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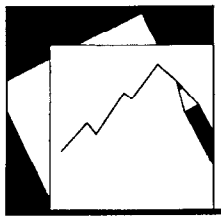

IMF Working Paper

Trust as a Means of Improving Corporate Governance and Efficiency

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Trust as a Means of Improving Corporate Governance and Efficiency

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Abstract

Agency problems within the firm are a significant hindrance to efficiency. We propose trust between coworkers as a superior alternative to the standard tools used to mitigate agency problems: increased monitoring and incentive-based pay. We show how trust induces employees to work harder, relative to those at firms that use the standard tools. In addition, we show that employees at trusting firms have higher job satisfaction, and that these firms enjoy lower labor cost and higher profits. Finally, we show how trust may also be easier to use within the firm than the standard agency-mitigation tools.

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I. INTRODUCTION

Corporate governance is the process of guiding and regulating the actions of the employees who act on behalf of the corporation. The purpose of corporate governance is to ensure that the firm pursues the maximization of shareholder value, so that "good" corporate governance promotes efficiency and shareholder wealth. In other words, corporate governance attempts to resolve the many agency problems that exist within the firm. Recently, both academics and policymakers have turned their attention to the link between corporate governance and economic development. In doing so, they have focused largely on external corporate governance issues, which are the attempts of shareholders, creditors, and others outside the firm to affect the behavior of the managers of the firm. These governance issues, which include transparency and responsibility to the shareholders, are clearly important to economic development, and especially to the development of financial markets.

But one aspect of corporate governance that has been overlooked is the internal component. By internal corporate governance, we mean the rules, procedures and incentives that are created within the firm to mold or affect the behavior of the firm's regular employees. Internal corporate governance is just as important to economic development as external corporate governance, because specialization is essential to growth. Successful firms are ones who implement and master new technology in production, financing, and distribution. In order to increase the level of technology that they use, firms subdivide and specialize the tasks that make up their business. Consequently, one employee's output depends on receiving high quality inputs from an expanding circle of other employees. In addition, managers become further removed from the actual tasks they are managing. In short, the number of agency relationships among the employees—relationships in which a principal must rely on another person to perform a certain task—rises as the corporation grows.[2] The key to increasing efficiency and profitability in the corporation, therefore, is finding a cost-effective resolution for the agency problems that arise between regular employees. In other words, it is a matter of good internal corporate governance.

Two general strategies for dealing with agency problems have emerged from the academic literature[3] and found practical application in many corporations. One strategy is to avoid the agency problem entirely by expending some effort or paying some cost to improve the principal's ability to monitor the agent, so that the principal and agent can contract directly on the task to be performed. Monitoring costs include both monitoring expenditures incurred by the principal as well as "bonding costs" such as sureties or third-party verification services purchased by the agent. The other strategy is to align the incentives of principal and agent. The main mechanism for aligning incentives, which was suggested in the voluminous academic

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[2] See, for example, Holmström (1982).

[3] See Jensen and Meckling (1976, 1999) and Jensen (1998) for a thorough discussion of the agency problem and strategies to resolve agency problems in the firm.

literature on executive compensation, is through compensation contracts that alter the agent's incentives. For example, by making executive compensation depend on a measure of firm performance—generally, the stock price—shareholders give executives the incentive to act in the shareholders' interests.

One weakness of the research into agency relationships in the firm is that it has concentrated on hierarchical relationships in the firm and in particular on the relationship between shareholders and top managers.[4] Consequently, the strategies discussed above have been specially tailored to the shareholder-manager relationship, as in the above example. While strategies such as increased monitoring and performance-based compensation may be successful in the context of the agency relationship between shareholders and top executives, it is unlikely that they can or should be applied to the agency relationships that exist between employees within the firm. Improving the monitoring of employees by supervisors or peers is often too costly to be practical. In addition, closer monitoring engenders resentment among those being so monitored, which may exacerbate the agency problem. Especially aggressive monitoring may even constitute a violation of a person's right to basic privacy, causing legal problems for the firm. Jacobs (1994) documents a several types of aggressive monitoring, such as secretly videotaping employee locker rooms, that have led to lawsuits and state laws prohibiting certain types of employee monitoring by businesses, in the U.S.

Aligning the incentives of principals and agents is in general a superior strategy. But using compensation contracts to alter the incentives of nonexecutives may not be very effective, particularly in a developing economy context. The connection between a regular employee's work efforts and the corporation's stock price is tenuous at best, so that the impact on incentives is minimal. To the extent that these contracts also shift risk onto the employees, they also raise the question of whether it is fair to increase risk on employees who have little influence over the direction of the firm. In addition, the literature presupposes the existence of a developed financial market that can accurately value financial instruments such as stocks and stock options. When these markets are underdeveloped or dysfunctional, basing compensation on stock price is impractical and unfair.

Mulligan (1997) takes a different approach to incentive alignment that has more broad application within the firm. He discusses the formation of company loyalty and models it as the purchase by principals of "principal oriented resources" that increase agent or employee altruism toward the firm. Firms invest in principal oriented resources by giving their employees perks such as company picnics or special benefits. Loyal employees take the firm's interests into account—namely, profit maximization—when they choose their work effort and activities. Although this approach to incentive alignment applies to the relationship between shareholders and all the employees of the firm, it still omits the agency relationships between employees.

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[4] In their defense, it is important to note that Jensen and Meckling (1976) and Jensen (1998) acknowledge that agency relationships permeate the firm. They focused initially on one particular relationship in order to meet the space constraints imposed by academic journals.

Both the compensation contract approach and the loyalty approach to incentive alignment operate only on the agent's incentives—that is, only the agent's incentives are being altered. This is probably appropriate in the context of the shareholder-employee agency relationship, but it is less clear that this general approach is feasible in the context of agency relationships between employees. Managers have relatively limited influence over employee compensation contracts or other means to purchase loyalty. Managers' subjective performance evaluations often help determine raises, promotions or bonuses, and Bull (1987) as well as Baker, Gibbons and Murphy (1994) discuss the importance of subjective performance evaluations in shaping employee incentives. But the bulk of employee compensation is set by company-wide policies that managers take as given.

We suggest trust as an alternative strategy to resolve the agency problems that occur within the firm. In 1975, Nobel Laureate Ken Arrow wrote "It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence." What is striking about Arrow's remark is that he cites mutual confidence—trust—rather than technology, natural resources, education, or some other input as being essential to the development of an economy. Recently, Fukuyama (1995, 2000) has argued that trust improves the performance of all institutions in a society, including businesses. And interesting empirical work done with macro-level data by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998) has found that trust promotes cooperation in large organizations, including governments.

In this paper, we develop a model of trust and use it to show how trust between employees resolves the agency problem and increases firm efficiency. By modeling trust and placing it in the context of a profit-maximizing firm in a competitive industry, we explicitly show how the presence of trust affects firm productivity and profits. In addition, we show how the firm with trust has a competitive advantage, relative to firms that lack such trust. The primary aim of the paper is to demonstrate how and why trust can replace or augment the compensation approach to resolving the agency problem. Trust, therefore, can be an important part of internal corporate governance in both developing and developed economies.

Our findings complement not only the research on trust mentioned above, but also the ongoing discussion on the reforms that are necessary to create market infrastructure in developing and transition economies. For example, much recent research has shown that corruption is correlated with slow or blocked development of markets.[5] A recent paper by Abed and Davoodi (2000), however, suggests that corruption is itself the result of weak economic institutions. Abed and Davoodi advocate that greater emphasis be placed on structural reforms over fighting corruption. While this may well be the appropriate response at the "macro" policy level, it nonetheless begs the question on the "micro" policy level of what form the structural reforms should take. Our paper, as well as the findings of other researchers mentioned above, suggests that building trust into the culture of economic and government institutions is an important and productive approach at the micro level.

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[5] See for example Tanzi (1998).

In the next section, we discuss the definition of trust and how we intend to model trust. In order to contrast trust with the compensation approach to incentive alignment, we first sketch out a simple model of the workplace that describes the fundamental agency problem. Then we discuss the compensation contract solution to the agency problem, which we call the standard agency case. Next, we examine the case of one-sided altruism and show how it actually exacerbates the agency problem. We then introduce trust and discuss the advantages of trust over the standard agency case as well as one-sided altruism. Finally, we discuss some of the model's implications for cultivating trust in the workplace.

II. Defining and Modeling Trust

Trust has proved to be a difficult term to define and measure precisely. Khan (2002) investigates whether it is appropriate to define trust as an economic commodity, and finding that it is not, performs a comprehensive search for a definition of trust that will be useful to economists. He concludes "...it may not be out of place to insist that we understand and articulate 'trust' in many ways, that there is no one picture or construction or model or narrative...." Rather than try to offer yet another definition, we will highlight the aspects of trust that we think are important to capture in a model. Nonetheless, we must start somewhere. Trust is commonly defined as "a confident reliance on the integrity, veracity, or justice of another.[6]" As Arrow's definition in the introduction suggests, trust also has a strong connotation of mutuality or reciprocation. Trust is generally something shared between two individuals in a relationship rather than held by one individual but not the other. Most people learn from experience that a relationship characterized by one-sided trust is not stable. Indeed, a " too trusting" person who "blindly trusts" in the integrity, veracity, or justice of strangers is often regarded as naïve or foolish. Thus, one aspect of trust that we think is essential to model is the fact that it is mutual or shared confidence between two people in some kind of relationship.

