Essays on the Economic Effects of Vanity and Career Concerns

Jerker Denrell

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Social laws are always visible, and in this field it is useless to expect discoveries like the discovery of micro-particles, chromosomes and so on. In this context the only discovery can be to establish what is visible and well known in a certain system of concepts and assertations, and to demonstrate how such trivialities can fulfil the role of laws which govern human existence....Herein lies the basic difficulty in understanding social life.

The *Schizophrenic* in Zinoviev's
The Yawning Heights (p. 55).

Contents

Preface

This thesis was written while Jerker Denrell was a doctoral student at the Institute of International Business (IIB). The research was generously founded by Jan Wallanders och Tom Hedelius' stiftelse för samhällsvetenskaplig forskning. This support is gratefully acknowledged.

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Director, Institute of International Business

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This work is dedicated to my parents.

Stockholm 1998
Jerker Denrell

Chapter 1

Introduction

At one point in the history of KMPX, that legendary San Francisco rock music radio station, at one point during the late sixties, Crosby, the owner of the station, told Melvin, the sales manager, to take any advertising account they could get. Otherwise, Crosby argued, they would not be able to meet the payroll. Melvin, however, felt horrified:

> The whole point of selling time on KMPX was to be selective about accounts, to take only what seemed in keeping. Rather than taking any accounts as Crosby had requested, he went to a friend of his who was a dope dealer and had savings and asked him for a loan of $1000. His friend wanted to give the money to KMPX as a donation but Melvin told him no, it had to be a loan. It was a loan, in small bills which Melvin's friend dug up from where he had buried them in his yard. Some of the bills had dried mud on them when they handed them out to the staff on payday. (Krieger, 1979, p. 62)

Similar examples can be found in Becker (1963), who observes, for example, that a jazz musician may resent playing the most popular and most profitable tunes: "...one cannot please the audience and at the same time maintain one's artistic integrity" (Becker, 1963, p. 108).

Such examples suggest that the relationship between monetary compensation and satisfaction may be more complicated than what traditional economic theory would imply. They suggest that individuals may not only care about the monetary compensation they receive but also about what impression they make. It follows that individuals may abstain from productive and rewarding activities if engaging in them would give others the wrong impression. Consider, for example, a publisher anxious to demonstrate his or her appreciation and knowledge of literature. Rather than targeting the most profitable niche such a publisher may choose a less lucrative niche. The reason is that only individuals with an appreciation and knowledge of literature would focus on this niche while more lucrative niches would also attract individuals with other motives. The status of practitioners of academic disciplines such as classical studies and philosophy can be explained in a similar way: since the knowledge gained by studying these subjects is practically useless only individuals with an appreciation of learning will devote time and effort to their study. The same logic explains why the life of the "true artist" must be a life in isolation, poverty and neglect; living on bread and water, using his last coins to buy paint, the true artist sacrifices the comforts of ordinary life for an existence devoted to Art.

The observation that the desire to display desirable attributes, such as competence, ability or sophistication, may lead individuals to choose unproductive rather than productive activities was first developed formally in Spence's (1973) model of job market signaling. Spence showed that individuals of high ability will invest in education even if education is worthless, i.e., if education does not increase productivity. The reason is that if education is more costly for individuals of low ability than for individuals of high ability, then, individuals of high ability can credibly demonstrate to future employers that their ability is high by choosing a high level of education. If the level of education is sufficiently high, so that individuals of low ability do not find it worthwhile to imitate the behavior of individuals of high ability, future employers can be sure that all individuals with this level of education will be of high ability.

This work makes use of the theory of signaling to analyze the economic effects of vanity and career concerns. It considers the effects of a desire to display attributes such as competence, social concern, literary sophistication, morality, and, helplessness. The first essay, *Incentives and Hypocrisy*, considers activities, such as acts of friendship, courage and social concern, which are valued only if they are performed as a proof of some attitude and not in anticipation of any additional gain. If there are such additional benefits it is difficult to know the intention of people performing them. The wealthy woman or man may find it difficult to evaluate the intentions behind proposals for marriage. A customer facing a car salesman with a bonus linked to the amount of sales may find it difficult to know whether the recommendation of an expensive car is motivated by the salesman's concern for the customer or for his or her bonus. Union members may find it difficult to know whether the decisions of a union leader, whose compensation as a board member is linked to the profitability of the firm, are favorable to the members of the union. And members of the cultural elite may find it difficult to know whether a publisher focusing on a profitable niche truly appreciates literature.

In situations like these, the existence of additional incentives make signals cheap. Consequently, if the existence of a credible signal is sufficiently valuable, individuals may be better off without these additional incentives. In the first essay this principle is used to discuss voluntary organizations, politics and the status of jobs and industries. Consider, for example, voluntary organizations. By working for a voluntary organization individuals may credibly signal their attitudes and values since only individuals with a commitment to these values would choose to work for free. The value of this signal may be sufficient to compensate for hard work. A similar argument shows why less profitable industries, jobs with a lower monetary compensation, and academic subjects of little practical value may have high status: only individuals with a true appreciation of these tasks will choose to practice them while more lucrative occupations may also attract individuals with other motives.

Inspired by H.C. Andersen's fairy tale the second essay, *The Emperor's New Clothes*, shows how individuals concerned with how they are perceived by others may praise practices they suspect are worthless, criticize objects they appreciate, abstain from asking from clarification when presented with information they do not understand, adopt innovations they do not believe in, and, condemn practices they personally believe are acceptable. The essay illustrates the potential adverse effects of vanity and career concerns: it is the fear of being perceived as stupid or ignorant, in combination with the knowledge that only individuals of high ability would understand an argument or appreciate a certain object, which explains the result.

The third essay, *Career Concerns*, deals with the incentives members of organizations have to engage in unproductive activities in order to display talent but also to conceal a lack of talent. Specifically, the third essay shows that to be able to display talent individuals of high ability will prefer tasks which are visible, unprepared, precise, individual, and, which are perceived to be difficult. Visible because anonymous tasks may be performed skillfully but no one notices. Unprepared because only individuals of high ability can succeed without preparation, but, if prepared, individuals of low ability can also succeed. Precise because only individuals of high ability will succeed at tasks where performance is largely a matter of skill while individuals of low ability may succeed if chance plays an important role in determining performance. Individual because only individuals of high ability can succeed on their own while individuals of low ability sometimes can succeed if they work together with others. Difficult because tasks which require a high minimal ability can only be successfully performed by individuals of high ability.

The third essay also deals with signal jamming, i.e., unproductive activities individuals of low ability may engage in to conceal a lack of talent. Specifically, the third essay shows that individuals of low ability may prefer unproductive but anonymous tasks to productive but visible tasks, and, that individuals of low ability may prefer working in an unfamiliar field whose difficulty is less well-known. Individuals of low ability may also engage in "self-handicapping" behavior, i.e., behavior which reduces their probability of success at a difficult task. In this way a bad performance can be attributed to extenuating circumstances rather than to a lack of talent. Similar reasons explain why individuals of low ability may choose to work in teams even if working individually is more productive, and, why individuals of low ability may choose an excessively risky task in order to have some chance of being identified as an individual of high ability.

In contrast to the above essay, the last essay, *Incompetence and Indifference*, focus on situations in which individuals want to be seen as incompetent rather than competent. Specifically, it focuses on public goods which could be supplied by single individuals. Examples include department chairing, making coffee, queuing for tickets, programming the VCR, doing the dishes, and driving a car. In situations like these all individuals may have a positive payoff from supplying the public good if they had to. But all individuals, to avoid the costs of providing the public good, would rather that someone else provided it. In this type of conflict, being perceived as incompetent may provide a strategic advantage. For example, it can be an advantage to be seen as an incompetent driver if this implies that one can sleep during longer trips. Similarly, the worst teacher may not have to teach. Indifference can also provide a competitive edge. For example, individuals who value a fresh cup of coffee less than you may not have to brew a new can. And the least ambitious member of the group may not have the write the memorandum which has to be delivered tomorrow.

Rousseau, in his *Discourse on Inequality*, argued that "...social man, outside himself, lives only in the opinion of others, and it is, so to speak, from their judgement alone that he gets the sense of his own existence" (Rousseau, 1994/1755, p. 84). As a result "...everything is reduced to appearances" (p. 84). This work is about "social man" and his concern for appearances. It is about the economic effects of "the presentation of the self" (Goffman, 1959).

As such it is also a study of incentives in markets and firms. The study of incentives is fundamental in any theory which assumes purposeful behavior. Purposeful behavior is, by definition, the attempt to accomplish some end. And the (positive) study of incentives is the study of the relation between alternative actions and the various ends - honor, love, wealth - individuals may have. Studies of the economic effects of incentives, however, have usually focused on a limited set of incentives. Price theory has focused on the monetary incentives individuals face in markets. Contract theory has focused on explicit incentive contracts in firms and other organizations. This work is an attempt to consider another set of incentives - incentives which stem from the desire to make a good impression.

These incentives may be seen as the indirect effects of explicit incentive schemes and social norms. More specifically, suppose that according to social norms, reward systems or individual preferences there are certain desirable attributes, $a_1, \ldots, a_n$, such as competence, creativity, modesty and morality.

Suppose, further, that certain tasks, $t_1, \ldots, t_n$, are the most suitable for displaying these attributes. In this case, the indirect effects of the incentives to display $a_1, \ldots, a_n$ are the incentives to engage in $t_1, \ldots, t_n$.

The effects of such indirect incentives are often positive. For example, individuals who desire to display their talents may work overtime, volunteer for difficult and complex tasks, and advise fellow-workers [Cf. Akerlof (1976), Fama (1980), Holmström (1982), and Gibbons and Murphy (1992)]. And individuals who desire to display morality may make considerable personal sacrifices in order to help others. However, since activities suited for demonstrating talent may not make the best use of talent the desire to display talent sometimes has negative consequences. Similarly, since giving people the right impression may require doing what is wrong the desire to display morality sometimes has negative consequences.

Positive or negative, the incentives a concern for appearances give rise to are likely to be important for understanding the behavior of members of organizations. Although countervailing incentives exist, in the form of explicit incentive contracts and informal group norms, most individuals probably have some leeway in pursuing their own interests. As a result the behavior of members of organizations, like the behavior of teenagers, cannot be fully understood without considering what implications different alternatives have for the image of the individual.

Chapter 2

Incentives and Hypocrisy

Can't buy me love.
Beatles

2.1 Introduction

Theories of incentives and compensation today form the core of the economics of organization. And with good reason. Many valuable activities would not be performed if individuals were not compensated. Few individuals engage in menial tasks without the promise of additional gains. There are other activities, however, such as acts of friendship, courage and social concern, which are valued only if they are performed as a proof of some attitude and not in anticipation of any additional gain. If there are such additional benefits it is difficult to know the intention of people performing them. The wealthy woman or man may find it difficult to evaluate the intention behind proposals for marriage. A customer facing a car salesman with a bonus linked to the amount of sales may find it difficult to know whether the recommendation of an expensive car is motivated by the salesman's concern for the customer or for his or her bonus. Union members may find it difficult to know whether the decisions of a union leader, whose compensation as a board member is linked to the profitability of the firm, are favorable to the members of the union. And members of the cultural elite may find it difficult to know whether a publisher focusing on a profitable niche truly appreciates literature.

In situations like these, the existence of additional incentives make signals cheap. Consequently, if the existence of a credible signal is sufficiently valuable, individuals may be better off without these additional incentives. Thus, the salesman and the union leader may be better of with a fixed salary and the publisher may be better off in a less lucrative niche. This complication of the theory of incentives is the theme of the present essay. The structure of the argument is the following: In section 2.2, using the example of hypocrisy, I show how and when the introduction of additional compensation can destroy the credibility of a signal, and, in under certain assumptions, reduce the utility of the individual thus compensated. Section 2.3 makes use of this principle to discuss voluntary organizations, politics and the status of jobs and industries. Consider, for example, voluntary organizations. By working for a voluntary organization individuals may credibly signal their attitudes and values since only individuals with a commitment to these values would choose to work for free. The value of this opportunity to signal may be sufficient to compensate for hard work. A similar argument shows why less profitable industries, jobs with a lower monetary compensation, and academic subjects of little practical value may have high status: only individuals with a true appreciation of these tasks will choose to practice them while more lucrative occupations may also attract individuals with other motives. The same principle explains why a union leader with a fixed salary may be better off than a union leader whose salary is linked to the profitability of the firm.

The theory underlying these observations is not new. The difficulty of signaling when all sender types prefer the same message is a simple implication of the basic Spence model of signaling (Spence, 1973). The fact that incentives can make truthful revelation of private information difficult has previously been discussed by Milgrom and Roberts (1990a, 1992) in the context of redistributional decisions, and, by Carmichael (1988) in the context of tenure. These papers focus on why a principal may be better off by paying the agent a fixed salary. In this essay I use the same underlying theory to discuss why individuals in general may be better off without explicit incentives.

2.2 Compensation and signaling: The example of hypocrisy

To illustrate how compensation makes signals cheap, consider the relation between incentives and hypocrisy. We value statements of appreciation or friendship when we have no reason to believe that the person uttering them would gain anything by doing so. In such environments statements of friendship and appreciation can be taken at face value. In firms, markets and royal courts, however, promotions, sales and royal privileges are at stake. And the criteria for distributing these perks can seldom be objective. Personal relations to the CEO, the customer and the king may matter.[1] Subsequently, everybody is

[1]For evidence on ingratiation and career progression in organizations see Gould and Penley (1984) and Pandey (1981). For the relation between smiling and tipping see Tidd and Lockard (1978). For a detailed discussion of patronage at the court in early Stuart England see Peck

friendly with him or her. The former president of the Ford Foundation, McGeorge Bundy, summarized his experience as "never a bad meal, never an unkind word".[2] Although everybody is friendly, it may be lonely at the top. Invitations to parties, the lack of objections to suggestions, and, the laughter the superior's jokes produce, reflect the importance of his and her decisions as well as genuine feelings of friendship and appreciation. As a result, friendly gestures, even if genuine, may be viewed sceptically. In other words, when there are incentives for acting in a friendly manner, the credibility of such acts is low.

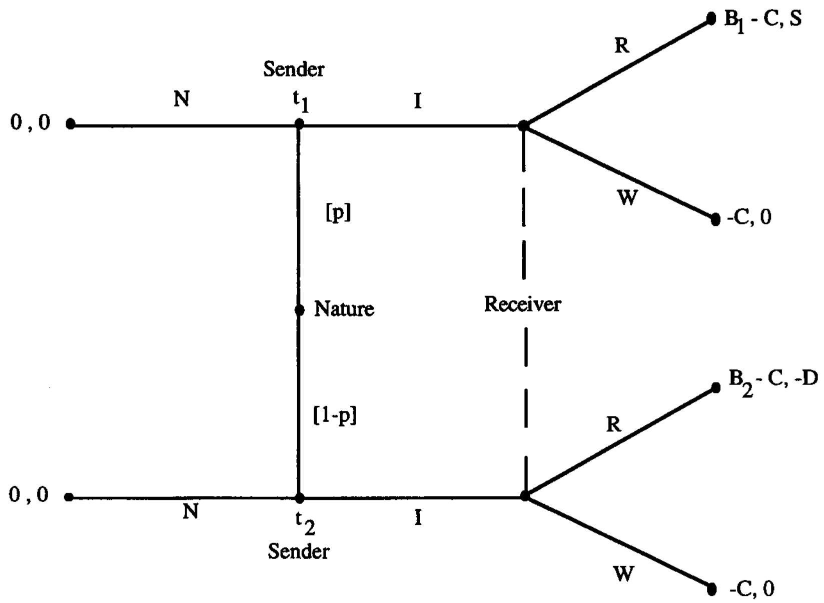

Figure 2.1. Game 2.1.

2.2.1 A formal analysis

To illustrate these points consider the game depicted in Figure 2.1, from now on called Game 2.1. There are two players: a sender and a receiver. The sender can choose between initiating a contact with the receiver (I) or not (N). The receiver observes the choice of the sender and then makes a choice between responding to the initiative of the sender (R) or to withdraw (W) (see Appendix A for a complete list of symbols).

(1990).

[2]This quote is taken from Klitgaard (1991, p. 212).

The sender can be of two types corresponding to two different attitudes towards the receiver: the first type (t_1) appreciates interacting with the receiver while the second type (t_2) does not. Specifically, the von Neuman-Morgenstern utility of senders of type i, denoted U_{si}, is

$$U_{si} = B_i x - C + F. \tag{2.1}$$

Here F is the monetary compensation the sender may receive (in Game 2.1 $F = 0$) and C is the monetary equivalent of the cost of initiating a contact with the receiver.[3] Furthermore, x is a dummy variable which is equal to one if the sender interacts with the receiver and is equal to zero if the sender does not interact with the receiver. The utility of interacting with the receiver is measured by B_i. I assume that $B_1 > B_2 > 0$, i.e., that senders of the first type appreciates interacting with the receiver more than senders of the second type. I also make the following assumption.

Assumption 2.1 *If the sender is indifferent between choosing I and N senders of the first type choose I while senders of the second type choose N.*

The receiver is assumed to appreciate interacting with senders of the first type only, that is, only with senders who truly appreciate the receiver. Specifically, the von Neuman-Morgenstern utility of the receiver, U_r, is

$$U_r = Sy_1 - Dy_2. \tag{2.2}$$

Here S is a positive constant and y_1 is a dummy variable which is equal to one if the receiver responds to the initiative of a sender of the first type and is equal to zero if the receiver does not respond. Similarly, D is a positive constant and y_2 is a dummy variable which is equal to one if the receiver responds to the initiative of a sender of the second type and is equal to zero if the receiver does not respond.

