal. Therefore, Fischer and Hughes (1997) do not provide a first-best solution. However, they demonstrate conditions under which truthful reporting and desired actions can be implemented at nearly no additional cost with their compensation scheme.

The common theme of the aforementioned peer reporting systems is that they all rely on one agent reporting on other agents' private information or action to the principal. The peer reporting systems are based on two fundamental assumptions. First, agents are wealth maximizers. Second, agents will independently choose their strategies to maximize their individual wealth. As a result, agents will always prefer to be the principal's information providers and in equilibrium, all these models are tacit collusion proof. However, as pointed out by Towry (2003), off-equilibrium collusion is still possible under these models. Specifically, agents can explicitly or implicitly side contract with each other, agreeing to both lie and then cover for each other to achieve economic benefits. The possibility of off-equilibrium collusion suggests the importance of studying these peer reporting systems in context. One of the major goals of this dissertation is to investigate under which circumstances agents are more likely to engage in off-equilibrium collusion. Before I elaborate on the objectives of this dissertation, I will first review previous experimental studies that investigate different aspects of the multi-agent environment. The focus of the review is on research that has enriched our knowledge of multi-agent issues by bringing both the economic and the social/psychological perspectives into their studies.

### **2.2.2 Multi-Agent Experiments**

In an extensive review of experimental research in managerial accounting, Sprinkle (2003) points out that only a few studies have examined incentive issues in multi-agent settings, and it is unclear how the theoretical benefits and costs associated with multi-agent environment translate into realized performance. More experimental studies examining multi-agent issues (such as cooperation, competition, mutual monitoring, risk sharing, free riding, collusion, etc.)

across different production settings, incentive schemes and communication and monitoring arrangements would be valuable to accounting research (Fisher, 1994; Nalbantian and Schotter, 1997; Sprinkle 2003).

Early experiments involving multiple agents include Waller and Bishop (1990), Chow, Hirst and Shields (1994) and Young, Fisher and Lindquist (1993). The first two studies experimentally examine the effects of alternative incentive schemes for controlling agents' opportunistic behaviors in intra-firm resource allocation settings. Both papers test the effect of a multi-agent incentive scheme, specifically, the Groves Scheme, in comparison with the effects of the single-agent incentive schemes.<sup>5</sup> These papers are among the pioneers that extend their scope of study to multi-agent situations. However, both studies treat multiple agents as a collection of individuals and do not encompass in their experiments important features characterizing the multi-agent environment, such as interactions and social comparisons among individuals, cooperation and competition among peers, etc. In addition, as pointed out in Evans and Moser (2004), the multi-agent incentive scheme (i.e. the Grove Scheme) studied in these papers are not used in practice, nor is it demonstrated to be able to improve welfare over currently existing schemes. As a result, these studies improved our understanding of multi-person issues only to a limited degree. Young et al. (1993) investigate how intra-group cooperation and performance feedback received from inter-group competition affect group performance and slack. Their experiment captures some important behavioral aspects of the multi-person environment. However, the paper lacks any clear economic benchmark predictions against which to compare the behaviors observed in their experiment. Therefore, although the study identifies a potentially

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<sup>5</sup> Under the Grove Scheme, a unit manager's pay is linear in the sum of his or her unit's actual profit and the other unit's budgeted profit (Waller and Bishop 1990).

interesting challenge to existing theory, it does not take advantage of the opportunity to advance theory in a structured, incremental fashion (Evans and Moser 2004).

More recent experiments involving multiple agents capture more elements specific to the multi-agent environment in their designs and more successfully integrate both economic theory and behavioral science. Fisher, Maine, Peffer and Sprinkle (2002) and Hannan, Rankin and Towry (2005) both investigate the effect of explicit and implicit competition among multiple agents in the participative budgeting setting. Fisher et al. (2002) examine whether two practices—using budgets to allocate scarce resources and providing information about co-workers—reduce budget slack. Both practices arise naturally in budget settings involving multiple agents. Both practices are expected to increase competition among agents. The results of the experiment show that when the principal can allocate more resources to the more productive agent, agents build significantly less slack into their budgets. The results also indicate that a non-economic factor, i.e., providing agents information about their co-workers' budget proposals, promotes the desire to outbid co-workers, thereby motivating agents to reduce budget slack. Hannan, Rankin and Towry (2005) investigate how increasing the principal's span of control (changing from a single-agent setting to a multi-agent setting) can improve the effectiveness of the budgeting process. They find that the principal in the multi-agent situation is more willing to incur a cost in order to punish an agent who is assumed to have incorporated excess slack in the budget, i.e., the principal is tougher. In addition, agents anticipate that the principal will be more willing to reject profitable budget proposals to enforce norms in the multi-agent condition. This anticipation creates implicit competition among agents to propose a project with a lower cost compared to other agents and results in more honest budget report. Both Fisher et al. (2002) and Hannan et al. (2005) suggest that prior single agent studies may have

underestimated the importance of social factors in eliciting truthful reporting from agents. In particular, agents' reporting is influenced by the social pressure due to the presence of other agents. Together, these papers suggest that the influence of social norms on agents' behaviors is even greater in the multi-agent setting than in the single agent setting.

None of the above papers involving multi-agent consider a phenomenon characterizing many multi-agent environments. That is, there often is low (or no) information asymmetry among multiple agents. As discussed earlier, in practice, agents often can observe each other's actions and local signals. The principal can take advantage of the low information asymmetry among agents and encourage peer mutual monitoring. Two studies that have investigated mutual monitoring in multi-agent settings and therefore are most relevant to this dissertation are by Nikias (2002) and Towry (2003). Both papers experimentally test mutual monitoring models proposed in the analytical literature. Nikias (2002) focuses on mutual monitoring issues in a team setting. He experimentally studies the effect of the tit-for-tat system in a two-period game. The system is based on Arya et al. (1997). Under this system, one agent has the chance to punish the other agent in the second period, if the other agent shirks in the first period. Nikias (2002) finds that, consistent with Arya et al. (1997), team members play the punishment strategies in the second period if their teammates shirk in the first period. However, inconsistent with the model, agents only infrequently coordinate to the Pareto-dominant strategy (work in both periods) without pre-play communication. In fact, when there is no pre-play communication, the agents' proportion of working under the tit-for-tat system is significantly lower than that under the individual incentive system. When the agents are allowed to engage in pre-play communication, their coordination rate under the tit-for-tat system increases significantly, and the proportion of working under the tit-for-tat system is not significantly different from that under the individual

incentive system. The paper suggests that coordination is a decisive issue in the success of the tit-for-tat system. Providing individuals with an opportunity to communicate facilitates coordination and is an important factor to consider in the design of mutual monitoring contracts.

Towry (2003) also examines mutual monitoring in teams. She experimentally investigates both types of mutual monitoring systems discussed in section 2.2.1: the tit-for-tat system and the peer reporting system. She manipulates team identity (high or low) among team members and finds that monitoring system interacts with team identity to influence team members' effort choice. Specifically, a high team identity leads to increased effort levels under the tit-for-tat system. However, a high team identity leads to decreased effort levels under the peer reporting system. Further analyses show that, under the tit-for-tat system, high team identity increases the level of coordination between team members, which in turn increases their choice of the mutually beneficial outcomes—cooperate and contribute high effort in both the odd and even periods. In contrast, under the peer reporting system, high team identity increases the level of collusion between team members, which in turn leads to lower effort and false reporting in teams. These findings are particularly important with regard to the role of team identity, a factor that analytical models do not predict will systematically affect agents' behaviors. This anomaly presented in Towry (2003) provides valuable insight into how the theory of mutual monitoring can potentially be modified to lead to better predictions of the agents' actual behaviors.

Both Nikias (2002) and Towry (2003) contribute to our understanding of the effect of peer mutual monitoring on controlling moral hazard problems in teams. Both studies address a phenomenon ubiquitous in practice that has been neglected in prior experimental research in management accounting. That is, there often is lower information asymmetry among agents than there is between the agents and the principal, and agents are more likely than the principal to be

aware of their coworkers' opportunistic behaviors. As a result, peer mutual monitoring, either formal or informal, can be valuable to firms. In addition, both studies point out that the effectiveness of peer monitoring is contingent not only on incentive contracting designs, but also on a variety of contextual, psychological or social factors. Further research is needed to combine theories from diverse disciplines and examine mutual monitoring across a range of production settings and social contexts.

### **2.3 MOTIVATIONS OF THIS DISSERTATION**

This dissertation is an extension to the aforementioned line of research. Instead of addressing how mutual monitoring can help the moral hazard problems in teams, it investigates how mutual monitoring can help solve the information asymmetry problem in multi-agent participative budgeting. The setting studied involves two managers who know their own and each other's private information reporting to an owner. The setting is an extension of Antle and Eppen (1985)'s owner-manager model. The details of the setting are described in Chapter 3.

I am not aware of any experiment that addresses mutual monitoring issues in a multi-agent participative budgeting setting. However, this setting is quite relevant to business practices. In the workplace, budgeting often involves multiple agents who can better observe each other's actions and local signals than the principal can. Many companies have a budget review meeting during which agents present their budget proposals in the presence of peer agents and the principal (Finney, 1993, 1994). Due to similarities in the work environment or their prior work experience, peer agents often have more insight into the veracity of the data presented by the other agent in the budget report than the principal does. When an agent in a multidivisional firm



reports his local information to the principal, his capacity to misrepresent local information can potentially be seriously undermined if there are other agents (either from the same division or from other divisions) who can observe his local information. Of course, this depends on the willingness of the other agents to report their knowledge to the principal. The first objective of this dissertation is to introduce peer mutual monitoring to the participative budgeting setting and study how peer mutual monitoring can help induce honesty in multi-agent reporting.

As discussed before, there are two basic types of mutual monitoring systems: the tit-for-tat system that relies on team self-management and tit-for-tat strategy among team members, and the peer reporting system that relies on whistle blowing on peer's misconduct. This dissertation chooses to study the effect of the peer reporting system in the multi-agent budgeting setting. In the setting of interest, agents who can observe each other's information are not from the same divisions (teams). Since these agents are not from the same divisions (teams), their compensations are not contingent on each other's performance. Therefore, they do not have to share gains or bear losses resulting from the other agent's opportunistic behavior.<sup>6</sup> As a result, these agents do not have incentives to punish the other agent's opportunistic behavior. Hence, the tit-for-tat mutual monitoring system would not work in the setting studied in this dissertation. This is even truer when agents can work together for their mutual benefit by colluding to build in slack and consume more perquisites. In contrast, the peer reporting system suggested by the analytical literature does not rely on gain/loss sharing in teams and can be very useful in this budgeting setting. Firms that face persistent problems with budget slack may wish to provide monetary rewards to encourage agents to blow the whistle on other agents' dishonest reports.

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<sup>6</sup> In my setting, scarce resource is not a problem and capital is not rationed. Agents in this dissertation do not have to compete for limited resources. If one agent overstates the resources he needs, the amount of resources the other agent may receive will be not affected.

A secondary reason I choose to study the peer reporting system is because the use of such systems is becoming increasingly widespread in practice. The peer reporting system is essentially a whistle blowing system; an internal control tool that has been used in firms for a long time and has been promoted for broader implementation since the passage of the Sarbanes Oxley Act. An empirical study of the Fortune 1000 by Weaver et al. (1999) indicates that most of these companies have some kind of corporate whistle blowing functions to receive reports about corporate wrongdoing from employees. Many firms provide monetary rewards to encourage whistle blowing. The Sarbanes-Oxley Act includes a groundbreaking provision protecting employees who blow the whistle on corporate fraud. Public companies are now required to write a corporate code of conduct that encourages employees to report potential financial, ethical, legal or other misconduct and to establish a corporate compliance telephone hotline and/or name a corporate compliance or ethics officer (Forbes, June 18, 2003).<sup>7</sup>

To study how peer reporting can help induce honesty in multi-agent budgeting, it is important to investigate conditions under which peer reporting are more or less useful. Thus, the second objective of this dissertation is to explore contextual factors that can systematically affect the effectiveness of the peer reporting system. As mentioned in section 2.2.1, the problem associated with the peer reporting system is that it faces the potential threat of off-equilibrium

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<sup>7</sup> Miceli and Near (1992) suggests that most leaders of organizations want to encourage valid whistle-blowing. While whistle-blowing may be threatening to some managers or co-workers, it often can improve long-term organizational effectiveness, because whistle-blowers may suggest solutions to organizational problems. More importantly, organization members, stockholders, and society in general, can benefit from the cessation of organizational wrongdoing. Potential costs of whistle blowing include increased level of mistrust among colleagues. However, research suggests that organizations that specifically encourage reporting and specify a channel for blowing the whistle do not experience tension among employees (Miceli and Near 1992). There is also evidence that the climate for whistle-blowing is associated with higher levels of employee satisfaction (Gorden et al., 1988; Zalkind 1987). In addition, according to a survey by Keenan (1988), 95% of the respondents personally expressed approval of the practice of employees reporting illegal or wasteful activities within their company's operations. 96% of these managers thought organization employees should be encouraged to report illegal or wasteful activities and 56% indicated very strong feelings that internal whistle blowing is in the best interest of the organization.

collusion between agents. In the budgeting setting, this means that agents can agree to build in slack into their budgets and cover for each other. The analytical models do not consider the likelihood of off-equilibrium collusion, and, therefore, do not look into the processes through which such collusion could emerge. This dissertation explores situations under which agents are more likely to engage in off-equilibrium collusion. In other words, the situations under which the peer reporting system is more likely to fail. Studying these contextual factors both can provide better advice to practitioners who establish managerial control systems and offer useful insights for theoretical advancement.

The first contextual factor studied is the relationship between agents and the principal (as reflected by agents' perceived fairness of the principal). Towry (2003) studies how the relationship between agents (as reflected by team identity) can affect the peer reporting system in a team setting. In her study, the principal does not play an active role. However, I argue that the principal's role can be very important in determining the success or failure of the peer reporting system. Organizational structures involve both the principal and the agents. In modern business, the relationship between agents is often intertwined with the relationship between agents and the principal. Together, these two types of relationships affect individual behaviors. Under the peer reporting system, agents often have to make two competing choices: whether to cooperate (collude) with other agents (by covering for each other's opportunistic behaviors) or to cooperate with the principal (by policing other agents and being the principal's information provider). As will be elaborated in Chapter 4, in such a situation, agent's choices can be systematically affected by agent's perceived fairness of the principal. In the current study, the principal plays an active role by choosing a wage level for the agents. Agents' perceived fairness of the principal in this study is based on the wage they receive from the principal. Much evidence in prior literature

suggests that the agency relationship is significantly affected by distributive concerns. Agents take into account the fairness associated with the payment they receive from the principal. Agents' concerns for fairness result in their reciprocating behaviors and affect their willingness to cooperate with the principal, thereby impacting the effectiveness of the peer reporting system.

The second contextual factor is the effect of non-binding communication between agents. Prior studies (Kachelmeier 1994, Rankin et al. 2003, Nikias 2002, Towry 2003) suggest that non-binding communication can play an important role in coordinating individuals' actions. Coordination between agents is an important factor in determining agents' off-equilibrium collusion under the peer reporting system (Towry 2003). In practice, agents communicate with each other frequently. However, communication is generally missing from multi-agent studies in accounting. Prior research normally assumes that there is no communication among agents (Towry 2003). Without communication, agents in these studies can not replicate agents in the real business environment (Birnberg et al. 1970). Additionally, having the communication condition in the current study allows me to investigate whether agents will take into account the way the principal behaves when they have the chance to communicate (collude) with their peers, in other words, whether communication between agents is affected by agents' perceived fairness of the principal. The no communication condition in the experiment is used as a benchmark. Furthermore, the no communication condition permits one to observe the power of fairness norm in coordinating agents' behaviors in a multi-person environment, when agents cannot explicitly coordinate their actions.

This dissertation builds on theories from both economics and behavioral sciences, suggesting that insights from each can help us better understand mutual monitoring in organizations. In the following chapter, I introduce the economic perspectives on the

effectiveness of the peer reporting system and on the roles of non-binding agent communication and agents' perceived fairness of the principal. In Chapter 4, I introduce behavioral theories on the roles of fairness and communication, and review the relevant experimental literature.

## CHAPTER 3: MODEL DEVELOPMENT

In this chapter, I describe the multi-agent, managerial reporting setting of this dissertation and apply the peer reporting system to this setting. I then develop predictions regarding agents' behaviors under the peer reporting system based on the wealth maximizing assumption. These wealth maximizing predictions will provide a clear benchmark against which to compare agents' actual behaviors in my experiment.

### 3.1 SETTING

The setting in this dissertation is an extension of Antle and Eppen's (1985) owner-manager model of the budgeting process. In Antle and Eppen (1985), project completion requires a manager's presence and funding is provided by the owner. The cost of the project is uniformly distributed as  $c \in (c_{\min}, c_{\max})$ , and revenue,  $R$ , equals  $c_{\max}$ . The expected total surplus from the project is given by  $R - E(c)$ . Revenue and the probability distribution over costs are common knowledge. However, only the manager knows the actual cost. Because of the manager's private information, the owner uses participatory budgeting to elicit a "cost report" from the manager.