Implicit in the above definitions of trust is the idea that trust only has meaning in a context of asymmetric information. In particular, at least one agent must take hidden or unobservable actions that affect other agents. Dasgupta (1988) offers a definition of trust that emphasizes the role of hidden action: "I am using the word 'trust' in the sense of correct expectations about the actions of other people that have a bearing on one's own choice of action when that action must be chosen before one can monitor the actions of those others." If every person's actions were perfectly and immediately observable to every other person, then trust would not be necessary. Therefore, a key feature of a model of trust must be hidden action by one or more agents.

In fact, trust not only implies that the trusting person can predict the trusted person's hidden actions, but also that these actions will be in accord with the trusting person's wishes. In other words, trust implies some element of cooperative behavior. After all, noncooperative game theory and Nash equilibrium are built on the premise that agents guess each others' preferences and predict each others' behaviors. But expecting another agent to act in their own self interest

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[6] *Funk and Wagnall's New International Dictionary of the English Language*, 1995.

is clearly not what is meant by trusting the person, though people make ironic statements along the lines of "I trust him to do whatever is best for him."

The setting of hidden action enables us to distinguish between trusting a person and acting in a trustworthy way. Imagine that Alex and Bertha are coworkers, and that Alex supplies data to Bertha that she will analyze and use to make a business decision. Bertha would like to have accurate data, so that she may make a more informed decision. Alex's actions in preparing the data are hidden to Bertha. He can work hard to supply accurate data to Bertha, shirk and provide inaccurate data to Bertha, or even make up data in order to influence her decision in a way that benefits him. The person who is affected by the hidden action may extend trust to the person who takes the action. That is, if Bertha trusts Alex then she predicts that he will work hard to provide her with accurate data, and act accordingly. Acting in a trustworthy way, on the other hand, is an option within the set of actions available to the agent taking the hidden action. We often associate acting in a trustworthy way with making promises and then keeping them. Alex, for example, could promise to Bertha that he will work hard and collect accurate data, and then do just that.

This distinction between trusting a person and acting trustworthy is important because there is a temptation to create a model of trustworthy behavior and call it a model of trust. A model of trustworthy behavior—promise keeping or truth telling—is an incomplete model of trust, for several reasons. First, such an approach reduces the decision over whether to extend trust to a trivial one. If all agents act in a trustworthy way, then it is trivial to predict their actions even when they cannot be observed. This seems to run contrary to reality, in which the decision over whether to extend trust is at least as difficult as the decision of whether to act in a trustworthy way. In addition, given the correct assumptions, we could devise a model in which no agent truly trusts any other but provides incentives for each agent to act in a trustworthy way. Such a model is an interesting exercise in mechanism design, but probably won't tell us much about trust. Finally, a truth telling or promise keeping model does not necessarily include any incentives for the agents to act cooperatively. Again, trusting others only to follow their own self interest is not really trust.

The elements of trust that we think are important, therefore, are mutuality, hidden action, and cooperative behavior. We think that models of mutual altruism can capture these elements well. Economists model an altruistic individual as having a utility function that includes her own consumption, but also includes the utility of the person toward whom she feels altruistic. The other person's utility has a weight attached to it that runs from zero, meaning that the altruistic person is actually selfish, to a weight of unity, which implies that the other person's utility is equally important to the altruist as her own. For the purposes of this paper, we therefore define trust as mutual, reciprocal altruism between individuals where the weight on the other person's utility is close to unity. This definition obviously satisfies the requirement for mutuality in trust. It also satisfies the requirement of cooperative behavior, because the altruistic individuals have some shared preferences that will lead, as we shall see, to at least some degree of cooperative behavior. To complete the requirements, we will have one of the individuals take some hidden action that affects the other agent.

Our modeling of trust as mutual, reciprocal altruism naturally begs the question of whether people truly act altruistically or consider other people's preferences in their own utility calculations. The standard assumption made by economists is generally that individuals gain utility only from their own consumption, and that noncooperative behavior is the norm. But casual observation confirms that cooperative if not altruistic behavior does exist, and academic studies provide some explanation. Zak and Knack (2001), in their empirical study of the relationship between trust and economic growth, provide a survey of literature from economics, biology, psychology and anthropology and argue that cooperative behavior may provide a survival advantage to groups like clans or tribes, and therefore may be naturally selected. In addition, the authors also point out that the socialization process that shapes the preferences of children may likewise grant evolutionary advantages to groups who socialize cooperative preferences into their offspring.

A related way to think about the existence of altruistic preferences and cooperation is that humans may have a genetically based taste for trust. That is, humans would prefer to trust those that they interact with, because this confers survival advantages. This taste for trust could apply both to kin and unrelated individuals, and does not necessarily have to be satisfied. Trust may therefore be like a commodity, a "merit good" in the terminology of Becker (1991), to the extent that it requires expenditure of some resources to create and maintain. We assert that most people would prefer to trust their family members, coworkers, and strangers, but realize that it is not always possible to trust any given individual.

Further insight into the evolutionary fitness of cooperative behavior also comes from game theory, as applied to the setting of repeated games. The folk theorem is a well known result from game theory which says that infinitely repeated games may have cooperative Nash equilibria. In other words, cooperation can be one of the outcomes of repeated interaction. Starting with this result, game theorists have investigated whether cooperation is necessarily the outcome in repeated games in which many players following various strategies compete against each other. In these experiments, players with "losing" strategies are replaced by those with "winning" strategies between successive rounds of play. Binmore (1994) discusses this literature and finds that neither cooperative strategies nor noncooperative strategies have yet been shown to be evolutionarily superior. In many games, a population of cooperative players can hold its own through time, neither driving the noncooperative players out of the population nor being driven to extinction itself. What is particularly interesting about these results is that they apply not to groups that already share some common bond, but to collections of strangers. These results suggest that playing a cooperative strategy with relative strangers such as coworkers may be evolutionarily viable.

A tendency for some kinds of altruism or cooperative behavior, therefore, may be part of the human genetic heritage. Our results support this idea by showing that when trust is present in a firm, this does indeed raise productivity relative to non-trusting firms. Firms that cultivate trust, therefore, will have a comparative advantage relative to firms that do not, with the implication that the employees of these firms will also fare better.

For the purposes of our model, therefore, we assume that where altruistic preferences are present, it is because of genes, because they have been socialized into the agents as a result of genes, or because agents have a preference for mutual altruism (and have been able to create or "purchase" trust in order to satisfy this preference). Our aim is to show what benefits accrue to the firm that has or is able to engender trust between employees. Basically, this benefit is a resolution of the agency problem discussed above.

The Agency Problem

We start with a simple model of the fundamental agency problem in the firm. The firm is a small player in a large competitive market. It consists of two people: the owner-manager, whom we refer to as the principal, owns and is in charge of the firm; and the employee, whom we call the agent, is hired by the manager to carry out tasks that contribute to production or sales. The owner-manager earns a rental fee r, which reflects the opportunity cost of owning the firm, and claims the revenues of the firm that are left over after paying the agent. Let x be the revenues of the firm *net* of the rental rate paid to the principal.

The revenues of the firm are random, but for simplicity we assume that output can either be high, $x = x_H$, or low, $x = x_L$. The probability that the low revenue state occurs is $P(e)$, where e is the effort put forth by the agent, so that revenues of the firm are positively related to the level of effort but not directly related. As effort increases, the probability of a low-revenue outcome falls, but this effect decreases as effort increases so that it is not possible to drive the probability to zero and guarantee a high-revenue outcome. In other words, $P'(e) < 0$, $P''(e) > 0$. The principal cannot observe the agent's effort without incurring some cost, either because effort is difficult to measure or because the principal has other duties that prevent her from monitoring the agent closely. The cost of monitoring rises so quickly, past some point, that the principal can never observe effort perfectly. In addition, the principal cannot accurately infer the agent's effort from observing the revenues of the firm.[7]

The problem faced by the manager of the firm is to write a compensation contract that will entice a person to work for the firm but will maximize expected firm profits.
The compensation contract for the worker will specify the wage earned by the agent in the low-revenue state, w_L, and the wage in the high-revenue state, w_H . The principal therefore receives x_L-w_L and x_H-w_H in the low-revenue and high-revenue states, respectively. The expected profits of the firm are given by

$$E[\pi(w_L, w_H; e)] = P(e)x_L + (1 - P(e))x_H - [P(e)w_L + (1 - P(e))w_H] \quad (1)$$

Because the firm is in a competitive industry, the expected profits of the firm will be driven to zero. This implies that there will be an inverse relationship between w_L and w_H that determines the set of contracts that the principal will be able to offer the agent. If the principal were to offer

[7] In fact, if the principal tries to write a compensation contract in which the wage paid depends on the observed revenues of the firm, the results given below will not change and in fact may be strengthened.

a contract that was inconsistent with zero expected profits, then the firm would earn negative profits on average and go out of business.