I assume that the sender knows his or her own type but that the receiver does not know the type of the sender. However, the receiver knows that the probability that the sender is of the first type is p. I also assume that the sender knows that the receiver knows this, and, that the receiver knows that the senders knows that the receiver knows this, and so on, *ad infinitum*. That is, I assume that it is *common knowledge* that the probability that the sender is of the first type is p.[4]

The timing of this game is as follows. In the first period nature draws a type t_i for the sender. In the second period the sender observes t_i and then

[3] This specification presumes that the sender's marginal utility of money is constant. More general formulations are possible but the above formulation is sufficient for the purposes of this essay.

[4] See Auman (1976) for the formal definition of common knowledge.

chooses whether to take the initiative and start interacting with the receiver (I) or not (N). If the sender chooses N the game ends and both players receive a payoff of zero. In the third period the receiver observes the choice of the sender and chooses whether to respond to the initiative of the sender (R) or to withdraw (W). In the fourth period the utility of the receiver and the sender are determined according to U_r and U_{si}. The utility of the receiver depends on the type of the sender and on whether the receiver responds to the initiative of the sender (R) or withdraws (W). If the receiver responds to the initiative of the sender (R) and the sender is of the first type the utility of the receiver is $S > 0$. If the receiver responds to the initiative of the sender (R) and the sender is of the second type the utility of the receiver is $-D$. If the receiver withdraws (W) and does not respond to the initiative of the sender the utility of the receiver is zero. The utility of the sender depends on whether the sender starts to interact with the receiver, whether the receiver responds, and, on the senders type. The cost of approaching the receiver is $C > 0$ for both types. If the receiver responds the utility of the sender is $B_1 - C$ for senders of the first type and $B_2 - C$ for senders of the second type.

To define a perfect Bayesian equilibrium in Game 2.1 denote the strategy of the sender, a mapping from $\{t_1, t_2\}$ into $\{I, N\}$, by $s(\cdot)$, and, denote the strategy of the receiver, the choice between R and W if the receiver has chosen I, by $r(\cdot)$. Moreover, let $\mu(t_1|I)$ and $\mu(t_2|I)$ be the receiver's estimate of the probability that the sender is of the first and second type if the receiver observes I. Finally, let U_s be the utility of the sender. Obviously, $U_s = U_{s1}$ if $t_i = t_1$ and $U_s = U_{s2}$ if $t_i = t_2$. Using this notation a perfect Bayesian equilibrium, in Game 2.1, can be defined in the following way

Definition 2.1 *A perfect Bayesian equilibrium, in Game 2.1, is a pair of strategies, $s(\cdot)$ and $r(\cdot)$, and beliefs, $\mu(t_1|I)$ and $\mu(t_2|I)$, such that*

- *$s(\cdot)$ maximizes U_s given $r(\cdot)$.*
- *$r(\cdot)$ maximizes U_r given $s(\cdot)$, $\mu(t_1|I)$ and $\mu(t_2|I)$.*
- *$\mu(t_1|I)$ and $\mu(t_2|I)$ follows from Bayes rule and $s(\cdot)$, except after an event which according to $s(\cdot)$ should occur with probability zero. In this case it is only required that $0 \leq \mu(t_1|I) \leq 1$, $0 \leq \mu(t_2|I) \leq 1$, and $\mu(t_1|I) + \mu(t_2|I) = 1$.*

Assuming that the sender and the receiver only can use pure strategies, i.e., that they cannot randomize between different alternatives, there are only two possible types of equilibria in this game: separating and pooling.

Definition 2.2 *In a separating equilibrium senders of the two types choose two different actions in the second period.*

Definition 2.3 *In a pooling equilibrium senders of the two types choose the same action in the second period.*

In Game 2.1 a separating equilibrium is possible only if the following incentive compatibility conditions hold.[5]

$$B_1 - C \geq 0 \tag{2.3}$$

and

$$B_2 - C \leq 0. \tag{2.4}$$

That is, only the first, appreciative, type feels that interacting with the receiver is really worth the effort. Since only individuals who appreciate the receiver will consider it worthwhile to approach the receiver, the receiver can trust the sincerity of the individuals who approach him or her. More precisely, as shown in Appendix B, when the above incentive compatibility conditions hold the only perfect Bayesian equilibrium in Game 2.1 which satisfies the "intuitive criterion" of Cho and Kreps (1987) is the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, the receiver chooses R whenever the receiver observes that the sender chooses I, and, where $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$.

Consider now Game 2.2 (see Figure 2.2) which is identical to the previous game but where senders of both types, if they choose I, receive some additional benefit, $F_b > 0$, if the receiver responds to their initiative and does not withdraw. Examples of F_b include the additional benefit of marrying a wealthy woman or man, the bonus a waiter receives from treating customers kindly, or, the promotion which could follow if your superior comes to like you.

In Game 2.2 a separating equilibrium is possible only if the following incentive compatibility conditions hold:

$$B_1 + F_b - C \geq 0 \tag{2.5}$$

and

$$B_2 + F_b - C \leq 0. \tag{2.6}$$

Using an argument similar to that in Appendix B it can be shown that when these incentive compatibility conditions hold the only perfect Bayesian equilibrium in Game 2.2 which satisfies the "intuitive criterion" of Cho and Kreps (1987) is the separating equilibrium in which senders of the first type choose I,

[5] A separating equilibrium is possible even if equations (2.3) and (2.4) do not hold if the receiver uses a mixed strategy, i.e., if the receiver randomizes between R and W. For an analysis of this case see Appendix C.

senders of the second type choose N, the receiver chooses R whenever the receiver observes that the sender chooses I, and, where $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$.

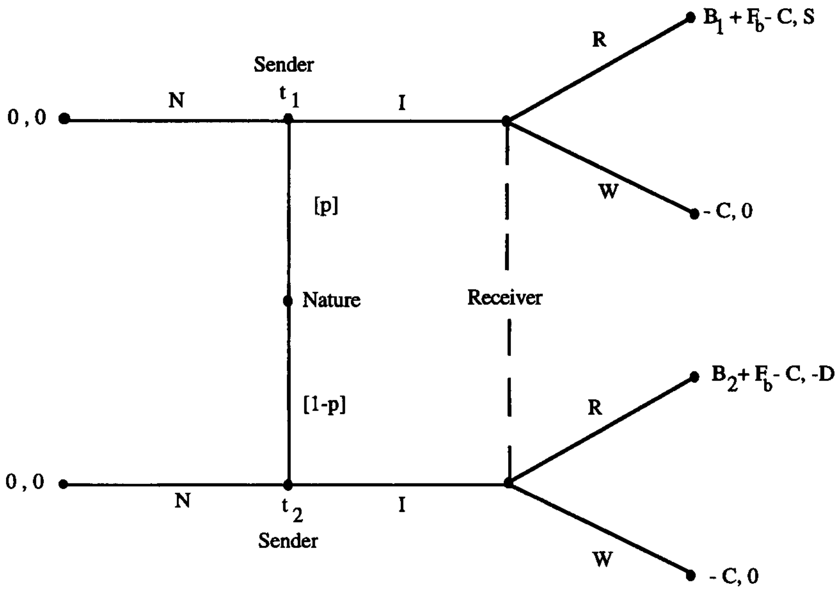

Figure 2.2. Game 2.2.

From equation (2.6) it follows that B_2 has to be less than or equal to $C - F_b$ for a separating equilibrium to be possible. Assuming that $B_1 \geq C$ we have the following proposition.

Proposition 2.1 *Whenever $C > B_2 > C - F_b$ a separating equilibrium in Game 2.1 will be destroyed by the introduction of F_b.*

Proposition 2.1 shows when the introduction of some additional incentive will destroy a separating equilibrium and thus make impossible credible signaling of attitudes. The intuition is simple. Increasing the compensation for a certain activity will make this activity a less credible signal since people without the required attitude may also find it worthwhile to perform it.[6] Examples of this principle are numerous. In a religious society, where piety is a virtue, performance of religious ceremonies may not be considered as a credible signal of

[6]In social psychology this principle is know as "the self-presenter's dilemma" (Cf. Leary, 1995, p. 107). For experimental evidence see Jones et. al. (1962) and Jones and McGillis (1976).

faith.[7] In a society with a dominant ideology, reciting canonical texts may not be considered as a credible sign of ideological purity.[8] And in a society where politeness is an important part of the formal etiquette, appreciative comments and gestures may not be considered as a credible sign of genuine appreciation.[9]

In a society where hypocrisy, in this way, has become a dominant strategy, the best action for the receiver depends on the probability p that a sender approaching the receiver will be of the first type. If this probability is sufficiently low, if p is less than $D/(S+D)$, the receiver will not risk interacting with a sender who probably is insincere. The result is that no sender will be trusted. In this situation the utility of senders of the first type is zero. If F_b would have been lower, however, the utility of senders of the first type would have been $B_1 - C + F_b$. It follows that senders of the first type are always better off if the additional compensation, i.e., F_b, is low rather than high. This reasoning is summarized in Proposition 2.2 and illustrated in Figure 2.3.

Proposition 2.2 *Whenever $p < D/(S+D)$ the utility of senders of the first type is higher when $F_b \leq C - B_2$ compared to when $F_b > C - B_2$.*

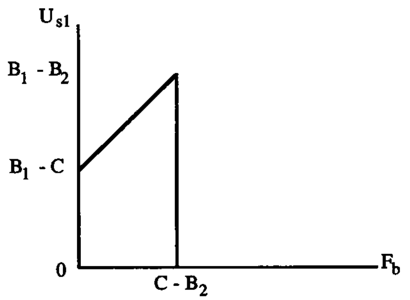

Figure 2.3. The utility of senders of the first type in Game 2.2 as a function of F_b. (The figure is drawn under the assumptions that $B_1 = 6, B_2 = 2$ and $C = 4$.)

[7]"Be on guard against performing religious acts for people to see....When you are praying, do not behave like the hypocrites who love to stand and pray in synagogues or on street corners in order to be noticed" (Matthew 6: 1-2,5).

[8]Consider, for example, the following instructions from the Soviet publication *Oktyabr* in 1949: "One must not content oneself with merely paying attention to *what* is being said for that may well be in complete harmony with the Party programme. One must pay attention also to the *manner* - to the sincerity, for example, with which a schoolmistress recites a poem the authorities regard as doubtful, or the pleasure revealed by a critic who goes into detail about a play he professes to condemn." (Cited in Kuran, 1995, p. 124).

[9]Thus, in the Middle Ages, when politeness was routinized, "humble refusals to take precedence of another last upwards of a quarter of an hour; the longer one resists, the more one is praised" (Huizinga, 1954, p. 46).

Not only senders of the first type but also the receiver is better off if F_b is low. If $p < D/(S+D)$ the utility of the receiver is $S > 0$ whenever F_b is lower than or equal to $C - B_2$ but zero whenever F_b is higher than $C - B_2$. This is summarized in the following proposition.

Proposition 2.3 *Whenever $p < D/(S+D)$ the utility of the receiver is higher when $F_b \leq C - B_2$ compared to when $F_b > C - B_2$.*

The above model assumed that senders of both types received some additional compensation only if the receiver responded to their initiative. In some situations, however, senders receive some additional compensation even if the receiver does not respond to their initiative. Examples include the bonus a salesman may receive for contacting potential customers and the wage a social worker receives for helping the sick and old. To model this situation consider Game 2.3, illustrated in Figure 2.4. In this game senders of both types receive some additional benefit, F_{nb}, if they choose I even if the receiver does not choose R, i.e., even if the receiver does not respond to the initiative of the sender.

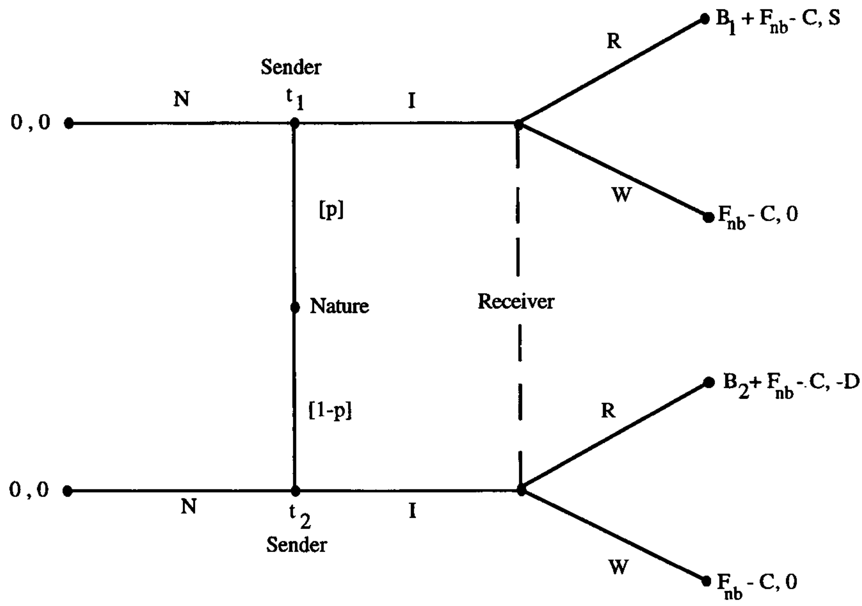

Figure 2.4. Game 2.3.

In Game 2.3 a separating equilibrium is possible only if the following incentive compatibility conditions hold:

$$B_1 + F_{nb} - C \geq 0 \tag{2.7}$$

and

$$B_2 + F_{nb} - C \leq 0. \tag{2.8}$$

Using an argument similar to that in Appendix B it can be shown that when these incentive compatibility conditions hold the only perfect Bayesian equilibrium in Game 2.3 which satisfies the "intuitive criterion" of Cho and Kreps (1987) is the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, the receiver chooses R whenever the receiver observes that the sender chooses I, and, where $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$.

From equation (2.8) it follows that B_2 has to be less than or equal to $C - F_{nb}$ for a separating equilibrium to be possible. Assuming that $B_1 \geq C$ we have the following proposition.

Proposition 2.4 *Whenever $C > B_2 > C - F_{nb}$ a separating equilibrium in Game 2.1 will be destroyed by the introduction of F_{nb}.*

Like in the above model we also have that senders of the first type may be better off if the additional compensation, i.e., F_{nb}, is low rather than high. However, in this model, this is true only if the additional compensation, F_{nb}, which senders receive regardless of the response of the receiver, is not too high. Specifically, $F_{nb} - C$ must not be higher than the maximal utility senders of the first type could receive in a separating equilibrium. The maximal utility senders of the first type could receive in a separating equilibrium is the payoff they would receive when equation (2.8) holds with equality, i.e., when $F_{nb} = C - B_2$. In this separating equilibrium the utility of senders of the first type is $B_1 + (C - B_2) - C = B_1 - B_2$. Senders of the first type would have received the same utility by choosing I even if the above incentive compatibility conditions did not hold if F_{nb} had been sufficiently high. Specifically, by choosing I at a cost of C when $F_{nb} = B_1 - B_2 + C$ senders of the first type would also have received $B_1 - B_2$. We thus have the following proposition.

Proposition 2.5 *Whenever $p < D/(S+D)$ and $F_{nb} < B_1 - B_2 + C$ the utility of senders of the first type is higher when $F_{nb} \leq C - B_2$ compared to when $F_{nb} > C - B_2$.*

Proposition 2.5 is illustrated in Figure 2.5.

The receiver is also be better off if F_{nb} is low. Assuming that $p < D/(S + D)$ the utility of the receiver is $S > 0$ whenever F_{nb} is lower than $C - B_2$ but zero whenever F_{nb} is higher than or equal to $C - B_2$. This is summarized in the following proposition.

Proposition 2.6 *Whenever $p < D/(S+D)$ the utility of the receiver is higher when $F_{nb} \leq C - B_2$ compared to when $F_{nb} > C - B_2$.*

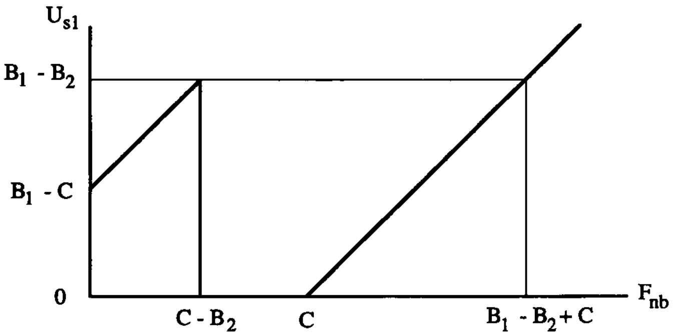

Figure 2.5. The utility of senders of the first type in Game 2.3 as a function of F_{nb}. (The figure is drawn under the assumptions that $B_1 = 6, B_2 = 2$ and $C = 4$.)

2.2.2 A model with a continuous action space

The foregoing analysis assumed that C was fixed. That is, senders of the first type could not distinguish themselves by increasing C. However, Propositions 2.1 - 2.6 do not stand and fall with this assumption. To see this consider the following version of Game 2.2. Suppose that C is a function of time spent in some costly activity. Specifically, $C = \int_0^t f(c)dc$, where $f(\cdot)$ is a strictly increasing function and t is the time spent in some costly activity. The interpretation is that the sender spends time in the costly activity and when the sender has finished the sender approaches the receiver. I assume that both the sender and the receiver discount payoffs exponentially using a discount rate of $\pi > 0$.