The setting described in this dissertation differs from Antle and Eppen (1985) in that there are two managers. The owner elicits information from both managers, A and B. The cost of project A is uniformly distributed as  $c_A \in (c_{A\min}, c_{A\max})$ ; the cost of project B is uniformly

distributed as  $c_B \in (c_{Bmin}, c_{Bmax})$ . The revenue of project A,  $R_A$ , is equal to  $c_{Amax}$ ; the revenue of project B,  $R_B$ , is equal to  $c_{Bmax}$ . The firm's expected total surplus from the project is given by  $R_A - E(c_A) + R_B - E(c_B)$ . Both projects' revenue and the probability distribution over costs are common knowledge. However, only the managers know the projects' actual costs. That is, the managers know their own actual cost and can perfectly observe the other's actual cost.

Under the assumption that both the owner and the managers have utility only for wealth, manager A and manager B will submit the highest feasible cost reports (i.e.,  $c_{Amax}$  and  $c_{Bmax}$ , respectively) to the owner if there is no control system in place. Therefore, the managers appropriate the entire surplus from the projects.

### **3.2 APPLY MA (1988)'S MODEL TO THE SETTING**

To resolve the problem noted above, the owner could introduce a peer reporting system into the above setting. The peer reporting system selected in this dissertation is based on Ma (1988). Ma (1988)'s model is chosen because 1), it provides a first-best solution; 2), it has an intuitive appeal and can be examined experimentally; and 3), it represents the whistle blowing practice frequently observed in practice. Ma (1988) originally investigates a moral hazard problem. Under Ma (1988)'s system, each agent's compensation is based on the report filed by the other agent. The principal enforces the veracity of the agents' reports in such a way that, if one agent accuses the other of lying, the accusing agent is required to accept an output-based lottery which is valuable only if the other agent did in fact lie. An alternative way to verify the accusation, as suggested by Towry (2003), is for the firm to employ an auditor. The auditor is called only if one agent accuses the other of lying. The accusing agent is then rewarded if the

auditor determines that the accusation is truthful and penalized if the accusation is false. One apparent disadvantage of using an auditor as opposed to using a lottery to enforce truthful whistle blowing is that the principal would have to pay the auditor, making it a costly solution. However, if agents are rational players, they will always prefer to truthfully report their peer's action to the principal to obtain the reward. By backward induction, the threat of peer reporting will deter agents from shirking in the first place. Therefore, in equilibrium, no whistle blowing will have to take place and the auditor is never called. The off-equilibrium possibility of an audit is sufficient to induce truthful reporting by both agents. From the principal's perspective, this approach improves her welfare when compared with a simple one that treats agents independently and audit every report from agents.

By logical extension, Ma's model can also be applied to the information asymmetry case in this dissertation. Assume that the owner utilizes the two managers' knowledge about each other to enforce truthful reporting. Assume that the owner asks each manager to report their own cost, and then uses the other manager's reaction as a policing device. One manager's pay depends on the other manager's verification. Specifically, if manager B states that manager A honestly reported the cost, manager A receives his reservation utility payment,  $w$ , and will be reimbursed for the production cost he reported. If B states that A overstated the cost, A will receive his reservation utility payment,  $w$ , and be fined  $f$  for overstating. Incentives to B's verification are provided by demanding that any accusation be supported by an audit. If B's accusation is proved to be right, then B is provided a bonus,  $b$ ; if not, then B has to pay a penalty,  $p$ , for falsely accusing A.<sup>8</sup>

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<sup>8</sup> An important feature of this system is that the audit only takes place when one manager accuses the other of overstating. From the owner's perspective, the optimal approach is to audit only when there is an accusation, because under this approach, the audit only occurs off-equilibrium.



This monitoring system involves a two-stage game. That is, each manager needs to make two sequential choices: either to honestly report or overstate his own cost in stage-one; and either to tell the principal that the other manager was honest or dishonest in stage-two.

Given this peer reporting system, a manager's expected payoff is determined by two factors: **(1)** how the other manager reports on him, and **(2)** how he reports on the other manager. Specifically, for any manager  $i$  ( $i=A,B$ )

Depending on **(1)**, manager  $i$  receives:

$$w + (r_i - c_i) \quad \text{if manager } j \text{ (} j=A, B; j \neq i \text{) reports manager } i \text{ as } \mathbf{honest}$$

$$w + (r_i - c_i) - f = w - f^9 \quad \text{if manager } j \text{ reports manager } i \text{ as } \mathbf{dishonest}$$

Depending on **(2)**, manager  $i$  receives:

$$b \quad \text{If manager } i \text{ reports manager } j \text{ as } \mathbf{dishonest} \text{ and the audit shows that } j \text{ is } \mathbf{dishonest}$$

$$-p \quad \text{If manager } i \text{ reports manager } j \text{ as } \mathbf{dishonest} \text{ and the audit shows that } j \text{ is } \mathbf{honest}$$

$$0 \quad \text{If manager } i \text{ reports manager } j \text{ as } \mathbf{honest}$$

$w$ : reservation utility payment;

$c_i$ : actual total cost for division  $i$ ;

$r_i$ : resources provided to division  $i$  by the owner;

$f$ : Fine for overstating;

$b$ : bonus for truthful accusation (whistle blowing); ( $f \geq b > 0$ )<sup>10</sup>

$p$ : penalty for false accusation;  $p > 0$

In this study, the following specific parameters are used, resulting in the normal form decision table presented in Table 1-Panel A.

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<sup>9</sup> If manager  $j$  reports that manager  $i$  is dishonest, an audit will take place and the resource transferred to division  $i$ ,  $r_i$ , will be equal to the actual cost incurred,  $c_i$ .

<sup>10</sup> The requirement that  $f \geq b > 0$  is because if otherwise, managers will have incentive to overstate all the time and truthfully report their peers as dishonest to get the high reward for blowing the whistle.

$$w=500$$

$$c_i: \begin{cases} c_A \in (c_{Amin}, c_{Amax}) \in (1000, 1050, \dots, 2000, \dots, 2950, 3000) \rightarrow E(c_A)=2000 \\ c_B \in (c_{Bmin}, c_{Bmax}) \in (4000, 4050, \dots, 5000, \dots, 5950, 6000) \rightarrow E(c_B)=5000 \end{cases}$$

$$r_i: \begin{cases} r_i = c_i & \text{if manager } j \text{ reports manager } i \text{ as dishonest;} \\ c_{imax} \geq r_i \geq c_i & \text{if manager } j \text{ reports manager } i \text{ as honest} \end{cases}$$

$$E(r_i - c_i) = \begin{cases} 0 & \text{if manager } j \text{ reports manager } i \text{ as dishonest;} \\ 1000 & \text{if manager } j \text{ reports manager } i \text{ as honest}^{11} \end{cases}$$

$$f: 1000$$

$$b: 1000$$

$$p: 2000$$

The game can be solved by backward induction, resulting in a unique subgame perfect Nash Equilibrium in which each manager reports honestly both in stage-one and in stage-two. To see this, depending on what the two managers might have done in stage-one, they play one of four subgames in making their whistle blowing decisions in stage-two. For example, if manager A honestly reports his actual cost and manager B overstates in stage-one, the stage-two subgame is represented by the four bottom left cells in Table 1-Panel A. By looking at the payoffs in the cells, regardless of what B will do, A is always better off to tell the owner that B was dishonest (overstated). Regardless of what A will do, B is always better off to tell the owner that A honestly reported the cost.<sup>12</sup> That is, the unique Nash Equilibrium for this subgame is for both A and B to truthfully tell the owner what the other party actually did in stage-one.

<sup>11</sup> A wealth maximizing manager should always overstate to  $c_{imax}$  if the other manager does not report on him. In such a situation,  $E(r_A - c_A) = c_{Amax} - E(c_A) = 3000 - 2000 = 1000$ ;  $E(r_B - c_B) = c_{Bmax} - E(c_B) = 6000 - 5000 = 1000$

<sup>12</sup> In the case when B tells the owner that A honestly reported the cost, if A blows the whistle on B, A will receive 1500 (500 wage + 1000 reward for whistle blow) and B will receive -500 (500 wage - 1000 fine for overstating). If instead, A covers for B, A will receive 500 (wage) and B will receive 1500 (500wage + 1000 slack).

In the case when B falsely accuses A to have overstated the cost, if A blows the whistle on B, A will receive 500 (500 wage - 1000 fine + 1000 reward), and B will receive -2500 (500 wage - 1000 fine - 2000 for false accusation).

If in stage-one, manager B honestly reports his cost but manager A overstates, their stage-two subgame will be represented by the four upper right cells in Table 1-Panel A. If both A and B honestly report their costs (overstate their costs) in stage-one, their stage-two subgames are represented by the four lower right cells (upper left cells) in the panel. The unique Nash Equilibrium for each subgame is for both managers to truthfully tell the owner what their peer actually did in stage-one (see the four highlighted cells in Table 1-Panel A).

Knowing that the other manager will truthfully report on peers in stage-two, through backward induction, each manager's dominant strategy in stage-one is to honestly report their costs.<sup>13</sup> Therefore, based on the wealth maximizing assumption, the unique subgame perfect Nash Equilibrium for this two-stage game is for both managers to honestly report their own cost in stage-one, and truthfully report to the owner in stage-two that the other manager was honest in stage-one. No whistle blowing or audit will have to take place. The control system thereby allows the owner to achieve the first-best outcome.

It is important to point out that under the wealth maximizing assumption, the above predictions should hold as long as the owner pays the managers their reservation utility payment (as long as the managers' individual rationality constraint is satisfied). Whether the managers perceive their wage and the owner to be fair or unfair is irrelevant to their decisions, and in turn, irrelevant to the functioning of this peer reporting system.

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If A covers for B, A will receive -500 (500 wage - 1000 fine), B will receive -500 (500 wage +1000 slack -2000 for false accusation).

Therefore, in this subgame, no matter what B will do, A is better off to blow the whistle on B. No matter what A will do, B is better off not to falsely accuse A, that is, to tell the owner that A was honest in stage one.

<sup>13</sup> Through backward induction, the stage-one game is to choose among the four stage-two subgame equilibria (the four highlighted cells in Table 1-Panel A). Regardless of what the other manager might do in stage-one, a manager is always better off to honestly report his cost in stage-one. The unique Nash equilibrium for this stage-one game is for each manager to honestly report his cost.

To summarize, the prediction according to the wealth maximizing assumption is as follows:

**Wealth Maximizing Prediction 1:** When managers can not communicate with each other under the peer reporting system, they always will honestly report their own cost in stage-one, and truthfully inform the owner in stage-two that the other manager was honest in stage-one, regardless of the managers' fairness perception of the wage they receive from the owner.

### 3.3 RELAX THE NO-COMMUNICATION ASSUMPTION

In the previous arguments, managers are assumed to make their decisions independently without interacting with each other.<sup>14</sup> In business practice, employees constantly interact with each other and this interaction may allow them to explicitly form collusive side agreements, to both lie and then cover for each other to achieve economic benefits. Under the peer reporting system in this study, there exists a collusive outcome (both managers lie to the owner in stage-one and cover for each other in stage-two) that is beneficial for the managers. If managers have a chance to communicate with each other before they make any decisions, they may decide to collude against the owner.<sup>15</sup> This poses a potential threat to the functioning of the peer reporting system. Therefore, a natural next step is to relax this no-communication assumption and see how the system will be affected.

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<sup>14</sup> This is an assumption in peer reporting monitoring models proposed by Demski and Sappington 1984, Demski et al. 1988, Ma 1988, Ma et al. 1988, Fischer and Hughes 1997, and Arya et al. 1996.

<sup>15</sup> In this study, as we can see from Table 1-Panel A, if the managers collude, they can receive their wage plus the slack they build into the cost report. If they choose to be honest to the owner, they can only receive their wage. This equilibrium is Pareto optimal for them, but harms the owner.

In game theory, any costless, non-binding, pre-play communication is labeled as “cheap talk”. According to conventional economic theory, even if managers can communicate with each other, the peer reporting system should still be collusion proof as long as the communication between managers is non-binding. This is because as in a typical Prisoner’s Dilemma Game (PDG), although the collusive outcome is the best joint outcome for the managers, it is not a Nash Equilibrium. Even if the managers formed a nonbinding agreement where both would overstate and cover for each other, both managers have incentives to defect from the collusive agreement no matter whether the other person keeps the collusive agreement or not.<sup>16</sup>

For collusion to occur, the collusive agreement between managers must be self-enforcing, i.e., neither manager has an incentive to break the collusive agreement given that the other manager does not (Baiman, Evans and Nagarajan 1991). If enforceable agreements are not feasible, then even if rational players had agreed on a collusive strategy, they would not rationally expect each other to respect this agreement. Thus, no such agreement should occur in equilibrium (Harsanyi and Selten 1988) and non-binding communication between managers should not undermine the effectiveness of the peer reporting system. The wealth maximizing prediction for the game when managers can communicate is for both managers to honestly report their own cost in stage-one, and truthfully report to the owner in stage-two that the other manager was honest in stage-one. No whistle blow or audit will have to take place.

In addition, as in the no communication situation, according to the wealth maximizing assumption, the above predictions should hold as long as the owner pays managers their

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<sup>16</sup> As shown in the four upper left cells in Table 1-Panal A, if B breaks the agreement and blows the whistle on A, A is better off to blow the whistle on B since receiving 500 (500 wage-1000 fine for overstating +1000 reward for whistle blow) is better than receiving -500 (500 wage-1000 fine); if B keeps the agreement and covers for A, A is still better off to blow the whistle on B since 2500 (500 wage+1000 slack + 1000 reward for whistle blow) is better than 1500 (500 wage +1000 slack). The same strategy applies to B.

reservation utility payment. Whether managers perceive the wage and the owner to be fair or unfair is irrelevant to this game.

**Wealth Maximizing Prediction 2:** When managers can communicate with each other under the peer reporting system, they always will honestly report their own cost in stage-one, and truthfully inform the owner in stage-two that the other manager was honest in stage-one, regardless of the managers' fairness perception of the wage they receive from the owner.

## CHAPTER 4: BEHAVIORAL THEORIES

All incentive systems operate in some social context. The peer reporting system analyzed in the preceding chapter is collusion proof in inducing honesty in managerial reporting, either with or without manager communication. The conclusions heavily depend on the assumption that managers are wealth maximizers and they are always willing to turn in their lying peers given the financial reward for whistle blowing. However, evidence from the whistle blowing literature shows that this is not always the case. The analytical model of the previous chapter treats whistle blowing on lying peers as given and does not probe into the processes through which such actions are more or less likely to take place. Behavioral research, on the other hand, provides theories for predicting when whistle blowing may or may not be expected to occur. In this chapter, I present evidence from the whistle blowing literature indicating that individuals are often reluctant to blow the whistle on others despite the financial reward for doing so. I also show evidence from research in whistle blowing, social psychology, accounting and experimental economics suggesting that agents' fairness perceptions of the principal can affect agents' inclination to report peer' misconduct to the principal. I then introduce the experimental cheap talk literature illustrating how agent communication and the credibility of such communication can affect cooperation (collusion) between agents. Finally, I argue that fairness norm can have a powerful influence on agents' behaviors either with or without communication.

#### **4.1 SOME EVIDENCE FROM THE WHISTLE BLOWING LITERATURE**

An agent's private information concealed from the principal may be observed or even shared by the agent's co-workers. A survey of 725 executives and managers by Keenan (1988, 2000) indicates that 65% of the managers have personally observed or obtained direct evidence of one or more types of fraud, waste, overstatement of cost or mismanagement within their companies. Another survey by the Institute of Management and Administration (IMA) in 1998 reports that 45% of their respondents have observed other subordinates lying to their superiors (Darley, Messick and Tyler, 2001). However, noticing opportunistic behaviors does not mean that they are always confronted. According to the above IMA survey, slightly more than 70% of respondents fail to report an observed wrongdoing to another individual or group. Keenan (1988, 2000) reports that about 50% of the managers who observe misbehaviors do not report them to higher management.

The whistle blowing literature suggests that it is often socially and psychologically costly to blow the whistle on others. Any whistle blowing may require psychological, emotional, physical, and time investment (Newell and Stutman 1991). All the social/psychological costs of whistle blowing on peers may reduce an agent's inclination to report a peer's misconduct (Trevino and Victor 1992). Thus, it takes more than financial rewards to motivate agents to report observed misconducts to the principal.

The whistle blowing literature indicates that a situational factor that is important to an agent's inclination to blow the whistle is the agent's perception of the principal. Jones, James & Bruni (1975) find that agents who trust the principal exhibit more upward communication on problems than do other agents. Greater supervisory trust is associated with more use of the chain of command as an internal whistle blowing channel. Blackburn (1988) and Graham (1986)



propose that more supervisory support leads to more whistle blowing. Blackburn (1988) finds that agents with unexpressed concerns believe that their principal is less supportive of their concerns than do agents who voice concerns. Further, inactive observers also believe that they have less positive relationships with the principal than do other agents. Blackburn (1988) finds that silence is associated with a negative perception of the principal. These results provide preliminary evidence that an agent's perception regarding the principal is important in the whistle blowing decision process.