When choosing w_L and w_H, the principal must also ensure that the worker will accept this contract. This involves taking into account several factors. First, the agent has other opportunities besides working for the firm. We represent these opportunities by saying that the agent could have utility u_{a0}, called his reservation utility, instead of having the utility from working for the firm. This is important, because expending effort gives the agent disutility. We let $u_a(w)$ represent the utility that the agent gets from consuming his wage and $v(e)$ represent the disutility the agent gets from expending effort, so that the net utility that the agent gets from working is the difference between the two. In addition, the agent is also risk averse. The agent prefers w_L and w_H to be equal. The more unequal the two wages are, the more risk the agent faces and the less utility the agent gains from the contract (holding the expected wage constant). Conversely, we say that as w_L approaches w_H, the wage contract provides more insurance to the agent. Finally, the principal also realizes that given a wage contract (w_L,w_H), the agent will choose the level of effort e^* that maximizes his expected utility.

The principal would like to have the agent put forth the highest level of effort possible, because this would lead to the highest profit, on average. The worker would like a high wage that is the same regardless of whether revenues are high or low, because this would insure the agent against bad times. The obvious solution is to simply write a contract that pays the agent a flat wage in return for putting forth the highest level of effort. This is the best possible contract because it would make both the principal and agent as well off as possible.

This contract is not feasible, however, because the worker's effort is not observable. The principal could never verify that the agent was indeed expending the highest level of effort. The worker, therefore, has an incentive to choose a low level of effort and blame any bad results on luck. This is the classic moral hazard problem: the firm must rely on the agent's moral character not to take advantage of it. The firm that offers the contract described above will have many job applicants, but won't stay in business very long, because the low effort will lead to Low output more often, causing the firm to be less profitable than its peers and have to exit the industry. The principal must write a different contract. Several contracts are possible, and they depend on the relationship between the principal and the agent.

Solution 1: The Standard Agency Case

The standard solution to the agency problem assumes that there are no ties of mutual interest or altruism connecting the principal and agent—their relationship is strictly business. In this case, which we call the Leaner and Meaner Firm, the principal's expected utility is given by

$$EU_p = P(e)u_p(r + x_L - w_L) + (1 - P(e))u_p(r + x_H - w_H) \quad (2)$$

and the agent's expected utility is given by

$$EU_a = P(e)u_a(w_L) + (1 - P(e))u_a(w_H) - v(e). \quad (3)$$

Given the agent's incentives, he will not expend effort unless w_H is greater than w_L. Therefore, the principal writes a contract that gives the agent an incentive to pay attention to the success of

the firm and work for that success. The agent chooses a level of effort between zero and the highest level.

But the agent is less well off under this contract than the ideal contract described above. One reason is that the agent now faces some of the risk of production—in fact, the principal and agent are sharing the risk. Since the agent would prefer to be insured against this risk, the agent is worse off. In fact, under the standard agency case contract, the agent is indifferent between working and not working: the contract offered by the principal gives the agent expected utility equal to u_{a0}. This does not imply, however, that the agent's loss is the principal's gain. The principal also loses out relative to the ideal contract, because the revenues of the firm will be lower. In addition, in order to compensate for the agent's risk aversion, the principal must set w_L greater than x_L, so the principal is not even adequately compensated for the opportunity cost when the low-revenue state occurs.[8]

Solution 2: The Case of One-sided Altruism

Seeing that the standard solution to the agency problem creates a riskier and less pleasant work experience, some may advocate a return to the days when firms seemed to take better care of their employees, shielding them from risks and providing more generous pay and benefits. We call this the case of one-sided altruism. We can analyze this case within the framework that we established above, by assuming a particular relationship between the principal and agent. In the case of one-sided altruism that we will examine, the principal is altruistic toward the agent.[9] Taking the economist's definition of altruism from the above discussion, this therefore implies that the principal's utility depends on the utility of the agent in addition to her own consumption. We assume that the utility function of the principal in this case is given by

$$U_p = u_p(r + x - w) + \beta_p U_a \qquad (4)$$

where the parameter β_p is the altruism parameter showing the weight that the principal places on the utility of the agent. The altruism parameter ranges from zero, which indicates a "selfish" principal, to unity, which indicates that the principal values the utility of the agent as much as the utility she gains from her own consumption.

The agent, in this case, does not feel altruistic toward the principal—or feels a significantly lower degree of altruism. For simplicity, we assume that the agent is not altruistic toward the principal.

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[8] See Holmstrom (1979) for the original formulation of the agency problem.

[9] The case in which the agent is altruistic toward the principal is the case of loyalty examined by Mulligan (1997) and discussed above. Our case complements Mulligan's discussion by showing what may happen when a firm attempts to purchase employee loyalty.

The impacts of altruism on the wage contract and on the interaction of the principal and agent are significant. We present the results in the form of the following propositions and corollaries. The proofs are found in the Appendix.

Proposition 1: Under one-sided altruism, the firm offers more wage insurance to the agent than it does under the standard agency case. Altruism leads the principal to take into account the effect of the wage contract on the agent's utility. Since bearing the risk of production makes the agent worse off, this also makes the principal worse off. Therefore, the principal offers a wage contract with less risk sharing (or equivalently, more insurance) than in the standard agency case. This means that the high wage and low wage are closer together.

Proposition 2: The agent takes advantage of one-sided altruism by lowering his effort. The agent responds to the higher level of insurance in the wage contract by lowering his effort. This is a partial movement toward the situation of full insurance described above, in which the agent expends no effort. The principal is willing to give up some efficiency in exchange for making the agent better off.

Corollary 1: Under one-sided altruism, the wage contract is so generous that the agent has no incentive to work anywhere else, and as such his participation constraint is not binding. The agent's expected utility from working for the altruistic principal is greater than u_{a0}. This raises the worker's utility over the utility from working at a firm under the standard agency case, so that the agent prefers working for an altruistic principal over working for a non-altruistic principal, as well as not working. Thus one may say that the agent is loyal to the firm with one-sided altruism, in the sense that he will not seek outside opportunities. The agent is indifferent between working at two such firms, however.

Corollary 2: The Principal and Agent do not see eye to eye on the proper level of effort, so the moral hazard problem is exacerbated. One-sided altruism in the firm does not resolve the moral hazard problem associated with offering wages with a higher level of insurance against business risk. Even though the principal takes into account the disutility of effort for the agent $v(e)$, she places a weight of $\beta < 1$ on it, while the agent sees the "full" disutility of effort. Thus the principal expects a higher level of effort than the agent is willing to expend, and must rely on the agent's moral character to meet her expectations. Since effort is unobservable, the agent will follow his incentives and put forth a lower level of effort. Therefore the moral hazard problem persists in this case and in fact is made worse.

Proposition 3: The Firm that exhibits one-sided altruism is dysfunctional and will have to exit the competitive market in the long run. Because of the agent's lower level of effort, the average profit level of the firm with an altruistic owner-manager will be lower than the firms with no altruism. Not only does this reduce the payoff to the principal, but given that the average profit of the nonaltruistic firms will be zero, this means that the firms with one-sided altruism will lose money on average. Eventually, these firms will be driven out of the market by the nonaltruistic firms, causing both principal and agent to lose their jobs. In the case of one-sided altruism, the principal sacrifices efficiency for the benefit of the agent, and pays for it out of her own pocket. Unfortunately, her pockets will never be deep enough if there is competition

from more efficient firms in the market. Thus, not only is a return to such one-sided altruistic practices undesirable, it is infeasible. Indeed, the wave of downsizing and "rightsizing" that occurred in the U.S. economy during the 1980s and 1990s, and which is slowly spreading to Europe, can be interpreted as firms' attempting to shed their paternalistic practices in order to earn higher profits and remain competitive.

Some readers may recognize that the one-sided altruism case has a parallel in earlier literature on altruism, namely the parent of Becker's Theory of Social Interactions. In Becker's theory, which produced the famous "Rotten Kid Theorem," an altruistic parent used transfers to induce her selfish children to maximize family welfare and to internalize the effects on other family members of their actions. In the case of the firm with one-sided altruism, however, the principal is unable to induce this behavior from the agent. This is because, as Bergstrom (1989) shows, the agents in this firm have utilities that depend positively on consumption and negatively on effort. In this situation, which Bergstrom termed the case of the "Lazy Rotten Kids," the Rotten Kid Theorem does not hold and the principal will be unable to induce the agent to act in a way that maximizes profits. Jurges (2000) shows that this occurs because the principal's wage contract distorts the incentives of the agent. In particular, in the case of one-sided altruism described above, there is an income effect that leads the agent to consume more leisure (expend less effort).[10] As long as the agent's utility depends both on effort and on consumption, the firm with one-sided altruism will find that its altruism yields lower efficiency and profits.

