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Incentives in a Common Agency: An Experiment

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Abstract

Title	Incentives in a Common Agency: An Experiment
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Tutors	Dr. Fredrik Andersson and PhD Tommy Andersson
Course	Master Thesis in Economics – 10 Swedish credits (15 ECTS)
Purpose	Analyze the make-or-buy decision from a microeconomic perspective by combining modern common agency theory with the theory of incentives and game theory. From this I hope to convey two things. First I like to look at which contracts that can be establish when an agent is contracted by multiple competing principals. Secondly, I will try to identify their key properties and interpret their economic significance for firms buying part of their production or services from an independent entrepreneur.
Research questions	(i) Which contracts can be established? (ii) What are their key properties?
Methodology	The thesis is based on an experimental design constructed for the above stated purpose. All data is examined where an OLS regression constitute an important part.
Conclusions	This paper shows that if the cost of loosing a job is low and agents are paid a fixed wage shirking will occur. Thus, in a common agency situation where multiple principals are trying to influence a single agent and where hazardous behaviour cannot be punished it may be better to rely on bonus result contracts. Moreover it is shown that the decisive factor for allocating effort to a contract is the bonus rate and that wage has a very small influence on this decision, i.e. agents *do* respond to incentives. Finally it is shown that incentive pay serves not only to allocate risks and motivate hard work, it also serves to direct the allocation of the agents' attention among the two different contracts, i.e. by increasing the incentive for just one task it is found that it causes an agent to devote to much time to this specific task and neglect other aspects of contracted job.
Key words	Incentive – Contract - Game theory – Make-or-Buy – Common Agency

CONTENTS

Preface

This thesis was written during the fall of 2006 at the Department of Economics at Lund University. The paper corresponds to 15 ECTS and is the final element of my Master degree in Business and Economics.

I would like to take this opportunity to acknowledge all persons that has contributed with ideas, experiences and opinions. Especially I would like to thank my tutors, Dr. Fredrik Andersson and Ph. D. Tommy Andersson for fruitful and instructive discussions throughout the whole process.

When this topic is relatively uncultivated and of great economic interest for many firms and industries I am hopeful and confident that further research will follow.

Thank you!

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"No man can serve two masters; for either he will hate the one, and love the other; or else he will hold to the one and despise the other"

(St Matthew, 6, 24)

1. Introduction

The chapter begins with a background and a brief account of the previous research on the modern theory of the firm. Thereafter follows a problem discussion which discharges into two research questions. The chapter is concluded with the stated purpose of this paper and a description of target group and delimitations made.

1.1 Background

One of the most intensively studied topics in the modern theory of the firm is the make-or-buy decision. This is the firm's decision to either acquire some intermediate input by having an employee make it, usually with a fixed wage or by engaging an independent contractor, usually paid proportionally to the quantity supplied, doing the job Holmström& Milgrom, (1994;p.972). This decision is more formally known as outsourcing and is often defined as the delegation of non-core operations or jobs from internal production within a business to an external entity that specializes in that operation.

Milgrom&Roberts (2006) stress the obvious fact that traditional manufacturing is undergoing a revolution. The mass production model, first initiated by Henry Ford in the early twentieth century, is being replaced by a vision of a flexible multi-product firm. Further, in the pursuit of higher profits, improved marginal and lower cost, firms also emphasize product quality and fast adoption to rapid changing market conditions and the use of advanced technology. This in turn has lead to the origin of a number of new organizational forms and management systems. However, the popularity of outsourcing elucidates the increasing recognition that it is intricate to perform all activities as productively as specialists. While more and more firms decide to outsource in order to stay competitive, Porter (1996) discusses a downside risk with outsourcing which is not as frequently discussed as the possible benefits. Porter (1996;p.64) state "*the more that rivals outsource activities to efficient third parties, often the same ones, the more generic those activities become*". Lately, as a preventive measure some industries have adopted the idea of exclusive contracts with manufacturers. Marvel (1982; p.1) defines exclusive dealing as "*a contractual requirement by which retailers or distributors promise a supplier that they will not handle the goods of competing producers*". It has been shown that an exclusive contract obstructs the competition when it works as a market barrier, Bolton et al (1987).

The theory of common agency can be seen as the opposite to the theory of exclusive dealing. Desgagné (2001; p.2) defines a common agency as "*a situation where several principals have a stake in the actions of a particular agent*". Such situations are frequent, and have become more so as outsourcing has increased. It is especially common in US politics, where lobbying is a relatively large element, and in industries where competitive principals outsource similar products/services to the same agent. In such situations, it is intuitive to expect that each principal will try to influence the agent's actions. However, there is some complexity to the problem; each principal will design a contract in order to align the agent's preferences with those of the specific principal. The agent will therefore face a set of different contracts. This set has been examined by Dixit (1996) and Tirole (2001). One important

conclusion of their theoretical studies is that a common agency situation would generate low-powered incentives, i.e. the agent's payoff would be insensitive to output. However, this theoretically based conclusion is based on the presence of two major obstacles.

The first is discussed by Dixit (1996) who shows that competing principals with different objectives sometimes might offset other principals' incentive scheme by encouraging effort only on those specific tasks that are crucial to one self while insuring the risk-averse agent against underperforming on the remaining tasks. The second obstacle is discussed by Tirole (2001) who illustrates the fact that even if the principals cooperate, some tasks will still be heterogeneous which indicates that some tasks will be more difficult to monitor than others. And as stated by Holmström&Milgrom (1991) – monitoring effort is costly and some principals will therefore be more profitable than other.

Given the amount of consideration outsourcing demands in the public media, surprisingly little rigorous empirical research have been done on its economic impacts. In this paper I present an economic experiment on a common agency game. My intention is to make allowances for human behaviour and analyse how this can be used by firms when designing contracts in a common agency situation.

1.2 Problem Discussion

In most cases, the efforts of employees cannot be measured. However, by monitoring employees, efforts can to some extent be measured. Nevertheless, monitoring is imperfect and costly, which enables only a few set of activities to be rewarded effectively, Schotter (2001). So, if efforts of employees cannot be measured, how can a firm be certain that the employees put forth the expected amount of effort? In fact, if employees are paid a fixed monthly salary, why would they work at all? While this must be considered as the extreme case it evokes some interesting propositions from a common agency perspective. Both Dixit (1996) and Tirole (2001), shows in a theoretical framework that a common agency framework generates low-powered incentives. Will this be true for a model that takes the complex human behaviour into account? Would it not be more intuitive to expect that each principal focuses on his preferred task and bids aggressively on it?

Holmström (1982) introduced a forcing contract to deal with the moral hazard problem of employees not working. With a forcing contract employees will earn a wage, w, which assumedly is larger than zero if all employees exert the contracted level of effort, e*. However, if one worker decide to reduce her effort from e* to e' with e'<e*, the total revenue of the firm will fall below the contracted level, R*, and all workers will be paid nothing. Schotter (2001) argues that while this idea looks good theoretically, there are some major drawbacks with it and exemplifies this by questioning the harshness of the forcing contract and illustrates with the fact that *all* workers earn nothing for a given period of time if just *one* worker decides to reduce her level of effort during that period. However, while the no-work equilibrium for the forcing-contract game does indeed exist it is very unlikely that this equilibrium ever will occur. The reason is that workers would be better of working somewhere else for an opportunity wage and not wasting their time pretending to work hard which would result in no income.

This discussion presumes rational individuals (Homo-Economicus), meaning that people are selfish and hate to work and must therefore be motivated and monitored. However, while this outlook on of human behaviour can be questioned as being to negative it has some implications and is important for further analysis.

Fehr&Schmidt (2004) presents a two-task principal-agent experiment, which has some similarities to the common agency framework, in which only one task is contractible. In their

experiment the principals can offer a *voluntary* bonus to the agent. Their results are unambiguous; 81% on average offers a bonus to the agent. This behaviour contradicts the self-interest theory but is consistent with theories of fairness. In addition it supports the intuitive idea that principals will bid aggressively to get their private interests fulfilled. But how will the agent allocate his effort among the principals if monitoring is imperfect? Dixit (1996) argue that competing principals with different objectives force a situation where the agent will favour one principal before the other. This is shown by Dixit (1996) who states that competing principals encourage effort only on those specific tasks that are crucial to one self while insuring the risk-averse agent against underperforming on the remaining tasks.

Today many different firms (principals) are outsourcing services to the same contractor (agent). Concurrently, doing so does not mean they have the same incentives and the contracts being written between the agent and the principals will therefore differ, Dixit (1996). Hence, how can the principal effectively serve the dual function of allocating risks and rewarding productive work when the agent's job, who is serving multiple principals, is not or very expensive to observe? Further, by knowing that the agent is contracted by competitors and the allocation of the agents resources are motivated by incentives, which contracts can be written to secure contracted quality?

My analysis is based on the observation that, when multiple tasks compete for an agent's attention, there is a tendency for the levels of incentives presented for the different activities of an agent to be complementary in the incentive problem. Further, my intuitive idea is similar to an idea first published by Holmström and Milgrom (1994), which is by increasing the incentive for just one task, could cause an agent to devote too much time to this specific task and thus neglect other aspects of the contracted job. I will implement this intuitive idea in a context where one agent is contracted by two competing principals. From this analysis I will examine and see if the high rate of failure for contracts being outsourced can to a degree be explained by how the agent allocate her time and resources.

1.3 Purpose

To analyze the make-or-buy decision from a microeconomic perspective, by combining modern common agency theory with the theory of incentives and game theory.

From this I hope to convey two things; firstly I would like to look at which contracts that can be established when an agent is contracted by multiple competing principals. Secondly, by analyzing incentive contracts I will try to identify their key properties and interpret their economic significance for competing firms outsourcing part of their production or services to the same independent entrepreneur.

1.4 Research Questions

(i) Which contracts are preferable?
(ii) What are their key properties?

1.5 Delimitations

Delimitations have been inevitable due to the timeframe and the character of the problem. First and foremost I have adjusted the empirical model and the methodology to the limited amount of time disposable. Further, to be able to collect and analyze all data I also

had to choose a reasonable number of paid human subjects. Moreover, the purpose of this thesis is not to generalize a common problem but rather to widen the understanding of the phenomenon. To make this feasible, the designed experiment is relatively profound and narrow. I consider these limitations necessary to be able to process all information in an objective and correct manner. Due to these limitations, the experiment in this thesis can only give an incomplete picture of the subject. This, however, reflects the state of the available evidence, which is still more limited than desirable.