Let t^1 be the time senders of the first type engage in the costly activity. Then, for the receiver to respond with R to a sender who engages in the costly activity until t^1, the following incentive compatibility conditions must hold:

$$B_1 e^{-\pi t^1} + F_b e^{-\pi t^1} - \int_0^{t^1} f(c) e^{-\pi c} dc \geq 0, \tag{2.9}$$

and,

$$B_2 e^{-\pi t^1} + F_b e^{-\pi t^1} - \int_0^{t^1} f(c) e^{-\pi c} dc \leq 0. \tag{2.10}$$

It follows that for senders of the first type to distinguish themselves, they need to be engaged in the costly activity at least until a time t^{1*} such that

$$B_2 e^{-\pi t^{1*}} + F_b e^{-\pi t^{1*}} = \int_0^{t^{1*}} f(c) e^{-\pi c} dc. \tag{2.11}$$

As shown in Appendix D, if $p < (D/(S+D))$, the only perfect Bayesian equilibrium which satisfies the "intuitive criterion" of Cho and Kreps (1987) is an equilibrium in which senders of the first type are engaged in the costly activity until t^{1*}, senders of the second type never engage in the costly activity, and, the receiver chooses R only if he or she observes that the sender engages in the costly activity until t^{1*}.

In this equilibrium the utilities of the receiver and of senders of the first type are decreasing in F_b. To see this notice that by substituting equation (2.11) into equation (2.9) the utility of senders of the first type, U_{s1}, can be written as

$$B_1 e^{-\pi t^{1*}} + F_b e^{-\pi t^{1*}} - B_2 e^{-\pi t^{1*}} - F_b e^{-\pi t^{1*}} = (B_1 - B_2) e^{-\pi t^{1*}} \qquad (2.12)$$

Similarly, the utility of the receiver, in this separating equilibrium, is

$$U_r = S e^{-\pi t^{1*}}. \qquad (2.13)$$

Since t^{1*} is increasing in F_b we have the following propositions

Proposition 2.7 *The utility of senders of the first type is a decreasing function of F_b.*

Proposition 2.8 *The utility of the receiver is a decreasing function of F_b.*

Propositions 2.7 and 2.8 show that in an environment where there are additional motives for displaying a certain attitude more costly means must be used to signal this attitude. Consider, for example, politeness. Social conventions oblige us to make certain statements, to show certain kinds of appreciation and to give our approval in certain situations. It is customary to applaud an artistic performance and to compliment the food at a dinner. Because appreciative comments are expected genuine appreciation can only be signaled by excessively enthusiastic comments.

2.3 Examples and Applications

2.3.1 Credibility, compensation and independence

As the example of hypocrisy shows, sincere statements may not be credible in situations where the gains from a successful deception are large. Thus, a politician sponsored by the steel industry may find it difficult to convince voters about the necessity of subsidizing domestic steel firms.[10] And the wine servant may find it difficult to convince customers that the most expensive wine is also the best. Similarly, an applicant for a well paid job may find it difficult

[10]For experimental evidence see Eagly et. al. (1978).

to communicate his or her genuine appreciation of the corporation.[11] And a mental patient, assessed for an eventual release, may find it difficult to show that he or she has recovered since the display of "normal" behavior may not be a credible signal of recovery.[12]

Because of such problems individuals and organizations may deliberately avoid compensation if it would compromise their integrity.[13] Thus, Lyndon Johnson, in the early 1940s, declined to participate in an attractive oil deal in order not to be associated with oil interests if he later ran for president (Caro, 1990). Another example is the deliberate attempt of the Swedish aristocracy in the seventeenth century to limit their involvement in commercial activities (Cf. Englund, 1989). Commercial activities, it was claimed, would denigrate the status and authority of the aristocracy. Instead of being involved in commercial activities in pursuit of personal profit, members of the aristocracy should be engaged in activities for the common good. Only this would guarantee the moral authority of the aristocracy.[14] The French aristocracy had a similar attitude to commercial activities: "Bravery, magnanimity, generosity - these were the virtues especially valued by nobles. Largesse was considered so essential that not a few nobles went heavily into debt in the interest of hospitality and conspicuous display. Unselfishness and willingness to sacrifice - these too were aristocratic virtues. The nobleman was supposed to be ready to give his all in the service of king and country." (Bitton, 1969, p. 73). Subsequently, "it was the 'first law of nobility' that he prefer the public interest to his own. Trade would cause him to concentrate on private gain. It was therefore unthinkable that nobles be found in the markets buying things cheap in order to sell them dear, haggling over prices of all kinds of riffraff." (Bitton, 1969, p. 73).

The need to avoid compromising incentives also explains the advantage of impartial and independent individuals in situations when credible and reliable information is important, such as in the choice of advisers, mediators, politi-

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[11]Pandey and Rastagi (1979) show that individuals are more likely to ingratiate a job interviewer when competition for the job becomes more intense.

[12]Braginsky and Braginsky (1967) show that schizophrenics in a mental hospital displayed fewer symptoms of psychological problems when they were being evaluated for placement in an open ward.

[13]Individuals may also try to build a reputation for reliability and impartiality (Cf. Sobel, 1985). Since it is generally difficult to observe what others' true interests are, a reputation mechanism may not be effective, however. Although some individuals may be truly impartial other may agree with decisions they dislike or disagree with decisions they like in order to make their own statements seem less self-interested. Others may base their arguments on some principle of impartiality, but since there are many such principles, their choice of what principle to use may have been motivated by self-interest (Cf. Elster, 1995).

[14]Another reason why the aristocracy wanted members of their class to limit their commercial activities was to isolate them from the temptations involved in such activities; temptations which could have led to scandalous and denigrating behavior (Englund, 1989). For a discussion of such "private rules" with the purpose of avoiding impulsive behavior see Ainslie (1985).

cians and accountants.[15] Consider, for example, Popkin's (1979) argument that it was the self-abnegation of the leadership which enabled the Viet Minh to outrecruit other organizations: "The self-denial of communist organizers...were striking demonstrations to peasants that these men were less interested in self-aggrandizement than were the visibly less self-denying organizers from other groups" (Popkin, 1979, p. 261). The successes of the new religious orders during the eleventh century, such as the order of Carthusians and the Cistercians, provide another illustration: the strict requirements of these new orders provided a convincing demonstration of their leader's faith.[16]

The relation between compensation and hypocrisy can also explain why the receiver may benefit from reducing the sender's compensation. Consider the following example. A firm believes that people who enjoy their work are more productive. The firm subsequently reduces the wage in order to deter applicants who only are interested in the monetary compensation (this may be an argument for paying low wages to academics and public servants).[17] Instead of reducing the compensation the receiver may keep his or her identity, and thereby the additional incentive, secret to the sender. This is the tactic used by many contemporary celebrities when they are trying to live a normal life. Another example is anonymous reviews in academia. A more dramatic example of this tactic was featured in the movie "Coming to America". In this movie Eddie Murphy plays a fictional prince from an African country who comes to New York in order to find himself a bride. To be certain of the feelings of his future bride, however, he takes on the identity of a poor university student with a part-time job as a janitor.

2.3.2 Activities outside the "economic sphere"

The positive relation between incentives and hypocrisy also provides an economic argument for why some activities should be outside the "economic sphere". Arguments for a non-economic sphere have been common in critiques of the market system. Both radical and conservative writers have argued that the use of money and monetary compensation should be limited.[18] These limits have often been justified by reference to individual rights, justice, or the irrational tendencies of consumers.[19] This paper suggests a different argument. Because of the inverse relation between incentives and credibility it can be inefficient to compensate certain activities. In fact, individuals may more content with per-

[15]For discussions about auditing, independence and credibility see, e.g., Antle (1984), Fellingham and Newman (1985), and Wilson (1983).

[16]For a discussion of the reform movement in the eleventh century see, e.g., Strayer and Munro (1970, pp. 243) and Cantor (1969, pp. 402).

[17]Greenberg and Haley (1986), in a similar vein, argue that a reduction in judicial salaries can lead to self-selection of judges who place a high nonpecuniary value on judging.

[18]Cf. Okun (1975) and Walzer (1983).

[19]For exceptions see, e.g., Aghion and Hermalin (1990) and Frank (1985, Ch. 10).

forming a task if the compensation is low rather than high. The reason is that if the compensation is low their work would be a signal of some attitude, such as social concern, industriousness or cultural sophistication. If the compensation is higher, however, even individuals without these attitudes would find it beneficial to work for the organization. In this pooling equilibrium working would not signal any attitude.

A model of voluntary organizations

To illustrate the emergence of voluntary organizations consider the following interpretation of Game 2.3 in section 2.2. Suppose there is an organization which needs a number of workers to perform some task. This task could be to take care of older people or to work for the environment. There are two types of workers: workers who find this work important (t_1) and workers who do not find it important (t_2). Workers can choose between working for the organization (I) or not (N). Outside the organization other individuals observe if an individual works for the organization. On the basis of this information, outside observers choose between interacting with an individual working for this organization (R) or not (W). For example, outside observers may invite a worker to a party or may offer the worker another job. Outside observers cannot observe the attitude of the worker. It is common knowledge, however, that the probability that a worker finds the work important is p.

The utility of workers depends on the cost of performing the task, the reward they receive, and on their type. The cost of performing the task is C for both types of workers. The reward workers receive is the monetary payment from the organization, $F_{nb} \geq 0$, and the potential reward if outside observers choose to interact with them, B_i. I assume that workers of type 1 enjoy interacting with outside observers more than workers of type 2, i.e., $B_1 > B_2 \geq 0$. The interpretation is that workers of type 1 actually have the attitude that forms the basis of the interaction between the worker and the outside observer but workers of type 2 lack this attitude. The utility of the outside observer depends on the type of the worker and whether the outside observer starts to interact with the worker (R) or not (W). If the outside observer starts to interact with the worker and the worker is of the first type the utility of the outside observer is $S > 0$. If the outside observer starts to interact with the worker and the worker is of the second type, the utility of the outside observer is $-D$. The interpretation is that the outside observer is disappointed by the attitudes and personal characteristics of the worker. If the outside observer chooses not to interact with the worker the utility of the outside observer is zero.

Consider now the utility of workers of the first type as a function of F_{nb}. Since this model is identical to Game 2.3 it follows from Proposition 2.5 that if $p < D/(S+D)$ and $F_{nb} < B_1 - B_2 + C$ then the utility for workers of the first type is $B_1 + F_{nb} - C$ whenever $F_{nb} \leq C - B_2$ but only $\max\{0, F_{nb} - C\}$

whenever $F_{nb} > C - B_2$. In other words, workers of the first type may be better off if their wage (F_{nb}) is low rather than high. If their wage is low they receive an additional reward of B_1 since working in the organization then provides a means to signal some attitude to outside observers. But if their wage is high even individuals who do not have this attitude will find it beneficial to join the organization. In this case working in the organization no longer signals a certain attitude and the only reward workers of the first type receive is the monetary compensation F_{nb}.

Consider now the cost to the organization. If $F_{nb} \leq C - B_2$ then the utility of workers of the first type is $B_1 + F_{nb} - C$. In this case, if we assume that the reservation utility of both workers is zero, and if we assume that $B_1 > C$, the cost of inducing workers of the first type to work in the organization is zero. Whenever $F_{nb} > C - B_2$ and $p < D/(S + D)$, however, the utility of workers of the first type is only $\max\{0, F_{nb} - C\}$. In this case to induce any workers to work in the organization the monetary compensation, F_{nb}, has to be at least C. It follows that if $p < D/(S + D)$ and if the supply of workers of the first type is sufficient, a cost-minimizing organization would set $F_{nb} = 0$. In other words, a cost-minimizing organization would rely on voluntary labor.

Comment

For an illustration of the above model consider the market for blood. In *The gift relationship: From human blood to social policy* Richard Titmuss (1971) argued that a commercial market for blood was inefficient partly because it reduced the symbolic value of giving blood, and, as a result, reduced peoples' willingness to give blood.[20] The above model provides one possible argument for this view. If individuals may signal some attitude, such as social concern or altruism, by giving blood, a commercial market for blood may be inefficient. Individuals may contribute voluntarily only if the compensation is low or zero since giving blood will then be a credible signal of some attitude.[21] If the compensation is higher, however, all individuals would require some compensation. Of course, if the proportion of individuals who would give blood without compensation is insufficient, or, if individuals may still give blood for free and are able communicate this to others, a monetary compensation may nevertheless be efficient.[22]

[20]For a discussion of Titmuss' views see Arrow (1972).

[21]The same reasoning explains the moral status of the Martyr: "Only he who fights knowingly for a lost cause can be free from suspicion of ulterior motives" (Kolakowski, 1968, p. 116). Compare also Kierkegaard's statement that: "Every person who initiates an act of true self-denial will come to suffer for it. If this were not so, true self-denial would be impossible, since the self-denial that is profitable in an external way is indeed not true self-denial" (Kierkegaard, 1990, p. 205).

[22]In fact, if voluntary donations can be made public, a commercial market for blood may provide individuals with an even better signal of altruism, since in this case they would sacrifice not only their time and blood, but also the monetary compensation they could have

More generally, the above model provides an economic explanation for the existence of voluntary organizations where members do not receive any monetary compensation. Notice that this explanation does not simply assume that people may work for free since they receive some non-monetary benefit from working in the organization. Rather, I show that the value of the non-monetary benefit is positive only if the monetary compensation is sufficiently low. Thus, this argument shows why it is important that the monetary compensation is low. Other arguments for voluntary organizations, based, for example, on altruism, only show why members of a voluntary organization would work for free even if there was no monetary compensation. In this type of argument nothing would be lost if the members of voluntary organizations received lavish wages. The above model, however, explains when and why this would be inefficient.

2.3.3 Status, commercialism, and counterculture

The relation between compensation and signaling can also shed light on the inverse relationship between commercial success and social status found in certain contexts. Consider, for example, a publisher focusing on a small and relatively unprofitable niche. Observers may infer that only individuals with an appreciation of literature would focus on this niche. As a result they may treat the publisher with a certain respect. A publisher focusing on a more profitable niche may not receive the same respect. Similarly, a music group focusing on a more profitable and popular segment may not receive the same respect as an "underground" band.[23] As these examples show, individuals may sometimes prefer a job or an industry with a low monetary compensation. The reason is that only individuals with a true appreciation of his or her work will choose such a job or industry while more lucrative occupations may also attract individuals with other motives.[24]

By slightly modifying the above model of voluntary organizations, it is easy to see this inverse relationship between social status and commercial success. As above, assume that there are two types of workers: workers with an appreciation of their work (t_1) and workers without this appreciation (t_2). Outside the organization other individuals observe the industry a worker is employed in. On the basis of this information, outside observers choose between interacting with this worker or not. Again, I assume that outside observers cannot observe the

received.

[23]See, e.g., Becker (1963, Ch. 5-6) and Thornton (1996). The status of an underground band may also be inversely related to its popularity. As more individuals listen to the band's music its exclusivity is reduced; it is no longer a signal of subcultural sophistication to listen to this band (Cf. Thornton, 1996).

[24]Bourdieu (1996), in a similar vein, observes that "Avant-gardism often offers no other guarantee of its conviction than its indifference to money and its spirit of contestation" (Bourdieu, 1996, p. 162).

attitude of the worker. It is common knowledge, however, that the probability that a worker finds the work important is p. I assume that $p < D/(S + D)$.

The utility of the outside observer is the same as in the above model of voluntary organizations. The utility of the worker is also assumed to be the same. The worker's monetary compensation, however, is determined in a competitive market. Thus, the monetary compensation is equal to the value of the marginal product, $F_{nb} = MV$ where M is the marginal product and V is the price of the goods workers produce. I assume that the marginal product is the same for all workers and in all industries. Industries differ, however, in the price they receive for their products, i.e., they differ in V. Given these assumptions, Figure 2.6 shows the total utility of workers of the first type (U_{s1}) as a function of V.

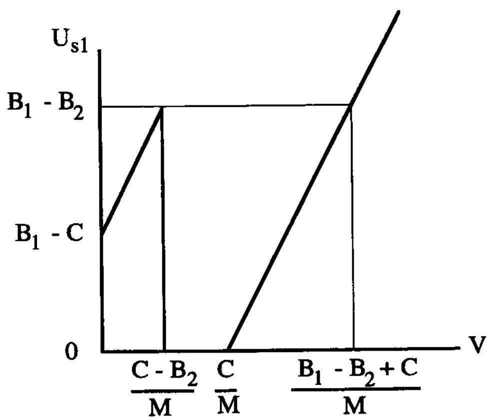

Figure 2.6. The utility of workers of the first type as a function of V. (The figure is drawn under the assumptions that $B_1 = 6, B_2 = 2, C = 4$ and $M = 2$.)

As Figure 2.6 shows, an individual may find it beneficial to work in less lucrative industries since this choice may be a good signal of some attitude. Specifically, if there is no industry in which V is equal to or higher than $V = (B_1 - B_2 + C)/M$, workers of the first type prefer an industry in which $V \leq (C - B_2)/M$ to an industry in which $V > (C - B_2)/M$. In other words, workers of the first type may resent working in the industry producing the most popular and valuable products. For example, a jazz musician may resent playing the popular tunes most audiences want to hear (Becker, 1963). Similarly, an underground radio station may refuse to broadcast pre-recorded, upbeat and slick commercials for well-known consumer products (Krieger, 1979). And English rave bands may prefer being banned on Radio One, which is the best guarantee of radicalism, to appearing on the *Top of the Pops*, which is the sub-cultural kiss of death (Thornton, 1996).[25]

The same logic explains why the life of the "true artist" must be a life in isolation, poverty and neglect; living on bread and water, using his last coins to buy paint, the true artist sacrifices the comforts of ordinary life for an existence devoted to Art. In a similar way, the faithful distinguish themselves, by retreating from the profane world into the sacral world of the monastery or the convent.[26] The status of practitioners of academic disciplines such as classical studies and philosophy can be explained in a similar way: since the knowledge gained by studying these subjects is practically useless only individuals with an appreciation of learning will devote time and effort to their study.[27]

These examples illustrate a phenomenon opposite in character to Veblen's "conspicuous consumption". In "conspicuous consumption" goods are valued for their effectiveness as a signal of wealth.[28] The above examples, however, illustrate situations in which activities and occupations are valued only if they do not have any substantial monetary value. Such activities and occupations are valued for their effectiveness as a signal of some attitude; an attitude incompatible with the desire for monetary gain. Of course, activities and occupations without substantial monetary remuneration can also be used to signal wealth, since only individuals with substantial wealth could afford to spend their money on such activities and their time in these occupations. In the above models, however, it was implicitly assumed that wealth was evenly distributed. If it is not, the income of the individual must be considered when determining the credibility of a signal. The sacrifice required to signal, say, faith, will then depend on the income of the individual.[29]

[25]Only if it is made clear that the members of the band do not take their appearance seriously is it possible for them to appear on the *Top of the Pops*: "Two basic strategies for maintaining an underground sensibility and immunizing oneself against the domesticity of *Top of the Pops* are disguise and parody; dance acts frequently hide their faces with sunglasses, hoods and hats and/or go 'over the top' in their performance. Nothing is less 'cool' than taking *Top of the Pops* seriously." (Thornton, 1996, p. 126). For a more general discussion of such tactics see Goffman's discussion of 'role-distance' (Goffman, 1961).