A New Solution: Trust within the Firm

The main lesson from the case of one-sided altruism is not that altruism in the workplace is dysfunctional, but that asymmetric altruism is. Now we present the situation in which the principal and agent are altruistic toward each other, which we term the case of trust within the firm. We assume a situation in which trust has already been established. We are not assuming that trust is easy or costless to instill in employees—indeed, we are avoiding altogether the issue of how the trust was formed, and at what cost. Such considerations are important, but in order to address them adequately, we need a model of how trust is formed, which is beyond the scope of the current argument. We do, however, discuss some ideas related to the formation of trust later in this essay.

In our model, to say that trust is present means that altruism between the principal and agent is mutual and equal. The principal's utility is given by

$$U_p = u_p(r + x - w) + \beta_p \left[u_a(w) - v(e)\right],$$

while the agent's utility is given by

$$U_a = u_a(w) + \beta_a \left[u_p(r + x - w)\right] - v(e).. \qquad (5)$$

[10] If the wage contract is contingent on output, Jurges (2000) shows that a substitution effect is also present, which also drives effort lower. The principal in effect taxes the agent's effort.

In order for trust to be operative, the altruism must be symmetric (or very close to it), so we assume $\beta_a = \beta_p$, and the weight must be greater than zero. It is easiest to visualize trust in the case in which each person places a high value on the other's utility—in other words, when trust is high. The results that we discuss below apply to any pair of $\beta > 0$, and the effects of trust that we describe in the propositions and corollaries become stronger as $\beta \to 1$. Rather than assume a set value for altruism, therefore, we state the following results for any nonzero level of altruism and we also consider what happens as $\beta \to 1$.

When trust is operative, the principal derives utility from the agent's utility and adjusts the wage contract to account for its effect on the agent's utility, as in the case of one-sided altruism. But the symmetry of the altruism changes the dynamic between the principal and agent, the compensation contract, and the outcomes. We discuss the implications of trust in the form of the following propositions.

Proposition 4: The agent works harder for the firm characterized by trust than for firms characterized by one-sided altruism or by the standard agency relationship. If there is trust within the firm, the agent takes into account the effect of his effort on the principal's utility when choosing his effort level. Under trust, effort has an additional positive effect for the agent—increasing the utility of the principal—that offsets more of the disutility of effort. Therefore, the agent would choose a higher level of effort than he would when working for a firm with one-sided altruism or for a firm with the standard agency problem, given the same wage contract.

Corollary 3: There is less need for monitoring when trust is present within the firm, since the agent polices himself. When the agent internalizes the effect of his actions on the principal, he acts in a manner consistent with the principal's interests as well as his own. Therefore, as the level of altruism increases, the agent can increasingly be trusted to do what the principal expects, even in the absence of monitoring.

Corollary 4: As the altruism parameter rises, the agent becomes less susceptible to the moral hazard problem. As the agent cares more about the principal (and vice-versa), the benefit to putting forth less effort falls, because doing so will decrease the utility of the principal. The result is that the agent will not take (as much) advantage of the principal, even in the presence of wages that offer a high level of insurance against business risk. Another way to interpret this result is that the agent becomes more willing to share risk with the principal as trust increases. This interpretation also applies to the following Proposition.

Proposition 5: As trust increases, the principal increases the insurance aspect of the wage contract, and may fully insure the agent against business risk. As in the case of one-sided altruism, the principal will write a wage contract with more insurance than under the standard agency case. Given the above results, it may appear that the wage contract reaches a uniform wage across High and Low output realizations as in the ideal wage contract. But this will only occur if the principal is risk neutral or sufficiently wealthy. If the principal is also risk averse,

the agent prefers to share some risk with the principal rather than having the principal absorb all business risk.

Proposition 6: The firm characterized by trust is more efficient than firms with one-sided altruism or standard agency, enjoying higher productivity and profits for a given wage contract. From the above propositions, we know that the agent will expend a higher level of effort when working for a firm characterized by trust, given a wage contract. This leads to higher revenues for the firm. At the same time, monitoring costs are lower at such a firm. Since revenues are higher and costs are lower, profits are higher than at rival firms.

Proposition 7: Trust within the firm produces a higher level of employee satisfaction and loyalty than one-sided altruism or standard agency. We know from Proposition 5 that the wage contract features more insurance as the principal's altruism increases. But from Proposition 1 and Corollary 4, we also know that effort is higher, because the agent's altruism toward the principal overcomes the moral hazard problem. This implies that revenues are higher, which in turn implies through the zero-profit condition that wages are higher. Thus, the wage earned by the agent will be both higher and less risky than that earned under standard agency. The wage earned is also higher than that earned at the firm with one-sided altruism. Therefore the agent will prefer to work where there is trust within the firm.

As a means of summarizing the Propositions and Corollaries, we present Figures 1-3. These figures show the solution to the agency problem in the standard case, the case of one-sided altruism, and the case of trust. On the axes in the figures, we have the wages in the high state and the low state. The forty-five degree ray through the origin represents full insurance for the agent: $w_L = w_H$. The zero-profit line **ZPL** represents the set of all wage contracts that the principal is able to offer the agent. The intersection of **ZPL** with the agent's indifference curve, $\mathbf{U_a}$ represents the optimal wage contract. Point **A** in Figure 1 represents the wage contract under standard agency. Note that the contract does not feature full insurance. The agent would be made better off by the existence of actuarially fair insurance, which is demonstrated by the fact that a line with slope –P/(1-P) lies above $\mathbf{U_a}$.

Figure 2 shows the optimal contract in the case of one-sided altruism, and compares this to the optimal contract offered in the standard agency case. Point **C** represents the optimal contract for the firm with one-sided altruism. Note that the cost of paternalism is apparent in the fact that the zero profit line for this firm, $\mathbf{ZPL_2}$, has moved from its initial position at $\mathbf{ZPL_1}$ toward the origin. This reflects the lower effort of the agent, which lowers the expected output and hence the profit for any wage contract. The agent earns lower wages and would have a lower utility if it were not for the lower disutility of effort, which more than makes up for the lower wages.

Figure 3 shows the effect of trust. In this case, trust engenders higher effort, so the zero profit line moves away from the origin from $\mathbf{ZPL_1}$ to $\mathbf{ZPL_3}$ because the firm is obtaining higher revenues for every wage contract. This clearly shows how trust increases efficiency over the standard agency case as well as the one-sided altruism case. The optimal wage contract is also closer to the full insurance line than the optimal contract under standard agency. Higher wages and more insurance help to offset the disutility of the higher effort expended by the agent.

Some readers may see parallels between the case of trust within the firm and the situation described in Rotemberg (1994), in which employees find it in their best interests to cooperate in production, because cooperation increases output. But in Rotemberg's model, the production process is characterized by strategic complementarities, and agency problems are not an issue. It is possible to think of work situations in which employees do not trust one another, but nonetheless cooperate because of strategic complementarities. In the model of trust, however, there are no such strategic complementarities. The results are driven by the presence of the agency problem, and its mitigation through trust. Of course, lack of trust may form an obstacle that prevents employees from taking advantage of strategic complementarities. It may be difficult to assign the credit for success in such cases, for example, and employees may forego opportunities to exploit these complementarities because they do not trust their coworkers to share the credit for any success. Trust may be an essential prerequisite for effective teamwork.

III. An Ownership Alternative to Trust?

One of the main ideas that comes from the compensation literature is that ownership of capital or other claims on profits is a powerful tool for aligning incentives within the firm as well as between the stockholders and employees of the firm. Owning claims on profits gives the employees of the firm a benefit to exerting effort that offsets its disutility, in the same way that altruism gives this additional reward. One would therefore expect firms with sufficient employee ownership to behave like firms with trust between employees and to share its advantages in terms of efficiency over the standard agency and one-sided altruism cases.

To demonstrate the effects of employee ownership while preserving the agency context, we need to modify our model in order to make it dynamic.[11] We assume production takes place for two successive periods rather than only one period. The first period proceeds in the same way as in the previous model: the principal hires the agent according to some wage contract specified by the principal, the agent chooses effort, and then revenues are realized. In addition, the effort of the agent affects the capital stock of the firm, from which output is produced. In the second period, the principal is replaced by the agent. The new principal receives the claim to the residual profits of the firm, specifies a new wage contract, and hires a new agent.

In the above model, the agent inherits the firm and takes full ownership of the capital. Chami (2001) shows that this is a practical and successful strategy for family businesses, which are an important part of the U.S. and global economies. But this model also captures the essence of employee profit-sharing plans, which pay employees part of company profits at the end of some measurement period. The employees expend effort in the present in return for present wages plus some future payment related to the output of the firm. Therefore, we call this the case of profit sharing.

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[11] Introducing ownership into our static model would make the principal and agent identical.

Proposition 8: Profit sharing can achieve the same qualitative results as trust within the firm. Because the agent's effort in the first period helps determine the size of his reward in the second period, he has an incentive to work hard during the first period. In fact, the principal is able to reduce her reliance on incentive-based wages and offer a wage contract that features more insurance, because the agent is self-motivated and self-policing. The higher effort leads to a higher wage for the agent and higher productivity than in firms that do not feature succession. New agents will want to work for this firm, even though they will work harder than at other firms, because they will receive higher, less risky wages in the first period and the profits of the firm in the second period. All of these qualities are characteristics of trust within the firm.