1.6 Disposition of This Paper

The remainder of this paper is organized as follows. In order to facilitate the conception of the methodology used section 2 presents the theory employed in this paper. Section 3 reviews the methodology and presents the experimental design, while section 4 presents the results confirming the hypotheses presented in section 3. In section 5 the empirical results are analyzed and the hypotheses are resolved. Section 6 offers some conclusions which are followed by an Appendix containing the instructions for the experiment described in section 3.

2. Theory

The chapter underlies to explain and present the theories used in this paper. The basic principal-agent model is described, followed by a thorough review of the common agency theory.

2.1 Theory on the Make-or-Buy Decision

The make-or-buy question represents a fundamental dilemma faced by many firms. As discussed earlier, most firms solely focus on cost minimization and therefore often fail to fully comprehend the consequences of such a decision. The decision can be analyzed from different perspectives and the approaches found in the literature can generally be classified into two groups: the quantitative and the qualitative approach. The former, which will be used in this paper, addresses the make-or-buy decision using a mathematical economical approach while the latter uses a more strategic management framework. Further, by using this approach the make-or-buy decision can be discussed by using, transaction cost theory, game theory and agency theory. When I believe that other issues are more relevant for this paper, the depiction of the agency theory is concise and of a more descriptive character. However, to fully understand main theories and discussions, I strongly believe that the fundamentals have to be covered first.

2.2 Agency Theory

An intensively studied problem in economics is the *principal-agent problem*. The problem arises when a principal compensates an agent for performing certain acts which are favourable for the principal and costly to the agent, and where monitoring the performance is costly to the principal. This can to some extent be generalized for all contracts designed in a world with uncertainty, information asymmetry and where risk is present. The principal can not be certain that the counterparty abides by its terms or to what extent the agent delivers contracted effort. The solution to this problem is closely related to the moral hazard problem, and it is to construct appropriate incentives so the agents act in line with the principals' interests. It is important to notice that the agent possess private information about level of effort, capacity and competence, thereof the asymmetric information.

2.2.1 A Linear Model

The classic model in agency theory involves one agent and one principal. The agent takes an action to produce an output which is advantageous to the principal. The principal contracts to share the output with the agent by paying a salary which depends on the output produced. The agent's output is uncertain due to a noise term which makes the production

somewhat uncertain. The procedure can be seen as an incomplete game between two players. The classical model assumes the following:

(1) The agent is risk averse, which is a prerequisite for the trade-off between incentives and insurance to exist.
(2) The principal is risk neutral, and wants to maximize the expected value of profit, y-w.

With this model there are two extreme cases. First, if the principal decides to pay the agent a constant wage, $w(y) \equiv w_0$ it would give the agent full insurance but no incentive. Second, by selling the firm to the agent for an amount, F, or equivalently paying the agent w(y) = y-F, gives the agent no insurance but full incentives. An optimal and efficient contract lies between these extremes. This can be summarized into the fundamental structure of the classical Principal-Agent model;

$$w = a + b(e + x + g^{*}y) \text{ where,} \qquad \text{(i)}$$

w= wage, e=(unobserved) effort, x= unobserved exogenous effects on outcomes, y= observed exogenous effects, g= weight given to y and a= base salary. *b* can be interpreted as the intensity of incentives provided to the employee.

2.2.2 Contractual Design

Agent theory distinguishes between behavioural- and result oriented contracts. Hourly wage is a basic example of behavioural oriented contracts where the individuals get paid for being at work. Piece wage is an example at the latter. These contracts render possible goal congruence. With these types of contracts the external risk is transferred from the principal to the agent. If the agent is risk-averse these contracts are considered to be appropriate in situations where the uncertainty is low, Baker, Gibbons, Murphy (2002).

The agent tends to act in line with the principal's interest when the contracts are either result oriented or when the principal possesses relevant information and insight about the agent's actions, Baker, et al (2002). Thus, if it is possible to measure a relevant result-variable, result oriented contracts are suitable, and if the task only can be performed in a specific way, behavioural contracts can be used. The difficulty to choose between these two contracts occurs when both, or neither, of these conditions are fulfilled, Holmström&Milgrom (1991). Finally, Baker, et al (2002), states that if both conditions are fulfilled, the cost to observe and measure the behaviour can determine which type of contract to apply.

Milgrom&Roberts (1991) identifies four basic principles of contractual design, (i) the Informativeness Principle, (ii) the Incentive-Intensity Principle, (iii) the Monitoring Intensity Principle and (iv) The Equal Compensation Principle.

Informativeness Principle

In 1979, Holmström initiated the idea of the informativeness principle. What Holmström showed was that, any measure of performance, which (on the margin) reveals information about the effort chosen by the agent, should be included in the compensation contract. Holmström (1979) finds that if some exogenous sources of randomness in the agent's income are removed it will increase the agent's ability to bear risk. Holmström continues by stating that if the principal is observant and take advantage of this by offering piece rates to a larger extent, this should improve the agents' incentive.

Incentive-Intensity Principle

Milgrom&Roberts (1991) argue that too intense incentives may not always be favourable to the principal. Instead Milgrom&Roberts (1991) argue that optimal intensity of incentives is dependent on the following four factors;

(i) The incremental profits created by additional effort,
(ii) The precision with which the desired activities are assessed,
(iii) The agent's preferences towards risk
(iv) The agent's responsiveness to incentives.

With this stated it is relatively easy to understand that performance-related pay is associated with some major constraints. The primary constraint, noted by Prendergast (1999) is that its prerequisite imposes additional risk on agents. This requires agents risk preferences towards risk to decline relatively steeply. Expressed in incentive terms, when compensation varies with effort agents will have better incentives to produce than under fixed conditions.

Monitoring Intensity Principle

This principle can, according to Milgrom&Roberts (1991), be seen as complementary to the former. This presumes that situations in which the optimal intensity of incentives are high correspond to situations in which the optimal level of monitoring is also high. Thus, there exists a selection of monitoring/incentive intensities from which the principal has to choose. Milgrom&Roberts (1991) explains this finding by stating that monitoring is a costly way to reduce the variance in agents' performance which therefore makes profits more volatile in situations where it is optimal to make incentives intense.

Equal Compensation Principle

Milgrom&Roberts (1991), state that activities equally valued by an agent should be equally valued to the principal. Expressed differently, in many situations agents are engaged in multiple activities and if one of these tasks is monitored less frequently, it will be neglected. According to Milgrom&Roberts (1991), agents will prefer to perform activities with higher marginal returns.

2.2 Employment Contracts

When constructing employment contracts, principals try to connect available information about agents' performance as close as possible to the compensation for that performance. By this procedure principals hope to *get what they pay for*. However, as Prendergast (1999) shows; information available and the quality of that information varies between different states. As a result a set of different mechanisms have been developed, i.e. *piece rate contracts, discretionary bonuses, options, promotions, profit sharing, efficiency wages and deferred compensation*. Holmström&Milgrom (1994) and Baker (2002) have showed that these different mechanisms are used in different contexts, i.e. different organizations and types of employment. In this paper I will look more into the differences and similarities between bonus related compensation and efficiency wages.

2.3.1 Bonus Related Compensation

Recently, subjective assessments have come to play an important role when designing incentive contracts. In several industries, both *within* and *between* firms, a fraction of the total compensation is bonus related which size is based on the principal's subjective assessment of the agent's performance. Numerous papers investigate the relation between the level of bonus and performance. Hayes and Schaefer (2000) present evidence suggesting that a fraction of executives' performance related compensation cannot be explained by current performance measures. Gibbons (2005) argues that subjective assessments of current performance may play an important role when establishing future compensation and promotions, even in situations where current compensations does not involve incentive pay of any kind. Hence bonus related compensation is a complex phenomenon since it is almost impossible to determine what induces effort, i.e. all variables cannot be identified and furthermore it is very difficult to determine the correlation between specific variables and performance.

2.3.2 Efficiency Wages

A principal can choose to either offer or not offer rents to agents in order to induce effort exertion. Efficiency wage theory considers the first, where firms offer workers such rent to induce effort exertion, Prendergast (1999). More specifically, it gives managers some incentive to pay their employees more than the market-clearing wage in order to increase productivity or efficiency. By increasing these factors, higher wages can be financed. More explicit, firms pay their employees higher wages in order to make their jobs more valuable and thus to decrease the likelihood of shirking, Prendergast (1999). By this procedure, the cost of losing the job due to shirking becomes larger so that agents exert effort at the efficient level, Shapiro&Stiglitz (1984).

2.3.2.1 Shirking

Since complete contracts, as stated above, rarely are observed in real life, the shirking model was developed. The basic model, initiated by Shapiro&Stiglitz (1984), states that agents can either work or shirk and if agents shirk there is a certain probability of being caught, with the penalty of being fired. As mentioned earlier, to prevent this firms set the wage above the market-clearing wage. However, as noted by Shapiro&Stiglitz (1984) all firms can not set their wages above the market-clearing wage since it will result in a low-income alternative which makes job loss costly. However, this model is based on two relatively strong assumptions (i) all workers are identical and (ii) the penalty of being fired, which Shapiro&Stiglitz (1984) admits. A relatively easy way to interpret the shirking version of efficiency wage theory is to consider a state where an agent's wage can not be reduced below 0, which can be interpreted as the reservation utility, Prendergast (1999). Prendergast present the following model in order to prove that inefficient monitoring yields rents for the agent; Effort decision, e, is a binary set equal to either 0 or 1 so effort of 1 has a marginal cost equal to $\frac{c}{2}$. The probability, p, illustrates the probability of being caught shirking. When a wage below 0 is not allowed, the minimum wage offered by the firm, to induce effort exertion must be equal to $w^* = \frac{c}{2p}$. When inefficient monitoring implies p<1 this relationship yields rents, equal to $\frac{(1-p)c}{2p}$ for the agent, Prendergast (1999; p.44).

2.4 Common Agency

"A common agency is a situation where several principals have a stake in the actions of a particular agent" Desgagné (2001, pp.1).These situations can both be internal and external, and both occurs frequently in economic life. Common for both the internal and the external case is that it is natural to expect that each principal will try to influence the agent's actions, Dixit, Grossman&Helpman (1997).

Just as in the basic agency model there are information asymmetries which are of significant importance. However, the introduction of multiple principals brings more complexity to the analysis, Dixit et al. (1997). Even in situations with complete information common agency raises questions concerning whether multiple principals can reach an efficient outcome for all players, and how the obtainable surplus gets divided among all players, Dixit et al. (1997).