[26]For a discussion of the value of sacrifice as a screening device in religious sects, see Iannaccone (1992).

[27]This interpretation of the status of classical learning can be contrasted with Veblen's who argued that "there is little doubt that it is their utility as evidence of wasted time and effort, and hence of the pecuniary strength necessary in order to afford this waste, that has secured to the classics their position of prerogative in the scheme of the higher learning, and has led to their being esteemed the most honorific of all learning." Veblen (1994/1899, p. 242-243).

[28]For economic models of the signaling of wealth see, e.g., Bagwell & Bernheim (1996), Glazer & Konrad (1996) and Leibenstein (1950).

[29]As pointed out by Dorine in Molière's *Tartuffe* a signal is not credible without a sacrifice of some consequence: "It's quite true that she leads a strict sort of life but it's age that has made her turn pious. We all know that she's virtuous only because she has no alternative" (Molière, 1959, p. 113).

2.4 Conclusion

Recently microeconomics has been concerned with failures of exchange related to incomplete information. Models of adverse selection (Akerlof, 1970) and moral hazard (Cf. Holmström, 1979) have shown how asymmetric information makes it difficult to exploit all gains from trade. To this list of inefficiencies in exchange we may add that some goods lose their value if they can be exchanged for money. This category includes status goods such as membership in an exclusive club, attendance at a prestigious university and participation at a high society party. Such status goods are valued mainly because they are exclusive and signal some characteristic of individuals who possess them. If they could be bought by anyone they would lose this value. This category also includes services whose value depend on being given spontaneously, the kind of services investigated in this paper. Exchanging such services for money, or for any type of compensation, reduces their value since their value depends on being performed as a proof of some attitude and not in anticipation of any monetary gain.

Appendix A: List of Symbols

t_i	Senders of type $i \in [1, 2]$
p	The probability that the sender is of the first type
$\mu(\cdot)$	The receiver's belief about the type of the sender
U_{si}	Utility of t_i
U_r	Utility of the receiver
B_i	The value for t_i of interacting with the receiver
x	Dummy variable
C	The cost for senders of contacting the receiver
F	Compensation the senders may receive
F_b	The sender's compensation if the receiver chooses R
F_{nb}	The sender's compensation if the receiver chooses R or W
y_1	Dummy variable
y_2	Dummy variable
S	The utility of the receiver of interacting with t_1
$-D$	The utility of the receiver of interacting with t_2
I	The sender initiate contact with the receiver
N	The sender does not initiate contact with the receiver
R	The receiver responds to the initiative of the sender
W	The receiver withdraws
π	Interest rate
t	Time
t^i	The time t_i engages in the costly activity.
t^{1*}	The minimal time t_1 must perform the costly activity.
$f(\cdot)$	A strictly increasing function
$s(\cdot)$	The strategy of the sender
$r(\cdot)$	The strategy of the receiver
M	Marginal product
V	Price
q	Probability that the receiver will choose R

Appendix B: Equilibrium in Game 2.1

To see why the only perfect Bayesian equilibrium in Game 2.1 which satisfies the "intuitive criterion" of Cho and Kreps (1987) is the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, and the receiver chooses R, notice first that it follows from equation (2.4) and Assumption 2.1 that there can be no perfect Bayesian equilibrium in which senders of the second type choose I. However, there could be a perfect Bayesian equilibrium in which senders of both types choose N, $\mu(t_1|I) = 0$, $\mu(t_2|I) = 1$, and, the receiver chooses W. This equilibrium, however, does not satisfy the intuitive criterion. To see why notice that in this context the intuitive criterion can be restated as follows:

Definition 2.4 *Let $U^*_{t_i}$ denote the utility of t_i in the perfect Bayesian equilibrium PBE^*. Suppose that*

- *t_i, by deviating from the perfect Bayesian equilibrium PBE^* and choosing an action which according to PBE^* should occur with probability zero, cannot possibly achieve a utility level higher than $U^*_{t_i}$, and, if t_i could achieve a utility level equal to $U^*_{t_i}$, then t_i would choose the action specified in the perfect Bayesian equilibrium PBE^* rather than deviating.*

- *t_j, by deviating from the perfect Bayesian equilibrium PBE^* and choosing an action which according to PBE^* should occur with probability zero, could achieve a utility level higher than $U^*_{t_j}$, and, if t_j achieved a utility level equal to $U^*_{t_j}$, then t_j would choose to deviate from the perfect Bayesian equilibrium PBE^* rather than taking the action specified in the perfect Bayesian equilibrium PBE^*.*

If this is the case, then, according to the intuitive criterion the receiver should, after observing a deviation from the perfect Bayesian equilibrium PBE^*, assign probability zero to t_i and probability one to t_j.[30]

A perfect Bayesian equilibrium is said to satisfy the intuitive criterion if, in addition to the requirements for a perfect Bayesian equilibrium, the above out-of-equilibrium beliefs of the receiver are common knowledge.

Using this definition it is easy to see that if equations (2.3) and (2.4) hold then the pooling equilibrium in which senders of both types choose N does not satisfy the intuitive criterion. The reason is that in this equilibrium it follows from equations (2.3) and (2.4) and Assumption 2.1 that only senders of the first type could possibly prefer to deviate from the equilibrium and choosing I. The intuitive criterion then requires that $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$. That is, if the receiver observes I the receiver should conclude that the sender is of the first type. The optimal response for the receiver is then to choose R. Given this strategy of the receiver senders of the first type maximize their utility by choosing I, i.e., by deviating from the equilibrium. In other words, the pooling equilibrium in which senders of both types choose N does not satisfy the intuitive criterion. On the other hand, the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, and the receiver chooses R whenever the receiver observes that the sender chooses I, trivially satisfies the intuitive criterion since, according to this equilibrium, there are no actions which occur with probability zero.

[30] For the general definition see Cho and Kreps (1987).

Appendix C: Mixed strategies

Section 2.2 assumed that the receiver only used pure strategies. In this appendix I relax this assumption and allow the receiver to use mixed strategies. Specifically, the strategy of the receiver, $r(\cdot)$, is some number $q \in [0,1]$. Here q is the probability that the receiver will choose R if the sender has chosen I. Using this notation a perfect Bayesian equilibrium in this model can be defined in exactly the same way a perfect Bayesian equilibrium was defined in Game 2.1 (see Definition 2.1).

Game 2.2: $F_b > 0, F_{nb} = 0$. Under these circumstances the following incentive compatibility conditions must hold for a separating equilibrium to be possible:

$$qB_1 + qF_b - C \geq 0, \tag{2.14}$$

and,

$$qB_2 + qF_b - C \leq 0. \tag{2.15}$$

When these incentive compatibility conditions hold the only perfect Bayesian equilibrium which satisfies the "intuitive criterion" of Cho and Kreps (1987) is the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, the receiver chooses the maximal q for which a separating equilibrium is possible, i.e.,

$$q = \min(\frac{C}{B_2 + F_b}, 1), \tag{2.16}$$

and, where $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$.

To see why notice first that it follows from equation (2.15) and Assumption 2.1 that there can be no perfect Bayesian equilibrium in which senders of the second type choose I. However, there could be a perfect Bayesian equilibrium in which senders of both types choose N, $\mu(t_1|I) = 0$, $\mu(t_2|I) = 1$, and, the receiver chooses W. This equilibrium, however, does not satisfy the intuitive criterion. The reason is that it follows from equation (2.15) and Assumption 2.1 that only senders of the first type could possibly prefer to deviate from the equilibrium and choose I. The intuitive criterion then requires that $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$. That is, if the receiver observes I the receiver should conclude that the sender is of the first type. The optimal response for the receiver is then to choose R. Given this strategy of the receiver senders of the first type maximize their utility by choosing I, i.e., by deviating from the equilibrium. In other words, the pooling equilibrium in which senders of both types choose N does not satisfy the intuitive criterion. On the other hand, the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, and the receiver chooses $q = \min(\frac{C}{B_2+F_b}, 1)$, trivially satisfies the intuitive criterion since, according to this equilibrium, there are no actions which occur with probability zero.

It follows that if the above incentive compatibility conditions hold the utility of senders of the first type, U_{s1}, whenever $B_2 + F_b < C$ and thus $q = 1$, is

$$U_{s1,q=1} = B_1 - C + F_b, \tag{2.17}$$

which is increasing in F_b. However, whenever $B_2 + F_b > C$ and $q < 1$ the utility of senders of the first type is

$$U_{s1,q<1} = qB_1 - C + qF_b = C\frac{(B_1 + F_b)}{(B_2 + F_b)} - C. \tag{2.18}$$

Since

$$\frac{\partial U_{s1,q<1}}{\partial F_b} = \frac{C(B_2 - B_1)}{(B_2 + F_b)^2} < 0, \tag{2.19}$$

it follows that whenever $B_2 + F_b > C$ and thus $q < 1$ U_{s1} is decreasing in F_b. And since

$$\frac{\partial^2 U_{s1,q<1}}{(\partial F_b)^2} = \frac{-2C(B_2 - B_1)}{(B_2 + F_b)^3} > 0, \tag{2.20}$$

U_{s1} is decreasing in F_b at a decreasing rate. The utility of senders of the first type, U_{s1}, as a function of F_b can therefore be illustrated with Figure 2.7.

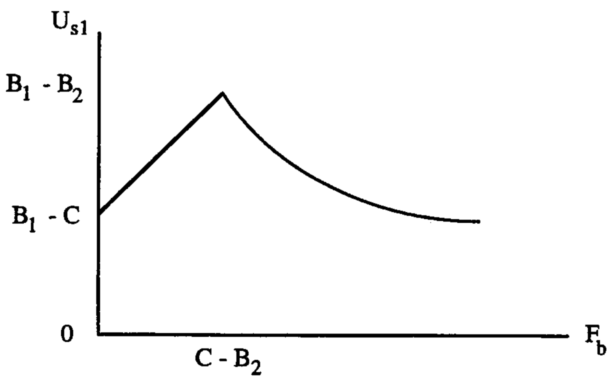

Figure 2.7. The utility of senders of the first type in Game 2.2, when the receiver uses mixed strategies, as a function of F_b. (The figure is drawn under the assumptions that $B_1 = 6, B_2 = 2$ and $C = 4$.)

Game 2.3: $F_{nb} > 0, F_b = 0$. Under these circumstances the following incentive compatibility conditions must hold for a separating equilibrium to be possible:

$$qB_1 + F_{nb} - C \geq 0, \tag{2.21}$$

and,

$$qB_2 + F_{nb} - C \leq 0. \tag{2.22}$$

When these incentive compatibility conditions hold the only perfect Bayesian equilibrium which satisfies the "intuitive criterion" of Cho and Kreps (1987) is the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, the receiver chooses the maximal q for which a separating equilibrium is possible, i.e.,

$$q = \min(\frac{C - F_{nb}}{B_2}, 1), \tag{2.23}$$

and, where $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$.

To see why notice first that it follows from equation (2.22) and Assumption 2.1 that there can be no perfect Bayesian equilibrium in which senders of the second type choose I. However, there could be a perfect Bayesian equilibrium in which senders of both types choose N, $\mu(t_1|I) = 0$, $\mu(t_2|I) = 1$, and, the receiver chooses W. This equilibrium, however, does not satisfy the intuitive criterion. The reason is that it follows from equation (2.22) and Assumption 2.1 that only senders of the first type could possibly prefer to deviate from the equilibrium and choose I. The intuitive criterion then requires that $\mu(t_1|I) = 1$ and $\mu(t_2|I) = 0$. That is, if the receiver observes I the receiver should conclude that the sender is of the first type. The optimal response for the receiver is then to choose R. Given this strategy of the receiver senders of the first type maximize their utility by choosing I, i.e., by deviating from the equilibrium. In other words, the pooling equilibrium in which senders of both types choose N does not satisfy the intuitive criterion. On the other hand, the separating equilibrium in which senders of the first type choose I, senders of the second type choose N, and the receiver chooses $q = \min(\frac{C-F_{nb}}{B_2}, 1)$, trivially satisfies the intuitive criterion since, according to this equilibrium, there are no actions which occur with probability zero.

It follows that if the above incentive compatibility conditions hold the utility of senders of the first type, U_{s1}, whenever $B_2 + F_{nb} < C$ and thus $q = 1$, is

$$U_{s1,q=1} = B_1 - C + F_{nb}, \tag{2.24}$$

which is increasing in F_{nb}. However, whenever $B_2 + F_{nb} > C$ and $q < 1$ the utility of senders of the first type is

$$U_{s1,q<1} = qB_1 - C + F_{nb} = \frac{B_1}{B_2}(C - F_{nb}) + F_{nb} - C. \tag{2.25}$$

Since this can be written as

$$C(\frac{B_1}{B_2} - 1) + F_{nb}(1 - \frac{B_1}{B_2}), \tag{2.26}$$

and since $B_1 > B_2$, it follows that whenever $B_2 + F_{nb} > C$ and thus $q < 1$ U_{s1} is decreasing in F_{nb} until $q = 0$ and $F_{nb} = C$. After this U_{s1} is obviously increasing in F_{nb}. Summarizing, we have that the utility of senders of the first type, U_{s1}, as a function of F_{nb}, can be illustrated with Figure 2.8.

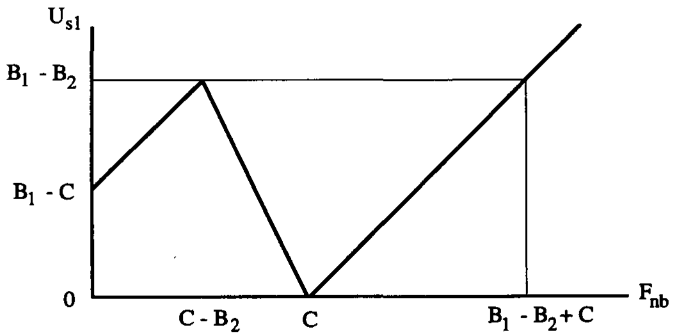

Figure 2.8. The utility of senders of the first type in Game 2.3, when the receiver uses mixed strategies, as a function of F_{nb}. (The figure is drawn under the assumptions that $B_1 = 6, B_2 = 2$ and $C = 4$.)

Appendix D: Equilibrium in the model with a continuous action space

To define a perfect Bayesian equilibrium denote the strategy of the sender, a mapping from $\{t_1, t_2\}$ to t^i, by $s(\cdot)$. Here t^i is the time a sender of type i engages in the costly activity. Denote the strategy of the receiver, a mapping from $t \in [0, \infty)$ into $\{R, W\}$, by $r(\cdot)$. Here t is the time the receiver observes the sender to be engaged in the costly activity. Moreover, let $\mu(t_1|t)$ be the receiver's estimate of the probability that the sender is of the first type if the sender engages in the costly activity until t. Similarly, let $\mu(t_2|t)$ be the receiver's estimate of the probability that the sender is of the second type if the sender engages in the costly activity until t. Using this notation a perfect Bayesian equilibrium, in this model, can be defined in a way analogous to how a perfect Bayesian equilibrium was defined in Game 2.1 (see Definition 2.1).

Using the definition of a perfect Bayesian equilibrium it is easy to verify that one perfect Bayesian equilibrium is an equilibrium in which senders of the first type engage in the costly activity until t^{1*}, senders of the second type never engage in the costly activity, the receiver chooses R only if he or she observes that the sender engages in the costly activity until t^{1*}, and where $\mu(t_1|t^{1*}) = 1$ and $\mu(t_2|t^{1*}) = 0$.

It can also be shown that this perfect Bayesian equilibrium is the only perfect Bayesian equilibrium which satisfies the "intuitive criterion" of Cho and Kreps (1987). To see why notice first that it follows from equation (2.10) that there can be no perfect Bayesian equilibrium in which senders of the second type choose $t^2 > t^{1*}$. The reason is that if equation (2.10) holds then senders of the second type would prefer $t^2 = 0$ to $t^2 > t^{1*}$. From Assumption 2.1 it also follows that there can be no perfect Bayesian equilibrium in which senders of the second type choose $t^2 = t^{1*}$. The fact that senders of the second type could not possibly gain by choosing $t^2 \geq t^{1*}$ also implies that upon observing such a deviation from a perfect Bayesian equilibrium the intuitive criterion requires that the receiver assign probability zero to t_2 and probability one to t_1. That is, the intuitive criterion requires that $\mu(t_1|t \geq t^{1*}) = 1$ and $\mu(t_2|t \geq t^{1*}) = 0$. This implies that senders of the first type can always achieve a positive utility by deviating and choosing $t^1 = t^{1*}$. This, in combination with the fact that in any perfect Bayesian equilibrium we have that $t^2 < t^{1*}$, implies that if $p < D/(D+S)$ then no pooling equilibrium can satisfy the intuitive criterion. To see this notice that in any pooling equilibrium, in which $t^2 < t^{1*}$ and thus $t^1 < t^{1*}$, if $p < D/(D+S)$, then senders of both types receive an utility of zero. By deviating and choosing $t^1 = t^{1*}$, however, senders of the first type can achieve a positive utility.