Trust, Profit Sharing ... or Both?

The above findings suggest that profit sharing and trust are substitutes. Given a choice between the two, most firms would probably want to implement a profit-sharing plan rather than attempt to increase trust within the firm. Profit-sharing plans appear to be much more practical than trust. They are concrete formulae that spell out the connection between performance and pay in a way that all employees can understand. Trust, on the other hand, is subjective. Firms cannot write policies that make employees trust each other.

The choice is actually not as clear-cut as this. Profit sharing plans have their own practical issues, which we discuss below. In addition, firms may have more control than they believe over the level of trust in their organizations. Finally, companies may be able to use profit sharing plans as a tool to cultivate trust among employees.

In order for profit sharing to be as effective as trust, there are two crucial conditions that must hold. First, the agent must be able to directly trace his effort to the size of the payoff. Otherwise, the agent will see no benefit from effort. In the worst case, where there is too much noise, the agent will view the profit sharing as an arbitrary additional payoff. This would give him even greater incentive to shirk. This phenomenon is similar to the Samaritan's Dilemma analyzed by Buchanan (1975) and Bruce and Waldman (1990). The second condition is that the agents must value the future payoff enough to offset the disutility of effort in the present. This requires that the agent be sufficiently patient: the agent's discount factor (the weight the agent puts on future utility) must be high enough. At the same time, the expected payoff itself must be sufficiently large.

The first condition presents a huge problem—literally—for the profit sharing solution. Because the size of the modern corporation is so large, it is impossible for employees to trace the impact of their efforts to the company's revenues or profits. This leads to a free-rider problem, which was modeled in Kandel and Lazear (1992). Therefore companies must find some smaller units within the firm upon which to base profit sharing. But even smaller natural units within the company, such as divisions or lines of business, may still be too large for individuals to see the impact of their effort on the unit's performance. The firm must then divide the company into even smaller units, for which it is difficult to measure performance in terms of profitability, since they do not contribute directly to the company's bottom line. Choosing other measures of performance for these small units—such as production—may lead to perverse incentives.

Some firms try to overcome the "1/N problem" by dividing the profit sharing unequally among employees, according to their performance reviews.[12] But this makes profit sharing a function of subjective evaluation, which may not make the connection between actual effort and its reward any clearer for the employee. Instead, it may create a tournament in which employees compete for a limited number of top ratings by engaging in activities that are not value-maximizing for the firm. Lazear & Rosen (1981) discuss such a tournament approach to labor contracts and its outcomes for employee behavior.

The employee's valuation of the profit sharing payoff also presents serious practical problems. Most profit sharing is paid out annually, after the firm's performance has been measured. It is not clear whether employees are patient enough to sufficiently value even a large expected payment one year in the future. The optimal size of the profit-sharing itself is unknown. If it is too small, then it will have very little effect on employee effort. But if it is too large, it risks angering the firm's shareholders. Profits paid out to employees are profits that could have been paid out as dividends or used to increase the value of the stock through investments or stock buybacks.

While good profit-sharing plans are far more difficult to implement than they appear, trust may be easier for a firm to cultivate than it would appear. Given the findings discussed above, it would appear that human beings have an inborn tendency toward, or a taste for, trusting others. We suggest that although trust is not strictly a commodity, trust formation has much in common with a joint investment problem between two or more people. People will want to invest in trust to the extent that it provides them with benefits that exceed the costs involved in forming the trust.

Khan (2002) suggests the complexity of trust formation by focusing on vulnerability as one of the keys to understanding trust. Trust is created, Khan argues, when one person exposes a vulnerability to another, thereby exposing oneself to harm from any self-interested or opportunistic behaviors of the other. This interpretation of trust brings the analysis of risk, information, altruism, psychology, and games into consideration as well. In sum, there is still much to be learned about trust formation, which is best left to future research.

Despite the challenges inherent in modeling trust formation, we believe that our model can provide some guidance for firms wishing to cultivate trust. To begin with, our findings suggest that rather than attempting to create trust directly, a firm should establish the incentives and

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[12] Some may believe that this problem affects the Trusting Firm as well, because a large firm may imply that each worker must trust an expanding number of other employees. In reality, each worker works closely with a relatively small number of other employees, no matter how large the corporation. In addition, trust is formed between pairs of individuals as well as among groups of individuals, so that a chain of trust can be formed within a firm that links all of the employees together although each employee does not trust—or even know—every other employee.

opportunity for employees to build trust between each other. If employees have a natural desire to build trust, then providing additional incentives to build trust may not be necessary. As Chami and Fisher (1996) discuss, risk sharing is a powerful motivation for building up trust. In addition, a person's job satisfaction is related to her relations with coworkers and the sense of accomplishment that the person gains at work. Trust can enhance both of these aspects of job satisfaction. Existing financial incentives designed to motivate employees may have the positive side effect of inducing employees to develop trust. Profit sharing plans, for example, can encourage trust if they measure and reward the performance of small enough groups within the firm.

The firm need not provide incentives, but what it must do in order to develop trust is to provide the opportunity for employees to develop trust. This is probably where most firms need to improve if they want to increase trust among employees. Most aspects of a job are dictated to the employees: where they will work, with whom they will work, and how the job will be done. In other words, control over the work process is out of the employee's hands. An employee's opportunities to build trust are determined by luck, and once set, they are changed infrequently. Creating the opportunity to build trust requires that managers cede some control over the work process to the employees under them.

One area of control that our modeling strategy points to is the formation of work groups and working relationships. Given the mutuality aspect of trust that we emphasize in this paper, an important initial step in building trust appears to be finding the right partner or set of partners. This implies that firms should allow their employees greater say in forming teams or workgroups. This begs the question, of course, of whom an employee will want to partner with. Chami and Fisher (1996), in the context of insurance markets, show that individuals who share identical altruism toward each other will become partners. Stark (1993) and Bernheim and Stark (1988) illustrate this point from the negative side, by exploring what happens when individuals with unequal altruism become partners. They show that "nice guys" do finish last, in the sense that the more altruistic partner is always taken advantage of. Once the partnership based on equal altruism is established, the partners can choose to invest in building up trust between them. Lorenz (1999) shows, in a model with imperfect information and imperfect contracting, how agents may develop procedures to build up trust among themselves.

Of course, there are many areas in which firms could create opportunities for cultivating trust by yielding some control over the work processes. Doing this helps to build trust in two ways. First, it enables employees to search for compatible coworkers with whom to build trust, and to arrange work processes in order to take advantage of already existing trust relationships. We refer to this as peer-level or horizontal trust. Peer-level trust presents a direct contrast with peer monitoring, which is a solution to agency and insurance problems presented in Arnott & Stiglitz (1991). As discussed above, peer trust can increase effort and decrease the need for monitoring. Trustworthiness may become a quality demanded or expected of coworkers, functioning like peer pressure, which is discussed in Kandel and Lazear (1992).

In addition, delegating control sends a signal that managers trust the people under them. We refer to this as hierarchical or vertical trust. Vertical trust is similar to Mulligan's (1997)

concept of loyalty, except that the altruism is mutual. A firm with vertical trust would be characterized by very little micromanagement of employees by their supervisors. Instead, managers set goals for employees and permit them flexibility in meeting these goals. In this sense, vertical trust is similar to goals-oriented regulation of financial intermediaries discussed by Bliss (1995) and Kupiec and O'Brien (1995).

IV. Conclusion: Trust, Efficiency and Corporate Governance

In this paper, we have shown how trust—a high level of mutual altruism—can resolve the agency problems that arise between employees of a firm. When employees who work together trust each other, they exert more effort in their jobs and expend less effort monitoring each other. This leads to increased productivity, lower costs, and greater satisfaction for workers as well as shareholders.

To some, trust may appear to be similar to the "empowerment" movement that recently gained popularity among management gurus, only to disappear after a short while. Although our discussion of how to develop trust has some elements in common with employee empowerment, there is one critical difference that separates the two ideas. While both trust and empowerment transfer more control of the work process to employees, trust demands that careful matching of individuals take place before any transfer takes place. This screening is an essential part of the trust process that was overlooked by the supporters of empowerment. Employee empowerment without careful selection of partners is simply a manifestation of one-sided altruism, which we showed above to be the least efficient way to operate a firm of the three alternatives considered.

The emphasis on screening and careful selection of partners suggests that in order for trust to become operative, it must become a part of the culture of a firm. A firm must actively value trust among its employees and treat employees differently based on their individual trustworthiness. The hiring process must incorporate screening and matching based on candidates' trustworthiness. Severe breaches of trust—even ones with no financial consequences for the firm—must result in severe penalties or dismissal.

Trust relies on upfront screening and continued monitoring of the persons who are to receive the trust. Because of this, its effectiveness is limited by the quantity and quality of contacts between different employees. Trust may therefore be an inappropriate solution to agency problems that exist between employees who work together only once or very infrequently, for example. It is also an inappropriate solution to the agency problems that arise between shareholders and employees. Developing trust among employees is thus a solution only to some of the agency problems that exist within the corporation.