When influenced by multiple principals, the agent will, as a consequence, face a number of diverse contracts, each one being designed in order to align the agent's preferences with those of a specific principal, Dixit et al. (1997). By examine this set of contracts one can conclude that it would in general yield low-powered incentives, i.e. one can expect that the agent's payoff would be relatively insensitive to output., Dixit (1996). This is an important conclusion and it is based on the occurrence of two key obstacles. Dixit (1996) illustrates that competing principals with different objectives might contradict each others' incentive scheme by encouraging effort only on those specific tasks that matter to themselves and insure the risk-averse agent against underperforming on the enduring tasks. Both Baker (2001) and Holmström &Milgrom (1991) argue that strong output-based incentives would lead the agent to disregard all the tasks but those which look somewhat easier to assess.

2.4.1 General Theory

Please notice that this outline closely follows the one presented in Dixit, Grossman&Helpman (1997).

There is a set L of principals and for each principal *i* has continuous preferences $U^i(\mathbf{a},c_i)$, where the vector **a**, denotes the agent's action and the scalar c_i denotes principal *i's* payment to the agent. Thus, principal *i's* utility is determined by two variables, the payment to the agent, c, and what action, **a**, the agent decides to implement. Each principal's preference function is decreasing with higher payments to agent's, i.e. higher payments, ceteris paribus, to the agent involve lower utility for principal *i.*

Agents' preference functions are also continuous and is represented by, G(a,c), where **a** denotes the action taken and c is the vector of the principals' payments. The function G is increasing with each component of c, higher payments. More explicit, for any chosen action, each principal dislike making contributions and the agent likes receiving them. Principal *i* can choose a payment function $C_i(a)$ from a set $\mathbb{C}$ and the agent can choose any action **a** from a set A, where A and $\mathbb{C}$ describe feasibility and institutional constraints. More explicit, A and $\mathbb{C}$ describes the set of *all possible* actions and payments that can occur. The following assumption on the sets of feasible payment functions are made;

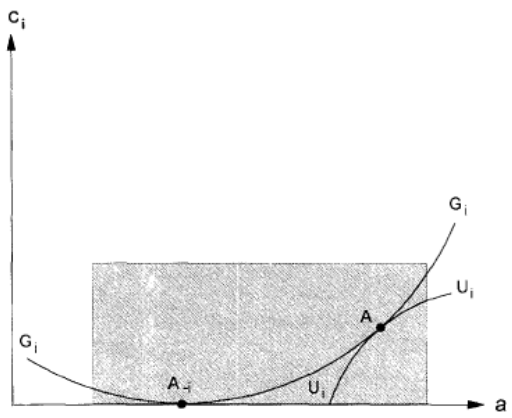
ASSUMPTION 1. *Let* $C_i \in \mathbb{C}_i$. *Then* $C_i(a) \geq 0$ *for all* $a \in A$, *and every payment function* C_i^* *that satisfies (i)* $C_i^*(a) \geq 0$ *for all* $a \in A$ *and (ii)* $C_i^*(a) \leq C_i(a)$ *for all* $a \in A$ *also belongs to* $\mathbb{C}_i$

Explanation: Payments from the principal to the agent must be nonnegative. If a certain payment function is feasible, then all less valuable payment functions are also feasible. This is in line with most relevant economic applications.

2.4.1.1 Equilibrium

The purpose of this theory is to construct and study a concept of equilibrium for a two-stage game. In the first stage, a principal chooses a payment schedule, knowing that all other principals are simultaneously and noncooperatively choosing their own payment schedule. In the second stage, the agent chooses an optimal action to take given the payment functions of all principals. Given all other principals' payment functions, there is always a best-response alternative which maximizes principal *i's* utility. When calculating the best-response function of principal *i* the simultaneously chosen strategies of all other principals are fixed, but recognize that in the second stage the agent will optimize with respect to all payment functions along with any deviated function proposed by principal *i*. More explicitly, if principal *i* cannot find another feasible payment function that yields a better outcome for him, i.e. higher utility, considering the expected response by the agent, then it is a best-response for principal *i* to the candidate function of all other principals. All players in this game seek to maximize their own utility. As explained, this is applied by choosing the best-response strategies at all time. If principal *i* know which strategies competitive principals will play he can, to some extent, calculate what actions the agent will take. Considering both these elements he can construct a best-response strategy in order to maximize his private utility given the strategies of all other players. If the situation is examined from the perspective of principal *i* we note that the strategies of all other principals are taken as given and reflects his own choice. Thus, more explicitly, principal *i* must offer a payment function which derives at least as much utility to the agent as the agent's best-response to the payment functions offered by all other principals. Subject to this constraint, principal *i* can propose to the agent an action and a feasible payment that maximizes his own utility.

2.4.1.2 Graphical Exposition



Dixit,Grossman & Helpman (1997; p.758)

Figure 1 *Graphical exposition of equilibrium in a common agency set*

Dixit, et al. (1997), exemplifies their results in the figure illustrated above. The figure can be interpreted as follows;

- The agents' indifference curve G_i,G_i depicts possible combinations of the action. Along this curve the agent's utility is fixed when the contribution functions of the other principals are given.
- Point A_i illustrates the agent choice if principal *i* make no contribution whatsoever.
- The shaded area illustrates the combination of feasible actions the agent can take and feasible payment levels. As described earlier, and noticeable in this figure, payments are non-negative.
- If the agent consider the point Ai as the best action to take, the principal can take this into account and design a payment schedule that induces the agent to choose a point in the shaded area that lies above the indifference curve G_i,G_i. By doing so, he will shift the agent's indifference curve outward, i.e. making higher levels of utility feasible to the agent.
- If assuming that the principal's utility is increasing with **a,** which is a reasonable assumption since higher effort yields more outcome in general, this would imply indifference curves to be upward sloping. If this is the situation, principal *i* would choose the point on G_i,G_i that maximizes his utility. This point is the tangency point between G_i,G_i and U_i, U_i denoted A. Remember that Ui denotes principal *i's* utility and with this in mind it is relatively easy to see that we have an equilibrium at the tangency point.

How can principal *i* construct a payment schedule in order to induce the agent to choose point A? For example, the principal might offer a schedule that coincides with the horizontal axis until some point to the right of A_i and then rises to a tangency with G_i,G_i at A without ever crossing the indifference curve. Each principal make sure that the agent receives his opportunity utility. However, it is in every principal's interest to pay no more than this opportunity wage. If a principal would pay more, his utility would decrease since we know that his utility is decreasing, ceteris paribus, with higher payment to the agent. Further, the agent's utility in an equilibrium is equal to what he would have got if one of the principals were to contribute zero whereas all others maintained their equilibrium payment functions, and the agent then chose his optimum action in response to this deviation.

3. Methodology

The chapter underlies to present and explain the methodology used in order to reach later presented results and conclusions. The chapter begins with a brief overlook of earlier empirical work which is followed by the empirical model constructed for this thesis. The chapter is concluded with a brief reflection regarding the chosen methodology and to what extent the results can be generalized.

3.1 Previous Empirical Research

As Foss&Laursen (2005) points out, the empirical work in agency theory is relatively limited. Klein (2004) states that most of the empirical works on the make-or-buy decision have adopted the transaction cost framework and most papers follow the same basic model. Further, most existing empirical work in agency theory is related to the common principal-agent model or the more recently extended version where the agent is multitasking.

Fehr&Schmidt (2004) reports on a two-task principal-agent experiment in which only one task is contractible. The principal can choose to offer a piece rate contract or a (voluntary) bonus to the agent. They find that bonus contract strongly outperform piece rate contracts. Interestingly, almost all agents with a piece rate contract focus on one task while disregarding the other task, whereas agents offered a bonus contract provide high efforts on both tasks. Principals understand this and principally offer bonus contracts. This behaviour contradicts the self-interest theory but is consistent with theories of fairness. In their experiment the average share for bonus contracts is a remarkable 81 percent. In some periods, principals experiment with the piece rate contracts. This, however, can probably to some extent be explained by the monotonic procedure, but less than 1/3 of the principals offer a piece rate contract more than three times.

Empirical papers on common agency are less widespread than empirical papers using the basic principal-agency framework. Desgagné (2001) considers a situation where an agent must allocate his non-observable effort among several tasks and where several principals hold diverging viewpoints on what the best allocation should be. Desgagné (2001) concludes that there exists many situations in which an agent can be facing relatively strong incentives to serve several non-cooperating principals. Desgagné (2001) proposes a fairly simple contingent monitoring scheme which allows the principals to coordinate in making the tasks they respectively require complementary in the agents' utility. However, the proposed scheme is only optimal if the agents' absolute risk aversion decreases sufficiently fast with respect to wealth. This fairly strong constraint brings some major limitations to the proposed schemes' usefulness.

Another common agency paper by Kirschsteiger&Prat (1999) introduces a new class of equilibria which they call *natural*. In a natural equilibrium, each principal offers a strictly positive contribution on at most one alternative. In their experiment they designed a common agency game consisting of two principals and three alternatives, denoted I, II and III. Alternative I and III are both inefficient alternatives, i.e. they are only attractive for one

principal whereas alternative II is efficient when it gives both principals a positive gross payoff. Alternative I represents a natural equilibrium whereas the truthful equilibrium is represented by III. Interesting to notice is that alternative II only was chosen in 3.6% of the cases, while alternative I was chosen in 65% of the matches.

From this review one can conclude that the main focus of previous papers principally deals with labour market issues, which remains accurate even as research on the subject is increasing. Further, direct investigations of contractual design and its impact on firm productivity are moderately few in number.

3.2 The Experiment and Experimental Design

In this paper I present a simple classroom experiment on a common agency game. Class size does not really matter, however I decided to run the experiment with 18 students, which is enough to get a reasonable amount of observations and viable in view of resources. The experiment requires some amount of preparation. The instructor needs to copy (i) the instructions, (ii) the contract design sheet for the principal and (iii) the effort decision sheet of the agent. In addition a result sheet, where the payoffs from each round are compiled, must be prepared in advance.

To be able to answer my research questions I implemented an experimental design with two principals and one agent. 12 out of 18 students were acting principals and the remaining 6 were acting agents. The experiment was repeated for 6 rounds and the different roles of principals and agents where static over time. Moreover, the experiment is designed so that no one will neither know the identity of their opponents nor play against the same opponent more than once. In total 144 observations were made.

Each round begins with both principals, privately and simultaneously, designing a contract offer to the agent. It can either be a bonus offer or a fixed wage offer. When both principals have designed a contract offer the agent is acquainted with each of the both contracts. The agent examines simultaneously both contracts after which he can choose to accept both contracts, reject one and accept the other, or reject both contracts. If the agent decides to reject a contract the profit for the rejected principal will be equal to zero. If the agent decides to reject both contracts, his profit will also be equal to zero.