Summarizing we have that there can be no equilibrium in which $t^2 \geq t^{1*}$, and, that there can be no pooling equilibrium. Notice also that there can be no separating perfect Bayesian equilibrium in which $t^1 < t^{1*}$. In any such equilibrium senders of the second type will imitate senders of the first type by setting $t^2 = t^1$. It follows that in any separating equilibrium which satisfies the intuitive criterion we have that $t^2 < t^{1*}$ and $t^1 \geq t^{1*}$. Since it was shown above that the intuitive criterion requires that $\mu(t^1|t \geq t^{1*}) = 1$ and $\mu(t^2|t \geq t^{1*}) = 0$ it follows that senders of the first type maximize their utility by choosing $t^1 = t^{1*}$, senders of the second type maximize their utility by choosing $t^2 = 0$, and, that the receiver maximizes his or her utility by choosing R only if he or she observes the sender to engage in the costly activity until t^{1*}.

Chapter 3

The Emperor's New Clothes

3.1 Introduction

In Hans Christian Andersen's fairy tale "The Emperor's New Clothes" we hear about "the Emperor who was so uncommonly fond of gay new clothes that he spent all his money on finery". One day, in the big city where this Emperor lived, two men appeared. These men, the rumour said, could weave the most beautiful clothes. Not only were the colors and patterns lovely but "the clothes made from the cloth had the wonderful property of remaining invisible to anyone who was not fit for his job or who was particularly stupid". The Emperor, impressed with these qualities, promptly ordered some of this cloth made up for him. However, when the Emperor received the clothes woven from this magical cloth he was shocked to discover that he was not able to see it. Yet, to avoid a scandal, he nodded in a satisfied manner and said "Oh, it's very beautiful...It has my highest approval". And the courtiers, despite the fact that they could not see anything, all praised the Emperor's new clothes. Somewhat later the Emperor decided to wear his new clothes in a procession through the streets of the big city. The response was overwhelming: everybody praised the Emperor's new clothes. Everybody, except for a small child who cried "he's nothing on". And suddenly, after the comment of this child, everybody there was shouting "he's nothing on".

This essay formalizes the phenomenon underlying the story of "The Emperor's New Clothes". Specifically, using a stylized signaling game, this essay shows that individuals concerned with how they are perceived by others may praise practices they suspect are worthless, criticize objects they appreciate, abstain from asking from clarification when presented with information they do not understand, adopt innovations they do not believe in, and, condemn practices they personally believe are acceptable. The model illustrates the potential adverse effects of vanity and career concerns: it is the fear of being perceived as stupid, ignorant or insensitive, in combination with the knowledge that only individuals of high ability would understand an argument or appreciate a certain object, which explains the result.

Since this model predicts that all individuals, out of fear of being perceived as incompetent, will choose the same alternative, thus ignoring substantive private information, it also provides an alternative explanation of herd behavior. Explanations of herd behavior include models which assume that individuals make their decisions sequentially and that the choices of previous individuals contain some information [Cf. Banerjee (1992), Bikhchandani et. al. (1992), and Conlisk (1980)]. In other models individuals imitate the choices of previous individuals since choosing a different and unconventional alternative will be perceived as a signal of incompetence (Scharfstein and Stein, 1990). In the model in this essay individuals make their choices simultaneously and independently but still choose the same alternative. The reason is that there is one statement or action which is characteristic of individuals of high ability.

3.2 The Art Game

To illustrate how the phenomenon of "The Emperor's New Clothes" could be modeled, consider the following situation involving two individuals: A and B. B, an individual of universally recognized status, is trying to decide whether to invite A to a prestigious party for the art elite. A is studying a new painting in a gallery and is trying to decide whether to tell B that the painting is an interesting contribution to modern art or not.

Deciding this would have been easy if A's ability would have been high: such individuals find a painting original if and only if the painting actually is an interesting contribution to modern art. What complicates matters, however, is that A realizes that perhaps his or her ability is low rather than high. And A knows that individuals with a low ability would not be able to understand that a new painting is an interesting contribution to modern art even if they were standing in front of it.

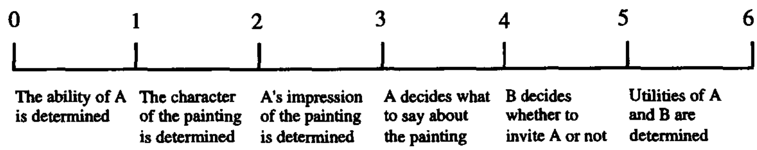

Figure 3.1. Timing of the Art Game.

3.2.1 The model

To develop a model of the above situation consider the Art Game, depicted in Figure 3.1. There are two players: A and B. The timing is as follows:

Period 1: Nature draws the ability of individual A. The ability of A can be high (H) or low (L). I assume that the ability of individual A is unknown to both A and B.[1] However, both A and B know that A's ability is high with probability p. Moreover, both A and B know that they both know this, and, both A and B know that they know that they know this, and so on, *ad infinitum.* That is, I assume that it is *common knowledge* that A's ability is high with probability p (for a complete list of symbols see the Appendix).[2]

Period 2: Nature draws the character of the painting: whether the painting is an interesting contribution to modern art (I) or not (N). The character of the painting is unknown to both A and B. It is common knowledge, however, that a new painting is an interesting contribution to modern art with probability q.

Period 3: A's impression of the painting is determined by A's ability and by the character of the painting. A can find the painting original (O) or tasteless (T). An individual of high ability will find a painting original if and only if the painting actually is an interesting contribution to modern art. And an individual of high ability will find a painting tasteless if and only if the painting actually is not an interesting contribution to modern art. Formally:

$$Prob(O|I,H) = Prob(T|N,H) = 1; \tag{3.1}$$
$$Prob(O|N,H) = Prob(T|I,H) = 0, \tag{3.2}$$

Individuals of low ability, on the other hand, will always find a new painting tasteless irrespective of if it is an interesting contribution to modern art or not.[3] Formally:

$$Prob(T|I,L) = Prob(T|N,L) = 1; \tag{3.3}$$
$$Prob(O|I,L) = Prob(O|N,L) = 0. \tag{3.4}$$

Period 4: A decides whether to explain to B why the painting is an interesting contribution to modern art (E_I) or to explain why it is not an interesting contribution to modern art (E_N).

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[1] This is the assumption I believe best captures the essence of the story of "The Emperor's New Clothes". Roughly the same results would follow, however, if it were assumed that A knew his or her ability.

[2] See Auman (1976) for the formal definition of common knowledge.

[3] After all, had not Clement Greenberg, that famous art critic, once said that "all profoundly original art looks ugly at first"? For an ironic discussion of this and other theories of art see Wolfe (1976).

Period 5: B decides whether to invite A to a prestigious party for the art elite (P) or to reject him or her (R).

Period 6: Utilities are determined. The von Neuman-Morgenstern utility of A, denoted U_A, is a function of whether A is invited to the party, of what A says about the painting, and, of A's impression of the painting. If A is invited to the party A's utility is increased with $F > 0$. However, A's utility is reduced by $C > 0$ if A's explanation to B differs from A's impression of the painting, i.e., if A finds the painting tasteless but argues that it is an interesting contribution to modern art, or, if A finds the painting original but argues that it is not an interesting contribution to modern art. The interpretation is that C represents the discomforts of inventing an argument for something one does not believe in. Alternatively, C may represent the expected costs of being caught lying. I assume that $F - C > 0$, i.e., that although lying is costly it may be worth it. The von Neuman-Morgenstern utility of B, denoted U_B, is a function of whether B invites A to the party and of A's ability. If B invites A to the party and A's ability is high the utility of B is $S > 0$. If B invites A to the party and A's ability is low the utility of B is $-D < 0$. The interpretation is that B wants A to impress B's other guests, who all are known to be of high ability. If B does not invite A to the party the utility of B is 0.

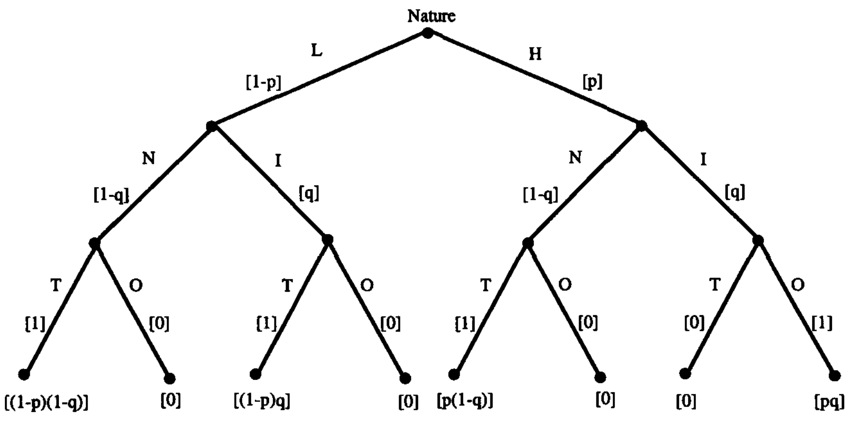

Figure 3.2. The first three periods of the Art Game.

3.2.2 Analysis of the model

To analyze the Art Game consider periods one to three (see Figure 3.2). In these periods nature first determines the ability of A then the character of the painting. The ability of A and the character of the painting then determines whether A finds the painting original or tasteless. Due to the assumptions made above, however, A will only find the painting original if A's ability is high and the painting actually is an interesting contribution to modern art. It follows that if A finds the painting original, A knows that his or her ability is high and that the painting is an interesting contribution to modern art. If A finds the painting tasteless, however, A cannot be sure whether this is because the painting is uninteresting or because A's ability is low.

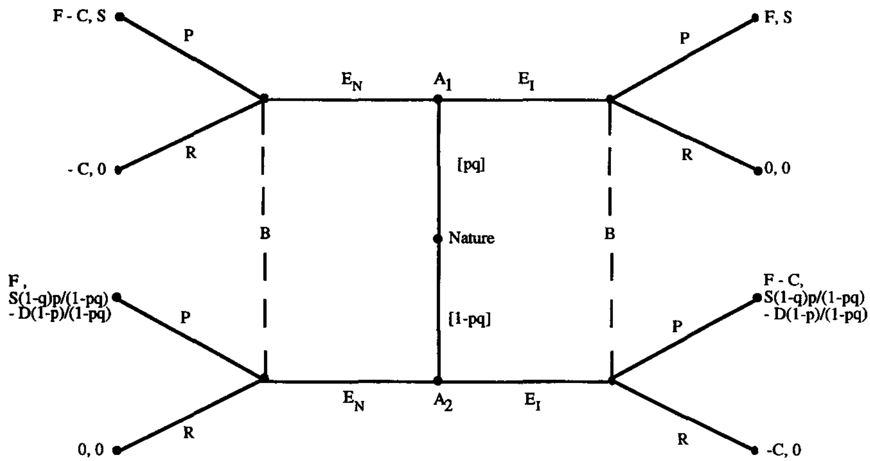

Figure 3.3. The Modified Game.

This reasoning suggests that the above game can be analyzed by considering a game in which A can be of two types. The first type (A_1) would be the individuals who find the painting original and thus know that the painting actually is interesting. The second type (A_2) would be the individuals who find the painting tasteless. In this Modified Game, depicted in Figure 3.3, periods one to three reduce to one period in which nature draws the type of A. There are thus four periods:

Period 1: Nature draws the type of individual A. Following the assumptions made above the probability that A will be of the first type is pq and the probability that A will be of the second type is $1 - pq$.

Period 2: A observes whether A_1 or A_2 was drawn in the first period. Then A decides whether to explain to B why the painting is an interesting contribution to modern art (E_I) or to explain why it is not an interesting contribution to modern art (E_N).

Period 3: B decides whether to invite A to a prestigious party for the art elite (P) or to reject him or her (R).

Period 4: Utilities are determined. The von Neuman-Morgenstern utility of A, U_A, is a function of whether A is invited to the party, of what A says about the painting, of A's impression of the painting, and, in this game, of A's type. As in the above game if A is invited to the party A's utility is increased with $F > 0$. And A's utility is reduced by $C > 0$ if A's explanation to B differs from A's impression of the painting, i.e., if A finds the painting tasteless but argues that it is an interesting contribution to modern art, or, if A finds the painting original but argues that it is not an interesting contribution to modern art. In the Modified game this implies that the utility of A is reduced by C if A is of the first type and argues that the painting is uninteresting, i.e., chooses E_N, and, that the utility of A is reduced by C if A is of the second type and argues that the painting is interesting, i.e., chooses E_I. Recall that $F - C > 0$. The von Neuman-Morgenstern utility of B, denoted U_B, is a function of whether B invites A to the party and of A's type. If B does not invite A to the party the utility of B is 0. If B invites A to the party and A is of the first type the utility of B is $S > 0$. If B invites A to the party and A is of the second type the expected utility of B is

$$Prob(H|A_2)S - Prob(L|A_2)D. \tag{3.5}$$

Since we have that

$$Prob(H|A_2) = \frac{Prob(A_2|H)Prob(H)}{Prob(A_2)} = \frac{(1-q)p}{1-pq}, \tag{3.6}$$

and, since

$$Prob(L|A_2) = \frac{Prob(A_2|L)Prob(L)}{Prob(A_2)} = \frac{1-p}{1-pq}, \tag{3.7}$$

it follows that the expected utility of B, if B invites A to the party and A is of the second type, is

$$\frac{S(1-q)p - D(1-p)}{1-pq}. \tag{3.8}$$

To define a perfect Bayesian equilibrium in the Modified Game denote the strategy of A, a mapping from $\{A_1, A_2\}$ into $\{E_I, E_N\}$, by $a(\cdot)$, and denote the strategy of B, a mapping from $\{E_I, E_N\}$ into $\{P, R\}$, by $b(\cdot)$. Moreover, let $\mu(A_1|E_I)$ and $\mu(A_2|E_I)$ be B's estimate of the probability that A is of the first and second type if B observes E_I. Similarily, let $\mu(A_1|E_N)$ and $\mu(A_2|E_N)$ be B's estimate of the probability that A is of the first and second type if B observes E_N. Using this notation a perfect Bayesian equilibrium (Cf. Fudenberg and Tirole, 1991), in the Modified Game, can be defined in the following way

Definition 3.1 *A perfect Bayesian equilibrium, in the Modified Game, is a pair of strategies, $a(\cdot)$ and $b(\cdot)$, and beliefs, $\mu(A_1|E_I)$, $\mu(A_2|E_I)$, $\mu(A_1|E_N)$ and $\mu(A_2|E_N)$, such that*

- *$a(\cdot)$ maximizes U_A given $b(\cdot)$.*
- *$b(\cdot)$ maximizes U_B given $a(\cdot)$, $\mu(A_1|E_I)$, $\mu(A_2|E_I)$, $\mu(A_1|E_N)$ and $\mu(A_2|E_N)$.*
- *$\mu(A_1|E_I)$, $\mu(A_2|E_I)$, $\mu(A_1|E_N)$ and $\mu(A_2|E_N)$ follows from Bayes rule and $a(\cdot)$, except after an event which according to $a(\cdot)$ should occur with probability zero. In this case it is only required that $0 \leq \mu(A_1|E_I) \leq 1$, $0 \leq \mu(A_2|E_I) \leq 1$, and $\mu(A_1|E_I)+\mu(A_2|E_I) = 1$, and, that $0 \leq \mu(A_1|E_N) \leq 1$, $0 \leq \mu(A_2|E_N) \leq 1$, and $\mu(A_1|E_N) + \mu(A_2|E_N) = 1$.*

Assuming that A and B can only use pure strategies, i.e., that they cannot randomize between different alternatives, there are only two possible types of equilibria in this game: separating and pooling.

Definition 3.2 *In a separating equilibrium the action A chooses in the second period if A observes A_1 is different from the action A chooses in the second period if A observes A_2.*

Definition 3.3 *In a pooling equilibrium A chooses the same action in the second period irrespective of if A observes A_1 or A_2.*

Proposition 3.1 *Whenever $Sp - (1-p)D > 0$ and*

$$\frac{S(1-q)p - D(1-p)}{1-pq} < 0, \tag{3.9}$$

the only perfect Bayesian equilibria in the Modified Game are the following two pooling equilibria: i) Irrespective of if A observes A_1 or A_2 A chooses E_I, B chooses P whenever B observes E_I, $\mu(A_1|E_I) = pq$ and $\mu(A_2|E_I) = 1 - pq$. ii) Irrespective of if A observes A_1 or A_2 A chooses E_N, B chooses P whenever B observes E_N, $\mu(A_1|E_N) = pq$ and $\mu(A_2|E_N) = 1 - pq$.

Proof: We first prove that there is no separating equilibrium under the above conditions. Two types of separating equilibrium are possible. In the first type of separating equilibrium A chooses E_I if A observes A_1 and A chooses E_N if A observes A_2. In this type of equilibrium B maximizes his or her utility by choosing P whenever he or she observes E_I. If,

$$\frac{S(1-q)p - D(1-p)}{1-pq} < 0, \tag{3.10}$$

B maximizes his or her utility by choosing R whenever B observes E_N. In this type of equilibrium, however, A's choice of E_N when A observes A_2 does not maximize A's utility given the choice of B. The reason is that if B chooses P whenever B observes E_I, A is better off by choosing E_I if A observes A_2.