According to Rennie and Crosby (2002), the thinking process of a person's whistle blowing decision involves three steps—first, recognition of the wrongdoing, second, assessment of the wrongdoing and third, judgment of responsibility. In step one, people apply their standards of what constitutes wrongdoing against their perceptions of what has taken place. In step two, people consider whether the wrongdoing deserves any action, that is, whether it is intolerable. In step three, people consider whether it is their responsibility to blow the whistle. If any of these questions are answered negatively, silence follows and the thinking process terminates. This process further suggests that a positive perception of the principal is important in triggering an agent's decision to blow the whistle on organizational misconducts for three reasons. First, an agent's standards of what constitutes organizational wrongdoings are more aligned with the standards of a principal for whom the agent has a positive opinion. Second, an agent who views the principal and the organization as a whole positively is less tolerant of the wrongdoing that can potentially harm the organization. Third, an agent who views the principal positively identifies more with the organization and is more likely to feel that it is his/her responsibility to help address problems within the organization. Thus, an agent who views the principal positively is more likely to blow the whistle to the principal.

## 4.2 AGENTS' FAIRNESS PERCEPTIONS OF THE PRINCIPAL

The above mentioned findings from the whistle blowing literature indicate that an agent's perception of the principal should be taken into account when studying peer reporting. These findings echo those from experimental economics, social psychology and accounting which suggest that agents' behaviors in agency relationships are heavily influenced by their perceptions of the principal. This research also indicates that agent's perceptions of the principal are significantly affected by agent's perceived fairness of the principal; and agents often judge a principal's fairness by judging how fairly they are compensated by the principal. In Gift Exchange Games (e.g., Fehr et al. 1993; Fehr et al. 2002) agents are found to take into account the way principals behave and perform systematic comparisons of payoffs. Agents' concerns for the principal's distributive fairness result in agents' reciprocating behaviors-costly reward of the principal's fair behavior and costly punishment of the principal's unfair behavior. Research in experimental economics shows that in sequential response games, responders probe a proposer's intention by judging how equitable the proposed payoff allocation is. The responders penalize the proposer if the proposer makes a deliberately selfish move, and reward the proposer if the proposer's intention is viewed as neutral (Falk et al. 2000; Charness and Rabin 2002). Prior surveys and field studies have found that increased wages are associated with increased productivity (Raff and Summers 1987), and with lower levels of supervision (Osterman 1994). In accounting, Moser, Evans and Kim (1995, 2005) find that in a tax reporting setting, exchange inequity effects induce taxpayers to report less income to the government when the tax rate increases, thereby offsetting the economic forces that provide incentive for individuals to report more income. Evans, Hannan, Krishnan and Moser (2001) indicate that managers report less honestly when the contract leads to an inequitable payoff distribution between the owner and the

managers. Hannan (2005) finds that workers provide more effort when they are paid higher wages by the owners.

The above studies suggest that feelings of equity motivate agents to directly reciprocate by working hard or giving up personal gains in their bilateral interaction with the principal. Other studies indicate that feelings of equity also lead agents to identify with an organization's goal, take pride in their work, and exhibit loyalty to the organization (Simon 1991). Agent loyalty is important since it inspires agents to obey authority, internalize duties and responsibilities commensurate with their position and make decisions that are in the best interest of the organization. As a result, loyal agents are more intolerant of unethical behaviors such as embezzlement and theft conducted by other agents, and they are more likely to go out of their ways to help the organization address these problems. In contrast, agents who feel that they are underpaid by the employers often view embezzlement and theft not as inappropriate but as a morally justified addition to wages and as an entitlement due from exploiting principals (Mars 1974). Instead of stopping others from conducting these acts against the organization, agents who feel exploited by the organization are more likely to participate in these acts as a mechanism to correct perceptions of inequity or injustice (Hollinger and Clark 1983).

The argument that feelings of equity can lead agents to go out of their ways to help the organization address problems is further supported by the third-party-reciprocity (indirect reciprocity) literature. Studies by Seinen and Schram (2001) and Fehr and Fischbacher (2004) show that when one party to an exchange relationship violates an implicit norm, thereby "hurting" the exchange partner, a third party who knows of the violation may intervene. The third party may enforce exchange norms and sanction the party that violates the norm, even though doing so is costly, and even though the norm violation does not negatively affect the third

party's economic payoff. However, the motivation for indirect reciprocity is heavily related to distributive norms and fairness judgments. The more negative the fairness judgments are towards the norm violators, the more likely the third party is to punish the violator (Fehr and Fischbacher 2004). Fehr and Fischbacher conduct a third party punishment game with three players. The game between player A and player B is just a dictator game. Player A receives an endowment of 100 tokens of which he can transfer any amount to player B, the recipient. Player B has no endowment and no choice to make. Player C has an endowment of 50 tokens and observes the transfer of player A. After this, player C can assign punishment points to player A. Each punishment point assigned to player A costs player C 1 token and costs player A 3 tokens. Since punishment is costly, a self-interested player C will never punish. However, the experimental results show that player As are never punished if they transferred 50 or more tokens to player B. If player A transfers less than 50 tokens, the punishment is the stronger the less player A transfers. Players Cs are willing to punish a selfish player A to enforce a fair sharing norm, and the more player A violates the norm, the more player Cs are willing to sacrifice themselves to punish A.

Seinen and Schram (2000) study a repeated helping game with random pairing in large groups. Individuals in their experiment are divided between donors and recipients. Donors decide whether to help the individuals they are matched with at a certain cost. The cost the donors have to incur in order to help the recipients is smaller than the benefit the recipients will receive. They find that many donors decide whether they will incur a cost to help the recipients based on the information they receive about the recipients' previous behaviors towards other people. The donors are more willing to help the recipients whose behavior towards other people complies with a contribution norm.

The above third-party reciprocity studies suggest that when an agent embezzles from the principal (or performs other similar acts), another agent (the third party) who witnesses this behavior may be willing to sanction the embezzler to help the principal, even though helping the principal is costly, and that the embezzler's behavior does not negatively affect the third party's own economic well-being. This willingness to help depends on the third party's fairness perception of the principal. The third party is more likely to sanction the embezzler to help the principal if he/she feels that the principal is following a fairness norm when treating the agents.

### **4.3 NON-BINDING AGENT COMMUNICATION**

This dissertation also explores the effect of non-binding agent communication on the peer reporting system. Nikias (2002) and Towry (2003) suggest that agent communication is the key to coordination between agents and coordination between agents affects agents' off-equilibrium collusion under the peer reporting system. In addition, studying both agent communication and their perceived fairness of the principal allows me to explore how these two factors together affect agents' behaviors. Specifically, when agents have the opportunity to communicate (collude) with each other, will their communication and their subsequent behaviors be affected by their perceived fairness of the principal? On the other hand, when agents cannot communicate with each other, will agents' behaviors be affected by their fairness perception of the principal and their anticipation of other agents' fairness perception of the principal? This section reviews prior experimental literature on the role of non-binding communication (cheap talk) and presents theories and evidence to explore the potential influence of fairness norm on non-binding communication between agents.

### 4.3.1 Evidence from the Experimental Cheap Talk Literature

As discussed in Chapter 3, according to conventional economic theory, agent communication has no value as long as such communication is non-binding. However, recent evidence from the experimental cheap talk literature suggests that messages sent by other players, although non-binding, may nonetheless influence actual play by affecting the beliefs that players hold about their partners and their potential actions. When cheap talk is allowed and the talk is perceived as credible in Prisoner's Dilemma Games (Hereafter PDG), players frequently take advantage of pre-play communication and choose a Pareto optimal, dominated strategy that would otherwise be foregone without the cheap talk (Radlow and Weidner 1967; Dawes 1980; Dawes and Thaler 1988; Dawes et al. 1977; Farrell and Rabin 1996; Crawford 1998; Miller, Butts and Rode 2002).

For example, Miller et al. (2002) suggests that agents often base their behavior on the signals they receive from others and also recognize the importance of the signals they send. Miller et al. (2002) use an adaptive computation model of endogenous agent communication to study cooperation in a series of one-shot PDGs. The agents in their model are randomly paired with each other in each game. Their results show that communication allows the emergence of cooperation. Cooperation is most likely to emerge when both agents communicate. If one agent communicates and the other says nothing, the game usually ends up in mutual defection. Dawes, McTavish and Shaklee (1977) conduct a series of PDG and find 72% cooperation in their non-binding communicating group as opposed to an average of 31% in their no-communication groups. Radlow and Weidner (1967) compare the cooperation rate in the Partially Cooperative PDGs (players in these PDGs are allowed to make unenforceable commitments about future actions) with that of the Non-Cooperative PDGs (players in these PDGs made no initial

statement of their future actions). Their experiments last for 98 trials. They find that overall, 90% of all the choices made by the Partially Cooperative group are cooperative, while this is true of 55% of the Non-Cooperative control group. Their findings indicate that first, even without player communication, the cooperation rate in the PDG is much higher than predicted by the game theory; and second, communications with unenforceable commitments result in substantially more cooperative play than when no communication is permitted, and they provide almost as much security as negotiations with enforceable commitments. In short, as pointed out by Dawes (1980), the salutary effects of communication on cooperation are ubiquitous.

Since agents under the peer reporting system are essentially playing a PDG with each other, the above mentioned findings suggest that when agents are allowed to engage in non-binding communication, they should cooperate more frequently than in the no-communication situation. That is, we should see more agents in the communication condition choosing the collusive outcome (cheating together and covering for each other), rendering the peer reporting system less effective. However, other research suggests that non-binding communication per se may not affect the players' cooperation rate in the PDG. Rather, it is the credible non-binding communication that matters. For example, Gahagan and Tedeschi (1969) compare participants' reactions to promises sent by their hypothetical partners in the PDG. These promises express the willingness to cooperate and have a 90%, a 60% or a 30% credibility level. They find that participants send significantly more cooperative promises back, and cooperate significantly more often with their hypothetical partners on the next trial after they received the 90% credible promises. Their cooperating behaviors are not significantly different across the 60% and the 30% credibility levels. Their results suggest that a highly credible message produces different behavior in the recipients in a PDG than a message with a moderate or low credibility. Trust and

cooperation between players in the PDG is engendered not by communication of promises, but more specifically by the communication of credible promises. In addition, they suggest that in the PDG, participants normally see the non-binding promises as unbelievable unless the promises have a high level of credibility. In accounting, Kachelmeier et al. (1994) examine the effect of the firm's non-binding budgetary communication (threat) on the propensity of divisions to propose boondoggle projects. They find that the effect of the non-binding budgetary threat depends on the credibility of such a threat, in other words, whether the division believes the firm has the incentive to actually carry out such a threat. Specifically, budgetary threat has (has no) significant effect on the divisions' proposals when the threat is (is not) perceived as credible. These papers suggest that when studying the effect of non-binding communication on players' behaviors in non-cooperative games, it is important to consider factors that can affect the credibility of such communications.

#### **4.3.2 Fairness Norm and Non-Binding Communication**

The cheap talk studies discussed so far all deal with a simple environment where communication between players and the result of the game only affect the payoffs of the communicating players. In other words, in all the above games, neither players' communication on subsequent cooperating or defecting choices nor the outcome of the game has any impact on the payoff of a participant who is not part of the cheap talk exchange. If instead, communication between two players not only affects their own payoffs, but also that of a third party, it is reasonable to expect that the substance of the communication as well as the two players' subsequent choices can be affected by the third party's behavior and the two players' perception of the third party. For example, in the situation of agent collusion, where the mutual cooperation



(collusion) between agents is harmful to the principal, collusive cheap talk between agents can be affected by how the principal treats the agents. If the principal treats the agents fairly, the agents should be more reluctant to use their ability to communicate to collude against the principal for two reasons. First, according to the fairness and reciprocity literature introduced in section 4.2, the agents may wish to reciprocate a fair principal by being honest. Second, the agents may be afraid to hurt their social image by cheating a fair principal. Despite the fact that an agent might want to initiate a collusive offer, he might hesitate to do so, knowing that it violates social norms. Because there is a social norm against cheating a principal who is perceived to be fair, initiating a collusive offer is not considered to conform to the public standard of behavior. For this reason, one agent might hesitate to initiate a collusive offer to the other agent even if he personally would prefer to reap greater benefit from the principal by colluding.

In addition, the perceived fairness of the principal can also influence how a collusive suggestion is received by the other agent. In other words, the perceived fairness of the principal can affect the credibility of the collusive message. When an agent sends a message suggesting colluding against a fair principal, this could undermine the sender's credibility because merely making this suggestion violates social norms. Therefore, the receiver of the message may reject the collusive offer because he believes that an agent who announces the willingness to collude against a fair principal cannot be trusted not to renege on his announcement if there is an economic advantage to renegeing. Another reason the receiver of the collusive offer may reject the offer is to repay a fair principal (i.e., out of positive reciprocity to the principal).

In contrast, an agent should be more willing to ask the other agent to collude with him when the principal is perceived to be unfair. This can be driven by negative reciprocity (tit-for-tat

to an unfair boss), and by the fact that social norm is more ambiguous on what the agents should do to an unfair principal. Research from social psychology reveals that lying in self-defense against punishment is regarded as more permissible than lying for personal gain at the expense of others (Lindskold and Walters 1983). Initiating a collusive offer is more socially justifiable when the principal is unfair.

On the other hand, if the principal is perceived to be unfair, an agent might be more willing to accept the other agent's collusive offer to restore perceived fairness (i.e., out of negative reciprocity to the principal). In addition, the credibility of the collusive agent's message should be higher in this situation because the offer is not only driven by pure self interest, but also could be driven by the more socially acceptable motive of getting even with an unfair party.

### **4.3.3 A Note on Norm Anticipation**

Much evidence suggests that a social norm has powerful influence on people's behaviors. Individuals have the preference for enforcing social norms and they anticipate that others have this preference too. In Gift Exchange games, the principals anticipate agents' preference for fairness and offer wages that are much higher than the minimum (zero rent) wage. Roth et al. (1991) report the result of several ultimatum games and provide evidence that the offerors in the game make offers that are a best reply to their beliefs concerning the rejection behavior of receivers. Fehr, Fischbacher and Gächter (2002) show that in the presence of punishment opportunities, the strong reciprocators can force the selfish-type players to cooperate. In accounting, Rankin et al. (2003) show that the subordinates in their experiment anticipate the superiors' preference for honesty and their ability to reject projects. As a result, they only

overstate costs by an average of 58%. Rankin et al. (2005) provide evidence consistent with the idea that the subordinates in their study anticipate the superiors' increased ability to reject high cost report to enforce fairness norms in the high span condition and lower the level of slack built into their budget reports accordingly. In social psychology, Lindbeck (1997) suggest that there is a disutility associated with deviation from the actual behavior of others or even the expected behavior of others'. Rege & Telle (2004) show that simply the suspicion that others disapprove of one's behavior when acting against the social norm can carry significant non-monetary costs, such as internalized feelings of guilt or loss of self respect. As a result, people act in accordance with social norms. All the above research indicates that anticipations of others' preference for enforcing social norms can have powerful effect on individuals' choices. It is important to emphasize here that in all the above studies, communication among participants is not a prerequisite for norm anticipation. Participants in the above studies did not communicate with each other. Nevertheless, they anticipated that others have the preference for norm enforcement and acted accordingly.

## **CHAPTER 5: BEHAVIORAL HYPOTHESES**

This chapter develops specific hypotheses on the relationships between fairness, communication and managers' behaviors under the peer reporting system in the participative budgeting setting of this dissertation. The hypotheses are based on theories and evidence discussed in the preceding chapter. I first consider how managers' perceived fairness of the owner might affect the peer reporting system in the simple case where managers cannot communicate with each other. Later, I investigate when managers can communicate with each other, how their perceived fairness of the owner and their ability to communicate with each other work together to affect the peer reporting system.

### **5.1 WITHOUT MANAGER COMMUNICATION**

The fairness and third party reciprocity literature presented in the preceding chapter indicates that in the context of this dissertation, when a manager reduces the owner's monetary payoff by overstating his own production cost, another manager who witnesses this overstatement may be willing to sanction this behavior. However, such willingness depends on the manager's perception of the fairness of the owner. In the current experiment, before managers make any decisions, the owner makes the first move by offering a wage to the managers. When the owner is perceived as unfair by offering managers an unfair wage, the

owner, rather than the manager who overstates cost, may be considered as the party who first violates the fairness norm. As a result, the manager who observes the overstatement may punish the owner by covering for the overstating manager rather than punishing the overstating manager by blowing the whistle.

On the other hand, when the owner is perceived as fair by offering a fair wage, the overstating manager is more likely to be considered as the party who first violates the fairness norm. In this case, the overstating behavior by the manager may be seen more as an act of greed, rather than “getting even”. In addition, social identity research indicates that employees usually identify more with the organization when the perceived fairness is high, and people are more likely to cooperate with or contribute more to the group with which they identify (Brewer and Kramer 1986; Wit and Wile 1992, Towry 2003). This reasoning suggests that the manager should be more willing to report on his overstating peer when the owner offers a fair wage.