Next, if the agent decides to accept at least one contract he has to report a level of effort, which is a number between 1 and 10, where 1 represent low effort and 10 represent high effort. The agents' maximum level of effort is equal to 10 and if the agent only decides to accept one contract he can at most report a level of effort equal to 10. However, if the agent decides to accept both contracts the sum of effort that the agents decide to allocate to these two contracts may not exceed 10. Thus, for instance, the agent can choose to allocate 5 to principal A and 5 to principal B. In addition, the agents' total level of effort can be below 10. The total revenue for the principal is directly dependent on the level of effort of the agent. However, each level of effort is afflicted with a private cost for the agent. The cost is increasing with higher level of effort, i.e. convex, which is illustrated in figure 1 below.

Level of effort	Payoff for principal	Private cost for agent
1	80	0
2	160	30
3	240	50
4	320	80
5	400	110
6	480	140
7	560	170
8	640	210
9	720	270
10	800	340

Figure 1 Payoff for principals' and the private cost for agents.

Principals' net-payoff depends on the contract offer and the agents' payoff depends both on the offer and their true effort level. How the payoff for the principals and the agents respectively is calculated, is described in detail in section *2.3 incentive schemes*. The experiment is designed so there will be situations where a fixed wage contract is preferred to a bonus offer for both principals and agents, i.e. the preferences coincide and we have a state of equilibrium. Further, there will be situations where a bonus offer is preferred to a fixed wage offer by both parts, i.e. preferences coincide and we have another state of equilibrium.

3.3 Incentive Schemes

At the beginning of each round, all principals have to decide which type of offer to make to the agent. The principal can choose between a bonus offer – a high powered incentive and a fixed wage offer - a low powered incentive. In the appendix there is a more detailed exposition of the incentive schemes.

3.3.1 Low Powered Incentives; Fixed Wage Contracts

A fixed wage contract consists of 2 components;

- The demanded level of effort, e*,
- A fixed wage

If the principal chooses to offer a fixed wage contract the payoff, (P), for the principal and the agent is calculated in the following way:

$$P^{principal} = \mathrm{Re}venue(e) - fixed \quad wage(w) - \cos t(e^*) \qquad \text{(i)}$$

Please note that the revenue is dependent on the actual effort e, which can be lower or higher (most unlikely) than the demanded effort e*.

$$P^{agent} = Fixed \quad wage(w) + \cos t(e^*) - \cos t \quad for \ actual \ \ effort(e) \qquad \text{(ii)}$$

Where the cost (e*) implies the cost for the demanded level of effort and where the cost for actual effort, (e) is the cost for the agent's actual effort.

3.3.2 High Powered Incentives; Bonus Related Contracts

A bonus offer also consists of 2 components;

- A fixed wage, w
- A bonus rate, b* expressed as a percentage of the principals' payoff for the agents' chosen level of effort.

If the principal chooses to offer a bonus, the payoff, (P), for the principal and the agent respectively is calculated in the following way:

$$P^{principal} = \mathrm{Re}venue(e^*) - fixed \quad wage(w) - bonus(b^*) \qquad \text{(iii)}$$

The revenue is based on the actual effort, e. Moreover, the bonus rate can constitute between 10-90% of the principals' revenue, R(e), and must be stated in intervals of 10%.

$$P^{agent} = Fixed \quad wage(w) + bonus(b^*) - \cos t \quad for\ actual\ \ effort(e) \qquad \text{(iv)}$$

3.4 Approach and Implementation

The experiment is implemented as follows. *First* the instruction sheets are distributed to all students, which are told to read them carefully and silently. The students will need about 8-10 minutes for this moment. *Second*, a verbal overhead presentation of the instructions and the procedures was performed in front of all students. I found it useful to go through a number of different examples describing how to design a contract and calculate the payoffs. This required about 10 minutes. It of great importance that *all* students fully understand the instructions before the experiment begins. Questions can be asked after the presentation. *Third*, the students are asked to design their contract respectively fill in the effort decision sheet. It is of course very important to make clear that students are not allowed to talk during the experiment. *Fourth*, after the principals have designed their contracts and the agents filled in the effort decision sheet all sheets were collected. This procedure was repeated six times. The whole experiment took about 1.5 hours, including the presentation and distributing and recollecting the decision sheets.

3.5 Human Subjects

In this experiment undergraduate students are used as subjects for a number of reasons. First, it is a convenient recruiting process. Second reason is the low opportunity cost of student subjects and their relatively step learning curve, which is a focus factor in this experiment. Friedman&Sunder (1994), state that the use of students can undermine the external validity or generalizability of experimental research. The argument for this statement is according to Friedman&Sunder (1994) that students are a narrow and special segment of the total population. However, when the purpose of this thesis is not to generalize but rather to highlight a relatively unexplored area within the theory of the firm, the characteristics of the University students will not risk the external validity of the results. Further, the experimental

instructions are not trivial to the novice and the experiment requires that the participants read and comprehend a great deal of detailed information in limited time. One can therefore argue that an average person is unlikely to have the abilities expected of the experimental subjects.

3.6 Rewards

One of the most frequently used reward funds to subjects in economic experiments is cash, Friedman&Sunder (1994). The budget for the experiment is 1800SEK which on average is equal to 100SEK per student. After the experiment is conducted all participants' pay offs in all rounds are summarized. Thereafter is each student's relative share of the total pay offs calculated. Agents were allotted 1/3 of 1800 and the principals were allotted the remaining 2/3. Thereafter, each participant was handed an envelope consisting the amount in SEK equivalent to the relative share of the total pay off in all rounds. Rewarding students for this experiment is possible thanks to allowance from Professor Fredrik Andersson at the Department of Economics Lund.

3.7 Hypotheses

From the problem discussion several hypotheses can be derived. The first one discusses rational human behaviour and preferences over time. As seen in previous theoretical and empirical papers preferences are stable over time and it has been showed that in a multitasking setting where the tasks are complementary, high powered incentives are preferred to low powered incentive. However, in a common agency framework Dixit (1996) proposes that it in general would yield low powered incentives. Since the experimental design does not allow principals to punish hazardous behaviour it would be intuitive to assume that fixed wage offers would not be observed as frequently as bonus offers. Hence, the first hypothesis is defined as:

(1) Preferences are stable over time and bonus contracts will be more frequent observed than fixed wage contracts.

The second hypothesis deals with the fact if agents respond to incentives and if; to what extent. In a competitive setting where a pair of principals is trying to influence a single agent it is intuitive to expect that the principal who render possible for the agent to achieve the highest utility by offering the highest bonus rates would encounter the highest provided level of effort. Therefore the second hypothesis is defined as:

(2) Agents will respond to incentives

In each period a single agent is faced by a diverse set of different contracts. The agent is restricted to allocate the maximum of 10 effort units, independent of how many contracts that are accepted. By assuming profit maximizing behaviour it would be intuitive to presume that agents would prefer the principal providing the most lucrative payment function while rejecting or underperforming on the remaining task. Hence, the third hypothesis is defined as:

(3) Facing a set of contracts, the agent will favour one principal, allocating effort to one task while underperforming on the remaining task.

In this experiment hazardous behaviour cannot be punished, i.e. if agents provide lower effort than the demanded, the principals cannot punish this behaviour. Thus it is intuitive to presume that when agents are faced by low powered incentives, shirking will be observed and the fourth hypothesis is therefore defined as:

(4) When agents' are offered low-powered incentives shirking will be observed

4. Empirical Results

In this chapter the results from the empirical study is presented. The most intriguing and fruitful results are presented and interpreted. All interpretations have been adjusted to the relevance of stated research questions.

4.1 Experimental Results

In total were 72 contract offers made from which 59 was accepted, (81.9%). On average each student earned 100SEK for participating in the experiment. However the spread is rather surprisingly vast. The spread in relative share of total earnings is smaller for agents than for principals, in fact the share varies between 13.5% and 22.0% for agents while it various between 1.0% and 18.3%. A small discrepancy was relatively expected since principals' net payoff is dependent on the effort provided by agents. However what causes this vast spread is somewhat ambiguous. Some explanations are given by studying the offers made by those receiving the lowest effort provided. This procedure reveals two common points, (i) offers made are relatively consistent over time and (ii) the bonus rate is much lower compared to more successful peers when bonus contracts are offered In addition, the least successful principal offered 5 fixed wage contracts with a low wage and a relatively high demanded effort level. Profit maximizing agents' accepted these contracts but provided the minimum effort level possible. This can to some extent explain the wide spread. However, it does not explain whether they have understood the experiment or not or if there is some other underlying psychological explanation to it. The empirical results are straightforward and will be presented by a number of observations.

4.1.1 Observation 1: Bonus contracts are preferred to fixed wage contracts

The first and the most obvious observation is that the majority of all contract offers, 48 out of 72, are bonus contracts (66.7%) while only 24 out of 72 offers are fixed wage contracts (33.3%). Figure 3 depicts the relative share for the bonus respectively fixed wage contracts. In period 1, the share of bonus contracts is almost 60% (58.3%) and it never falls below that level. After period 1, the share fluctuates between 58% and 83% and reaches the same share as period 1 in the final period. The average share for bonus contracts is 66.7%.

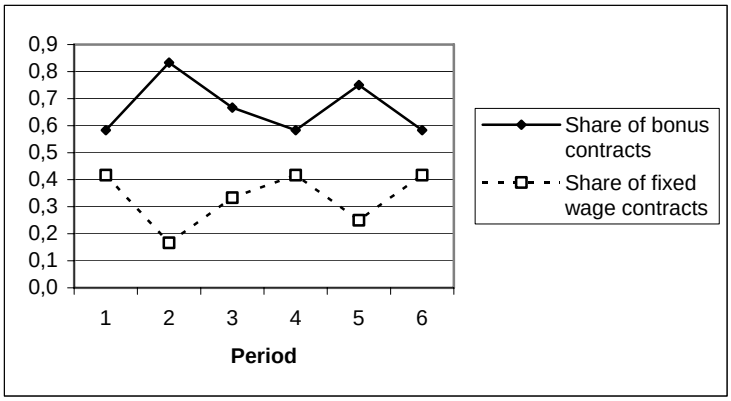


Figure 3 *Share of bonus and fixed wage contracts*

From figure 3 one can conclude that principals to some extent experiment with fixed wage contracts in various periods. However, a closer look reveals two interesting things, (i) only 33.3% of the principals offer a fixed wage contract more than 3 times, and (ii) three principals constitute 54.2% of all fixed wage contracts offers. Hence, principals seem to be relatively consistent when deciding on which type of contract to offer. Out of 72 contracts were 9 bonus contracts (18.8%) and 4 fixed wage contracts (16.7%) rejected. This is depicted in figure 4.