In the second type of separating equilibrium A chooses E_N if A observes A_1 and A chooses E_I if A observes A_2. In this type of equilibrium, if

$$\frac{S(1-q)p - D(1-p)}{1-pq} < 0, \tag{3.11}$$

then B maximizes his or her utility by choosing R whenever he or she observes E_I, and, B maximizes his or her utility by choosing P whenever he or she observes E_N. In this type of equilibrium, however, A's choice of E_I when A observes A_2 does not maximize A's utility given the choice of B. The reason is that if B chooses P whenever B observes E_N, A is better off choosing E_N when A observes A_2.

Consider next the two types of pooling equilibria. Suppose that A chooses E_I irrespective of if A observes A_1 or A_2. It then follows from Bayes rule that $\mu(A_1|E_I) = pq$ and $\mu(A_2|E_I) = 1 - pq$. In this case, if $Sp - (1-p)D > 0$, then choosing P whenever B observes E_I maximizes B's utility. And given that B chooses P whenever B observes E_I, A maximizes U_A by choosing E_I irrespective of if A observes A_1 or A_2. Similarly, suppose that A chooses E_N irrespective of if A observes A_1 or A_2. It then follows from Bayes rule that $\mu(A_1|E_N) = pq$ and $\mu(A_2|E_N) = 1 - pq$. In this case, if $Sp - (1-p)D > 0$, then choosing P whenever B observes E_N maximizes B's utility. And given that B chooses P whenever B observes E_N, A maximizes U_A by choosing E_N irrespective of if A observes A_1 or A_2. *Q.E.D.*

Remark: Notice that Proposition 3.1 holds even if $C = 0$.

Although the above pooling equilibria are both perfect Bayesian the equilibrium in which A chooses E_N irrespective of if A observes A_1 or A_2 is not reasonable. To see why, notice that A could only gain by choosing E_I rather than E_N if A has observed A_1. It is therefore reasonable to believe that upon observing such a deviation from the equilibrium B will think that the deviator must be an individual of the first type. Given this belief A maximizes his or her utility by choosing E_I rather than E_N whenever A observes A_1, i.e., A maximizes his or her utility by deviating from the equilibrium.

The requirement that B, after observing a deviation from the equilibrium, should assign zero probability to types who cannot gain by defecting corresponds to what Cho and Kreps (1987) calls "the intuitive criterion". More formally, in the Modified Game, the intuitive criterion can be defined as follows:

Definition 3.4 *Let $U^*_{A_i}$ denote the utility of A, whenever A observes A_i, in the perfect Bayesian equilibrium PBE^*. According to the intuitive criterion B should, after observing a deviation from the perfect Bayesian equilibrium PBE^*, assign probability zero to A_i and probability one to A_j, if, A cannot possibly* *achieve a utility level equal to or higher than $U^*_{A_i}$ by deviating from PBE^* when A has observed A_i, but, A could achieve a utility level equal to or higher than $U^*_{A_j}$ by deviating from PBE^* when A has observed A_j.*[4]

Lemma 3.1 *i) In the pooling equilibrium in which A chooses E_I irrespective of if A observes A_1 or A_2 the intuitive criterion requires that $\mu(A_1|E_N) = 0$ and $\mu(A_2|E_N) = 1$. ii) In the pooling equilibrium in which A chooses E_N irrespective of if A observes A_1 or A_2 the intuitive criterion requires that $\mu(A_1|E_I) = 1$ and $\mu(A_2|E_I) = 0$.*

Proof: Consider first the pooling equilibrium in which A chooses E_I irrespective of if A observes A_1 or A_2. Since A could only possibly gain, by choosing E_N rather than E_I, after having observed A_2 it follows from the intuitive criterion that $\mu(A_1|E_N) = 0$ and $\mu(A_2|E_N) = 1$. Consider now the pooling equilibrium in which A chooses E_N irrespective of if A observes A_1 or A_2. Since A could only possibly gain, by choosing E_I rather than E_N, after having observed A_1 it follows from the intuitive criterion that $\mu(A_1|E_I) = 1$ and $\mu(A_2|E_I) = 0$. *Q.E.D.*

Definition 3.5 *A perfect Bayesian equilibrium, in the Modified Game, satisfies the intuitive criterion if, in addition to the requirements for a perfect Bayesian equilibrium, it is common knowledge that the out-of-equilibrium beliefs of B correspond to the intuitive criterion.*

Proposition 3.2 *If $Sp - D(1-p) > 0$ and*

$$\frac{S(1-q)p - D(1-p)}{1-pq} < 0, \tag{3.12}$$

then the only perfect Bayesian equilibrium in the Modified Game which satisfies the intuitive criterion is the pooling equilibrium in which A chooses E_I irrespective of if A observes A_1 or A_2, B chooses P whenever B observes E_I and R whenever B observes E_N, $\mu(A_1|E_I) = pq$ and $\mu(A_2|E_I) = 1 - pq$, and, the out-of-equilibrium beliefs of B are $\mu(A_1|E_N) = 0$ and $\mu(A_2|E_N) = 1$.

Proof: From Proposition 3.1 it follows that if $Sp - D(1-p) > 0$ and

$$\frac{S(1-q)p - D(1-p)}{1-pq} < 0, \tag{3.13}$$

then the only perfect Bayesian equilibria in the Modified Game are the following two pooling equilibria: i) A chooses E_I irrespective of if A observes A_1 or A_2, B chooses P whenever B observes E_I, $\mu(A_1|E_I) = pq$ and $\mu(A_2|E_I) = 1 - pq$.

[4]For the general definition see Cho and Kreps (1987).

ii) A chooses E_N irrespective of if A observes A_1 or A_2, B chooses P whenever B observes E_N, $\mu(A_1|E_N) = pq$ and $\mu(A_2|E_N) = 1 - pq$.

Consider first the pooling equilibrium in which A chooses E_N irrespective of if A observes A_1 or A_2, B chooses P whenever B observes E_N, and, where $\mu(A_1|E_I) = pq$ and $\mu(A_2|E_I) = 1-pq$. In this pooling equilibrium, as Lemma 3.1 demonstrates, the intuitive criterion requires that $\mu(A_1|E_I) = 1$ and $\mu(A_2|E_I) = 0$. Given these beliefs A maximizes his or her utility by choosing E_I rather than E_N after having observed A_1. That is, A maximizes his or her utility by deviating from the pooling equilibrium. Consider next the pooling equilibrium in which A chooses E_I irrespective of if A observes A_1 or A_2, B chooses P whenever B observes E_I, and $\mu(A_1|E_I) = pq$ and $\mu(A_2|E_I) = 1 - pq$. In this pooling equilibrium, as Lemma 3.1 demonstrates, the intuitive criterion requires that $\mu(A_1|E_N) = 0$ and $\mu(A_2|E_N) = 1$. Given these beliefs B maximizes his or her utility by choosing R whenever B observes E_N and by choosing P whenever B observes E_I, and, A maximizes his or her utility by choosing E_I both after having observed A_1 and A_2. That is, A maximizes his or her utility by adhering to the equilibrium. *Q.E.D.*

Remark: Suppose $C = 0$. Then the intuitive criterion cannot distinguish between the two pooling equilibria described in Proposition 3.1. The reason is that if $C = 0$ then A receives the same utility in both pooling equilibria irrespective of if A observes A_1 or A_2. It follows that if $C = 0$ Proposition 3.2 does not hold. On the other hand, if C is very small but positive, i.e., if individuals who think that the painting is original (tasteless) have a slight preference for explaining to B that the painting is (not) an interesting contribution to modern art, then Proposition 3.2 holds.

3.2.3 Comment

Proposition 3.2 shows that even if A has the impression that the painting is tasteless A will claim that it is an interesting contribution to modern art. More generally, Proposition 3.2 illustrates that individuals concerned with how they are perceived by others may praise practices and objects they suspect are worthless. The underlying model, however, could also be used to illustrate the second part of the story of "The Emperor's New Clothes" where the comment of a small child made everybody change their opinion. Consider, for example, what would happen, in the above model, if an art critic, who is commonly known to have deep insight into modern art and to be unconcerned with how others perceive him or her, proclaims that the painting is a pathetic attempt to gain the attention of the cultural elite instead of an interesting contribution to modern art. In this case others may suddenly agree with the art critic. To see why notice that such an individual would not have any incentives to lie about his or her reactions. Knowing this others can take the art critic's statements at face value. Moreover, since the art critic is known to have deep insight into modern art the fact that he or she did not find the painting original implies that it cannot be an interesting contribution to modern art. Other individuals can then reveal their own negative reactions without the fear that their insight into modern art will be considered inferior.

3.3 Examples

To illustrate some of the implications of the above model of the "Emperor's New Clothes" this section considers a few examples.

3.3.1 Arts

Although it is difficult to show that a specific example is an instance of the phenomenon of "The Emperor's New Clothes", the story of "Camera obscura" (Wictor, 1946) may be a good candidate. "Camera obscura" was the title of an acclaimed collection of modern poetry published in Sweden in 1946. Its authors were two medical students: Torgny Greitz and Lars Gyllensten. During five hours, agitated by wine and by the state of modern poetry, these two students produced a collection of "poems" which subsequently were submitted for publication under the pseudonym Jan Wictor. After favorable reviews the students made public that the collection was intended merely as a parody of modernistic poetry.

3.3.2 Architecture

The art-gallery addition at Yale may be another instance of the phenomenon of "The Emperor's New Clothes", at least if we believe Tom Wolfe's description of the incident. The background is the following: To the existing art-gallery, an Italian Romanesque palazzo, an addition was to be built and Louis Kahn was appointed as architect. However, "Kahn's addition was...a box...of glass, steel, concrete, and tiny beige bricks. As his models and drawings made clear...there would be no arches, no cornice, no rustication, no pitched roof - only a sheer blank wall of small glazed beige brick. The only details discernible on this slick and empty surface would be four narrow bands (string courses) of concrete at about ten-foot intervals. In the eyes of a man from Mars, or your standard Yale man, the building could scarcely have been distinguished from a woolco discount store in a shopping center." (Wolfe, 1981, p. 64). When presented with this model some of the Yale administrators objected that the addition had nothing to do with the existing building. "It has nothing to do with the existing building?" Kahn was flabbergasted. "You don't understand? You don't see it? You don't see the string courses? They express the floor lines of the existing building. They *reveal* the *structure*." (Wolfe, 1981, p. 65). In response to this, the Yale administrators, "baffled but somehow intimidated...yielded to the destiny of architecture and took it like a man" (Wolfe, 1981, p. 65).

3.3.3 Academic research

The logic behind the phenomenon of "The Emperor's New Clothes" also seems to be applicable to academic research in areas such as continental philosophy, theoretical sociology, mathematical economics, and marxism to only name a few. To illustrate how consider the following sequence of events. A researcher reads a new book. The ideas in the book can be original and deep or cryptic and mediocre. The ability of the researcher can be high or low. The ability of the researcher is unknown even to the researcher him or herself. If the ideas in the book are cryptic and mediocre no one will appreciate them. If the ideas are original and deep only researchers of high ability will appreciate them. Suppose now that after reading the book the researcher can choose to praise or criticize it. It follows that few researchers will criticize it even if many suspect that its ideas are cryptic and mediocre. This might have been what happened when the editors of *Social Text* accepted Alan Sokal's article "Transgressing Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity" (Sokal, 1996). In this article, concerning "the western intellectual outlook" and "formative hermeneutics", "nonlinearity" and "emancipatory mathematics", Alan Sokal argued for the progressve implications of "quantum gravity". Impressed, or perhaps baffled, the editors accepted the article. Later, however, in *Lingua Franca*, Alan Sokal revealed that the article only was intended as a parody of postmodernistic "research", and, that the text deliberately had been interspersed with logical contradictions and scientific humbug.

3.4 Additional Applications

The story of "The Emperor's New Clothes" illustrates how individuals concerned with how they are perceived by others may praise practices and objects they suspect are worthless. Several other phenomena, however, have a similar structure. This section considers a few of these.

3.4.1 The Criticism Game

The model of "The Emperor's New Clothes" can also illustrate why individuals concerned with how they are perceived by others may criticize books, movies and plays they personally appreciate. To develop a model of this consider, say, an individual A asked by B about his or her opinion on a popular book. Consider now the following game:

Period 1: Nature draws the ability of individual A. The ability of A can be high (H) or low (L). I assume that the ability of individual A is unknown to both A and B. It is common knowledge, however, that the ability of individual A is high with probability p.

Period 2: Nature draws the character of the book: whether the book is an unsophisticated best-seller (I) or a sophisticated piece of literature (N). The character of the book is unknown to both A and B. It is common knowledge, however, that the book is an unsophisticated best-seller with probability q.

Period 3: A's appreciation of the book is determined by A's ability and by the character of the book. A either appreciates the book (T) or finds it unsophisticated in comparison with modern literature (O). An individual of high ability will appreciate the book if and only if the book is a sophisticated piece of literature. And an individual of high ability will find it unsophisticated in comparison with modern literature if and only if it actually is an unsophisticated best-seller. Individuals of low ability, on the other hand, will always appreciate the book irrespective of if it is a sophisticated piece of literature or not.

Period 4: A decides whether to explain to B why the book is unsophisticated in comparison with modern literature (E_I), or, to explain to B why the book is a sophisticated piece of literature (E_N).

Period 5: B decides whether to invite A to a prestigious party for the local elite (P) or not (R).

Period 6: Utilities are determined. The utility of A is a function of whether A is invited by B, of what A says about the book, and, of A's appreciation of the book. If A is invited by B A's utility is increased with $F > 0$. However, A's utility is reduced by $C > 0$ if A explains to B that the book is a sophisticated piece of literature although A does not appreciate it, or, if A explains to B that the book is unsophisticated in comparison with modern literature although A appreciates it. I assume that $F - C > 0$. The utility of B is a function of whether B invites A and of A's ability. If B invites A and A's ability is high the utility of B is $S > 0$. If B invites A and A's ability is low the utility of B is $-D < 0$. The interpretation is that B wants A to impress B's other guests, who all are known to be of high ability. If B does not invite A the utility of B is zero.

Applied to the Criticism Game Proposition 3.2 shows that even if an individual appreciates a book, movie or play, this individual may nevertheless denigrate it. The reason is that the individual realizes that his or her taste may not be sufficiently refined.

3.4.2 The Questioning Game

A phenomenon similar to that of "The Emperor's New Clothes" is that individuals concerned with how they are perceived by others may abstain from asking for clarification when presented with information they do not understand. To develop a model of this consider, say, a professor who visits a firm and gives a lecture in front of a group of senior managers, including the CEO of the firm. In terms of the model in section 3.2 let A be one the senior managers and let B be the CEO. Consider now the following game:

Period 1: Nature draws the ability of individual A. The ability of A can be high (H) or low (L). I assume that the ability of individual A is unknown to both A and B. It is common knowledge, however, that the ability of individual A is high with probability p.

Period 2: Nature draws the character of the lecture: whether the lecture is clear (I) or unclear (N). The character of the lecture is unknown to both A and B. It is common knowledge, however, that the lecture is clear with probability q.

Period 3: A's understanding of the lecture is determined by A's ability and by the character of the lecture. A either understands the lecture (O) or not (T). An individual of high ability will understand the lecture if and only if the lecture is clear. And an individual of high ability will fail to understand the lecture if and only if the lecture is unclear. Individuals of low ability, on the other hand, will never understand the lecture irrespective of if it is clear or not.

Period 4: A decides whether to ask the lecturer to clarify the presentation (E_N) or to be silent (E_I). I assume that if A asks the lecturer to clarify the presentation the clarification does not reveal whether the presentation was unclear or not. For example, the lecturer may explain the same point in more detail. Then, since individuals of high ability might have understood also the less detailed explanation, it does not follow from the fact that the lecturer had to clarify the presentation that the original presentation was unclear in the sense that no one could have understood it.

Period 5: B decides whether to promote A (P) or to reject him or her for a promotion (R).

Period 6: Utilities are determined. The utility of A is a function of whether A is promoted, of whether A asks the lecturer to clarify the presentation, and, of A's understanding of the lecture. If A is promoted A's utility is increased with $F > 0$. However, A's utility is reduced by $C > 0$ if A understands the lecture but nevertheless asks the lecturer to clarify the presentation to B, or, if A does not understand the lecture but does not ask the lecturer to clarify the presentation. I assume that $F - C > 0$. The utility of B is a function of whether B promotes A and of A's ability. If B promotes A and A's ability is high the utility of B is $S > 0$. If B promotes A and A's ability is low the utility of B is $-D < 0$. The interpretation is that B wants A to perform a task whose outcome either can be a success or a failure, only individuals of high ability will succeed, and, A's liability is limited so that A cannot be made the residual claimant. If B does not promote A the utility of B is zero.

Applied to the Questioning Game Proposition 3.2 shows that even if the senior manager does not understand the lecture, he or she will still abstain from asking the lecturer to clarify the presentation. The reason is that the manager realizes that the reason why he or she does not understand the lecture could be that his or her ability is low. More generally, the Questioning Game shows that if members of an organization believe that there is a chance that they will be revealed as incompetent, ignorant or deviant in any other way, they will rather be silent than questioning instructions and information they do not understand.[5]

Sometimes this mechanism can be used deliberately to silence potential critics. For example, if criticized one may respond by referring to technicalities the critic will not dare to challenge.[6] An intriguing example of this type of tactic can be found in Jerzy Kosinski's novel *Cockpit* (Kosinski, 1975), which, among other things, contains a detailed description of the successful attempt of a young scientist to escape a communist country. An important part of the plan behind the escape was the creation of four purely fictional members of the Academy of Science. First, letterhead is ordered in their names. Second, these fictional individuals are used to initiate a request for a foreign research scholarship. The plan's success relies on the power of the Academy's seal on official papers; on the fact that no one would dare to question the existence of member of the Academy of Science.