As discussed in section 4.3.3, individuals have the preference for enforcing social norms and they anticipate that others have this preference too. Even without communication, the managers are expected to be able to anticipate that fellow managers are more (less) willing to blow the whistle when the owner is perceived to be fair (unfair). As a result, the deterrent effect of the peer reporting system should be stronger when the owner is perceived to be fair and a manager who receives a fair wage from the owner should be more deterred from overstating his cost. In addition, prior research suggests that managers are also more willing to be honest or work hard when the owner is perceived as fair (Evans, Hannan, Krishnan and Moser 2001, Hannan 2005). All the above arguments lead to my first two hypotheses:

**Behavioral Hypothesis H1a:** Ceteris paribus, when managers are NOT allowed to communicate under the peer reporting system, they report their costs more honestly when they receive the fair wage from the owner than when they receive the unfair wage.

**Behavioral Hypothesis H1b:** Ceteris paribus, when managers are NOT allowed to communicate under the peer reporting system, the percentage of whistle blowing on lying peers is higher when they receive the fair wage from the owner than when they receive the unfair wage.

## 5.2 WITH MANAGER COMMUNICATION

The previous chapter argues that when a third party's benefit is involved, the communication between two players will be affected by the two players' fairness perceptions of the third party. In the setting of this dissertation, when the managers can communicate with each other, they may negotiate a collusive strategy that benefits them at the expense of the owner. Hence, whether the managers will utilize their communication opportunity to collude against the owner depends on the managers' fairness perceptions of the owner, specifically, whether the managers believe the owner pays them fairly.

If the owner is perceived as fair by offering the managers a fair wage, the managers should be more reluctant to use the communication opportunity to send any collusive message for two reasons. First, they may not want to collude out of positive reciprocity towards the owner. Second, they may not want to collude out of reluctance to violate the fairness norm. In addition, the perceived fairness of the owner will influence how a suggestion of colluding is received by the managers. This is because first, the receiver of the collusive suggestion is likely

to reject the offer in order to reciprocate to a fair owner; second, the receiver may reject the offer because a suggestion to collude against a fair owner sounds less credible. In contrast, if the owner is perceived as unfair by offering the managers an unfair wage, the above inhibitions against collusion will be diminished. As a result, the managers will be more likely to utilize their ability to communicate to collude against an unfair owner than a fair owner.

To summarize, when the managers can engage in non-binding communication, their fairness perception of the owner can affect their willingness to collude and the credibility of any collusive communication. In turn, the managers' fairness perception will affect the frequency of managers agreeing to both overstate their costs and cover for each other. Therefore, when the managers can communicate with each other under the peer reporting system, both their reporting honesty and their whistle blowing percentage are also affected by their fairness perception of the owner based on the wage. These arguments lead to the following hypotheses:

**Behavioral Hypothesis H2a:** *Ceteris paribus*, when the managers are allowed to communicate under the peer reporting system, they report their costs more honestly when they receive the fair wage from the owner than when they receive the unfair wage.

**Behavioral Hypothesis H2b:** *Ceteris paribus*, when the managers are allowed to communicate under the peer reporting system, their percentage of whistle blowing on lying peers is higher when they receive the fair wage from the owner than when they receive the unfair wage.

**Behavioral Hypothesis H2c:** Ceteris paribus, when the managers are allowed to communicate under the peer reporting system, they send more collusive messages to each other when they receive the unfair wage from the owner than when they receive the fair wage.

**Behavioral Hypothesis H2d:** Ceteris paribus, when the managers are allowed to communicate under the peer reporting system, they form more collusive agreements with each other when they receive the unfair wage from the owner than when they receive the fair wage.

### 5.3 COMMUNICATION VERSUS NO COMMUNICATION

In comparison with the no-communication condition, the managers' ability to communicate with each other is expected to lead to more collusion and less honesty in reporting when the managers receive the unfair wage from the owner, but not when they receive the fair wage. I elaborate on these next.

When the owner is perceived as unfair by offering an unfair wage, collusive communication can reinforce the managers' perception of the owner's unfairness, trigger their collusive intention and allow them to explicitly coordinate on a collusive strategy. Studies in organizational behavior have demonstrated the impact of social information processing on job attitudes. For example, Dean and Brass (1985) find that coworkers show greater congruence in perceptions as their social interactions with each other increase. Folger and Kass (2000) suggest that coworkers' perceptions can be used as diagnostic information and that discussing work experiences with coworkers can also mutually reinforce and alter justice perceptions among coworkers. Lind et al. (1998) find that when study participants are allowed to communicate and



discover that they have shared mutual injustices, fairness ratings plummet. A person who is surrounded by coworkers who complain that they are treated unjustly is primed to interpret the supervisor's ambiguous behavior as unfair (Lind et al. 1998). This shared perception of unfairness will lead to a higher level of collusion between the parties who communicate, in this dissertation, this means that the managers will overstate their costs and cover for each other to a higher degree.

**Behavioral Hypothesis H3a:** When the managers receive the unfair wage from the owner, the managers report their costs less honestly when the managers can communicate with each other than when they cannot.

**Behavioral Hypothesis H3b:** When the managers receive the unfair wage from the owner, the managers' percentage of whistle blowing on lying peers is lower when the managers can communicate with each other than when they cannot.

In contrast, when the owner is perceived as fair by offering a fair wage, it is not clear whether managers' communication will lead to more or less honesty. On one hand, experimental cheap talk literature suggests that communication provides the managers a better chance to cooperate (collude), thereby decreasing their reporting honesty. However, as stated before, when the owner is perceived as fair, the credibility of a collusive offer is reduced, and the non-binding agreement against the fair owner is less likely to succeed. In fact, communication may even lead to a higher level of reporting honesty, because the managers may communicate to reinforce the feeling of positive reciprocity towards the owner (Folger and Kass 2000). Similar arguments

apply to the managers' willingness to blow the whistle on a lying peer. This leads to the next two research questions.

**Research Question 1:** When the managers receive the fair wage from the owner, do managers report their cost less honestly when they can communicate with each other than when they cannot?

**Research Question 2:** When the managers receive the fair wage from the owner, is the percentage of whistle blowing on lying peers lower when the managers can communicate with each other than when they cannot?

## **CHAPTER 6: RESEARCH METHOD**

The hypotheses and research questions described in Chapter 5 are tested using an experiment. The experiment uses a 2x2x8 (Agent Communication x Wage x Experimental Period) design. Agent communication (yes or no), is manipulated between-subjects by assigning participants to one of the two communication conditions. Wage (fair or unfair) is measured by asking owners to choose either 500 Liras or 1000 Liras as wage for the managers and ask managers to rate their perceived fairness of the owners based on the wage. Experimental period (8 levels), is manipulated within-subjects. Section 6.1 illustrates the experimental scenario and the managers' expected payoffs in the experiment. Section 6.2 describes participants and procedures used in each communication conditions. Section 6.3 discusses the owner participants' role in the experiment.

### **6.1 SCENARIO AND THE MANAGERS' EXPECTED PAYOFFS**

The scenario used in both communication conditions is as follows: A firm sells 1000 units of product A at 3 Liras per unit and 1000 units of product B at 6 Liras per unit. Actual unit costs for product A falls within the range of (1.00, 1.05, 1.10...3.00) Liras, and the costs for product B falls within (4.00, 4.05, 4.10...6.00) Liras. The owner of the firm hires two divisional managers, A and B. The two managers are responsible for producing 1000 units of product A

and 1000 units of product B, respectively, and reporting their production cost to the owner. The managers are each paid a wage. The level of the wage (either 500 Liras or 1000 Liras) is decided by the owner.

Both managers know their own division's actual cost and the other manager's actual cost. The owner, however, only knows the probability distribution of the possible production costs. To control for potentially opportunistic reporting, the firm establishes an internal control system which encourages peer reporting (whistle blowing). Specifically, the system requires each manager to indicate whether his peer has overstated the cost after both managers independently report their own costs. If there is no accusation of overstating, the resource provided to the division equals the cost reported by the divisional manager. If the manager of any division is accused of overstating, the manager being accused is fined 1000 Liras. An audit will then take place and the resource provided to the division equals the division's actual cost. The accusing manager receives a 1000 Lira reward if the result of the audit confirms the accusation, but the accusing manager is fined 2000 Liras if the audit reveals that the accusation is false. The peer reporting system employed in this study loosely follows Ma (1988)'s design.<sup>17</sup> Although it may seem inappropriate to punish a manager solely based on the accusation of another manager, the reward structure makes it highly unlikely that any manager will falsely accuse another manager since the penalty for such false accusation outweighs any potential benefit.

In this study, the manager's wage ( $w$ ) is set by the owner at either 500 Liras or 1000 Liras. The expected slack each manager can consume,  $E(r_i - c_i)$ , is 1000 Liras if the manager's

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<sup>17</sup> The peer reporting system used in this dissertation is the same as the vertical system in Towry (2003). Towry used Ma's (1988) model. However, she modified Ma's (1988) model in two ways. First, Ma's (1988) model is asymmetric, i.e., agent A's task is to report both agents' actions and agent B's task is to verify agent A's reports. Towry (2003) took the spirit of that model and operationalized it with a symmetric model, i.e., both agents report their own actions and verify each other's report. This was a logical extension of the model. Second, instead of using a lottery, Towry (2003) employed a costless auditor. While the lottery and the auditor have the same effect, the latter is both easier to understand and to operationalize in an experimental setting.

overstatement is not detected, and 0 if the overstatement is detected.<sup>18</sup> The fine for overstating ( $f$ ) and the bonus for truthful accusation ( $b$ ) are both 1000 Liras. The penalty for false accusation ( $p$ ) is 2000 Liras. The managers' expected payoffs under each reporting and whistle blowing strategy combinations are displayed in Table 1. Panel A presents the managers' expected payoffs when the owner pays them a 500-Lira wage; Panel B presents the managers' expected payoffs when the owner pays them a 1000-Lira wage.<sup>19</sup> As analyzed in chapter 3, the unique subgame perfect Nash equilibrium for the game under the 500 Lira wage level would be that both managers honestly report their costs to the owner and then tell the owner that their peer reported honestly. In equilibrium, the managers should both receive their 500-Lira wage. The same logic applies to the game under the 1000 Lira wage level--the unique subgame perfect Nash equilibrium for the game would be that both managers honestly report their costs and then tell the owner that their peer reported honestly. Both managers receive their 1000-Lira wage in equilibrium.

## 6.2 PARTICIPANTS AND PROCEDURES

Sixty undergraduate students who were taking evening business classes participated in the experiment. The participants had an average age of 22.3 and an average of 2.67 years of work

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<sup>18</sup> The actual unit cost for division A (B) distributes evenly from 1 to 3 Liras (from 4 to 6 Liras). The expected unit cost is 2 Liras for division A and 5 Liras for division B. Since each division produces 1000 units, the expected total actual cost is 2000 Liras for A and 5000 Liras for B. Therefore, the expected organizational slack manager A can consume by reporting his maximum possible cost, 3000 Liras, would be 1000 Liras (=3000-2000). Similarly, the expected slack manager B can consume by reporting her maximum possible cost, 6000 Liras, would also be 1000 Liras (= 6000-5000).

On the other hand, if a manager's overstating behavior is detected, the slack would be 0 Lira since an audit would take place and the resource transferred to the division would be equal to the actual production cost.

<sup>19</sup> Table 1 only shows payoffs calculated based on the expected actual costs. When actual costs are higher or lower than the expected costs, payoffs under some choice combinations can be higher or lower. However, the changes will not affect the result of the game. The unique Nash Equilibrium is still for both agents to honestly report their own costs in stage-one and to truthfully reveal their information about each other in stage-two.

experience. One third of the participants played the owner's role, and two thirds the manager's role. Two experimental sessions were conducted for each of the two communication conditions, with at least four owners and eight managers in each session. In total, thirty-three students participated in the no communication condition (NCC) and twenty-seven in the communication condition (CC). The data from the two sessions in each communication conditions are pooled since there is no significant difference across sessions.

In both communication conditions, the owner participants and the manager participants were given instructions separately. The experimenters read the instructions aloud and went through several numerical examples with the participants. Participants were encouraged to ask questions to make sure that they understood the procedures. Participants also read a consent form. In the consent form, they were told that their participation in this research study was completely voluntary and they could withdraw from the study at any time, should they change their mind. This procedure not only is required by the IRB, but also is a step to guarantee that the manager participants accept the 500-Lira wage as the compensation to keep them in the experiment. Therefore, the 500-Lira wage can be seen as the manager participants' reservation payment for participating. After the instructions were explained, the managers were divided into two groups and were seated in rooms A and B. The owners were already seated in room C.

The experiment lasted for eight periods. In each period, a manager A was anonymously matched with a new manager B, and a new owner. No two managers ever were paired with each other more than twice and no triads were ever repeated. The participants in the same room were never paired with each other. The participants were not told who their partners were either during

or after the experiment. The experimenters announced at the beginning of every experimental period that their partners were changed in the new period.<sup>20</sup>

At the conclusion of the eighth period, all participants completed a post experimental questionnaire. The participants' final pay was determined by the result of one of the eight periods, which was randomly chosen. For each 1000 Liras they earned in the experiment, they received \$15. Their payment method was announced at the beginning of the experiment. Payment was made by an individual who is unfamiliar with the experiment to preserve the participants' anonymity.

### **6.2.1 Timeline in NCC**

Figure 1 shows the timeline in each experimental period for both communication conditions. In NCC, at the beginning of each period, the owners were asked to choose either 500 Liras or 1000 Liras as the wage for the two managers matched with him/her in that period. The two managers in each triad received the same wage and the experimenters made sure that both the owners and the managers knew this. In addition, both the owners and the managers were told that in the pilot study, the average wage chosen by the owners was 750 Liras.<sup>21</sup>

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<sup>20</sup> Participants were not repeatedly matched to avoid extraneous variables (such as reputation or tit-for tat behaviors) as explanations for the managers' behaviors, as well as to better test Ma's model. Ma's model is for a one-shot game. If the participants were repeatedly matched with each other in the experiment, they would have been involved in a multi-period game as opposed to eight one-shot games.

<sup>21</sup> The pilot study was run in April 2005. The design and the results are briefly discussed in Chapter 7, footnote 24.

Next, the managers were informed of the wage chosen by the owner matched with them in that period. The managers then learned the actual costs for both division A and division B and submitted the cost they wished to report for their own division.<sup>22</sup>

The experimenters collected the cost reports from each manager and informed the managers the cost reported by the manager with whom he/she was paired. The managers were then asked to circle one of two choices: "The other manager honestly reported his/her cost" or "The other manager overstated his/her cost." They were instructed that while they knew with certainty whether the other manager overstated the cost, they could choose to circle either response, regardless of what the other manager actually did. The experimenter then informed the corresponding owners both the managers' reported costs and the above choice they circled.

If a manager indicated that the other manager paired with him/her overstated the cost, the accusee was audited and the payoffs were calculated. If a manager reported that his/her partner was honest, there was no audit and the payoffs were calculated based on the managers' reported costs. Each participant was informed of his/her payoff for the period. After this, the next period started.

## 6.2.2 Timeline in CC

As shown in Figure 1, the timeline in CC is very similar to that in NCC except the follows:

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<sup>22</sup> To save time in the experiment, actual unit production costs for each period were predetermined by randomly drawing from 41 equally likely choices (1.00, 1.05, 1.10...3.00) for Division A and from 41 equally likely choices (4.00, 4.05, 4.10 ...6.00) for division B, with the exception of a few out-flyers (costs too close to the high or low end of the range) being thrown away. For any given period, the actual cost for all manager As are the same and the actual cost for all manager Bs are the same. The same set of costs was used in the two communication conditions. The drawn costs for both divisions were pre-printed on a pink paper and hidden under eight labels. The managers were told not to look ahead to the costs of subsequent periods.



After the managers learned their wage for the period, they could communicate twice with the other manager in writing. Specifically, in each period, the two managers who were paired with each other for that period simultaneously wrote a message to each other. The messages were placed in envelopes and exchanged through the experimenters. After the managers read the message sent to them, they simultaneously wrote a response. The responses were placed in envelopes and exchanged through the experimenters. The managers were told that they could write anything except for information that might reveal their personal identity. They were also told that writing was not obligatory. They did not have to write anything if they chose not to.

After the managers received the response (the second message) from their paired managers, they learned the actual costs for the period and submitted their own cost report to the owner. The rest of the timeline was the same as in NCC.