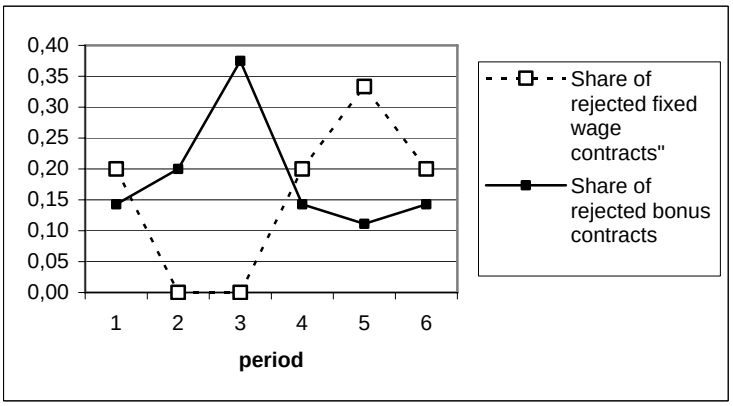


Figure 4 *Share of rejected bonus and fixed wage contracts per period*

By studying figure 4 one might wonder why almost 40% of bonus offers and not a single fixed wage offer were rejected in period 3. First, graphs depicting aggregated data frequently hide differences at more disaggregated level. Therefore by taking a closer look at contracts offered in period 3 it reveals that agents are faced by 4 fixed wage contracts and that two bonus contracts do not offer an attractive bonus rate. In addition, in this period is shirking observed on all fixed wage contracts, which is depicted in figure 5.

Furthermore, a closer look reveals that in 4 out of 24 fixed wage contracts (16.7%) agents choose an effort level equal to 1. When effort level 1 implies no private cost to the agent, this is equivalent to saying that the agent rejects these contracts but still receiving the fixed wage. Hence, implicit 8 out of 24 fixed wage contracts, 33.3% where rejected, which should be compared to 18.8% for bonus contracts.

In 15 out of 36 observations (41.7%) agents are faced simultaneously by two bonus contracts. 46.7% of these bonus contracts are discarded in favour of the other. When facing

two bonus contracts agents allocate all effort to the one that offers the highest bonus rate. The wage has no direct effect on the decision unless agents are faced with two bonus offers and where the discrepancy is large in terms of wage but small in terms of bonus rate. The reason for discarding a fixed wage contract is the direct opposite to the reasons for discarding a bonus offer. When agents are faced by a fixed wage contract and a bonus contract the former are discarded because the discrepancy in terms of wage is not large enough. Further, there are not many observations when this occur, instead agents accept the fixed wage contract but provide the minimum level of effort. This however can be interpreted, as mention earlier, as discarding the offer and rip the benefits from this action.

4.1.2 Observation 2: Agents respond to incentives

One relatively strong observation is the vast discrepancy in provided effort level under the different types of contracts. Figure 5 depicts that the average effort level provided under bonus contracts is always higher than for fixed wage contracts. In period 1 is the difference 0.7 which is the smallest difference throughout all periods. After period 1 the difference fluctuates, and the greatest discrepancy is found in period 3 when the difference is remarkable 7.4. The reason for this relatively wide spread in average effort provided is found when studying each offer in every period. It is found that agents strongly respond to small changes in bonus rate. And since principals experiment with the bonus rate in various periods the level of effort provided will therefore also fluctuate.

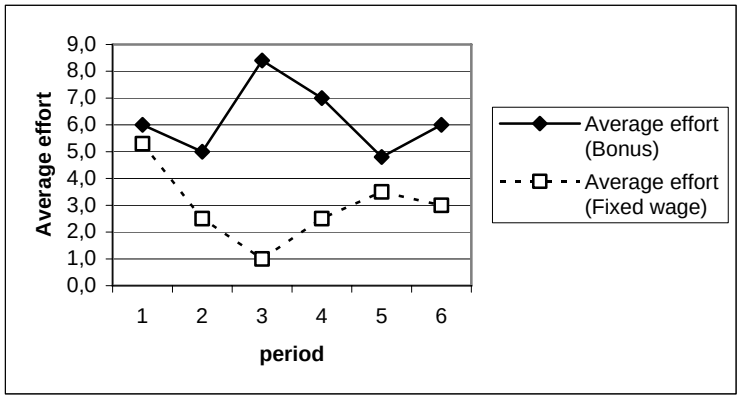


Figure 5 *Average effort provided under various contracts*

However in order to be able to conclude that agents *do* respond to incentives I ran the following OLS regression;

$$e_1=\beta+\alpha_1 b_1+\gamma_1 D_1+\alpha_2 b_2+\gamma_2 D_2$$

The intention with this regression is to provide answers to *if,* and to somewhat extent explain *how,* the agent respond to incentives. The data was organized as follows;

e1	e2	b1	b2	D1	D2
4	6	0	0	0	0
8	2	0,6	0,4	1	1
8	1	0,5	0	1	0
8	1	0,5	0	1	0
8	1	0,5	0	1	0

Table 1 *Data used was organized in columns and rows*

Hence, each row represents one observation per agent and period. Further, in periods where agents are faced by one bonus contract and one fixed wage contract is encoded so the principal offering a bonus contract is number 1. From this it ought to be clear that the regression should concern the effort provided to one principal, and because of the construction it should be e_1. Two dummy variables are used where D_1 indicates whether the agent was offered a bonus contract from principal 1 or not and D_2, indicates whether the agent was offered a bonus contract from principal 2 or not. The interpretation of the γ coefficients is the effect on provided effort when offered a bonus contract from the principal and the change in effort when the agent is faced by two competitive bonus contracts. Finally the bonuses, b_1, b_2, are encoded as 0 if the agent was not offered a bonus contract and 1 if offered one.

Dependent Variable: E1
Method: Least Squares
Date: 01/09/07 Time: 11:21
Sample: 1 35
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
β	1.500000	0.855526	1.753308	0.0898
α_1	10.71423	1.832361	5.847228	0.0000
γ_1	-0.821401	1.372925	-0.598285	0.5541
α_2	0.238610	3.081559	0.077432	0.9388
γ_2	0.594235	1.401577	0.423976	0.6746

R-squared	0.722656	Mean dependent var	6.457143
Adjusted R-squared	0.685677	S.D. dependent var	3.051931
S.E. of regression	1.711051	Akaike info criterion	4.043657
Sum squared resid	87.83091	Schwarz criterion	4.265849
Log likelihood	-65.76399	F-statistic	19.54222
Durbin-Watson stat	1.847016	Prob(F-statistic)	0.000000

Table 2 *Results from the OLS regression*

It is desirable to know how well the regression model actually fits the data. More explicit, it is desirable to have answer to the question; how well does the model containing the

explanatory variables that was proposed actually explain variations in the dependent variable, i.e. how well does changes in the bonus rate explain variations in provided effort? The most common goodness of fit statistic is known as R^2, which is a number between 0 and 1. It shows the square of the correlation coefficient between the values of the dependent variable and the corresponding fitted values from the model. Thus if the correlation is high, close to one, the model fits the data well. In this case R^2 is equal to 0.722 which is equivalent to saying that the variability in provided effort can approximately be explained by 72.2% of variations in bonus rates. This must be considered as a relatively strong finding. Figure 6 depicts the regression between b_1 and e_1. As noticed the residual sum of squares tend to be relatively low, i.e. this is depicted as the observation points lie relatively close to the fitted line.

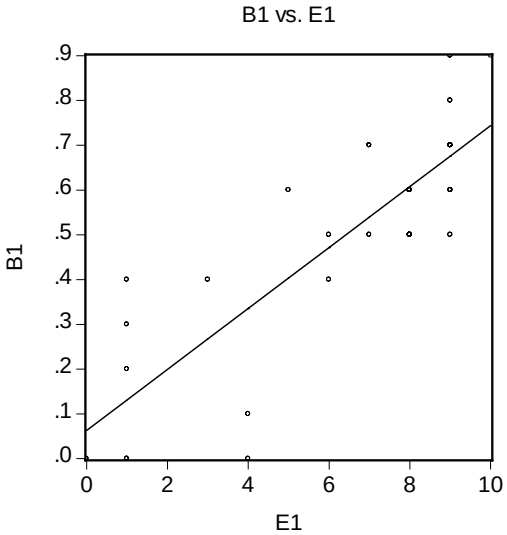


Figure 6 *Regression line between b_1 and e_1*

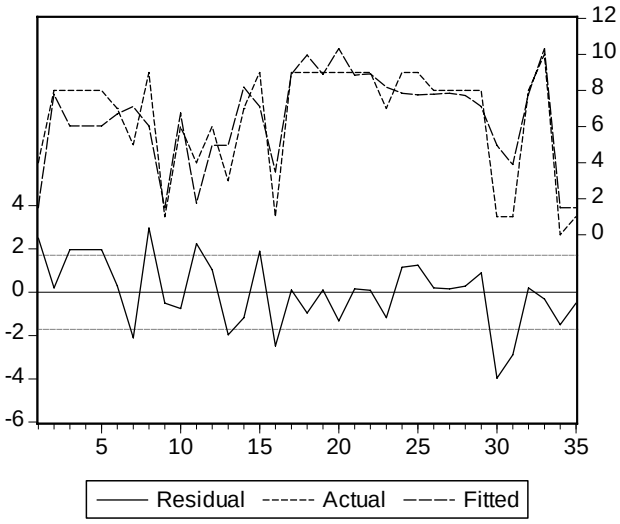


Figure 7 *Residual graphs*

Further, by studying the coefficients one can conclude that changes in bonus rate is strongly related to changes in effort. The coefficient α_1 is equal to 10.71, thus increasing the

bonus rate by 1 unit will result in an increase in effort provided by 10.71 units. Table 3 depicts the correlation between various coefficients. The correlation between b_1 and e_1 is positive and relatively strong; if the bonus rate is increased, the level of effort provided will increase as well.

	E1	B1	B2	D1	D2
E1	1.000000	0.841907	0.394283	0.591971	0.386616
B1	0.841907	1.000000	0.360505	0.742801	0.345956
B2	0.394283	0.360505	1.000000	0.282025	0.906584
D1	0.591971	0.742801	0.282025	1.000000	0.311086
D2	0.386616	0.345956	0.906584	0.311086	1.000000

Table 3 *Correlation matrix for all variables*

4.1.3 Observation 3: Facing a set of contracts, the agent will favour one principal, allocating high effort to one task while underperforming on the remaining task.