[5]In this example we only considered the decision of one individual. An even more interesting situation, however, is when several individuals are deciding simultaneously whether to ask for clarification. Consider, for example, a classroom where several students are listening to an incomprehensible lecture. Each of them have to decide whether and when to ask for clarification. Obviously, only the first student to ask will risk being considered ignorant. The others get the benefits without the costs. As this example illustrates, asking for clarification is a public good which could be supplied by a single individual. Such situations can be analyzed as a war of attrition in which two players (or more) wait for their opponent(s) to perform some public service and the player(s) who waits longest gets the benefits of this public service but avoids the costs of supplying it (Bliss and Nalebuff, 1984; Bilodeau and Slivinski, 1996). Using such models it would be easy to show that individuals who are most in need of clarification, or value it most, will be the ones who will have to ask for clarification. This also suggests a "Matthew effect" in intellectual reputation: individuals who are considered intelligent and learned seldom have to reveal their ignorance.

[6]Academic seminars provide excellent opportunities for the study of this tactic.

3.4.3 The Adoption Game

Another version of "The Emperor's New Clothes" is that individuals may adopt an innovation even if they do not believe in it. To develop a model of this consider, say, a young ambitious CEO who has to decide whether to adopt a new managerial technique (such as Management by Objectives, Strategic Planning, Reengineering etc.). In terms of the model in section 3.2 let A be the CEO and let B be an attractive potential future employer of A. Consider now the following game:

Period 1: Nature draws the ability of individual A. The ability of A can be high (H) or low (L). I assume that the ability of individual A is unknown to both A and B. It is common knowledge, however, that the ability of individual A is high with probability p.

Period 2: Nature draws the profitability of adopting the managerial technique. Adopting the managerial technique can be profitable (I) or unprofitable (N). The profitability of adopting the managerial technique is unknown to both A and B. It is common knowledge, however, that the managerial technique is profitable with probability q.

Period 3: Whether A thinks that the new managerial technique is profitable (O) or not (T) is determined by A's ability and by the profitability of adopting the managerial technique. An individual of high ability will think that adopting the managerial technique is profitable if and only if adopting the managerial technique actually is profitable. And an individual of high ability will think that adopting the managerial technique is unprofitable if and only if adopting the managerial technique actually is unprofitable. Individuals of low ability, on the other hand, will always think that adopting the new managerial technique is unprofitable. In other words, managers of low ability will not be able to understand the advantages of using modern managerial techniques.

Period 4: A decides whether to adopt the new managerial technique (E_I) or not (E_N).

Period 5: B decides whether to employ A (P) or not (R).

Period 6: Utilities are determined. The utility of A is a function of whether A is employed by B, of whether A adopts the managerial technique, and, of whether A thinks that the managerial technique is profitable. If A is employed by B A's utility is increased with $F > 0$. However, A's utility is reduced by $C > 0$ if A adopts the managerial technique although he or she thinks it is unprofitable, or, if A does not adopt the managerial technique even though he or she believes it to be profitable. I assume that $F - C > 0$. Here, this assumption implies that the benefits of being employed by B (F) are greater than the costs of not maximizing profits at the current firm (C). The utility of B is a function of whether B employs A and of A's ability. If B employs A and A's ability is high the utility of B is $S > 0$. If B employs A and A's ability is low the utility of B is $-D < 0$. The interpretation is that B wants A to perform a task whose outcome either can be a success or a failure, only individuals of high ability will succeed, and, A's liability is limited so that A cannot be made the residual claimant. If B does not employ A the utility of B is zero.

Applied to the Adoption Game Proposition 3.2 shows that even if the CEO thinks that adopting the new managerial technique is not profitable he or she will nevertheless adopt it. More generally, the Adoption Game shows that if individuals believe that there is a chance that they will be revealed as incompetent or ignorant by not adopting the latest techniques or products, they will adopt them even if they do not believe in them.[7]

3.4.4 The Morality Game

The model of "The Emperor's New Clothes" can also shed some light on the incentives to be politically correct. To see how, consider a somewhat controversial event, an incident, whose moral implications A is supposed to evaluate. Listening to this evaluation is B, an individual of recognized social status, who wants to assess the moral fibre of A. Consider now the following game:

Period 1: Nature draws the moral sensitivity of individual A. The moral sensitivity of A can be high (H) or low (L). I assume that the moral sensitivity of individual A is unknown to both A and B. It is common knowledge, however, that the moral sensitivity of individual A is high with probability p.

Period 2: Nature draws the character of the case under consideration: whether the behavior actually was an example of outrageous, immoral, behavior (I) or not (N). The character of the case is unknown to both A and B. That is, A and B have not had the time to check all the facts. It is common knowledge, however, that if an incident occurs it is an example of outrageous, immoral, behavior with probability q.

Period 3: Whether A thinks, based on just a few facts, that the the incident is an example of outrageous, immoral, behavior (O) or not (T), is determined by A's moral sensitivity and by the character of the case. An individual of high moral sensitivity will think that the behavior is an example of outrageous, immoral, behavior if and only if the behavior actually is an example of outrageous, immoral, behavior. And an individual of high moral sensitivity will think that the behavior is not an example of outrageous, immoral, behavior if and only

[7] This mechanism could also be used deliberately by, say, management consultants promoting various managerial techniques.

if the behavior actually is not an example of outrageous, immoral, behavior. Individuals of low moral sensitivity, on the other hand, will always think that the behavior is not an example of outrageous, immoral, behavior.

Period 4: A decides whether to explain to B why the behavior is an example of outrageous, immoral, behavior (E_I), or, to explain to B why the behavior is not an example of outrageous, immoral, behavior (E_N).

Period 5: B decides whether to invite A to a prestigious party for the local elite (P) or not (R).

Period 6: Utilities are determined. The utility of A is a function of whether A is invited by B, of what A says about the incident, and, of whether A thinks that the behavior is an example of outrageous, immoral, behavior or not. If A is invited by B A's utility is increased with $F > 0$. However, A's utility is reduced by $C > 0$ if A explains to B that the behavior is an example of outrageous, immoral, behavior although A does not believe this, or, if A explains to B that the behavior is not an example of outrageous, immoral, behavior although A believes it to be. I assume that $F - C > 0$. The utility of B is a function of whether B invites A and of A's moral sensitivity. If B invites A and A's moral sensitivity is high the utility of B is $S > 0$. If B invites A and A's moral sensitivity is low the utility of B is $-D < 0$. The interpretation is that B wants A to impress B's other guests, who all are known to be morally sensitive. If B does not invite A the utility of B is 0.

Applied to the Morality Game Proposition 3.2 shows that even if an individual believes that some behavior is moral, this individual may nevertheless state that it is immoral. The reason is that the individual realizes that he or she may not be sufficiently stringent.

3.5 Final Remarks

The story of "The Emperor's New Clothes" illustrates the difficulty of providing incentives for both advancement and truthtelling. The promise of promotions, honor, and social esteem provide powerful incentives for ambitious individuals but does not always encourage frankness. At medieval courts this dilemma was solved in part by making truthtelling the responsibility of the "Fool". In modern organizations old experienced members of the board or of the top management team have a similar role. With nothing to prove, or, perhaps, nothing to strive for, these individuals can state their true opinions. It follows that although they may seem to be contributing with little removing them may be a mistake.

Appendix: List of Symbols

A	Sender in the Art Game
B	Receiver in the Art Game
H	The ability of an individual of high ability
L	The ability of an individual of low ability
p	The probability that A's ability is high
$\mu(\cdot)$	B's belief about the ability of A
I	The painting is a contribution to modern art
N	The painting is not a contribution to modern art
q	The probability that the painting is interesting
O	A finds the painting original
T	A finds the painting tasteless
E_I	A explains why the painting is interesting
E_N	A explains why the painting is uninteresting
P	B decides to invite A to a party
R	B decides to reject A
U_A	Utility of individual A
U_B	Utility of individual B
F	The increase in A's utility if B invites A
C	The cost for A of lying
S	The utility of B if B invites A and A's ability is high
$-D$	The utility of B if B invites A and A's ability is low
A_i	Individual A of type $i \in [1, 2]$
$a(\cdot)$	The strategy of individual A
$b(\cdot)$	The strategy of individual B
$U^*_{A_i}$	The utility of A_i in the equilibrium PBE^*

Chapter 4

Career Concerns

4.1 Introduction

"It is the vanity, not the ease and pleasure, which interests us" Adam Smith observes in his *Theory of Moral Sentiments.*[1] This obviously has positive consequences. Individuals who desire to display their talents may work overtime, volunteer for difficult and complex tasks, and, advise fellow-workers.[2] However, the desire to display talent also has negative consequences. In particular, individuals may choose activities in order to most effectively display rather than utilize their talents. As a result they may disregard anonymous routine work and focus on activities with a greater potential for "dramatic self-expression" (Goffman, 1959, p. 31). Their most important concern may not be the quality of their work but how to attain a high profile.

Practical advice on how this can be accomplished can be found in any book on "career strategies". "Wheedle your way into high-visibility projects", one book suggests and continues: "If some important project is 'brewing,' try to get involved. Drop suggestions to your boss or to others in the department." (Mitchell and Burdick, 1985, p. 179). Another book suggests that to "...maintain a high visibility, get your message across through the appropriate channels: publish where possible, become involved in industry functions when necessary, become community-oriented and socially active." (Miller, 1973, p. 60). This book also draws the attention of ambitious young executives to the fact that "Every man who wants to get ahead in a corporation shudders at the thought of being assigned to some remote corporation outpost in the so-called boondocks.

[1]Smith (1982, p. 50).

[2]Cf. Akerlof (1976) and Landers et. al. (1996). For further discussion of the incentive effects of career concerns see e.g. Fama (1980), Holmström (1982) and Gibbons and Murphy (1992).

He knows that once there he will no longer have access to the people in power, the people he must reach to further his chances for corporate glory" (Miller, 1973, p. 102). Following this warning the author lists methods by which individuals who nevertheless have been assigned to corporate outposts can receive the attention of the people in power.

Several writers have noted the potential dysfunctional effects of career concerns. Examples include discussions about managerial conservatism (Hirshleifer and Thakor, 1993; Holmström and Ricart i Costa, 1986; Prendergast and Stole, 1996), short-term orientation (Narayanan, 1985a, 1985b), herd behavior (Palley, 1995; Scharfstein and Stein, 1990; Zweibel, 1995), and influence attempts (Milgrom and Roberts, 1992, 1990b, 1988). This essay contributes to this literature by providing further reasons why career concerns may lead individuals to engage in unproductive activities in order to display talent or to conceal a lack of talent. Specifically, section 4.2 shows that in order to display talent individuals of high ability will prefer tasks which are visible, unprepared, precise, individual and which are perceived to be difficult. Visible because anonymous tasks may be performed skillfully but no one notices. Unprepared because only individuals of high ability can succeed without preparation, but, if prepared, individuals of low ability may succeed. Precise because only individuals of high ability will succeed in tasks where performance is largely a matter of skill while individuals of low ability may succeed if chance plays an important role in determining performance. Individual because only individuals of high ability can succeed on their own while individuals of low ability may succeed if they work together with others. Difficult because tasks which require a high minimal ability can only be successfully performed by individuals of high ability.

Section 4.3 makes use of these observations to discuss education, corporate management, academic research, and subcultures. Consider, for example, corporate management. If corporate managers of high ability have a desire to display their talent this suggests that they would prefer to personally make all important decisions even if this type of centralization does not maximize the value of the firm. By making all important decisions themselves they can make sure that a good performance is attributed to their decisions and actions rather than to the decisions and actions of their subordinates. Or consider academic research. Here the desire to display talent suggests that PhD. students of high ability will prefer precisely delineated research questions and methodologies which require substantial technical ability even if this type of research does not address important problems.

Section 4.4 focus on signal jamming, i.e., unproductive activities individuals of low ability may engage in to conceal a lack of talent. Specifically, section 4.4 shows that individuals of low ability may prefer unproductive but anonymous tasks to productive but visible tasks, and, that individuals of low ability may prefer working in unfamiliar fields whose difficulty is less well-known. Section 4.4 also shows that individuals of low ability may engage in "self-handicapping" behavior, i.e., behavior which reduces their probability of success at a difficult task. In this way a bad performance can be attributed to extenuating circumstances rather than to a lack of talent. Section 4.4 also explain why individuals of low ability may choose to work in teams even if working individually is more productive, and, why individuals of low ability may choose an excessively risky task in order to have some chance of being identified as an individual of high ability.

In section 4.5 these observations are used to discuss education, corporate management, and academic research. Consider, for example, education. To conceal a lack of talent students may ignore school and homework. In this way failure at exams can be attributed to a lack of preparation rather than to a lack of ability. Similar reasons suggest that corporate managers of low ability may prefer to work in firms and industries in which there is a considerable risk of failure. In this way failure can be attributed to external events rather than to a lack of talent.

4.2 Signaling

The inefficiency of career concerns is partly a result of the desire to signal ability. To illustrate this a simple signaling model is developed in section 4.2.1. In sections 4.2.2 to 4.2.5 several variations of this model are developed. These variations can be seen as complements to the Spence (1973) model of signaling. By specifying characteristics of good signals they provide more specific predictions of the type of activities that will be used as signals.

4.2.1 Visibility

To illustrate how career concerns may lead individuals of high ability to perform inefficient activities consider the choice between a visible and an anonymous task. To display talent an individual obviously must choose a task whose performance is visible to others. Anonymous tasks may be performed skillfully but no one notices. Because of this an individual may choose a visible but unproductive activity instead of an anonymous and productive activity. To see this consider the following simple game, Game 4.1, involving a worker and two firms.[3] The timing is as follows:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$ (for a complete list of symbols see Appendix A). The ability of the worker is known only to the worker. However, the two firms know that the probability that the worker's ability is high is p. I also assume that the worker knows that the two firms know this and that the two

[3] In this model the assumption that there are only two firms is without loss of generality: the outcome would have been the same if there would have been more than two firms.

firms know that the worker know this, and so on, *ad infinitum.* That is, I assume that it is *common knowledge* that the probability that the worker's ability is high is p.[4]

Period 2: The worker observes his or her ability. The worker then decides between working, for him or herself, at a visible but less productive task (V) or at a more productive but anonymous task (A).[5] The output from working at the visible task, x_V, is

$$x_V = \alpha. \tag{4.1}$$

The output from working at the anonymous task, x_A, is

$$x_A = \alpha + k, \tag{4.2}$$

where k is a positive constant. Thus, working at the anonymous task is more productive. However, while both firms observe the output of workers working at the visible task, no one will observe the output of a worker working at the anonymous task. The output from working at the visible and the anonymous task for workers of high and low ability is summarized in Table 4.1.

Period 3: Both firms observe the worker's choice of task, and, if the worker chose the visible task, both firms observe the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 4: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 5: Payoffs are determined. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the output the worker produces in period 2, and, w is the wage the worker receives in period 4. Notice that this specification of the worker's utility function assumes that the worker, in the second period, receives the output him or herself. A natural interpretation is thus that the worker, in the second period, works for him or herself. However, another possible interpretation is that the worker, in the second period, works at a firm where the worker receives a wage equal to his or her output.

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[4]See Auman (1976) for the formal definition of common knowledge.

[5]In another interpretation individuals choose between an activity whose results are visible in the short-run and a more productive activity whose results are only visible in the long-run [Cf. Narayanan (1985a, 1985b)].

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Visible	H	Visible	L
Anonymous	$H+k$	Anonymous	$L+k$

Table 4.1: Output in Game 4.1 for workers of high and low ability.

To define an equilibrium in Game 4.1 denote the strategy of the worker, a mapping from $\{H, L\}$ into $\{V, A\}$, by $s(\cdot)$, and denote the strategy of firm j, a mapping from $E[\alpha]$, the firms' common belief about the expected ability of the worker, to w_j, by $f_j(\cdot)$. Using this notation a perfect Bayesian equilibrium, PBE, in Game 4.1, can be defined in the following way

Definition 4.1 *A perfect Bayesian equilibrium, in Game 4.1, is a triple of strategies, $s(\cdot)$, $f_1(\cdot)$, and $f_2(\cdot)$, and a common belief $E[\alpha]$, such that*

- *$s(\cdot)$ maximizes U given $f_1(\cdot)$ and $f_2(\cdot)$.*
- *$f_1(\cdot)$ maximizes π_1 given $s(\cdot)$, $f_2(\cdot)$ and $E[\alpha]$.*
- *$f_2(\cdot)$ maximizes π_2 given $s(\cdot)$, $f_1(\cdot)$ and $E[\alpha]$.*
- *$E[\alpha]$ follows from Bayes rule and $s(\cdot)$, except after an event which according to $s(\cdot)$ should occur with probability zero. In this case it is only required that $L \leq E[\alpha] \leq H$.*

Notice that this definition requires that both firms share a common belief, $E[\alpha]$, also after observing a choice of the worker which, according to $s(\cdot)$, should occur with probability zero. In other words, the definition requires that both firms share a common belief even in a situation in which both firms could, without violating the requirements of rationality, have different beliefs.

To solve for the equilibrium in Game 4.1 consider the strategy of the two firms and the choice of workers of low and high ability.