## **6.3 THE OWNERS IN THE EXPERIMENT**

### **6.3.1 The Owners' Expected Payoff**

In this experiment, the hypothetical firm sells 1000 units of product A at 3 Liras each and 1000 units of product B at 6 Liras each. The sales revenue of division A (B) is 3000 Liras (6000 Liras). The firm also has 2000 Liras other income.<sup>23</sup> The owner is the residual claimant of the firm. The owner's payoff in the study can be written as:

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<sup>23</sup> Adding 2000 Liras other income is to guarantee that the owners will never incur a loss by offering the 1000-Lira wage to the managers. Without the other income, if the owner chooses 1000 Liras as the wage level for the two managers, yet both managers lie to the maximum and cover for each other, the owner's payoff will be -2000 (=0 Gross Profit-2000 wage). Adding 2000 Liras other income is to make sure that the owners participants do not have to worry about incurring a loss by offering the 1000-Lira wage.

$$\pi_A (3000-c_A) + \pi_B (6000-c_B) + 2000 - W.$$

Here,  $W$  is the firm's total wage expense,  $c_i$  ( $i=A, B$ ) is the actual production cost for division  $i$ , “3000- $c_A$ ” and “6000- $c_B$ ” is the actual Gross Margin for division A and division B, respectively. “ $\pi_i$ ” ( $i=A, B$ ) is the owner's share of a division’s Gross Margin, which is determined by the two managers' reporting honesty and whistle blowing decisions. Specifically,

$$\begin{aligned} \pi_i &= 100\%, && \text{if Manager } j \text{ (} j=A, B; j \neq i \text{) blows the whistle} \\ &= \text{Manager } i \text{'s reporting honesty,} && \text{if Manager } j \text{ does not blow the whistle} \end{aligned}$$

If Manager  $i$  is dishonest in reporting and Manager  $j$  blows the whistle, the resources transferred to division  $i$  will equal the actual cost, and the owner can receive 100% share of the actual Gross Margin ( $\pi_i = 100\%$ ). On the other hand, if Manager  $j$  does not blow the whistle, the owner’s share of the actual Gross Margin will be determined by Manager  $i$ ’s reporting honesty. In the case when Manager  $i$ ’s reporting honesty is 0%, i.e., Manager  $i$  overstates his cost to the maximum and appropriates the entire surplus of the division, the owner's share of division  $i$ ’s Gross Margin will be 0% ( $\pi_i = 0\%$ ). Substituting the divisions’ actual costs with the expected costs (the expected cost for division A is 2000 Liras; the expected cost for division B is 5000 Liras), the owner's expected profit (OEP) can be simplified as:

$$1000 \pi_A + 1000 \pi_B + 2000 - W$$

Let  $\pi = (\pi_A + \pi_B)/2$ , the owner’s expected profit can be further simplified as

$$\text{OEP} = 2000 \pi + 2000 - W$$

The owners in the study can offer either a 500-Lira or a 1000-Lira wage to each manager (total wage expense,  $W$ , equals 1000 Liras or 2000 Liras). Holding all else constant, a 500-Lira wage will always assure the owner a higher payoff (see Figure 2). As derived below, only if increasing the wage from 500-Lira to 1000-Lira can increase  $\pi$  by more than 50%, is the owner economically better off to offer the high wage:

To make the owner's expected profit at high wage ( $OEP_{1000}$ ) equal that at low wage ( $OEP_{500}$ ), we should have

$$2000 * \pi_{1000} + 2000 - 2 * 1000 = 2000 * \pi_{500} + 2000 - 2 * 500$$

$$\text{This means } \pi_{1000} = 0.5 + \pi_{500}$$

Therefore,

$$\text{If } \pi_{1000} - \pi_{500} = 0.5, OEP_{1000} = OEP_{500}$$

$$\text{If } \pi_{1000} - \pi_{500} > 0.5, OEP_{1000} > OEP_{500}$$

$$\text{If } \pi_{1000} - \pi_{500} < 0.5, OEP_{1000} < OEP_{500}$$

### 6.3.2 A Note on Having Owner Participants in the Design

Instead of using hypothetical owners, student participants played the role of the owners in this experiment and chose the wage for the managers. There are both advantages and disadvantages associated with this design. One potential disadvantage is that by asking real participants to choose the wage, there is a risk of having very uneven number of 500 Lira and 1000 Lira wage choices. In the most extreme case, if the owner participants unanimously chose the 500 Lira wage, as predicted using the wealth maximizing assumption, the experiment would fail for the purpose of this dissertation. However, results from prior experimental studies (Fehr and Gächter, 2002; Hannan 2005) indicate that it is highly unlikely that the owner participants will always choose the minimum wage. There are at least two reasons for this. First, the owners may have concerns for reciprocity and fairness. Second, the owners may believe that the managers' subsequent colluding and reporting decisions will be affected by their perceptions of the fairness of the wage. In this case, the owner may want to choose a fairer wage level in order to induce the managers to report more honestly and turn in their lying peers more often, thereby increasing the owner's share of the profit.

On the other hand, the advantage of having real owner participants choose the wage is that it can accentuate the managers' feelings of reciprocity towards the owners. The managers' feeling of reciprocity towards the owners is vital to the managers' subsequent decision makings and is therefore very important to this study. In addition, this design affords an opportunity to observe the owners' behaviors under the peer reporting system in a controlled experiment. Therefore, in this experiment, student participants play the role of the owners and choose the wage for the manager participants.

## CHAPTER 7: RESULTS

This chapter presents the results of the experiment and the analysis of the primary hypotheses. In addition, supplementary analyses on the owners' wage choices and their payoffs in the experiment are provided.<sup>24</sup>

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<sup>24</sup> Before conducting the two experiments, a pilot study was run with 36 undergraduate students as participants, 15 of them participated in the no communication condition, 21 participated in the communication condition. The design of the pilot study is slightly different from the experimental design discussed earlier. The major differences are as follows. First, in the pilot, the owners were asked to choose one of three wage levels (500, 750, and 1000) as apposed to two wage levels (500, 1000). Second, in the pilot, the manager participants in the communication condition were only allowed to communicate once as apposed to twice in each round. Third, in the pilot, the participants were paid \$5 instead of \$15 for each 1000 Liras they earned. Fourth, five instead of eight rounds were run in the pilot.

In both communication conditions, the managers' reporting honesty and whistle blowing percentage are very high when they perceived the wage offer as fair. Both their reporting honesty and their whistle blowing percentages are much lower when they perceived the wage as unfair. Additionally, in the communication condition, lower fairness perception also led to a higher percentage of collusive offers sent and a higher percentage of collusive agreements formed.

Comparing the no-communication condition with the communication condition, I found in the pilot that when the manager participants perceived the wage offer as fair, their reporting honesty and their whistle blowing percentages are not significantly different across the communication conditions. In contrast, when the wage offer was perceived as unfair, the managers' self reporting honesty level is significantly lower in the communication condition. The only result in the pilot study that is not consistent with the behavioral hypotheses is that I did not find any support for H3b. That is, the managers' whistle blowing percentage is not lower in the communication condition. In other words, when the wage was perceived as unfair, the manager participants did not cover more for each other's overstating behavior when they could communicate with each other than when they could not. This result may be due to the fact that the manager participants in the pilot could only communicate simultaneously with each other once in each round, therefore they did not have the opportunity to reconfirm each other's collusive intention. Thus, the communication condition reported in this dissertation adopted the new design where the manager participants could communicate with each other twice (send a message and make a response to their manager partner) in each period. In addition, in the experiment reported in this dissertation, more rounds were run and higher incentive was offered to the participants in order to test the robustness of the results found in the pilot. Moreover, instead of using three wage levels (500 Liras, 750 Liras and 1000 Liras), the owners in the experiment were asked to choose between two wage levels (500 Liras and 1000 Liras), and the participants were informed that in the pilot, the average wage chosen was 750 Liras. This is to ensure that both the owners and the managers in the experiment had a benchmark for judging the fairness of the wage.

## 7.1 MANIPULATION CHECKS AND DESCRIPTIONS OF VARIABLES

Several manipulation check questions were asked to ensure that participants understood the scenarios and attended to the manipulations. Except for two managers from NCC, everyone answered all check questions correctly. The two managers' data is eliminated from the analyses.

The major independent variables in this study are manager communication and the wage offered by the owners. Wage is determined by the owners, rather than the experimenter. The results of the owners' choices are as follows: in NCC, the owners send a total of 160 wage offers to the managers across the eight periods (20 managers X 8 periods), 92 of them (58%) are the 500-Lira offers and 68 (42%) are the 1000-Lira offers. In CC, the owners send a total of 144 wage offers to the managers across the eight periods (18 managers X 8 periods), 118 of them (82%) are the 500-Lira offers and 26 (18%) are the 1000-Lira offers. In the post experimental questionnaire, a validity check on whether wage corresponds to managers' fairness perception of the owner was performed. The managers were asked to rate their perceived fairness of the owner based on the wage on a 1-7 point scale (with 1 being the most unfair, 4 being neither fair nor unfair, and 7 the most fair). Results show that receiving the 500-Lira (1000-Lira) wage highly corresponds to managers' perception of having an unfair (a fair) owner. In NCC, the mean fairness rating for the owner when he/she offers the 500-Lira wage is 2.3 and the rating is 6.3 when the owner offers the 1000-Lira wage ( $t=12.92$ ,  $p<0.001$ ). In CC, the mean fairness rating for the owner when he/she offers the 500-Lira wage is 2.2 and the rating is 5.7 when the owner offers the 1000-Lira ( $t=8.96$ ,  $p<0.001$ ). As a result, wage, as an indicator of the managers' fairness perception of the owner, is used as the major independent variable in the analyses. In this dissertation, the terms 500-Lira wage and unfair wage are used exchangeably; the terms 1000-Lira wage and fair wage are used exchangeably.

The major dependent variables of this study are the managers' reporting honesty, and the percentage of whistle blowing. A manager's reporting honesty refers to his honesty in reporting his/her own division's cost to the owner. Following Evans et al. (2001), reporting honesty is measured as "1- Slack Claimed/Slack Available".<sup>25</sup> Similar to Towry (2003), the percentage of whistle blowing is defined as the percentage of truthful whistle blowing on lying peers.<sup>26</sup>

## 7.2 HYPOTHESES TESTING

### 7.2.1 Overview of Results

Table 2-Panel A summarizes wealth maximizing predictions for this experiment. First of all, anticipating that the peer reporting system can ensure truthful reporting regardless of the wage level, wealth maximizing owners should always offer the 500-Lira wage to the managers. Second, regardless of the communication condition they are in, and regardless of the wage they receive from the owner, wealth maximizing managers should always report their cost honestly under the peer reporting system. There should be no cost overstatement in any situation. In turn, there should be no chance for whistle blowing.

Table 2-Panel B reports the major results of the experiment. The results differ from the wealth maximizing predictions. As mentioned earlier, in both communication conditions, the owners do not always choose the 500-Lira wage. When the managers receive the fair wage from

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<sup>25</sup> For example, if division A's actual unit (total) cost is 1.4 (1400) Liras, manager A's available slack by lying to the maximum extent (i.e., claiming 3000 Liras as his cost) is 1600 Liras. If manager A reported 2500 Liras as his cost, he therefore claimed 1100-Lira slack (=2500-1400). His reporting honesty= $1-1100/1600=31.25\%$ .

<sup>26</sup> For example, if participant A<sub>1</sub> is matched with five lying partners and A<sub>1</sub> only blows the whistle twice; the percentage of whistle blowing for A<sub>1</sub> will be 40%.

the owner, their reporting honesty is very high. When they receive the unfair wage, their reporting is much less honest. In the same spirit, in both communication conditions, more overstatements of cost are observed when the managers receive the unfair wage than when they receive the fair wage. Additionally, despite the high reward for whistle blowing, not every manager turn in their lying peer. The percentage of whistle blowing is the lowest when the managers in CC face the unfair wage. Moreover, when the managers can communicate with each other, they send significantly more collusive messages and form significantly more collusive agreements when they receive the unfair wage than when they receive the fair wage. Comparing the results in CC with those in NCC, the managers' ability to communicate reduces the managers' reporting honesty and the percentage of whistle blowing when they receive the fair wage, but not when they receive the unfair wage.

### **7.2.2 Tests of H1a and H1b**

H1a predicts that in NCC, when managers are not able to communicate with each other, they will report more honestly when they receive the fair wage from the owner than when they receive the unfair wage. Results are consistent with H1a. As shown in Table 2-Panel B, the managers' mean reporting honesty is 92% when they receive the fair wage and 72% when they receive the unfair wage. Table 3 shows the results of a linear mixed model test. The linear mixed model is used to test the effect of wage on the managers' reporting honesty after adjusting for heteroscedasticity due to repeated observations within subject. Wage is found to have significantly affected managers' reporting honesty ( $F=19.80$ ,  $p<0.001$ ), supporting H1a. Decreasing the wage from 1000 Liras to 500 Liras decreases a manager's reporting honesty by approximately 0.21 ( $t=-4.46$ ,  $p<0.001$ ). Experimental period does not significantly affect the



managers' reporting honesty ( $F=0.30$ ,  $p=0.59$ ). Replacing wage with the managers' fairness rating as the independent variable leads to similar results. Fairness rating significantly affects the managers' reporting honesty ( $F=5.28$ ,  $p<0.001$ ).

In NCC, a total of 51 overstatements are observed across the eight periods. As shown in Table 2-Panel B, 11 overstatements are observed when managers receive the fair wage; 40 are observed when managers receive the unfair wage. A logistic mixed regression using the "overstate or not" dummy as the dependent variable indicates that wage significantly affects managers' likelihood to overstate, further supporting H1a ( $p<0.001$ ).

H1b predicts that the percentage of whistle blowing on peer's overstatement will be higher when managers in NCC receive the fair wage than when they receive the unfair wage. In NCC, when the managers receive the fair wage, ten out of the 11 overstatements (91%) are turned in. When the managers receive the unfair wage, 22 out of 40 overstatements (55%) are turned in. The results are in the direction of H1b. However, the difference in percentage of whistle blowing across the two wage conditions is not statistically significant ( $t=0.56$ ,  $p=0.28$ ). The insignificant result is probably due to the fact that only 11 overstatements are observed when the managers receive the fair wage from the owners and this leaves little opportunity for whistle blowing in the fair wage situation. Consequently, the test has very limited power.

### **7.2.3 Tests of H2a and H2b**

H2a predicts that in CC, when managers are able to communicate with each other, they will report more honestly when they receive the fair wage from the owner than when they receive the unfair wage. Results are consistent with H2a. As shown in Table 2- Panel B, the

managers' mean reporting honesty is 89% when they receive the fair wage and 60% when they receive the unfair wage. Table 4 presents the managers' reporting honesty in CC by experimental period, and the results of the linear mixed model test. Again, wage significantly affects the managers' reporting honesty ( $F=6.52$ ,  $p=0.01$ ). Decreasing the wage level from 1000 Liras to 500 Liras decreases the managers' reporting honesty by 0.24 ( $t=-2.55$ ,  $p<0.01$ ). H2a is supported. Experimental period does not significantly affect the managers' reporting honesty ( $F=0.13$ ,  $p=0.73$ ). The participants' reporting behaviors are rather consistent across periods. Replacing wage with fairness rating in the model generates slightly weaker results. Fairness rating is significantly related with the managers' reporting honesty at a 0.10 level ( $F=2.01$ ,  $p=0.08$ ).

In CC, a total of 59 overstatements are observed across the eight periods. As shown in Table 2-Panel B, only three overstatements are observed when managers receive the fair wage; the remaining 56 overstatements are observed when managers receive the unfair wage. A logistic mixed regression using the “overstate or not” dummy as the dependent variable indicates that wage significantly affects managers' likelihood to overstate, further supporting H2a ( $p<0.001$ ).

H2b predicts that the percentage of whistle blowing on peer's overstatement will be higher when managers in CC receive the fair wage than when they receive the unfair wage. When the managers receive the fair wage, two out of the three overstatements (67%) are turned in. When the managers receive the unfair wage, 20 out of 56 overstatements (36%) are turned in. Again, the results are in the direction of H2b but not statistically significant ( $t=0.47$ ,  $p=0.34$ ). The test has very limited power given the fact that only three overstatements are observed in the unfair condition, leaving very little opportunity for whistle blowing.

#### 7.2.4 Tests of H2c and H2d

H2c predicts that in CC, when the managers are given the opportunity to communicate with each other, they will send more collusive messages to each other when they receive the unfair wage than when they receive the fair wage. A message is coded as collusive if it expresses an intention to overstate the cost and/or to cover for each other.<sup>27</sup> For example, the message "Overstate to the max and no ratting" is coded as collusive. Another example of collusive message is "let's overstate to the max and agree to say honest for each other. We can make the most money that way." An example of non-collusive message is "I get paid more this time. My wage is a lot. Let's be honest." A blank message is also coded as non-collusive.

As shown in Table 2-Panel B, when the managers receive the unfair wage, 92% of the times they send a final collusive message to the other manager.<sup>28</sup> When they receive the fair wage, 50% of the times they send a final collusive message to the other manager. Table 5 reports the number of final collusive messages sent by each individual manager. The table also shows the percentage of times each manager sends a final collusive message when he/she receives the unfair wage (percentage U), and the percentage of times each managers sends a final collusive message when he/she receives the fair wage (percentage F). A paired t-test is run to compare percentage U with percentage F. The result indicates that wage significantly affects the percentage of collusive messages sent by the managers ( $t=3.07$ ,  $p=0.01$  two-tailed), supporting H2c. A logistic mixed regression using "send final collusive message or not" dummy (1=sent,

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<sup>27</sup> The messages were independently coded by the author and two other doctoral students. The results are compared and there is unanimous agreement among the coders.