In total were 59 contracts (81.9%) of all contract offers accepted which on average is equal to 1.65 contracts per agent in each period. A closer look however reveals that agents tend to favour one principal providing high effort on the task one principal wants performed while underperforming on the remaining task. Figure 8 depicts the effort distribution in bonus and fixed wage contracts. The figure shows that the sum of effort level (e_1+e_2) provided to each principal in each period are relatively high. Moreover, the most frequent combination is (1,9). In fact, agents are providing high effort in one task and strictly underperforming on the remaining task in 17 out of 36 observations, (47.2%). This is derived by summarizing the diagonals, vertically and horizontally, denoted (1,1) and divide by n = 36.

$e^*_1 \backslash e^*_2$	0	1	2	3	4	5	6	7	8	9	10
0							2		5	2	
1	2	1			1			2	2	7	
2											
3											
4											
5						2					
6		1			3						
7	1				1						
8	1		1								
9		1									
10	1										

Figure 8 *Effort distributions in bonus and fixed wage contracts*

Only in 2 out of 36 observations, (5.6%), is the combination (5,5) chosen. However, this does not rule out that agents do not choose allocations which are efficient for both principals. In order to rule this out one has to revise the contract combinations faced by each agent in each period. In fact, agents are not faced by identical offers in any period; however there are some combinations that are rather similar. However, when faced by multiple contracts with

relatively few differences, agents still favour the one that is the most attractive, i.e. higher bonus rate or vast differences in terms of wage. One can conclude that agents are underperforming on one task while favouring the other. Figure 8 also depicts that in 14 out of 36 observations, (38.8%), agents choose to allocate effort to only one principle.

Furthermore, the figure illustrates some extreme observations. The combinations (1,0) and (1,1) is observed 3 times. At first these combinations look a bit odd. However, this is aggregated data, which frequently hide differences at a more disaggregated level. By studying the contract offers resulting in such low effort combinations reveal that agents do act in line with profit maximizing behaviour. Common for these low effort combinations is that when agents face a fixed wage contract with a relatively high demanded effort level in combination with a relatively adverse bonus offer, agents accept both contracts choosing the minimum effort level which induces no private cost. From this behaviour they maximize their profit in that period.

4.1.4 Observation 4: When agents' are offered low-powered incentives shirking will be observed

A relatively robust observation is that shrinking does occur when agents' are faced with low powered incentives. The observed level of effort diverge in 15 out of 24 fixed wage contracts, (62.5%), from the demanded level. Furthermore, 4 times is the lowest level of effort demanded and also accepted. In addition, figure 9 depicts one extreme observation where the demanded level of effort is 10 and the provided is only 1. Hence, resemblance between the demanded and the observed level of effort can only be found in 5 out of 24 observations, (20.8%). However, a closer look reveals another interesting point, the fact that there is the same agents' that provide the demanded level of effort. Agent 2 provides the demanded level of effort in 3 cases and agent 6 the remaining 2. This implies that 4 out of 6 agents take the chance to provide lower effort than demanded. This would imply, from a welfare perspective, that fixed wage contracts are inefficient. However, a closer look reveals that the discrepancy in wages between bonus and fixed wage contracts is relatively small. As a consequence most low powered incentive contracts with a relatively low fixed wage are nearly never accepted or accepted but the provided level of effort is the minimum level possible.

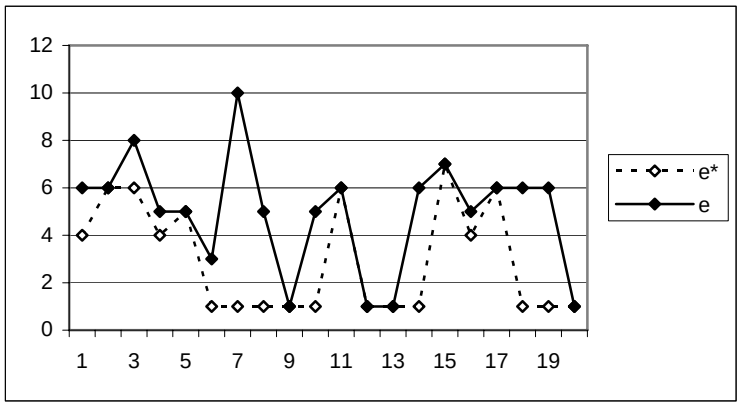


Figure 9 *Discrepancy in effort demanded and effort provided*

Figure 10 depicts all fixed wage contracts. As discussed earlier were only 16.7% of all fixed wage offers rejected. However, as seen in figure 10, the minimum level of effort is provided in 45.8% of all contracts. However, it is important to mention that in 16.7% out of these 45.8% is the demanded level equal to the minimum level. The results from the fixed wage contracts are somewhat ambiguous. However, by studying figure 10 one can conclude three things (i) the wage fluctuates relatively much during periods, (ii) a higher wage implies smaller discrepancy between the demanded efforts and provided, and (iii) higher wages, above 150, increases the level of provided effort and decreases shirking. Hence one can conclude that most low powered incentive contracts offered are seen as unattractive for agents since the discrepancy in terms of wage is too small when compared to a bonus contract. Therefore a relatively low number of efforts are provided in order to increase the pay off in that period.

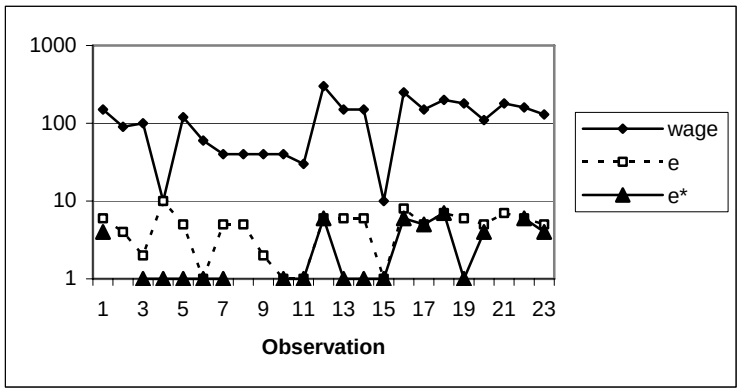


Figure 10 *The relation between wage and effort*

5. Analytical Approach

The chapter begins with resolving the hypotheses. By combining empirical data with existing theory these hypotheses can be solved. The chapter ends with a brief summary of the analysis and its significance for stated research questions.

5.1 Theoretical Interpretation of the Results

The experimental results are both expected and unforeseen. A first glance of the results seem to confirm most of the basic insights of the common agency and principal agent literature. For instance, the results indicate that individuals act in line with the theory of profit maximizing behaviour and the fact that shirking occurs when an opportunity is given. However, the experiment also shows that high powered incentive contract offers outperform low powered incentive offers and that agents *do* respond to incentives. Below, a theoretical interpretation of the experimental results is given.

5.1.1 Hypothesis 1: Bonus contracts will be preferred to fixed wage contracts

The idea with the experiment was to bring matters to a head by comparing the two direct opposites in terms of incentive structure to see if one type would outperform the other. Moreover, Baker et al (2002) argue that an agent should act in line with the principal's interest if the contracts are either result oriented or if the principal possesses relevant information and insight about the agent's actions. Thus by designing the experiment where the following two conditions are fulfilled (i) it is only possible to measure a relevant result variable and (ii) the task can only be performed in a specific way, principals should find it difficult to choose between bonus related contracts and fixed wage contracts, Holmström &Milgrom (1991).

The results depict that principals from the very first period and throughout the whole experiment, prefer bonus contracts to fixed wage contracts, although both conditions are fulfilled. Hence, the principals do not seem to encounter any difficulties when choosing between the two types of contract. Moreover, Baker et al (2002) state that if both conditions are fulfilled, the cost of observing and measuring the result or behaviour should be decisive for which type of contract to use. However since there is no direct cost associated with monitoring, i.e. the true level of effort performed by the agents is given to the principals without any cost, this cannot explain why bonus contracts is strictly preferred to fixed wage contracts. Can the experimental design give any inputs to explaining why bonus contracts are preferred to fixed wage contracts? Simply put, yes. First, one must consider the implications the competitive element of the experiment has on the result and secondly one must also take the fact that principals cannot punish hazardous behaviour into consideration. In the following I will discuss these two points in more detail.

According to Prendergast (1999) the efficiency wage theory entail that a principal can either choose to offer or not offer rents to agents to induce effort exertion. Thus, for fixed wage contracts to be equal attractive as bonus related contracts, the discrepancy in terms of wage should be relatively large. A review of the empirical data depicts that this is not the case, i.e. principals offering fixed wage contracts do not offer wages above the market-clearing wage in order to induce effort exertion. By studying the experimental design some input to understand why principals do not offer wages above market-clearing wages can be found. Hence, if offering a fixed wage contract principals must demand an effort level and set a wage which they consider fairly in relation to the demanded level of effort. Further, since principals cannot punish agents for hazardous behaviour they must compensate the agent for the demanded effort irrespective of shirking is observed or not. Thus, by offering a fixed wage offer principals risk paying too much in comparison to what they get in return. Further by studying the characteristics of a common agency situation some further input is given. According to Dixit, Grossman&Helpman (1997) principal *i's* utility is determined by two variables, the payment to the agent, c, and what action, a, the agent decides to implement. Hence, each principal's preference function is decreasing with higher payments to the agent's. Moreover, the agent's preference functions is also represented by two variables, the action taken, a, and the payment, c, received from the principal to perform the specific task. In the first step principals simultaneously choose their strategies, trying to maximize their own profit, given the expected competitive strategies and action taken by the agent. *In the second step, the agent will optimize with respect to all payment functions.* Further, principal i must offer a payment function which derives at least as much utility to the agent as the agent's best response to the payment functions offered by the other principal. Thus it should be clear that offering sufficiently high wages in order to induce effort exertion requires the principal to be relatively risk neutral. Hence, since the discrepancy in wages between fixed wage contracts and bonus related contracts is small, one could conclude that most principals suffer from risk aversion.

Furthermore, since the experiment is designed to resemble a common agency situation where two direct competing principals are trying to influence the agent's actions, I found it useful to examine the empirical data and see if the competing principals might have different objectives which contradict each others incentive schemes. It is found that the payment functions of those principals offering fixed wage contracts do not derive as much utility to the agent as the agent's best response to the payment function offered by principals offering bonus related contracts. This since principals offering fixed wage contracts do not offer rents to the agents to induce effort exertion, i.e. the discrepancy in terms of wage is not large enough. Hence, this result is in line with the prediction presented by Baker (2001) and Holmström&Milgrom (1991) that strong output-based incentives would lead the agent to disregard all other tasks except for those who look somewhat easier to assess.