Nonetheless, trust may be the most practical tool for internal corporate governance, especially in a developing economy setting. First, it does not require outlays for employee monitoring systems and in fact should reduce the need for employee monitoring. It avoids the need for tinkering with individual employee compensation, and does not rely on financial markets to accomplish the incentive alignment. Most people understand what trust and trustworthiness are, even though they are difficult to define precisely.

Good corporate governance within the firm is as essential to the health of the firm and the development of the economy as good external corporate governance. It is important for policymakers to concern themselves with the quality of internal corporate governance in developing economies, because potential investors already do. Promoting trust within the firm may therefore be as important a policy as promoting transparency and other external corporate governance measures.

Figure 1. Market Equilibrium With Moral Hazard—Standard Agency Case

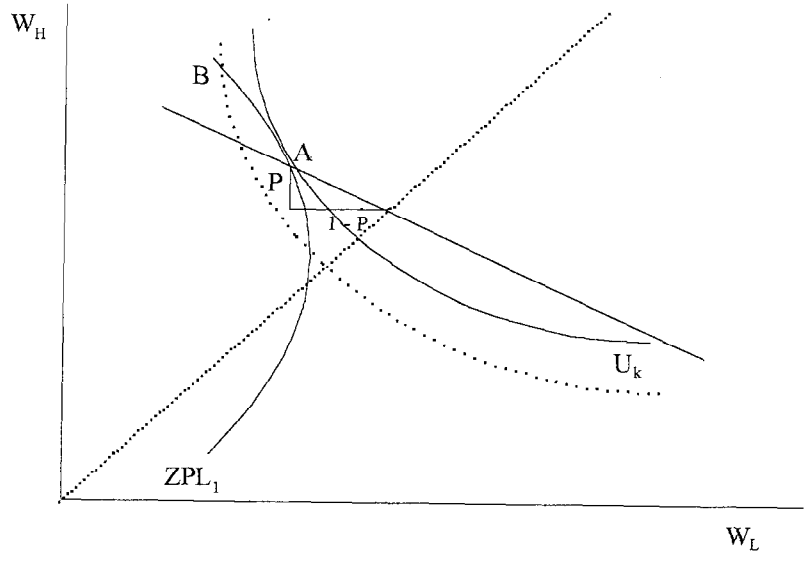


Figure 2. Market Equilibrium with One-Sided Altruism

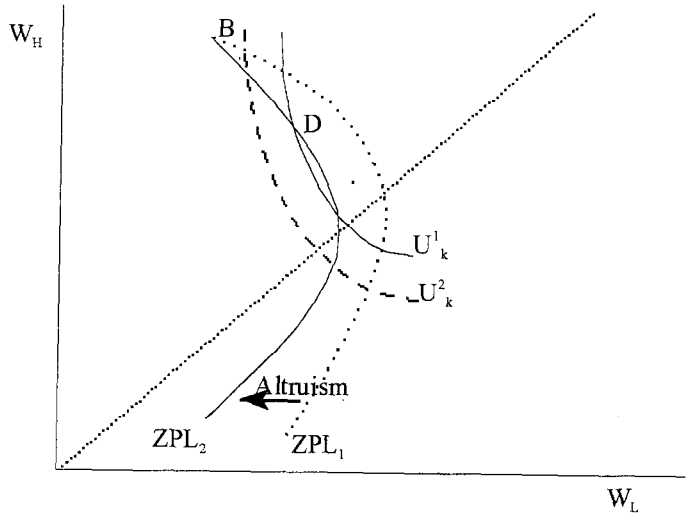
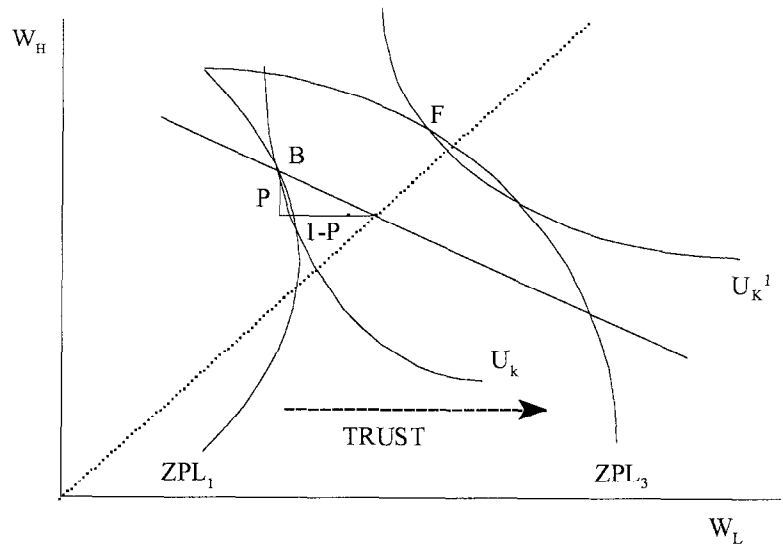


Figure 3. Market Equilibrium With Trust



Appendix I

This Appendix presents the proofs of the Propositions and Corrollaries from the text.

First Order Conditions, Agency

We use the standard agency setting as our benchmark case. We use the first order conditions of the agent and the principal in this setting, and results derived from these first order conditions, in the proofs that follow.

The agent's first order condition with respect to effort is given by

$$P' u_a(w_L) - P' u_a(w_H) - v' = 0. \qquad (6)$$

Equations (1) and (6) implicitly define e and w_H as functions of w_L. Denote these as e^{**} and w_H^{**}, respectively. Differentiating these two equations with respect to e^{**}, w_H^{**}, and w_L, we can calculate the total derivatives $\frac{dw_H^{**}}{dw_L}$ and $\frac{de^{**}}{dw_L}$. Restating the equations (1) and (6) as the functions $F(w_H^{**}, e^{**}, w_L)$ and $G(w_H^{**}, e^{**}, w_L)$, respectively, we have

$$F(w_H^{**}, e^{**}, w_L) = \left(1 - P(e^{**})\right)\left[x_H - w_H^{**}\right] + P(e^{**})\left[x_L - w_L\right] = 0$$

and

$$G(w_H^{**}, e^{**}, w_L) = (u_{aL} - u_{aH})P'(e^{**}) - v'(e^{**}) = 0,$$

where $u_{aL} = u_a(w_L)$ and $u_{aH} = u_a(w_H)$.

Differentiating these conditions yields

$$\begin{bmatrix} F_1 & F_2 \\ G_1 & G_2 \end{bmatrix} \begin{bmatrix} dw_H^{**} \\ de^{**} \end{bmatrix} = \begin{bmatrix} -F_3 dw_L \\ -G_3 dw_L \end{bmatrix},$$

where

$$F_1 \equiv \frac{\partial F}{\partial w_H^{**}} = -(1 - P(e^{**})) < 0,$$

$$F_2 \equiv \frac{\partial F}{\partial e^{**}} = -P'(e^{**})\left[(x_H - w_H^{**}) - (x_L - w_L) > 0\right],$$

$$F_3 \equiv \frac{\partial F}{\partial w_L} = -P(e^{**}) < 0,$$

$$G_1 \equiv \frac{\partial G}{\partial w_H^{**}} = -P'(e^{**})u'_{aH} > 0,$$

$$G_2 \equiv \frac{\partial G}{\partial e^{**}} = \left[u_{aL} - u_{aH}\right]P''(e^{**}) - v''(e^{**}) < 0,$$

$$G_3 \equiv \frac{\partial G}{\partial w_L} = P'(e^{**})u'_{aL} < 0.$$

In the following proofs, we will need to know the sign of $\frac{dw_H^{**}}{dw_L}$, which is given by

$\frac{dw_H^{**}}{dw_L} = \frac{\begin{vmatrix} -F_3 & F_2 \\ -G_3 & G_2 \end{vmatrix}}{|J|}$, where $|J| > 0$ is the Jacobian determinant. The sign of the derivative is therefore determined by the numerator, which is given by

$$-F_3G_2 + G_3F_2 = \underbrace{P\left[(u_{aL} - u_{aH})P' - v''\right]}_{(-)} + \underbrace{\left[-(P')^2 u'_{aL}\right]\left[(x_H - w_H^{**}) - (x_L - w_L)\right]}_{(-)} < 0,$$

where $P = P(e^{**})$. As a result, $\frac{dw_H^{**}}{dw_L} < 0$.

Proof of Proposition 1

Let w_L^P be the wage paid in the low-output state by the firm with one-sided altruism and w_L^A be the wage paid in the low-output state in the standard agency case. Proposition 1 states that $w_L^P > w_L^A$.