<sup>28</sup> Final collusive messages refer to the collusive messages sent by the managers in their final (second) round of communication. The number of collusive messages sent in the first round is not significantly different from that in the final round.

0=do not send) as the dependent variable further supports H2c—higher wage is associated with a smaller likelihood of sending a collusive message after controlling for repeated observation within subjects ( $t=-4.98$ ,  $p<0.001$ ). Replacing wage with fairness rating in the regression shows similar result. Rating coefficient is negative and significant ( $t=-4.33$ ,  $p<0.001$ ).<sup>29</sup>

As an additional analysis, I also compared the managers' tendency to treat the final collusive messages they send as "cheap talk" across the wage conditions. I compared the percentage of times the managers renege on their collusive messages across the wage conditions. In the unfair wage condition, after the managers send a final collusive message to their partners, 50% of the times they do NOT overstate. In the fair wage condition, after the managers send a final collusive message to their partners, 77% of the times they do NOT overstate ( $\chi^2=3.38$ ,  $p=0.07$ ). This provides preliminary evidence that the collusive communication is less likely to take effect when the managers perceive the owner to be fair.

H2d predicts that in CC, the managers will form more collusive agreements with each other when they receive the unfair wage than when they receive the fair wage. Table 6 reports the number of final collusive agreements formed between manager pairs across wage conditions. A final collusive agreement is formed if both managers send a final collusive message to each other. As shown in the table, only three out of the 13 manager pairs (23%) who receive the 1000-Lira wage offer form a final collusive agreement. In contrast, 52 out of the 59 manager pairs (88%) who receive the 500-Lira wage offer form a final collusive agreement. The difference is statistically significant ( $\chi^2=25$ ,  $p<0.001$ ), supporting H2d.<sup>30</sup>

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<sup>29</sup> Both wage and fairness ratings are found to be significantly associated with the managers' likelihood of initiating a first collusive message.

<sup>30</sup> I also analyze the percentage of times the managers renege on their final collusive agreements. As we know, very few final collusive agreements are formed in the fair wage condition, leaving limited sample size for me when I try to analyze the rate of renegeing on collusive agreements in the fair wage condition and compare the rate to that in the

### 7.2.5 Tests of H3a and H3b

H3a suggests that when the managers receive the unfair wage, their ability to communicate with each other will reduce their reporting honesty. As shown in Table 2-Panel B, when the managers receive the unfair wage, their mean reporting honesty in NCC is 72% and their mean reporting honesty in CC is 60%. A univariate analysis is run to test the effect of communication condition on the managers' reporting honesty when the managers receive the unfair wage. The results are shown in Table 7. Communication condition is found to have a significant effect on the managers' reporting honesty when the wage is unfair ( $F=5.00$ ,  $p=0.03$ ). This suggests that the managers' ability to communicate with each other in CC significantly decreases the managers' reporting honesty when they receive the unfair wage, supporting H3a.

H3b suggests that when the managers receive the unfair wage, their ability to communicate with each other will reduce the percentage of whistle blowing on lying peers. As shown in Table 2-Panel B, when the managers receive the unfair wage, the percentage of whistle blowing is 55% in NCC and 36% in CC ( $\chi^2=3.53$ ,  $p=0.06$ ). This suggests that, when the managers receive the unfair wage, their ability to communicate with each other in CC decreases their likelihood to blow the whistle, supporting H3b. Table 8 reports the result of a univariate analysis using individual managers' whistle blowing percentage as the dependent variable. Communication is found to have significantly decreased the managers' whistle blowing percentage, further supporting H3b ( $F=39.60$ ,  $p<0.001$ ).

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unfair wage condition. When the managers receive the fair wage offer, 67% of the times they decide NOT to overstate their own costs, after forming a final collusive agreement with their partners. When the managers receive the unfair wage offer from the owner, 51% of the times they decide NOT to overstate their own costs after forming a final collusive agreement. The difference is not significant possibly because of the size problem in the fair wage condition ( $\chi^2=0.56$ ,  $p=0.45$ ).

### 7.2.6 Tests of RQ1 and RQ2

RQ1 asks whether managers' ability to communicate with each other decreases their reporting honesty when they receive the fair wage from the owner. As shown in Table 2-Panel B, when the managers receive the fair wage, their mean reporting honesty in NCC is 92% and their mean reporting honesty in CC is 89%. A univariate analysis is run to test whether communication condition affects the managers' reporting honesty when the wage is fair. Results suggest that communication condition does not significantly affect the managers' reporting honesty when they receive the fair wage ( $F=0.33$ ,  $p=0.57$ ). These findings suggest that when the managers receive the fair wage, their reporting honesty is very high in both communication conditions and their ability to communicate does not decrease their reporting honesty.

RQ2 asks whether managers' ability to communicate with each other decreases their percentage of whistle blowing on lying peers when they receive the fair wage from the owner. As shown in Table 2-Panel B, when the managers receive the fair wage in NCC, 11 overstatements are observed, ten of these overstatements are turned in. When the managers receive the fair wage in CC, three overstatements are observed, two of these overstatements are turned in. The difference across conditions is not statistically significant ( $\chi^2=1.13$ ,  $p=0.29$ ). The managers' ability to communicate with each other does not seem to have decreased the managers' percentage of whistle blowing when they receive the fair wage. However, this statement must be interpreted with caution due to the small power of the test.

## 7.3 ADDITIONAL ANALYSES ON THE OWNERS

### 7.3.1 The Owners' Wage Choices-A Detailed Look

Although the owners' behaviors are not the focus of this study, it is interesting to see how the owners choose the wage given the peer reporting system. As mentioned earlier, contrary to the wealth maximizing prediction, the owners choose a significant number of 1000-Lira wages in both communication conditions. Further more, comparing the wage offered across the two communication conditions suggests that the owners are significantly less likely ( $\chi^2=21.2$ ,  $p<0.01$ ) to offer the 1000-Lira wage in CC (when they know that the managers can communicate with each other) than in NCC (when they know that the managers can NOT communicate with each other). Comparing the number of 1000-Lira wages received by each manager in the two communication conditions further demonstrates that the owners send significant more fair wage offers in NCC than in CC ( $t=5.49$ ,  $p<0.001$ ). The owners' responses in the post experimental questionnaire suggest that the owners in CC are concerned that communication may lead the managers to collude against them, and they are reluctant to offer the 1000-Lira wage to the managers when this possibility exists. One explanation for this finding may be suggested by Rankin et al. (2005). They find that when the subordinates in their study do not have unilateral authority on their budget proposals, they frame the budgeting situation as one of strategic negotiation with the superior rather than as an ethical dilemma. As a result, the subordinates' preference for honesty is crowded out and their honesty in reporting decreases. In this dissertation, the owners in CC may feel that the managers' communication ability challenges the owners' authority and control in the experiment, and they frame the situation in CC as one with primarily economic and strategic connotations rather than one with ethical/fairness implications.

As a result, the owners' non-pecuniary motivation, such as treating the managers fairly by offering them a higher-than-minimum wage, is reduced significantly. An alternative explanation for this finding may be suggested by Evans et al. (1994). In their study, the owner experiences disutility from the possibility of being exploited by the managers to whom the owner has entrusted his/her assets. The owners in Evans et al. (1994) are willing to pay to avoid the possibility of being exploited and to attain accountability. Accountability in their study refers to the likelihood that the firm's managers do not falsify reports in order to misappropriate the firm's assets. Applying their results to the current study would suggest that the owners may feel that they can expect less accountability from the managers in CC because of the increased likelihood of collusion between the managers. Therefore, the owners need to compensate for the disutility they experience (from the possibility of being taken advantage of) by offering a lower wage to the managers. Future studies may want to explore this further.

### **7.3.2 The Owners' Share of the Divisions' Gross Margin and the Owners' Final Payoff**

In this section, I report how the owner's share of the divisions' Gross Margin ( $\pi$ ) and their final payoff in this experiment are affected by fairness and communication under the peer reporting system.

The owner's share of the divisions' Gross Margin ( $\pi$ ) reflects the extent to which the managers expropriate the surplus from the divisions under the peer reporting system. As discussed in Chapter 6, the size of  $\pi$  is jointly determined by the managers' reporting honesty and the extent of whistle blowing on any dishonest report. Results show that  $\pi$  is positively associated with wage. When the owners offer the fair wage, the average  $\pi$  in the two communication conditions is 99.0%, indicating that the owners receive an average of 99.0% of



the two divisions' Gross Margin. The percentage is virtually identical with the economic prediction (100%), demonstrating that the peer reporting system works almost perfectly when the owners offer the fair wage to the managers. In contrast, when the owners offer the unfair wage, the average  $\pi$  significantly decreases to 79.9% ( $t=-5.61$ ,  $p<0.001$ , two-tailed). Additionally, the managers' ability to communicate with each other also has a significant impact on  $\pi$ . The owners in NCC receive an average of 93.1% of the Gross Margin, whereas the owners in CC receive an average of 78.4% ( $t=-3.19$ ,  $p=0.002$ , two-tailed). Table 9 shows the owner's share of the divisions' Gross Margin ( $\pi$ ) by wage and communication conditions. As shown in the table, when the owners offer the fair wage to the managers, the managers' ability to communicate with each other does not significantly affect the size of  $\pi$  ( $t=-0.97$   $p=0.35$ , two-tailed). However, when the owners offer the unfair wage to the managers, the managers' ability to communicate with each other significantly decreases the size of  $\pi$  ( $t=-2.26$ ,  $p=0.03$ , two-tailed).

As shown in Table 9, the largest increase in  $\pi$ , 22.3%, results from increasing the wage offer from 500 Liras to 1000 Liras in CC. As analyzed in Chapter 6, the owners are economically better off offering the fair wage only if increasing the wage from 500-Lira to 1000-Lira can increase  $\pi$  by more than 50%. The increase in  $\pi$  in the current experiment is less than 50%, and therefore can not cover the increase in the wage expense. As a result, the owners in the current study are better off offering the unfair wage to the managers. As shown in Table 10, considering the wage expense, the owners perform significantly better when offering the 500-Lira wage to the managers in both communication conditions. Nevertheless, the owners offer a significant number of fair wages to the managers, especially in NCC. This anomaly suggests that the owners are not pure wealth maximizers. Their wage choices are consistent with the notion that they have

preference for fairness, particularly in NCC, when the owners feel that they have more control on the situation and they can expect more accountability from the managers.

It should be noted that the result—the owners' payoffs are higher when they offer the unfair wage—is largely affected by the parameters selected for the study. For example, the fact that auditing is costless in the current study introduces a bias in favor of the owners offering the unfair wage. This is because managers overstate much more often when they receive the unfair wage than when they receive the fair wage. As a result, the owners have to call the auditor more frequently when they offer the unfair wage than when they offer the fair wage. If auditing is costly, the owners would incur an additional cost which will reduce their payoff and the presence of the auditing cost will make the selection of the unfair wage less desirable to the owners.

## **CHAPTER 8: CONCLUSIONS AND DISCUSSION**

In this chapter, I summarize the results of my experiment and discuss this study's contributions to theory and practice. I conclude this dissertation with a discussion of the limitations of this study and the potential avenues for future research.

### **8.1 SUMMARY AND CONTRIBUTIONS**

This study experimentally tests the effect of a peer reporting system in inducing honesty in managerial reporting and how the effect is influenced by managers' fairness perception of the owner (based on the wage offered to them by the owner) and manager communication. Results show that the peer reporting system is almost perfect in inducing honesty in managerial reporting when the managers perceive the owner to be fair. However, when the managers perceive the owner to be unfair, the managers' reporting honesty decreases significantly. In addition, despite the high reward for whistle blowing, the managers show a tendency to cover for each other when the owner is perceived as unfair.

The results also indicate that the managers' perceived fairness of the owner affects how the managers utilize their communication opportunities under the peer reporting system. The managers in the communication condition send significantly more collusive messages and form significantly more collusive agreements when they perceive the owner to be unfair than when

they perceive the owner to be fair. Compared to the findings in the no communication condition, having the ability to communicate with each other significantly decreases the managers' reporting honesty as well as the extent of whistle blowing only when the managers perceive the owner to be unfair. When they perceive the owner to be fair, the ability to communicate does not significantly affect the managers' reporting or whistle blowing behaviors.

Control systems relying on peer monitoring are frequently observed in practice and they represent a potentially cost effective way to improve the principal's contractual position. This study contributes to the literature by providing an experimental test of the effectiveness of a theoretically optimal peer reporting system in eliciting honest reports from the agents. Results indicate that the peer reporting system can be a useful tool in eliciting honesty in managerial reporting. In addition, the effectiveness of this system can be affected by factors outside conventional agency theory and such factors may need to be considered in incentive contracting design. These results are important to academic scholars who are interested in budgeting and control issues in multi-agent settings.

This dissertation also has implications for whistle blowing practices. The evidence presented in the current study suggests that people do not like to blow the whistle on others despite the monetary rewards for doing so. However, agents feel more loyal to a principal who has treated them fairly, and are more likely to blow the whistle on a fellow agent who has taken advantage of a fair principal. In this situation, having the whistle blowing function as an internal control tool can potentially help the principal to restrain agents' opportunistic behaviors.

The current study also enriches the empirical cheap talk literature. This study investigates a situation where the non-binding communication (cheap talk) between two players can not only affect the welfare of the two players, but also that of a third party. The results indicate that

whether the communication can lead the communicators to choose an outcome that is optimal to them at the detriment to the third party depends on the behavior of the third party and the communicators' perception of the third party's behavior. Specifically, the communicators choose the collusive outcome less frequently when they perceive the third party's behavior as fair. The above evidence also provides useful insights into the role of communication in business practices. Modern organizations put forth costly effort to encourage communication among agents. This study suggests that agent communication can be a double-edged sword for organizations. When the agents view the principal as fair, communication is likely to enhance cooperation and productivity, and is unlikely to enforce low work norms among the agents. On the other hand, if the agents share an unfair perception of the principal, communication can lead to collusion and other counter-productive activities.

This paper responds to the recent calls for studies on control issues in a multi-person setting (Sprinkle 2003) and for accounting research that integrates economic and behavioral factors (Kachelmeier 1994; Luft 1997; Moser 1998). The approach of the study is also consistent with Evans and Moser (2004), who argue that it is important for experiments to have a clear economic prediction against which to compare actual behavior.

## **8.2 LIMITATIONS AND FUTURE RESEARCH**

Certain limitations of this study may raise potential external validity concerns. At the same time, these limitations provide opportunities for future research. For example, this study makes a simplifying assumption that there is no information asymmetry among the agents, whereas in business practice, although the information asymmetry among certain agents is

usually much lower than that between the principal and the agents, it is unlikely that the agents can obtain perfect information about each other. Future studies should examine the effect of the peer reporting system in a situation where the agents can imperfectly observe each other's private information.

For experimental control purposes, I investigate managerial honesty in a reporting context with no uncertainty. In other words, in my setting, slack represents expropriation of rents by the managers and if the managers overstate their costs, it indicates with certainty that they do so for opportunistic reasons. However, in business practice, some level of slack may be desirable to the organization and not necessarily dishonest. Slack can be beneficial to the organization by reducing manager tension, increasing organizational resiliency to change, protecting the organization against uncertainty in the environment, and by making available some resources that can be used for innovation (Sprinkle 2003, Merchant 1998). It is unclear how closely my results would generalize to the above uncertain environments.

Finally, the owners in this experiment are not allowed to communicate with the managers. In addition, the owners can not choose whether they want to adopt the peer reporting system in the experiment. In future studies, giving the owners more choice and allowing the owner to play a more active role may influence the managers' fairness perceptions and honesty level. These and other potential limitations suggest a fruitful area for future research.

**TABLE 1: THE MANAGERS' EXPECTED PAYOFFS**

**PANEL A: THE MANAGERS' EXPECTED PAYOFFS WHEN WAGE=500**

Manager B's reporting choices (report Actual cost or Overstate) and whistle blowing choices (report manager A as Honest or Dishonest)

		<b>O, D</b>	<b>O, H</b>	<b>A, D</b>	<b>A, H</b>
Manager A's reporting choices (report Actual cost or Overstate) and whistle blowing choices (report manager B as Honest or Dishonest)	<b>O, D</b>	500, 500	2500, -500	-2500, 500	-500, -500
	<b>O, H</b>	-500, 2500	1500, 1500 <i>collusive outcome</i>	-500, 1500	1500, 500
	<b>A, D</b>	500, -2500	1500, -500	-2500, -2500	-1500, -500
	<b>A, H</b>	-500, -500	500, 1500	-500, -1500	500, 500 <sup>31</sup>

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<sup>31</sup> The two numbers in each cell represent the payoffs to manager A and manager B, respectively. The highlighted cells represent the unique Nash equilibria of the four stage-two subgames.