Result 1: *A large majority of principals choose to offer a bonus contract*

5.1.2 Hypothesis 2: Agents will respond to incentives

The experimental results are undisputed; agents *do* respond to incentives. More specifically, agents *do* respond to remunerative incentives. When the experimental result only provide evidence for that agents do respond to *financial incentives*, I find it vital to make this distinction since an incentive is any factor that provides a motive for a specific course of

action, or counts as a reason for preferring one choice to possible alternatives. However, the theoretical outline presented by Dixit et al (1997), predicts that a common agency framework in general would yield low powered incentives. From this one could argue that the findings in this experiment contradict this theoretical proposition. However, this prediction rest on the idea that each principal offers strong positive incentives for tasks he wants carried out and negative incentives for tasks other principals want carried out which in equilibrium results in overall weak incentives for the agent. Moreover, since the principals in this experiment can not offer incentives with respect to other principals' outcome, the findings in this paper cannot be interpreted on the basis of the theoretical prediction presented by Dixit et al (1997).

While the OLS regression concluded that agents respond to incentives, a review of each contract offer in each period revealed another interesting point; the most successful participants are those who offered the highest bonus rate on average but not necessarily the highest wage. In fact, the wage is not a decisive factor when designing a bonus contract. Milgrom&Roberts (1991) argue that too intense incentives may not always be in favour of the principal. Instead they propose that the intensity of incentives should be based on the agent's responsiveness to incentives and the incremental profits created by additional effort. More explicit, when compensation varies with effort agents will be better of providing higher effort than under fixed conditions. While the experimental results support the proposition that incentives should be based on the agent's responsiveness and the incremental profits created by additional effort, one can argue that the empirical results contradict the proposition that too intense contracts are not favourable to the principal. However, I would like to stress the significance of the explicit experimental design. In the experiment, multiple principals have a stake in the actions of a specific agent. In such situations, Desgagné (2001) argue that it would be intuitive to expect that every principal will try to influence the agent's actions. Hence, by studying the peculiar circumstances caused by a common agency situation one can conclude that it is in fact crucial for principals to provide intense incentives. As noted by Dixit et al (1997) each principal has continuous preferences U(**a**,c) where the vector **a** denotes the agent's action and the scalar c denotes the principal's payment to the agent. Each principal's preference function is decreasing with higher payments to the agent. Agents preference functions are also continuous and represented by G(**a**,c) where **a** denotes the action taken and c the vector of the principals' payments. For any chosen action, **a**, each principal dislikes making contribution and the agent likes receiving them. Hence each agent will in each period optimize with respect to all payment functions offered by each principal. Thus each principal must offer a payment function which derives at least as much utility to the agent as the agent's best-response to the payment function offered by the other principal. Theoretically, each principal should make sure that the agent receives his opportunity utility and it should be in every principal's interest to pay not more than this since his utility is decreasing with higher payments to the agent. The experiment shows however that principals find it difficult to determine this specific level. More explicit, by considering the competitive elements of the experimental design, one can conclude that if principals are not providing incentives which are at least equally attractive as competitive proposals, they suffer the risk of getting a zero pay off in that period.

Thus, due to a competitive setting where principals cannot punish hazardous behaviour the agent can outmanoeuvre principals offering payment functions which does not derive at least as much utility to the agent as the agent's best-response functions offered by the other principal. From this it should be relatively easy to see that agents would allocate effort to the task where he can earn the highest possible pay off. Thus, under the bonus contract, principals encounter high provided effort by the agents by paying sufficiently high bonuses, making it profitable for agents to induce high effort. In conclusion the experiment shows that

it may be better to rely on subjective performance evaluation and bonus payments then rewarding agents according to fixed conditions.

Result 2: *Agents do respond to incentives*

5.1.3 Hypothesis 3: Agents will favour one principal while underperforming on the remaining task

The experimental results depicts that more than 80% of all contract offers were accepted and that a total effort level of 8 or more is observed in 27 out of 36 observations, (75%).While this outlook looks somewhat legible and pleasant a closer look is far less pleasant and clear. A review of all contract offers reveal three interesting points, (i) there is a relatively large discrepancy in effort provided between the different types of contracts and (ii) that agents are providing high effort in one task while underperforming on the remaining task, in fact this is observed in 17 out of 36 observations, (47.2%) and (iii) in 14 out of 36 observations (38.8%) effort is only allocated to one principal. These observations is not specific for this experiment, in fact Dixit et al (1997) questions whether multiple principals, even in situations with complete information, can reach an efficient outcome for all players and how this obtainable surplus is divided among all players. However, while the results seem to confirm the idea presented by Dixit et al (1997) it does not explain *why* this behaviour is observed. In the following I will gradually approach an answer to this question.

First, the review reveals that the majority of accepted contracts afflicted with low provided effort are of fixed wage character. In order to induce effort exertion, the theory of efficiency wages proposes that principals should offer rents, i.e. wages above market-clearing wages. It is found that principals, in general, do not seize the opportunity to offer wages above market-clearing wages. From this, one could argue that the principals have not understood the idea of efficiency wage theory; yet it is hard to prove that this is the case. Besides, one has to take the experimental design into consideration; hazardous behaviour is not liable to be punished by principals. Thus, if principals are not offering agents sufficiently high wages to induce effort, low effort provided seem to be a relatively natural consequence. In addition, since hazardous behaviour is not punished, it would be intuitive for profit maximizing agents to shirk if an opportunity is given. This behaviour is observed on numerous occasions and thus gives some further insight to understanding why there is a relatively large discrepancy in effort provided between the different types of contracts.

Secondly, it was found that agents on average are accepting both contracts while providing high effort to one contract and underperforms on the other. In the following I will argue that this puzzle can be resolved by common agency theory. Dixit et al (1997) proposes that competing principals might have different objectives which might contradict other principals incentive schemes by encouraging effort only on the specific task he want performed. Additionally, both Baker (2001) and Holmström&Milgrom (1991) state that strong output-based incentives would lead the agent to disregard all tasks but those which look somewhat easier to assess. Such a strategy would imply that principals implicit insure agents against underperforming on the enduring task. Before continuing the analysis I find it important to stress that all players in this game seek to maximise their private profit and to remember the reader of the significance of the explicit experimental design, especially the

competitive elements. The experimental results are unequivocal; principals offering the most attractive payment functions experience the highest level of provided effort. Thus the proposition that all players seek to maximize their private payoffs is confirmed by the players in this experiment. If this situation is examined from the perspective of principal *i* we note that the strategies of all other principals are taken as given and reflects his own choice. Thus, more explicit, principal *i* must offer a payment function which derives at least as much utility to the agent as the agent's best-response to the payment functions offered by the competitive principal. By reviewing the experimental results it is found, unconditionally, that principals reciprocate high effort levels of agents by paying sufficiently high bonuses making it profitable for the agent to induce high effort.

Third, the experiment is designed so the agents' cost function to induce effort is convex and aggregated. Hence, inducing higher effort decreases the agents' utility, since the marginal cost increases for every level of provided effort. This can to somewhat extent explain why agents do not allocate all effort to one contract since the marginal cost to induce higher effort increases exponentially. To come around this, agents accept two contracts, providing a high total effort but where most effort is allocated towards the principal with the most attractive payment function. Thus due to the specific experimental design and profit maximizing behaviour agents facing strong output-based incentives disregard other tasks and the question whether multiple principals, even in situations with complete information, can reach an efficient outcome for all players remain unrequited. Consequently, the results presented in this experiment are in line with the propositions proposed by both Baker, (2001), Holmström&Milgrom (1991) and Dixit et al (1997).

Result 3: *Agents give preferential treatment to one principal while underperforming on the remaining task*

5.1.4 Hypothesis 4: Low powered incentives will induce shirking

First it should be stated that this analysis share some common points with the former. However, it expounds the former and gives a more detailed explanation to *why* shirking is observed when agents are faced by low powered incentives. The experimental results evidently depict that shirking occurs when agents are faced by a fixed wage offer. In fact, in 15 out of 24 observations (62.5%) the true effort diverge from the demanded. In fact, the experimental results depict that resemblance between the recommended and the true effort only occurs 5 times. Moreover, the lowest possible level of effort is recommended and accepted 4 times. A closer look also revealed that it is the very same two agents that provide the recommended level of effort and whereas the remaining four shirk if a possibility is given. An explanation to this can be found by studying the experimental result which showed two interesting points, (i) higher wages implies smaller discrepancy between the true effort and the demanded and (ii) wages above 150 increases the true effort. One could argue that this observation contradict the theory of rational behaviour, since agents do not suffer from hazardous behaviour. However, it shares some common points with a theory presented by Akerlof (1986) which in very simple terms discusses that higher wages encouraging high morale which raises productivity. Since this observation is not statistically secured no definitive conclusions can be drawn. However, it elucidates some interesting questions concerning economic decision making and human behaviour. In the following I will argue

that this puzzle can be explained by the experimental design and by the theory of efficiency wage. However, this does not exclude the possibility to explain this observation by some other theory.

First, by looking at the experimental design one can conclude that agents will not be punished for hazardous behaviour since principals lack the opportunity to deliver any forms of direct penalties. However since principals are monitoring agents perfectly, i.e. the true effort is given to the principals; any divergence from the recommended effort will be perceived. Hence, if shirking is observed in period 1, principals can punish *another* agent in period 2, *but not without risking a personal defeat.* This is derived by studying the peculiar circumstances caused by the specific experimental design. If a principal seeks to punish an agent in a period for a defeat in an earlier period he risks to get a zero payoff in that period since his offered payment function will, most likely, not derive at least as much utility to the agent as the agent's best-response to the payment function offered by the other principal. Hence, the fact that principals lack the opportunity to deliver any sort of direct punishments explains to somewhat extent *why* agents in such large extent shirk when faced by low powered incentives. Hence the prediction of Shapiro&Stiglitz (1984), that low cost of losing a job implies shirking, holds.