In order to prove this Proposition, we use the first order conditions for the one-sided altruism case and for the standard agency case with respect to w_L. Differentiating equation (4) with respect to w_L and setting the derivative equal to zero yields

$$\frac{\partial EU_p}{\partial w_L} = P\left[-u'_{pL} + \beta u'_{aL}\right] + \left[u_{pL} - u_{pH}\right]P'\frac{de^{**}}{dw_L} + (1 - P(e))\left[-u'_{pH} + \beta u'_{aH}\right]\frac{dw_H^{**}}{dw_L} = 0. \quad (7)$$

Denote by w_L^P the wage that solves this first order condition. Now, if altruism is absent altogether, as in the standard agency case, this first order condition becomes

$$\frac{\partial EU_p}{\partial w_L} = -P\left[u'_{pL}\right] + \left[u_{pL} - u_{pH}\right]P'\frac{de^{**}}{dw_L} + (1 - P(e))\left[-u'_{pH}\right]\frac{dw_H^{**}}{dw_L} = 0. \quad (8)$$

Denote by w_L^A the wage that solves the first-order condition in the standard agency case. If we define the function $H(\beta, w_L)$ as

$$H(\beta, w_L) \equiv -Pu'_{pL} + \left[u_{pL} - u_{pH}\right]P'\frac{de^{**}}{dw_L} + (1 - P)\left[-u'_{pH}\right]\frac{dw_H^{**}}{dw_L} + \beta\left[Pu'_{aL} + (1 - P)u'_{aH}\frac{dw_H^{**}}{dw_L}\right] = 0,$$

then when $\beta = 0$, the condition reduces to the first order condition in the case of agency, while when $\beta > 0$, the condition gives the first order condition for the one-sided altruism case. Using the implicit function theorem,

$$H_\beta = \left[Pu'_{aL} + (1 - P)\left[u'_{aH}\right]\frac{dw_H^{**}}{dw_L}\right] > 0,$$

which follows from the fact that $Pu'_{aL} > (1-P)u'_{aH}$ and that as long as $P \leq .5$, then $\left|\frac{dw_H^{**}}{dw_L}\right| < 1$.

As a result,

$$\left.\frac{dw_L^*}{d\beta}\right|_{\beta=0} > 0 \Rightarrow w_L^P > w_L^A .$$

Proof of Proposition 2

Proposition 2 says that the agent puts forth less effort in the case of one-sided altruism. Since we know from Proposition 1 that $w_L^P > w_L^A$, it is sufficient to show that effort falls as the wage paid in the low-output state increases: $\frac{de^{**}}{dw_L} < 0$. Using the equations for the total differential given above, we have $\frac{de^{**}}{dw_L} = \frac{\begin{vmatrix} F_1 & -F_3 \\ G_1 & -G_3 \end{vmatrix}}{|J|}$. Again with the Jacobian determinant $|J| > 0$, the sign of the derivative is determined by the numerator of the fraction:

$-F_1G_3 + G_1F_3 = \underbrace{(1-P)P'u'_{aL}}_{(-)} + \underbrace{PP'u'_{aH}}_{(-)} < 0$, where $P = P(e^{**})$. As a result, $\frac{de^{**}}{dw_L} < 0$.

Proof of Corrollary 1

Corrollary 1 states that the agent's participation constraint is not binding when the firm exhibits one-sided altruism. We know that in the standard agency case, the agent will be forced to his reservation utility. Denoting this utility by u_{a0}, Corrollary 1 can then be written as $EU_a(e^P) > u_{a0}$, where e^P is defined as the optimal effort chosen by the agent when the firm exhibits one-sided altruism.

It is sufficient to show that even when $e = 0$, $EU_a(0) > u_{a0}$. To simplify the analysis, suppose that if the agent chooses $e = 0$, then $P = 1$. As long as $r > 0$, the firm will pay some nonzero wage in the case of the altruistic principal. The principal's first order condition with respect to w_L in this case is

$-u'_p(r + x_L - w_L) + \beta u'_a(w_L) = 0$,

which will have a nonzero solution as long as $r > 0$. Therefore, even when the agent puts forth no effort, it is in his best interest to participate.

Proof of Corrollary 2

Corrollary 2 says that in the case of one-sided altruism, the moral hazard problem persists. This means that the principal and agent cannot agree on the optimal level of effort, or $e_p^P > e_a^P$,

where e_p^P denotes the prinicpal's choice of effort and e_a^P denotes the agent's choice of effort in this case.

If the principal were able to choose the agent's effort, her first order condition would be
$P'(u_{pL} - u_{pH}) + \beta\{P'(u_{aL} - u_{aH}) - v'\} = 0,$
while the agent's first order condition is given by (6). Inspection of the two conditions shows that $e_p^P > e_a^P$.

Proof of Proposition 3

Proposition 3 states that the firm characterized by one-sided altruism will have to exit the market, which occurs because $E(\pi(e^P)) < 0$.
We know that $e^P < e^A$ by Propositions 1 and 2, so $P(e^P) > P(e^A)$. Then $E(\pi^P) < E(\pi^A)$ follows from this and from Corrollary 1. Competition between firms drives $E(\pi^A) = 0$, so $E(\pi^P) < 0$.

Proof of Proposition 4

Proposition 4 states that the agent's effort is higher in the case of trust within the firm than in the standard agency case. Since we already know from Proposition 2 that the agent lowers his effort in the case of one sided altruism relative to the standard agency case, the proposition may be stated as $e^T > e^A > e^P$, where e^T is the effort chosen by the agent when working for the firm with trust.

In the case of trust, the agent's utility function is given by equation (5) rather than by equation (3), and the agent's first order condition with respect to effort is

$$P'[(u_{aL} - u_{aH}) + \beta(u_{pL} - u_{pH})] - v'(e) = 0. \qquad (9)$$

Comparison of this first order condition with the agent's first order condition in the standard agency case, (6), shows that the agent will choose higher effort.

Proof of Corrollary 3

Corrollary 3 states that there is less need to monitor the agent when trust is present. This follows directly from Proposition 4, since the purpose of monitoring is to induce higher effort.

Proof of Corrollary 4

Corrollary 4 states that as the altruism parameter approaches unity, the agent is less susceptible to the moral hazard problem. This means that the sensitivity of the agent's effort to changes in the wage declines as β increases: $\frac{de^T}{dw_L} \to 0$ as $\beta \to 1$.

In order to prove this Corrollary, we first derive $\frac{de^T}{dw_L}$ for the case of trust within the firm.

The agent's first order condition with respect to effort, (8), along with equation (1), implicitly define w_H^T and e^T as functions of w_L^T. Proceeding as above, we can summarize the zero-profit condition and the agent's first order condition, respectively, as the functions $F(w_H^T, e^T, w_L^T)$ and $G(w_H^T, e^T, w_L^T)$:

$$F(w_H^T, e^T, w_L^T) \equiv \left(1 - P(e^T)\right)\left(x_H - w_H^T\right) + P(e^T)\left(x_L - w_L^T\right) = 0.$$

$$G(w_H^T, e^T, w_L^T) \equiv \left[u_{aL} - u_{aH}\right]P'(e^T) - v'(e^T) + \beta P'(e^T)\left[u_{pL} - u_{pH}\right] = 0,$$

where $u_{aL} = u_a(w_L^T)$ and $u_{aH} = u_a\left(w_H^T(w_L^T)\right)$.

Differentiating the two functions yields

$$\begin{bmatrix} F_1 & F_2 \\ G_1 & G_2 \end{bmatrix}\begin{bmatrix} dw_H^T \\ de^T \end{bmatrix} = \begin{bmatrix} -F_3 d_{w_L}^T \\ -G_3 d_{w_L}^T \end{bmatrix}$$

where

$$F_1 \equiv \frac{\partial F}{\partial w_H^T} = -(1 - P(e^T)) < 0,$$

$$F_2 \equiv \frac{\partial F}{\partial e^T} = -P'(e^T)\left[(x_H - w_H^T) - (x_L - w_L^T) > 0\right],$$

$$F_3 \equiv \frac{\partial F}{\partial w_L} = -P(e^T) < 0,$$

$$G_1 \equiv \frac{\partial G}{\partial w_H^T} = -P'(e^T)\left[u'_{aH} + \beta u'_{pH}\right] > 0,$$

$$G_2 \equiv \frac{\partial G}{\partial e^T} = \left[u_{aL} - u_{aH}\right]P''(e^T) - v''(e^T) + \beta P''(e^T)\left[u_{pL} - u_{pH}\right] < 0,$$

$$G_3 \equiv \frac{\partial G}{\partial w_L} = P'(e^T)\left[u'_{aL} - \beta u'_{pL}\right] < 0.$$

Now

$$\frac{de^T}{dw_L} = \frac{\begin{vmatrix} F_1 & -F_3 \\ G_1 & -G_3 \end{vmatrix}}{|J|}$$

where $|J| > 0$ is the Jacobian determinant. The numerator is given by $-F_1G_3 + G_1F_3 = (1-P)P'(u'_{aL} - \beta u'_{pL}) - PP'(-u'_{aH} + \beta u'_{pH})$.

As $\beta \to 1$, the agent will count the principal's utility equally with his own, and vice-versa. Therefore, their marginal utilities in each state will tend to equality so that $u'_{aL} - \beta u'_{pL} \to 0$ and $u'_{aH} - \beta u'_{pH} \to 0$, which implies that $\frac{de^T}{dw_L} \to 0$.