**PANEL B: THE MANAGERS' EXPECTED PAYOFFS WHEN WAGE=1000**

Manager B's reporting choices (report **A**ctual cost or **O**verstate) and whistle blowing choices (report manager A as **H**onest or **D**ishonest)

Manager A's reporting choices (report <b>A</b> ctual cost or <b>O</b> verstate) and whistle blowing choices (report manager B as <b>H</b> onest or <b>D</b> ishonest)		Manager B's reporting choices (report <b>A</b> ctual cost or <b>O</b> verstate) and whistle blowing choices (report manager A as <b>H</b> onest or <b>D</b> ishonest)		
		<b>O, D</b>	<b>O, H</b>	<b>A, D</b>
<b>O, D</b>	1000, 1000	3000, 0	-2000, 1000	0, 0
<b>O, H</b>	0, 3000	2000, 2000 <i>collusive outcome</i>	0, 2000	2000, 1000
<b>A, D</b>	1000, -2000	2000, 0	-2000, -2000	-1000, 0
<b>A, H</b>	0, 0	1000, 2000	0, -1000	1000, 1000



**TABLE 2: WEALTH MAXIMIZING PREDICTIONS VERSUS RESULTS**

**PANEL A: WEALTH MAXIMIZING PREDICTIONS**

Wage Level	NCC		CC	
	500-Lira	1000-Lira	500-Lira	1000-Lira
% of Wage Offers	100%	0%	100%	0%
Reporting Honesty	100%	100%	100%	100%
Number of Overstatements	0	0	0	0
% of Whistle Blowing	N/A	N/A	N/A	N/A

**PANEL B: EXPERIMENTAL RESULTS**

Wage Level (Fairness Rating)	NCC		CC	
	500-Lira (2.3)	1000-Lira (6.3)	500-Lira (2.2)	1000-Lira (5.7)
% of Wage Offers	58% (=92/160)	42% (=68/160)	82% (=118/144)	18% (=26/144)
Reporting Honesty	72%	92%	60%	89%
Number of Overstatements	40	11	56	3
% of Whistle Blowing	55% (=22/40)	91% (=10/11)	36% (=20/56)	67% (=2/3)
% of Collusive Messages Sent	-	-	92% (=108/118)	50% (=13/26)
% of Collusive Agreements Formed	-	-	88% (=52/59)	23% (=3/13)

**TABLE 3: REPORTING HONESTY IN NCC**

Experimental Period	Reporting Honesty by Period (NCC)	
	500-Lira (Unfair) Wage	1000-Lira (Fair) Wage
1	97% (n=8)	98% (n=12)
2	79% (n=6)	87% (n=14)
3	62% (n=10)	79% (n=10)
4	66% (n=15)	100% (n=5)
5	81% (n=11)	100% (n=9)
6	49% (n=12)	100% (n=8)
7	68% (n=16)	100% (n=4)
8	82% (n=14)	83% (n=6)
<b>Total</b>	<b>72% (n=92)</b>	<b>92% (n=68)</b>

**Mixed Model Analysis on Reporting Honesty in NCC--Test of Fixed Factors**

Source	F	Sig.
Intercept	142.18	0.00
Wage	19.80	0.00
Period	0.30	0.59

**Mixed Model Analysis on Reporting Honesty in NCC--Estimates of Fixed Factors**

Parameter	Estimate	Std. Error	df	t	Sig.
Intercept	0.96	0.07	63.27	13.15	0.00
Wage=500	-0.21	0.05	126.60	-4.45	0.00
Wage=1000	-	-	-	-	-
Period	-0.01	0.01	44.75	-0.54	0.59

**TABLE 4: REPORTING HONESTY IN CC**

Experimental Period	Reporting Honesty by Period (CC)	
	500-Lira (Unfair) Wage	1000-Lira (Fair) Wage
1	65% (n=14)	100% (n=4)
2	50% (n=16)	7% (n=2)
3	51% (n=14)	100% (n=4)
4	73% (n=14)	100% (n=4)
5	59% (n=16)	100% (n=2)
6	65% (n=18)	N/A (n=0)
7	41% (n=12)	100% (n=6)
8	71% (n=14)	75% (n=4)
<b>Total</b>	<b>60% (n=118)</b>	<b>89% (n=26)</b>

**Mixed Model Analysis on Reporting Honesty in CC--Test of Fixed Factors**

Source	F	Sig.
Intercept	52.95	0.00
Wage	6.52	0.01
Period	0.13	0.73

**Mixed Model Analysis on Reporting Honesty in CC--Estimates of Fixed Factors**

Parameter	Estimate	Std. Error	df	t	Sig.
Intercept	0.82	0.12	100.18	6.85	0.00
Wage=500	-0.24	0.09	139.41	-2.55	0.01
Wage=1000	-	-	-	-	-
Period	0.01	0.02	35.09	0.35	0.73

**TABLE 5: NUMBER OF FINAL COLLUSIVE MESSAGES SENT ACROSS WAGES**

Participant	500-Lira Wage (Unfair)			1000-Lira Wage (Fair)		
	# of 500-Lira Wage received	# of Final Collusive Message Sent	Percentage U	# of 1000-Lira Wage received	# of Final Collusive Message Sent	Percentage F
23	8	7	88%	-	-	-
24	5	3	60%	3	0	0%
25	4	4	100%	4	1	25%
26	7	6	86%	1	1	100%
27	8	8	100%	-	-	-
28	6	6	100%	2	2	100%
29	8	8	100%	-	-	-
30	6	6	100%	2	2	100%
31	7	7	100%	1	1	100%
32	4	3	75%	4	3	75%
33	6	5	83%	2	1	50%
34	7	5	71%	1	0	0%
35	7	7	100%	1	0	0%
36	7	7	100%	1	1	100%
37	6	6	100%	2	0	0%
38	6	5	83%	2	1	50%
39	8	8	100%	-	-	-
40	8	7	88%	-	-	-
<b>Total</b>	<b>118</b>	<b>108</b>	<b>92%</b>	<b>26</b>	<b>13</b>	<b>50%</b>

**TABLE 6: NUMBER OF COLLUSIVE AGREEMENTS FORMED ACROSS WAGES**

		Number of Manager Pairs Who Received the Unfair Wage	Number of Manager Pairs Who Received the Fair Wage	Total
Did Not Form Collusive Agreement	Count % of Total	7 11.9%	10 76.9%	17 23.6%
Formed Collusive Agreement	Count % of Total	52 88.1%	3 23.1%	55 76.4%
<b>Total</b>		<b>59</b>	<b>13</b>	<b>72</b>

**TABLE 7: COMPARING REPORTING HONESTY ACROSS COMMUNICATION  
CONDITIONS WHEN WAGE=500**

**Dependent Variable: Managers' Reporting Honesty when Wage=500**

<b>Source</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Communication (1=yes, 0=no)	1	0.95	5.00	0.03
Period	7	0.24	1.25	0.28
Communication * Period	7	0.19	1.02	0.42
Error	194	0.19		
Total	210			
Corrected Total	209			

**TABLE 8: COMPARING WHISTLE BLOWING ACROSS COMMUNICATION  
CONDITIONS WHEN WAGE=500**

**Dependent Variable: Individual Whistle Blowing Percentage when Wage=500**

<b>Source</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Communication (1=yes, 0=no)	1	2.42	39.58	0.00
Error	28	0.06		
Total	30			
Corrected Total	29			

**TABLE 9: THE OWNERS' SHARE OF THE DIVISIONS' GROSS MARGIN (II)**

	$\pi$		<b>Difference</b>
	<b>500-Lira Wage</b>	<b>1000-Lira Wage</b>	
<b>NCC</b>	88.1% (n=41)	99.9%(n=31)	11.8% t=3.02, p<0.01 (two-tailed)
<b>CC</b>	74.3%(n=59)	96.6%(n=13)	22.3% t=3.88, p<0.01 (two-tailed)
<b>Difference</b>	-13.8% t=-2.26 p=0.03 (two-tailed)	-3.3% t=-0.97 p=0.35 (two-tailed)	

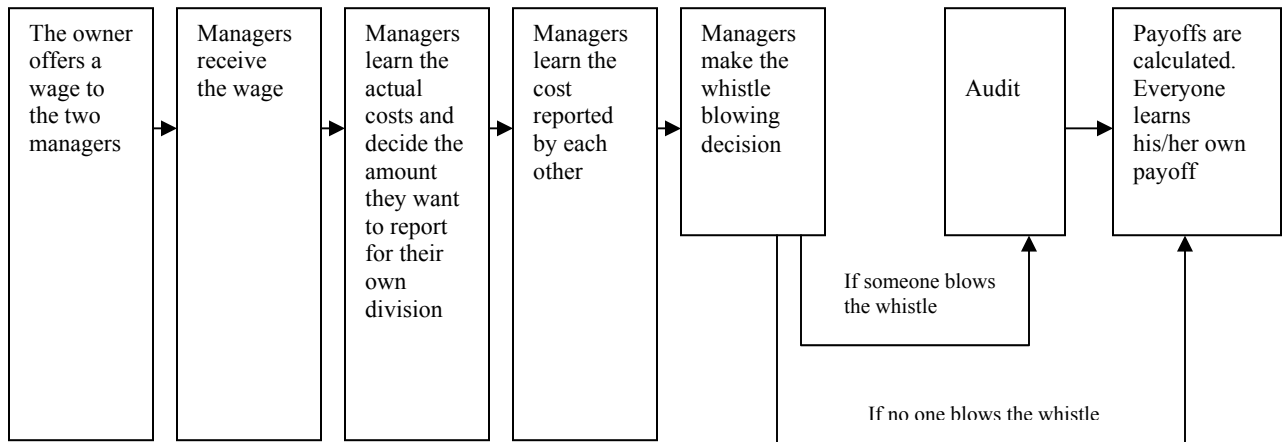


**TABLE 10: THE OWNERS' FINAL PAYOFF (IN LIRAS)**

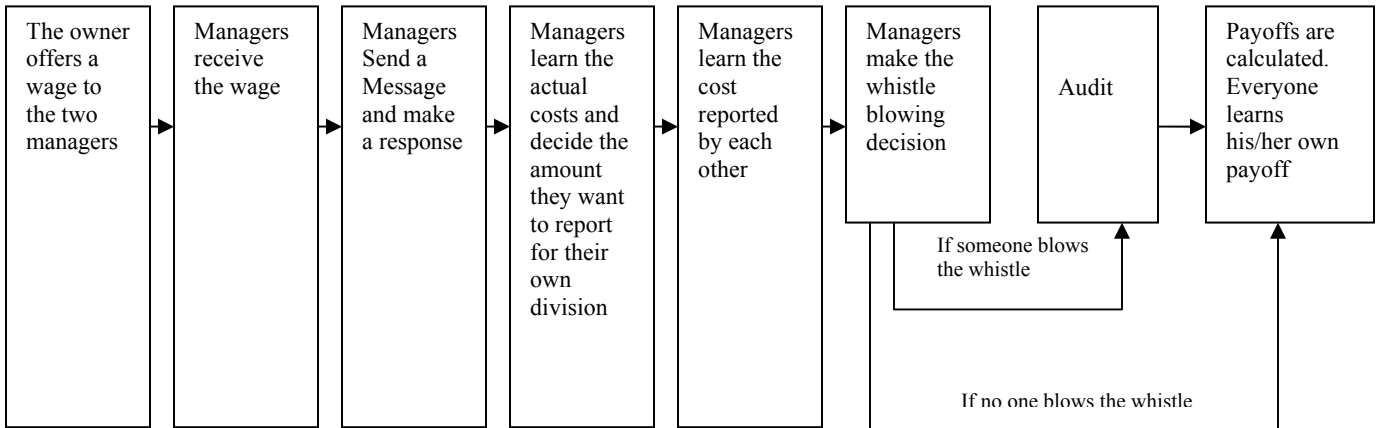
	The Owners' Final Payoff		<b>Difference</b>
	500-Lira Wage	1000-Lira Wage	
<b>NCC</b>	2714.6 (n=41)	1958.1 (n=31)	-756.5 t=-7.16, p<0.01 (two-tailed)
<b>CC</b>	2431.4 (n=59)	1896.2 (n=13)	-535.2 t=-3.92, p<0.01 (two-tailed)
<b>Difference</b>	-283.2 t=-2.21, p=0.03 (two-tailed)	-61.9 t=-0.53, p=0.60 (two-tailed)	

**FIGURE 1: TIMELINE IN EACH EXPERIMENTAL CONDITION**

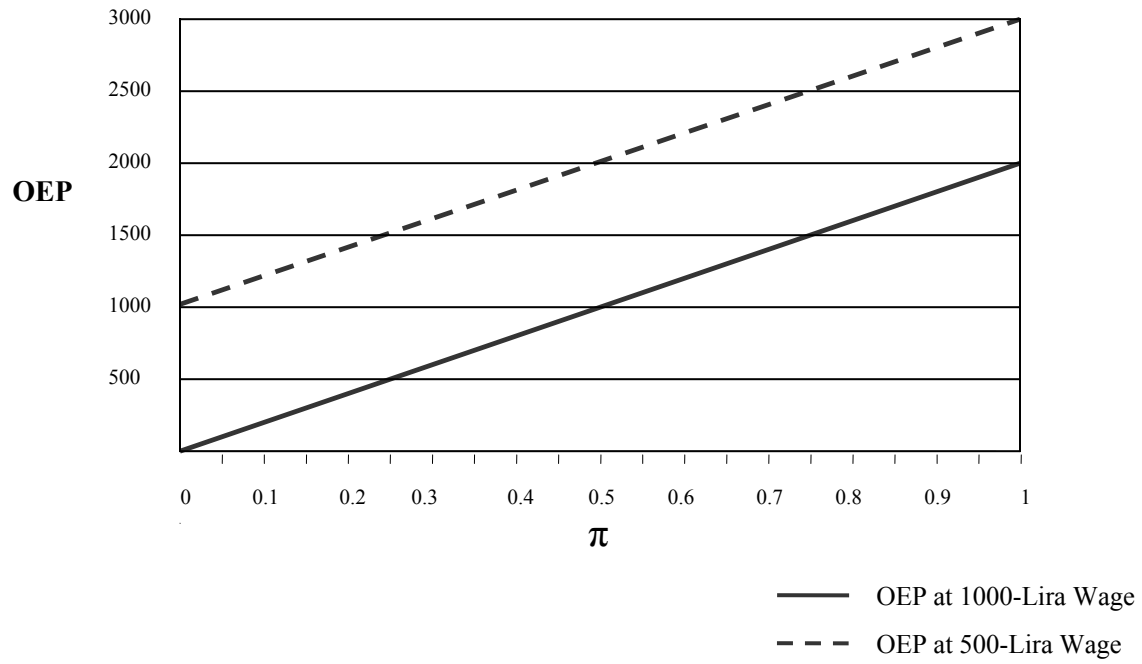
**NCC (No Communication Condition)**



**CC (Communication Condition)**



**FIGURE 2: THE OWNERS' EXPECTED PAYOFF (OEP)**



## APPENDIX: EXPERIMENTAL INSTRUCTIONS

### Instructions for the Managers (NCC)

#### GENERAL INFORMATION

This study is about decision-making in accounting. You will assume the role of a divisional manager throughout the experiment. The experiment will last eight periods. Each of you will be randomly grouped with another manager participant and an owner participant in each period. The amount of cash paid to you for participating in the experiment will depend on the decisions you and your group members make during the experiment. You will not be told who your group members are either during or after the experiment.

If you have any questions during the experiment, please raise your hand and the administrator will answer your questions. **Please do not talk with any participants other than the administrator after this point.**

#### OVERVIEW OF THE EXPERIMENT

You will play the role of either manager A or manager B throughout the experiment. Manager A and manager B are working as the head of Division A and Division B, respectively, for a manufacturing company. Manager A and B are responsible for reporting the production cost of their own division to the owner of the company. Manager A and B will be paid a wage for this job. This wage level is determined by the owner participants.

As the head of Division A, manager A knows the exact cost of his/her own division, which falls within [1000 Liras, 1050 Liras, 1100 Liras,..., 3000 Liras]. Due to similarities in the working environment, manager A also knows the exact cost of division B, which falls within [4000 Liras, 4050 Liras, 4100 Liras,..., 6000 Liras]. Likewise, manager B knows his/her division's exact cost as well as the exact cost of division A.

The owner knows that the distribution of division A's cost falls within [1000 Liras, 1050 Liras, 1100 Liras,..., 3000Liras], and division B's cost falls within [4000 Liras, 4050 Liras, 4100 Liras,..., 6000Liras]. However, the owner does NOT know the exact cost of either division.

Your first task in each period is to report to the owner a cost for your own division. Your actual cost in each period will be determined by a random draw by the experimenter. Since the owner does NOT know the exact cost of your division, if your reported cost is above your actual cost, and if the owner does not call an auditor to check upon you, you may keep the difference as additional income.

After reporting your divisional cost to the owner, you will learn the amount the other manager paired with you reported to the owner. If s/he overstated her/his cost to the owner, you can choose whether or not to inform the owner of this overstatement. If you do, the owner will call an auditor to check upon the other manager. The other manager will be fined 1000 Liras for overstating; you will receive 1000 Liras reward for helping the owner learn the truth. However, if the other manager did NOT overstate and you falsely accuses him/her, the auditor will find this out and you will have to pay a 2000 Lira fine.