Second, by comparing bonus related with fixed wage contracts, the experimental results reveal that the discrepancy in terms of wage is small and hence the possibility to make higher level of utilities feasible to the agent is found to a larger extent by principals offering bonus related contracts. Further, according to Prendergast (1999), principals must offer economic rents, i.e. offer a payment function above the market-clearing wage, in order to induce effort exertion. The experimental result depicts that principals do not seize the opportunity to make agents job more valuable and hence disregard the opportunity to decrease the likelihood of shirking. One reason for this may be that the probability, p, of being caught is equal to zero and according to Prendergast (1999) the minimum wage offered by a principal to induce effort exertion must be equal to:

$$w^* = \frac{c}{2p}$$

It should be clear that if p is sufficiently small the minimum wage becomes unreasonably high. Thus, from this perspective the experimental results seem to confirm the theoretical prediction. Further, one could argue that the specific experimental design make principals more risk avert; offering a fixed wage contract is always afflicted with the risk of getting a zero payoff while required to compensate the agents for the demanded effort. This could to somewhat extent explain why high fixed payments rarely are observed.

Third, since shirking is observed on numerous occasions the result seem to confirm the theory of self interest Many scholars, policy makers and general business people are according to Jensen (1998) suspicious of self-interest and incentives and often oppose the use of incentives. Further, Jensen (1998) argues that purposeful actions performed by agents only can be a result from responses to incentives. Yet, financial compensation may not always be the best way to motive people, however when monetary incentives are required, they are needed since people in such situations are motivated by other things than money. It is important to stress that self-interest behaviour is not equivalent to say that these people do not have any altruistic motives. Hence, the experimental result seems to confirm the proposition proposed by Jensen (1998). However, once again it is important to consider the specific conditions the experiment implies. Thus, in a competitive setting where all players seek to

maximize private utility and where agents do not suffer from hazardous behaviour, principals may be better of providing strong incentives to agents in order to induce purposeful actions.

Result 4: *Low cost of loosing a job in combination with low incentives evokes shirking*

5.2 Summary

The theoretical interpretation of the experimental results has brought insight on some interesting questions. The analysis has confirmed that in a common agency framework constructed accordingly to the design presented in chapter 2 a large majority of the principals will choose to offer a bonus contract. In fact, bonus contracts Pareto dominates fixed wage contracts because both agents and principals are better off.

The strongest observation of this paper, in combination with the former result, was the observation that agents do respond to incentives. I argued that this could be resolved by the theory of common agency and the peculiar circumstances caused under such a setting.

The analysis also showed that agents on average accept two contracts but favour one principal and underperforming on the remaining task. I argued that this could be resolved by the question first stated by Dixit et al (1997) regarding the fact if all players in a common agency situation can reach an efficient outcome. It was shown that this is not the case. Finally it was showed that a low cost of loosing a job in combination with low powered incentives evokes shirking.

6. Conclusions

The purpose of this paper has been to test some hypotheses of multitasking using an empirical model on the make-or-buy decision in a common agency framework. In section *1.2 Problem Discussion* some interesting questions were discussed. One of these concerned the issue whether agents would provide any effort at all if paid a fixed wage. This paper shows that if the cost of loosing a job is low and agents are paid a fixed wage, shirking will occur. This result is in line with the prediction of the theory of self interest which assumes that all players are only interested in their private payoff. Thus, in a common agency situation where multiple principals are trying to influence a single agent and where hazardous behaviour cannot be punished it may be better to rely on result oriented contracts.

Further, this specific setting is afflicted with some specific requirements when designing a contract. In general, too intense contracts will not favour principals. While this statement is still true, it has to be slightly modified for this specific situation. This paper unconditionally shows that the most successful principals are the one offering contracts which are strongly based on performance, i.e. very intense. It is also showed that the decisive factor for allocating effort to a contract is the bonus rate and that wage has a very small influence on this decision. Thus when designing a contract it may be better to focus on the bonus rate and not on the wage. In addition, in this very specific situation, incentive pay serves not only to allocate risks and motivate hard work; it also serves to direct the allocation of the agents' attention among the two different contracts.

Moreover, when calculating the best-response function in a non-multiple situation, the principal does not have to consider competitive strategies. This implies that the principal in such situation have relatively more power than in a common agency situation where the single agent can outmanoeuvre one principal against the other. Therefore principals will on average earn more in a non-multiple setting. This is showed by this paper, where principals who seek to maximize their own utility and disregard to make high levels of utility feasible to the agent encounter low effort provided. Finally, my analysis has been based on the observation that, when multiple tasks compete for an agent's attention, there is a tendency for the levels of incentives presented for the different activities of an agent to be complementary in the incentive problem. Moreover, by increasing the incentive for just one task it is found that it causes an agent to devote to much time to this specific task and neglect other aspects of contracted job. Thus it may be better to continuously offer high powered incentive contracts in order to get what you pay for.

Further Research

When this experiment studies a very specific situation one can envisage a number of different variations. For instance, it would be interesting to see how the possibility to punish hazardous behaviour affects the result and to analyse a game where all pairs are static, same principals and agents throughout all periods. Moreover, one can imagine a game with incomplete monitoring, i.e. where principals cannot perfectly observe the truly effort provided by agents. Finally, it would be interesting to investigate the relation between the size of wage and true effort, in more detail, to see if higher wages in fact implies higher effort even in situations with perfect information and where hazardous behaviour cannot be punished.

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Appendix

Instruktioner för agenter

INSTRUKTIONER

1. Varje omgång börjar med att du samtidigt erbjuds två kontrakt från två konkurrerande företag.

2. Du börjar med att ta ställning till dessa två kontrakt. Du kan välja att **acceptera** båda kontrakten, **avfärda** ett och acceptera det andra eller avfärda båda kontrakten. Om du avfärdar ett kontrakt blir vinsten för dig och företaget som erbjuder dig kontraktet 0 i den omgången.

3. Företagen kan antingen erbjuda dig ett **bonuskontrakt** eller ett **fast kontrakt**. Vad som gäller för respektive kontrakt förklaras längre ner.

4. Om du accepterar ett eller båda kontrakten måste du ange en ansträngningsnivå vilket är ett tal mellan 1-10. Din maximala ansträngning är 10. Om du väljer 1 jobbar du väldigt lite och om du väljer 10 jobbar du väldigt hårt. Om du endast accepterar ett kontrakt kan du välja ett tal mellan 1-10. Om du däremot väljer att acceptera båda kontrakten får summan av din totala ansträngning för båda kontrakten inte överstiga 10. Observera att din totala ansträngning kan vara lägre än 10. Se exempel nedan!

	Kontrakt 1	Kontrakt 2	Summa total ansträngning
Du väljer ansträngning	10	0	10
Du väljer ansträngning	0	10	10
Du väljer ansträngning	7	0	7
Du väljer ansträngning	0	7	7
Du väljer ansträngning	6	4	10
Du väljer ansträngning	5	5	10

Tabell 1 *Exempel på hur du kan välja att fördela din ansträngning*

5. Din ansträngningsnivå bestämmer den totala avkastningen. Varje ansträngningsnivå är behäftad med en kostnad. Desto mer du väljer att anstränga dig desto större blir denna kostnad. Se tabell 2 nedan.

Kontraktsformer:
Du kan bli erbjuden två (2) olika kontrakt, **fasta eller bonusrelaterade kontrakt**. För respektive kontrakt gäller följande:

Ett **bonusbaserat kontrakt** består av 2 komponenter:

- En fast lön, w

- En bonus, b* uttryckt som en procent av företagarnas vinst (se tabell 2) för din valda ansträngningsnivå. Bonusen kan utgöra 10-90% av företagarens vinst och måste anges i jämna 10% intervaller: b* = 10%, 20%, 30%, 40% osv.

Ett **fast kontrakt** består också av 2 komponenter:

- Den begärda ansträngningsnivån, e.
- En lön, w, utöver ansträngningskostnad för rekommenderad ansträngning

Hur beräknas din vinst?

Nedan följer ett antal exempel som illustrerar hur vinsten beräknas för olika kontrakt. Siffrorna är hämtade från tabell 2 på nästa sida. Observera att samtliga exempel är konstruerade för att illustrera hur vinsten beräknas för de olika kontraktsformerna och att samtliga parametrar kan varieras efter eget önskemål.

Vid accepterande av ETT kontrakt:

Bonuskontrakt

- Fast lön, w = 50
- Bonus, b* = 50%
- Experten väljer ansträngning, e=7

Företagarens vinst:

Företagarens vinst för expertens ansträngningsnivå - fast lön till experten –bonus

= 560-50-(0,5*560)

= 230

Expertens vinst:

Fast lön +bonus – kostnaden för vald ansträngningsnivå

= 50+(0,5*560)-170

= 160

Fasta kontrakt

- Fast lön, w = 150
- Begärd och faktisk ansträngning, e= 6

Notera *att experten endast antas följa företagarens begärda ansträngningsnivå men att experten fritt väljer hur denna allokerar sin ansträngning.*

Företagarens vinst:

Företagarens vinst för expertens ansträngningsnivå - fast lön till experten – expertens kostnad

= 480-150-140

= 190

Expertens vinst:

Lön utöver ansträngningskostnad för rekommenderad ansträngning + ersättning för rekommenderad ansträngning – privat kostnad

= 150 +140-140

= 150

Vid accepterande av TVÅ bonuskontrakt:

Kontrakt 1	**Kontrakt 2**
Fast lön, w = 50	Fast lön, w= 70
Bonus, b* = 50%	Bonus, b*= 30%
Din ansträngning, e=6	Din ansträngning, e=4

Företagarnas vinst

Företag 1

Företagarens vinst för expertens ansträngningsnivå - fast lön till experten – bonus

= 480 – 50 – (0,5*480)

= 190

Företag 2

Företagarens vinst för expertens ansträngningsnivå - fast lön till experten – bonus

= 320 – 70 – (0,3*320)

= 154

Expertens vinst:

Lön utöver ansträngningskostnad för rekommenderad ansträngning + bonus – kostnaden för total ansträngningsnivå

= 50 + (0,5*480) + 70 + (0,3*320) – 340

= 116

Vid accepterande av TVÅ olika kontrakt

Företag1 (bonuskontrakt)	**Företag 2 (fast kontrakt)**
Fast lön, w = 60	Begärd ansträngning, e = 5
Bonus, b* = 30%	Fast lön, w = 120
Din ansträngning, e = 5	

Företagarnas vinst

Företag 1

Företagarens vinst för expertens ansträngningsnivå - fast lön till experten – bonus

= 400 – 60 – (0,3*400)

= 220

Företag 2

Företagarens vinst för expertens ansträngningsnivå - fast lön till experten – expertens kostnad

= 400 – 120 - 110

= 170

Expertens vinst:

Lön utöver ansträngningskostnad för rekommenderad ansträngning + bonus – kostnaden för vald ansträngningsnivå

= 60 +(0,3*400) + 120 + 110 - 340

= 70