Proof of Proposition 5

Proposition 5 states that as trust increases, the principal increases the insurance aspect of the wage contract, relative to the standard agency case. This means that $w_L^T > w_L^A$.

The first order condition for the principal in the firm with trust is

$$\frac{\partial EU_p}{\partial w_L} = P\left[-u'_{pL} + \beta u'_{aL}\right] + (1-\beta)\left[u_{pL} - u_{pH}\right]P'\frac{de^T}{dw_L} + (1-P)\left[-u'_{pH} + \beta u'_{aH}\right]\frac{dw_H^T}{dw_L} = 0. \quad (10)$$

Let w_L^T be the w_L that solves (10). Let $e_1^T \equiv \frac{de^T}{dw_L}$, and define the function $\Psi(\theta, w_L)$ as

$$\Psi(\theta, w_L) \equiv P\left[-u'_{pL} + \beta u'_{aL}\right] + (1-\theta\beta)\left[u_{pL} - u_{pH}\right]P'\frac{de^T}{dw_L} + (1-P)\left[-u'_{pH} + \beta u'_{aH}\right]\frac{dw_H^T}{dw_L} = 0$$

where if $\theta = 0$, then the above first order condition reduces to equation (8) (since in this case, $e^T = e^{**}$), whereas $\theta = 1$ gives the above first order condition (10). Note that the parameter θ also enters e_1^T in the following way:

$$e_1^T \equiv \frac{de^T}{dw_L} = \frac{(1-P)P'(u'_{aL} - \theta\beta u'_{pL}) - PP'(-u'_{aH} + \theta\beta u'_{pH})}{|J|(\theta)} < 0,$$

where

$$|J|(\theta) = -(1-P)\left[(u_{aL} - u_{aH})P'' - v'' + \theta\beta(u_{pL} - u_{PH})P''\right] + (P')^2\left[(x_K - w_H) - (x_L - w_L)\right]\left[-u'_{aH} + \theta\beta u'_{pH}\right].$$

Now $\frac{de_1^T}{d\theta} = \frac{|J|\frac{dN}{d\theta} - N\frac{d|J|}{d\theta}}{|J|^2}$, where $N < 0$ is the numerator of the expression for e_1^T and $|J|$ is the Jacobian determinant. Next,

$$\frac{dN}{d\theta} = -\beta u'_{pL}(1-P)P' - PP'\beta u'_{pH} > 0, \text{ and}$$

$$\frac{d|J|}{d\theta} = \underbrace{-(1-P)P''\beta\left[u_{pL} - u_{pH}\right]}_{+} + \underbrace{(P')^2\beta u'_{pH}\left[(x_H - w_H) - (x_L - w_L)\right]}_{+} > 0.$$

Thus $\frac{de_1^T}{d\theta} = \frac{|J|\frac{dN}{d\theta} - N\frac{d|J|}{d\theta}}{|J|^2} > 0.$

Finally, using the implicit function theorem,

$$\Psi_\theta = \underbrace{-\beta\left[u_{pL} - u_{pH}\right]P'\frac{de^T}{dw_L}}_{+} + \underbrace{(1-\theta\beta)\left[u_{pL} - u_{pH}\right]P'\frac{de_1^T}{d\theta}}_{+} > 0,$$

which implies that $\frac{dw_L^T}{d\theta} > 0$, or $w_L^T > w_L^A$.

Proof of Proposition 6

Proposition 6 states that firm characterized by trust is more efficient than the other two firms considered. Since we know $w_L^T > w_L^A$ and equation (1) holds, it is sufficient to show that the wage paid in the high-output state rises as β increases, or in other words, $\frac{\partial w_H^T}{\partial \beta} > 0$. We can show this by inspecting the zero-profit condition (1) and taking the partial derivative:

$$\frac{\partial w_H^T}{\partial \beta} = \left[x_L - w_L\right]\frac{P'\frac{de^T}{d\beta}}{(1-P)^2}, \text{ where}$$

$$\frac{de^T}{d\beta} = -\frac{P'\left(u_{pL} - u_{pH}\right)}{P''\left[\left(u_{aL} - u_{aH}\right) + \beta\left(u_{pL} - u_{pH}\right)\right] - v''} > 0,$$

so that

$$\frac{\partial w_H^T}{\partial \beta} > 0.$$

Proof of Proposition 7

Proposition 7 states that in the case of trust within the firm, employees enjoy a higher level of satisfaction than standard agency case. This means that $\left.\frac{dEU_a}{d\beta}\right|_{\beta_p=\beta_a=\beta} > 0$.

First, note that

$$\left.\frac{dEU_a}{d\beta}\right|_{\beta_p=\beta_a=\beta} = \left.\frac{\partial EU_a}{\partial \beta}\right|_{w_L, w_H, e} + \frac{\partial EU_a}{\partial w_L}\frac{\partial w_L}{\partial \beta} + \frac{\partial EU_a}{\partial w_H}\frac{\partial w_H}{\partial \beta} + \frac{\partial EU_a}{\partial e^T}\frac{\partial e^T}{\partial \beta}.$$

Now $\frac{\partial EU_a}{\partial \beta} > 0$ by inspection, $\frac{\partial EU_a}{\partial w_L}\frac{\partial w_L}{\partial \beta} > 0$ by Proposition 5, $\frac{\partial EU_a}{\partial w_H}\frac{\partial w_H}{\partial \beta} > 0$ by Proposition 6, and $\frac{\partial EU_a}{\partial e^T}\frac{\partial e^T}{\partial \beta} = 0$ by the envelope theorem. Therefore $\left.\frac{dEU_a}{d\beta}\right|_{\beta_p=\beta_a=\beta} > 0$.

Proof of Proposition 8

Proposition 8 states that profit sharing mimics the effects of trust within the firm. Essentially, this means that the agent's effort and wages under profit sharing are higher than in the standard agency case: $e^S > e^{**}$, and $w_L^S > w_L^*$, where the S superscript indicates the variables associated with the profit sharing case.

In order to analyze profit sharing, we must extend our static model to two periods. In the first period, the principal declares a wage function (w_L , w_H) and the agent decides on his effort level. In the next period, the agent receives a payment based on the profit (output) of the firm, x. The expected utility for the agent is therefore

$$P[u_{a,1}(w_L)+\gamma u_{a,2}(x_L)]+(1-P)[u_{a,1}(w_H)+\gamma u_{a,2}(x_H)]-v(e),$$

where the subscripts 1 and 2 refer to the respective period and γ is the agent's intertemporal discount factor. As above, define $u_{aL,1} \equiv u_{a,1}(w_L)$ and so on. Define the function $G(\gamma,e)$, which is the agent's first order condition with respect to effort:

$$G(\gamma,e) \equiv P'\left([u_{aL,1}-u_{aH,1}]+\gamma[u_{aL,2}-u_{aH,2}]\right)-v'=0. \qquad (11)$$

Note that if $\gamma = 0$, the function returns (6), the agent's first order condition under standard agency, but $\gamma > 0$ corresponds to profit sharing. Using the implicit function theorem,

$$G_\gamma = P'[u_{aL,2}-u_{aH,2}] > 0 \Rightarrow \frac{de^S}{d\gamma} > 0,$$

which in turn implies that $e^S > e^{**}$.

Now we turn to showing that $w_L^S > w_L^*$. Start with the principal's first order condition in the case of trust within the firm:

$$\frac{\partial EU_p}{\partial w_L} = Pu'_{pL}+[u_{pL}-u_{pH}]P'\frac{de}{dw_L}-(1-P)u'_{pH}\frac{dw_H}{dw_L}=0.$$

This is a function of γ through $\frac{de}{dw_L}$. To see this, note that

$$e_1 \equiv \frac{de}{dw_L} = \frac{(1-P)P'u'_{aL,1}+PP'u'_{aH,1}}{-(1-P)\left[(u_{aL,1}-u_{aH,1})P''-v''+\gamma P''(u_{aL,2}-u_{aH,2})\right]-(P')^2[(x_H-w_H)-(x_L-w_L)]u'_{aH,1}} < 0,$$

which can be verified by noting that both terms in the numerator are negative and the denominator is positive. Let $|J|$ denote the denominator of e_1 and take the derivative of e_1 with respect to γ, calling it $\frac{de_1}{d\gamma}$:

$$\frac{de_1}{d\gamma} = -\frac{1}{|J|^2}\left[(1-P)P'u'_{aL,1} + PP'u'_{aH,1}\right]\left[-(1-P)P''\left(u'_{aL,2} - u'_{aH,2}\right)\right] > 0.$$

We will need to use this in the following step. Returning to the principal's first order condition, define the function $\Psi(\gamma, w_L) \equiv \frac{\partial EU_p}{\partial w_L} = 0$ and note that

$$\Psi_\gamma = \left[u_{pL} - u_{pH}\right]P'\frac{de_1}{d\gamma} > 0,$$

which implies that $\frac{dw_L}{d\gamma} > 0$ by the implicit function theorem, so that $w_L^S > w_L^*$.

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