Likewise, the other manager in your group will learn the amount you reported to the owner. If you overstated your cost, she/he can choose whether to inform the owner of your overstatement. If she/he does, you will be checked by an auditor and fined 1000 Liras, and the other manager will receive 1000 Liras reward. The other manager will also be fined 2000 Liras if she/he falsely accuses you.

### **PROCEDURES:**

1. The owner participant paired with you will decide the wage level for both you and the other manager. You will be informed of the owner's decision. The owner must pay you and the other manager the same wage.
2. On your desk, you will find eight blue papers and one pink paper with eight labels on it. When you peel label #1 off, you can see both manager A and manager B's actual cost for period #1, and so on. **Please do not peel any label off until the experimenter tells you to do so. Please do not look ahead to subsequent periods.**
3. Peel label #1 off from the pink paper. Write down the cost you want to report to the owner on a blue paper. The experimenter will collect the blue paper from you and the other manager.
4. The experimenter will give you a white paper documenting the cost reported by both you and the other manager. If you observe that the other manager overstated his/her cost, you can choose whether you will tell the owner about this by circling one of two choices on the white paper: **Honest or Overstated**. Note that while you know with certainty whether the other manager overstated his/her division's cost, you may choose to circle either "Honest" or "Overstated", regardless of what the other manager actually did. The experimenter will collect the white paper from you and pass it to the owner.  
At the same time, the other manager is making the same reporting decision on you.
5. An administrator who does not know your identity will calculate the payoff for you, you will be informed of how much you earned for the period.
6. The next period starts.

### **COMPENSATION SCHEME:**

#### **Compensation for you and the other manager in each period:**

The owner pays both you and the other manager a wage for your job. The owner can choose either 500 Liras or 1000 Liras as your wage level.<sup>32</sup> Your and the other manager's wage in each period will be determined by the owner matched with you in that period. Therefore, your wage level may vary from period to period, depending on the owner's choice.

However, you may receive greater than, equal to, or less than your wage in each period based on the decisions made by both you and the other manager. Specifically,

- If the other manager reports that you overstated when reporting your cost, you will receive an amount equal to your wage minus a 1000 Lira fine

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<sup>32</sup> A pilot study was conducted in April 2005. In the pilot study, the average wage offered by the owner participants was 750 Liras. The owner participants in the current experiment are informed of this before they make their wage choices.

- If the other manager reports that you were honest when reporting your cost, you will receive your wage, plus you can keep any difference between your reported cost and your actual cost.
- In addition, you can receive a 1000 lira bonus if you circle “Overstated” on your white paper, if and only if the other manager did overstate his/her cost. (Falsely accusing the other manager will result in a 2000 Lira fine for you)

Likewise, the other manager’s compensation will rely on his/her as well as your decisions.

**Compensation for the owner in each period:**

The owner’s compensation depends on both your decision and that of the other managers. Specifically, the owner’s compensation is determined as:

(3000 Liras–manager A’s reimbursed cost) + (6000 Liras- manager B’s reimbursed cost) +2000 Liras - wage paid to manager A and B

**Any Questions?**

The amount of cash you will take home from the experiment will be determined by the result of one period randomly selected from the periods played. For each 1000 Liras you earn in the experiment, you will receive \$15.

**Reminder: Functions of Different Papers:**

Pink Papers	Show your and the other manager’s actual cost in each period.
Blue Papers	Use them to report cost to the owner in each period
White Papers	Show your and the other manager’s reported cost in each period. You can also use them to inform the owner of the other manager’s overstatement, if any.



## **Instructions for the Managers (CC)**

### **GENERAL INFORMATION**

This study is about decision-making in accounting. You will assume the role of a divisional manager throughout the experiment. The experiment will last eight periods. Each of you will be randomly grouped with another manager participant and an owner participant in each period. The amount of cash paid to you for participating in the experiment will depend on the decisions you and your group members make during the experiment. You will not be told who your group members are either during or after the experiment.

If you have any questions during the experiment, please raise your hand and the administrator will answer your questions. **Please do not talk with any participants other than the administrator after this point.**

### **OVERVIEW OF THE EXPERIMENT**

You will play the role of either manager A or manager B throughout the experiment. Manager A and manager B are working as the head of Division A and Division B, respectively, for a manufacturing company. Manager A and B are responsible for reporting the production cost of their own division to the owner of the company. Manager A and B will be paid a wage for this job. This wage level is determined by the owner participants.

As the head of Division A, manager A knows the exact cost of his/her own division, which falls within [1000 Liras, 1050 Liras, 1100 Liras,..., 3000 Liras]. Due to similarities in the working environment, manager A also knows the exact cost of division B, which falls within [4000 Liras, 4050 Liras, 4100 Liras,..., 6000 Liras]. Likewise, manager B knows his/her division's exact cost as well as the exact cost of division A.

The owner knows that the distribution of division A's cost falls within [1000 Liras, 1050 Liras, 1100 Liras,..., 3000 Liras], and division B's cost falls within [4000 Liras, 4050 Liras, 4100 Liras,..., 6000 Liras]. However, the owner DOES NOT know the exact cost of either division.

Your first task in each period is to report to the owner a cost for your own division. Your actual costs in each period are predetermined by the experimenter based on a random draw. Since the owner DOES NOT know the exact cost of your division, if your reported cost is above your actual cost, and if the owner does not call an auditor to check upon you, you may keep the difference as additional income.

After reporting your divisional cost to the owner, you will learn the amount the other manager paired with you reported to the owner. If s/he overstated her/his cost to the owner, you can choose whether or not to inform the owner of this overstatement. If you do, the owner will call an auditor to check upon the other manager. The other manager will be fined 1000 Liras for overstating; you will receive 1000 Liras reward for helping the owner learn the truth. However, if the other manager did NOT overstate and you falsely accuses him/her, the auditor will find this out and you will have to pay a 2000 Lira fine.

Likewise, the other manager in your group will learn the amount you reported to the owner. If you overstated your cost, she/he can choose whether to inform the owner of your overstatement. If she/he does, you will be checked by an auditor and fined 1000 Liras, and the other manager will receive 1000 Liras reward. The other manager will also be fined 2000 Liras if she/he falsely accuses you.



## PROCEDURES:

1. The owner participant paired with you will decide the wage level for both you and the other manager. You will be informed of the owner's decision. The owner must pay you and the other manager the same wage.
2. On your desk, you will find eight pink papers with a label on each of them. When you peel label #1 off, you can see both manager A and manager B's actual cost for period #1, and so on. **Please do not peel any label off until the experimenter tells you to do so. Please do not look ahead to subsequent periods.**
3. There are eight envelopes on your desk. BEFORE you peel the label off in each period, you can use the pink paper to communicate with the other manager in your group (who will be sitting in another room after the experiment starts). You can put your pink paper in an envelope. The experimenter will pass the envelope to the other manager. **You can communicate with the other manager TWICE in each period. You have 2 minutes to write down your message on the pink paper each time.**
4. After you get the pink paper back from the other manager, peel the label off. Write a cost you want to report to the owner for the period on a blue paper on your desk. The experimenter will collect the blue paper from you and the other manager.
5. The experimenter will give you a white paper documenting the cost reported by both of you. If you observe that the other manager overstated his/her cost, you can choose whether you will tell the owner about this by circling one of two choices on the white paper: **Honest or Overstated**. Note that while you know with certainty whether the other manager overstated his/her division's cost, you may choose to circle either "Honest" or "Overstated", regardless of what the other manager actually did. The experimenter will collect the white paper from you and pass it to the owner. At the same time, the other manager is making the same reporting decision on you.
6. An administrator who does not know your identity will calculate the payoff for you, you will be informed of how much you earned for the period.
7. The next period starts.

## COMPENSATION SCHEME:

### Compensation for you and the other manager in each period:

The owner pays both you and the other manager a wage for your job. The owner can choose either 500 Liras or 1000 Liras as your wage level.<sup>33</sup> Your and the other manager's wage in each period will be determined by the owner matched with you in that period. Therefore, your wage level may vary from period to period, depending on the owner's choice.

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<sup>33</sup> A pilot study was conducted in April 2005. In the pilot study, the average wage offered by the owner participants was 750 Liras. The owner participants in the current experiment are informed of this before they make their wage choices.

However, you may receive greater than, equal to, or less than your wage in each period based on the decisions made by both you and the other manager. Specifically,

- If the other manager reports that you overstated when reporting your cost, you will receive an amount equal to your wage minus a 1000 Lira fine
- If the other manager reports that you were honest when reporting your cost, you will receive your wage, plus you can keep any difference between your reported cost and your actual cost.
- In addition, you can receive a 1000 lira bonus if you circle “Overstated” on your white paper, if and only if the other manager did overstate his/her cost. (Falsely accusing the other manager will result in a 2000 Lira fine for you)

Likewise, the other manager’s compensation will rely on his/her as well as your decisions.

**Compensation for the owner in each period:**

The owner’s compensation depends on both your decision and that of the other managers. Specifically, the owner’s compensation is determined as:

$(3000 \text{ Liras} - \text{manager A's reimbursed cost}) + (6000 \text{ Liras} - \text{manager B's reimbursed cost}) + 2000 \text{ Liras} - \text{wage paid to manager A and B}$

**Any Questions?**

The amount of cash you will take home from the experiment will be determined by the result of one period randomly selected from the periods played. For each 1000 Liras you earn in the experiment, you will receive \$15.

**Functions of Different Papers:**

Pink Papers	Show your and the other manager’s actual cost in each period. You can also use them to communicate with the other manager
Blue Papers	Use them to report cost to the owner in each period
White Papers	Show your and the other manager’s reported cost in each period. You can also use them to inform the owner of the other manager’s overstatement, if any.



## Instructions for the Owners (NCC)

### GENERAL INFORMATION

This study is about decision-making in accounting. You will assume the role of an owner of a company throughout the experiment. The experiment will last eight periods. Each of you will be randomly grouped with two manager participants in each period. The amount of cash paid to you for participating in the experiment will depend on the decisions you and your group members make during the experiment. You will not be told who your group members are either during or after the experiment.

If you have any questions during the experiment, please raise your hand and the administrator will answer your questions. **Please do not talk with any participants other than the administrator after this point.**

### OVERVIEW OF THE EXPERIMENT

You will play the role of an **owner** of a multidivisional company throughout the experiment. Your company hires two divisional managers A and B, who are responsible for producing 1000 units of product A and B, respectively, and reporting their division's production cost to you.

The actual cost of division A falls within [1000 Liras, 1050 Liras, 1100 Liras, ... , 3000 Liras]. The actual cost of division B falls within [4000 Liras, 4050 Liras, 4100 Liras, ... , 6000 Liras]. The actual cost of each division in each period is determined by a random draw by the experimenter. The manager participants will be informed of the **exact** actual cost of their own division as well as that of their peer's division. You only know the range of each division's cost. The manager participants decide how much cost they want to report to you in each period.

In order to control managers' potential opportunistic behaviors (overstating their costs), the firm establishes an internal control system which promotes peer mutual monitoring. Specifically, the system encourages each manager to indicate whether their peer has overstated his/her division's actual cost. If any manager blows the whistle, the manager being accused will be fined 1000 Liras for overstating. An audit will take place (the experimenter will be the auditor). The whistle blower will be rewarded 1000 Liras if the audit determines that the other manager indeed overstated the cost; the whistle blower will be fined 2000 Liras if the audit determines that the other manager did NOT overstate and the accusation was untruthful.

#### Your compensation in the experiment is determined as:

$(3000 \text{ Liras} - \text{Manager A's reported cost}) + (6000 \text{ Liras} - \text{Manager B's reported cost}) + 2000 \text{ Liras}$  Other Income-Wages to A and B *if no manager blows the whistle*

$(3000 \text{ Liras} - \text{Manager A's reported cost}) + (6000 \text{ Liras} - \text{Manager B's actual cost}) + 2000 \text{ Liras}$  Other Income- Wages to A and B<sup>34</sup> *if manager A truthfully blows the whistle on B*

$(3000 \text{ Liras} - \text{Manager A's actual cost}) + (6000 \text{ Liras} - \text{Manager B's reported cost}) + 2000 \text{ Liras}$  Other Income-Wages to A and B *if manager B truthfully blows the whistle on A*

$(3000 \text{ Liras} - \text{Manager A's actual cost}) + (6000 \text{ Liras} - \text{Manager B's actual cost}) + 2000 \text{ Liras}$  Other Income - Wages to A and B *if the managers truthfully blow the whistle on each other*

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<sup>34</sup> The formula should include the penalty for the lying manager and the reward for the whistle blower. However, since both the penalty and the reward equal to 1000 Liras, the two items cancel out each other and have a net effect of zero on the owner's compensation. Therefore, the two items are omitted from the formula. The same is true for the next two formulas.

Your task is to determine a wage for the two managers in each period (you can choose a different wage from period to period but the wage level for the two managers in each period must be the same). You can choose either **500 Liras or 1000 Liras** as the wage level.<sup>35</sup> Please remember: the manager participants will be informed that their wage level is determined by you at the beginning of each period. The managers who are grouped with you are **NOT** allowed to communicate with each other.

In each period, after you decide the wage level for the manager participants grouped with you, please write down the number on the green paper.

The amount of cash you will take home from the experiment will be determined by the result of one period randomly selected from the periods played. For each 1000 Liras you earn in the experiment, you will receive \$15. Thank you very much for participating!

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<sup>35</sup> A pilot study was conducted in April 2005. In the pilot study, the average wage offered by the owner participants was 750 Liras.



## Instructions for the Owners (CC)

### GENERAL INFORMATION

This study is about decision-making in accounting. You will assume the role of an owner of a company throughout the experiment. The experiment will last eight periods. Each of you will be randomly grouped with two manager participants in each period. The amount of cash paid to you for participating in the experiment will depend on the decisions you and your group members make during the experiment. You will not be told who your group members are either during or after the experiment.

If you have any questions during the experiment, please raise your hand and the administrator will answer your questions. **Please do not talk with any participants other than the administrator after this point.**

### OVERVIEW OF THE EXPERIMENT

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The actual cost of division A falls within [1000 Liras, 1050 Liras, 1100 Liras, ... , 3000 Liras]. The actual cost of division B falls within [4000 Liras, 4050 Liras, 4100 Liras, ... , 6000 Liras]. The actual cost of each division in each period is determined by a random draw by the experimenter. The manager participants will be informed of the **exact** actual cost of their own division as well as that of their peer's division. You only know the range of each division's cost. The manager participants decide how much cost they want to report to you in each period.

In order to control managers' potential opportunistic behaviors (overstating their costs), the firm established an internal control system which promotes peer mutual monitoring. Specifically, the system encourages each manager to indicate whether their peer has overstated his/her division's actual cost. If any manager blows the whistle, the manager being accused will be fined 1000 Liras for overstating. An audit will take place (the experimenter will be the auditor). The whistle blower will be rewarded 1000 Liras if the audit determines that the other manager indeed overstated the cost; the whistle blower will be fined 2000 Liras if the audit determines that the other manager did NOT overstate and the accusation was untruthful.

#### Your compensation in the experiment is determined as:

$(3000 \text{ Liras} - \text{Manager A's reported cost}) + (6000 \text{ Liras} - \text{Manager B's reported cost}) + 2000 \text{ Liras}$  Other Income-Wages to A and B *if no manager blows the whistle*

$(3000 \text{ Liras} - \text{Manager A's reported cost}) + (6000 \text{ Liras} - \text{Manager B's actual cost}) + 2000 \text{ Liras}$  Other Income- Wages to A and B<sup>36</sup> *if manager A truthfully blows the whistle on B*

$(3000 \text{ Liras} - \text{Manager A's actual cost}) + (6000 \text{ Liras} - \text{Manager B's reported cost}) + 2000 \text{ Liras}$  Other Income-Wages to A and B *if manager B truthfully blows the whistle on A*

$(3000 \text{ Liras} - \text{Manager A's actual cost}) + (6000 \text{ Liras} - \text{Manager B's actual cost}) + 2000 \text{ Liras}$  Other Income - Wages to A and B *if the managers truthfully blow the whistle on each other*

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<sup>36</sup> The formula should include the penalty for the lying manager and the reward for the whistle blower. However, since both the penalty and the reward equal to 1000 Liras, the two items cancel out each other and have a net effect of zero on the owner's compensation. Therefore, the two items are omitted from the formula. The same is true for the next two formulas.

Your task is to determine a wage for the two managers in each period (you can choose a different wage from period to period but the wage level for the two managers in each period must be the same). You can choose either **500 Liras or 1000 Liras** as the wage level.<sup>37</sup> Please remember: the manager participants will be informed that their wage level is determined by you at the beginning of each period. The managers who are grouped with you are allowed to communicate with each other.

In each period, after you decide the wage level for the manager participants grouped with you, please write down the number on the green paper.

The amount of cash you will take home from the experiment will be determined by the result of one period randomly selected from the periods played. For each 1000 Liras you earn in the experiment, you will receive \$15. Thank you very much for participating!

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<sup>37</sup> A pilot study was conducted in April 2005. In the pilot study, the average wage offered by the owner participants was 750 Liras.





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