Firms: In any perfect Bayesian equilibrium we have that $w_j = E[\alpha]$. To see this notice that an offer larger than $E[\alpha]$ cannot be part of a perfect Bayesian equilibrium since by making this offer firm j would make an expected loss while by offering a wage equal to $E[\alpha]$ firm j's expected loss would be zero. Notice also that an offer below $E[\alpha]$ cannot be part of any perfect Bayesian equilibrium. To see this let $E[\alpha] - \epsilon$ be the wage offered by firm j. Given this offer the best response of firm i would be to offer the worker a slightly higher wage, $E[\alpha] - \frac{\epsilon}{2}$, for example. But if firm i offers the worker a slightly higher wage firm j maximizes π_j by offering an even higher wage, $E[\alpha] - \frac{\epsilon}{4}$, for example. That is, offering the worker a wage of $E[\alpha] - \epsilon$ cannot be part of any perfect Bayesian equilibrium. Notice, finally, that it cannot be a perfect Bayesian equilibrium that one or both firms do not make the worker an offer. For if firm i does not make the worker an offer, the best response of firm j is to make the worker an offer of, say, $w_j = \epsilon$. If firm j makes the worker an offer of $w_j = \epsilon$, however, the best response of firm i is to make the worker a slightly larger offer. In other words, it cannot be a perfect Bayesian equilibrium that one or both firms do not make the worker an offer.[6]

Workers of low ability: In any perfect Bayesian equilibrium workers of low ability will choose the anonymous task. If a worker of low ability chooses the visible task his or her utility is $2L$. If a worker of low ability chooses the anonymous task, however, his or her output is $L + k$. And since the lowest wage the worker can receive is L the utility a worker of low ability receives from choosing the anonymous task must be higher than his or her utility from choosing the visible task.

Workers of high ability: If a worker of high ability chooses the visible task his or her output is H and his or her wage is H. If a worker of high ability chooses the anonymous task his or her output is $H + k$. The wage, however, is lower than H. Specifically the wage a worker of high ability receives if he or she chooses the anonymous task, given that all workers of low ability will choose the anonymous task, is

$$Hp + L(1 - p). \tag{4.3}$$

It follows that whenever this expression plus $H + k$ is less than $2H$ workers of high ability will choose the anonymous task. After some algebra (see Appendix B) we have the following proposition

Proposition 4.1 *Whenever,*

$$k < (H - L)(1 - p). \tag{4.4}$$

workers of high ability will, in the unique PBE, choose the visible task.

In other words, whenever the difference in ability, and, therefore, the difference in future wages, is sufficiently high, workers of high ability will prefer a visible but less productive task. The principle underlying Proposition 4.1 also explains why individuals of high ability prefer dramatic tasks. To develop a reputation for talent individuals must not only make sure that their performances are observed. The word about them must also be spread. For this reason their performances must be dramatic; they must be vivid, surprising, and, exciting.

[6]In other words, despite the fact that each firm is indifferent between making the worker an offer of $w_j = E[\alpha]$ and not making the worker an offer it cannot be an equilibrium that one firm or both firms do not make the worker an offer.

Such performances provide the audience with a good story. And this increases the probability that others will hear about it. Because of this effect performing a dramatic task can often be more valuable than performing a more productive but less dramatic task.

4.2.2 Preparation

A good task for signaling ability, in addition to being visible and dramatic, should also provide a conclusive test of ability. To provide a conclusive test of ability, however, the amount of preparation must be limited, or, at least controlled. Otherwise it is difficult to know whether a good result is to be attributed to talent or to persistent preparation. It follows that individuals of high ability may deliberately choose to perform a task with insufficient preparation (Cf. Tice and Baumeister, 1990). To see this consider Game 4.2:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: The worker observes his or her ability. The worker then decides between working, for him or herself, at a task without preparation (N) or, at the same task with sufficient preparation (P). If the worker starts working unprepared his or her output, x_N, is

$$x_N = \alpha. \tag{4.5}$$

It follows that working unprepared perfectly reveals the ability of the worker.

If the worker prepares his or her output, x_P, is

$$x_P = \begin{cases} H + k & \text{with probability } d \\ \alpha + k & \text{with probability } 1 - d \end{cases}$$

where k is a positive constant and $d \in [0, 1]$. Thus, being prepared always increases output. However, since after preparation workers of low ability produce $H + k$ with probability d, good results will only be an imperfect signal of high ability. The output from being prepared and being unprepared for workers of high and low ability is summarized in Table 4.2.[7]

Period 3: Both firms observe the worker's choice of preparation and the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

[7]Notice that even if $d = 0$ Game 4.2 is not identical to Game 4.1. The reason is that in Game 4.2 the output at both tasks is observable while in Game 4.1 only the output at the visible task is observable.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Not prepared	1	H	Not prepared	1	L
Prepared	d	$H+k$	Prepared	d	$H+k$
	$1-d$	$H+k$		$1-d$	$L+k$

Table 4.2: Output in Game 4.2 for workers of high and low ability.

Period 4: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 5: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the expected output the worker produces in period 2, and, w is the wage the worker receives in period 4. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.2 consider the strategy of the two firms and the choice of workers of low and high ability.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of low ability: In any perfect Bayesian equilibrium workers of low ability will choose to prepare. If a worker of low ability chooses not to prepare the worker's utility is $2L$. If a worker of low ability chooses to prepare, however, the worker's expected output is $d(H + k) + (1 - d)(L + k) \geq L + k$. And since the lowest wage the worker can receive is L the utility of a worker of low ability from choosing to prepare must be higher than the utility from choosing not to prepare.

Workers of high ability: If a worker of high ability chooses not to prepare his or her output is H and his or her wage is H. If a worker of high ability chooses to prepare his or her output is $H + k$. The wage, however, is lower than H. Specifically, if workers of high ability choose to prepare they will produce an output of $H + k$. Since also workers of low ability could have produced this output the wage will be equal to the expected ability of a worker producing $H + k$. To calculate the expected ability of a worker producing $H + k$ notice that all workers of high ability will produce $H + k$ but only d percent of workers of low ability will produce $H + k$. It follows that the probability that a worker will produce $H + k$ is $p + (1 - p)d$ and that the expected ability of a worker producing $H + k$ is

$$\frac{p}{p + (1-p)d}H + \frac{(1-p)d}{p + (1-p)d}L \tag{4.6}$$

Since workers of high ability receive $2H$ if they choose not to prepare it follows that workers of high ability will choose not to prepare if $2H$ is larger than the above expression plus $H + k$. After some algebra (see Appendix B) we have the following proposition

Proposition 4.2 *Whenever,*

$$k < \frac{(H-L)(1-p)d}{p+(1-p)d}, \tag{4.7}$$

workers of high ability will, in the unique PBE, choose not to prepare.

In other words, if the difference between H and L is sufficiently high, workers of high ability will choose not to prepare.

4.2.3 Perceived difficulty

A good task for signaling ability should not only be a conclusive test of ability. Its difficulty should also be well-known. A productive task whose difficulty is not well-known is less valuable than a less productive task whose difficulty is well-known.[8] To see this consider Game 4.3:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: The worker observes his or her ability. The worker then decides between working, for him or herself, at a familiar task (F) or, at an unfamiliar task (E). The output from working at the familiar task, x_F, is

$$x_F = \alpha. \tag{4.8}$$

The difficulty of the familiar task is well-known. Everybody knows that if someone produces H his or her ability must be high whereas if someone produces L his or her ability must be low. Thus, working at the familiar task perfectly reveals the ability of the worker.

[8] One case in point is nursing: "A patient will see his nurse stop at the next bed and chat for a moment or two with the patient there. He doesn't know that she is observing the shallowness of the breathing and color and tone of the skin. He thinks she is just visiting. So, alas, does his family who may thereupon decide that these nurses aren't very impressive". Lentz (1954, p. 2). Cited in Goffman (1959, p. 31).

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Familiar	H	Familiar	L
Unfamiliar	$H+k$	Unfamiliar	$L+k$

Table 4.3: Output in Game 4.3 for workers of high and low ability.

The output from working at the unfamiliar task, x_E, is

$$x_E = \alpha + k, \tag{4.9}$$

where k is a positive constant. Thus, the output from working at the unfamiliar task is higher than the output from working at the familiar task. However, its difficulty is not well-known. Not everybody understand that producing $H+k$ means that ones ability must be high. Specifically, the probability that both firms understand this is $y \in (0,1)$. With probability $1-y$, however, both firms believe that observing a worker producing $H+k$ or $L+k$ does not provide any information about the worker's ability. The output for workers of high and low ability from working at the familiar and the unfamiliar task is summarized in Table 4.3.[9]

Period 3: Both firms observe the worker's choice of task and the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers. Both firms know that if the worker produces H working at the familiar task his or her ability must be high whereas if the worker produces L his or her ability must be low. With probability $y \in (0,1)$ both firms understand that if the worker produces $H+k$ working at the unfamiliar task his or her ability must be high whereas if the worker produces $L+k$ his or her ability must be low. With probability $1-y$, however, both firms believe that observing the worker producing $H+k$ or $L+k$ working at the unfamiliar task does not provide any information about the worker's ability.

Period 4: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 5: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the output the worker produces in period 2, and, w is the expected wage the worker receives in period 4. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.3 consider the strategy of the two firms and the choice of workers of low and high ability.

[9]Notice that if $y = 0$ Game 4.3 is identical to Game 4.1.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$. It follows that if a worker chooses the unfamiliar task the worker's wage will be α with probability y and $pH+(1-p)L$ with probability $(1-y)$.

Workers of low ability: In any perfect Bayesian equilibrium workers of low ability will choose the unfamiliar task. If workers of low ability choose the familiar task they utility is $2L$. If they choose the unfamiliar task, however, their output is $L+k$. And since the lowest wage they can receive is L the utility for workers of low ability from choosing the unfamiliar task must be higher than the utility from choosing the familiar task.

Workers of high ability: If a worker of high ability chooses the familiar task his or her output is H and his or her wage is H. If a worker of high ability chooses the unfamiliar task his or her output is $H+k$. The expected wage, however, is lower than H. Specifically, the wage if they choose the unfamiliar task is

$$yH + (1-y)[pH + (1-p)L]. \tag{4.10}$$

Since workers of high ability receive $2H$ if they choose the familiar task it follows that they will choose the familiar task if $2H$ is larger than the above expression plus $H+k$. After some algebra (see Appendix B) we have the following proposition

Proposition 4.3 *Whenever,*

$$k < (H-L)(1-y)(1-p), \tag{4.11}$$

workers of high ability will, in the unique PBE, choose the familiar task.

In other words, if the difference between H and L is sufficiently large and y is sufficiently low, workers of high ability will choose an unproductive task which is perceived to be difficult rather than a productive task whose difficulty is not well-known.[10]

4.2.4 Individuality

A good task for signaling ability should also be performed individually. The reason is simple. Only a talented individual can succeed on her own. But even an untalented individual can succeed in a team. To illustrate this consider Game 4.4:

[10]Bernheim (1991) and Bernheim and Redding (1996), in a similar vein, note that an increase in the observable component of the cost of an activity can lead to more widespread use of that activity as a signal.

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: The worker observes his or her ability. The worker then decides between working, for him or herself, in a team consisting of two individuals (T) or working individually (I). The output from working individually, x_I, is

$$x_I = \alpha. \tag{4.12}$$

It follows that working individually perfectly reveals the ability of the worker.

If the worker decides to work in a team he or she is randomly paired with another worker. Specifically, I assume that there is a large but finite number of workers. All workers are in the same position: they all have to decide whether to work individually or in a team knowing that future employers will observe this choice and will observe their output if they work individually or in a team. I further assume that it is common knowledge that the probability that each worker is of high ability is p.

Consider now the probability that a worker, who has chosen to work in a team, will be paired with a worker of high ability. If the number of workers is large and if we consider only the first worker to be matched this probability can be approximated with

$$\frac{\eta_h p}{\eta_h p + \eta_l (1-p)}. \tag{4.13}$$

Here η_h is the proportion of workers of high ability who decide to work in a team, and, η_l is the proportion of workers of low ability who decide to work in a team.

For the same reasons as above we have that the probability that a worker, who has chosen to work in a team, will be paired with a worker of low ability, can be approximated with

$$\frac{\eta_l (1-p)}{\eta_h p + \eta_l (1-p)}. \tag{4.14}$$

I assume that the output, for each worker, from the resulting team, x_T, is

$$x_T = \max(\alpha_i, \alpha_j) + k, \tag{4.15}$$

where k is a positive constant. In other words, the output from working in a team is higher, for both workers of high and low ability, than the output from working individually. The output for workers of high and low ability from working individually or in a team is summarized in Table 4.4.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Individual	1	H	Individual	1	L
Team	$\frac{\eta_h p}{\eta_h p+\eta_l(1-p)}$ $\frac{\eta_l(1-p)}{\eta_h p+\eta_l(1-p)}$	$H+k$ $H+k$	Team	$\frac{\eta_h p}{\eta_h p+\eta_l(1-p)}$ $\frac{\eta_l(1-p)}{\eta_h p+\eta_l(1-p)}$	$H+k$ $L+k$

Table 4.4: Output in Game 4.4 for workers of high and low ability.

Period 3: Both firms observe the worker's choice of whether to work individually or in a team and both firms observe the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 4: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 5: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the expected output the worker produces in period 2, and, w is the expected wage the worker receives in period 4. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.4 consider the strategy of the two firms and the choice of workers of low and high ability.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of low ability: In any perfect Bayesian equilibrium workers of low ability will choose to work in a team. If workers of low ability choose to work individually their utility is $2L$. If they choose to work in a team, however, their expected output is at least $L + k$. And since the lowest wage they can receive if they choose to work in a team is L the utility for workers of low ability from working in a team must be higher than the utility from working individually.

Workers of high ability: If a worker of high ability works individually his or her expected output is H and his or her wage is H. If a worker of high ability work in a team his or her expected output is $H + k$. The expected wage, however, is lower than H. The wage then depends on whether a worker of high ability is identified as a worker of high or low ability. All teams which include a worker of high ability will produce $H + k$. But not all workers from such a team need to be workers of high ability. To calculate the expected ability of a worker in a team producing $H + k$ notice that a worker of high ability will always produce $H + k$, working in a team, irrespective of who he or she is paired with. A worker of low ability, however, will only produce $H + k$, working in a team, if he or she is paired with a worker of high ability. Since all workers of low ability choose to work in a team, and thus $\eta_l = 1$, and, if all workers of high ability choose to work in a team, and thus $\eta_h = 1$, we have that the probability that a worker is of high ability, given that the worker has chosen to work in a team, is p, and, the probability that a worker is of low ability, given that the worker has chosen to work in a team, is $(1-p)$. Since a worker of high ability always produces $H+k$ but a worker of low ability only produces $H+k$ if paired with a worker of high ability it follows that the probability that a team will produce $H+k$ is $p+(1-p)p$, and, that the expected ability of a worker in a team producing $H+k$ is

$$\frac{p}{p+(1-p)p}H + \frac{(1-p)p}{p+(1-p)p}L. \tag{4.16}$$

It follows that workers of high ability will choose to work individually if

$$2H > \frac{p}{p+(1-p)p}H + \frac{(1-p)p}{p+(1-p)p}L + H + k. \tag{4.17}$$

After some algebra (see Appendix B) we have the following proposition

Proposition 4.4 *Whenever,*

$$k < \frac{(H-L)(1-p)}{2-p}, \tag{4.18}$$

workers of high ability will, in the unique PBE, choose to work individually.

In other words, if the difference in output is sufficiently small workers of high ability will choose a less productive individual task. Workers of low ability, however, are happy to work in teams since working in teams is more productive. These conclusions hold even if the relation between ability and team output differs from the one assumed above. It is crucial, however, that there is some probability that workers of high ability, if they choose to work in a team, will not be revealed as workers of high ability. Only if this is the case workers of high ability will be reluctant to work in teams even if working in teams is more productive than working individually.

4.2.5 Precision

Another requirement of a good task for signaling ability is that performance should be a matter of skill rather than luck. If chance plays an important role it is difficult to tell the ability of an individual even if he or she performs well. If performance is largely a matter of skill, however, a good performance provides a good signal of ability. To illustrate this consider Game 4.5:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: The worker observes his or her ability. The worker then decides between working, for him or herself, at a safe task (S) or at a risky task (R). The output from working at the safe task, x_S, is

$$x_S = \alpha. \tag{4.19}$$

It follows that working at the safe task perfectly reveals the ability of the worker. The output from working at the risky task, x_R, is

$$x_R = \alpha + \varepsilon + k, \tag{4.20}$$

where k is a positive constant and ε is a random variable with distribution:

$$\varepsilon = \begin{cases} H - L & \text{with probability } z \\ 0 & \text{with probability } 1 - 2z \\ -(H - L) & \text{with probability } z \end{cases}$$

Thus, the risky task is a less precise signal of ability. Notice, however, that for both workers of high and low ability the expected output from working at the risky task is higher than the expected output from working at the safe task. The output for workers of high and low ability of working at the safe and the risky task is summarized in Table 4.5.

Period 3: Both firms observe the worker's choice of task and the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 4: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 5: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the expected output the worker produces in period 2, and, w is the expected wage the worker receives in period 4. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.5 consider the strategy of the two firms and the choice of workers of low and high ability.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Safe	1	H	Safe	1	L
Risky	z	$2H - L + k$	Risky	z	$H + k$
	$1 - 2z$	$H + k$		$1 - 2z$	$L + k$
	z	$L + k$		z	$2L - H + k$

Table 4.5: Output in Game 4.5 for workers of high and low ability.

Workers of low ability: In any perfect Bayesian equilibrium workers of low ability will choose the risky task. If workers of low ability choose the safe task the utility they receive is $2L$. If they choose the risky task, however, their expected output is $L + k$. And since the lowest wage they can receive if they choose the risky task is L the utility of workers of low ability from choosing the risky task must be higher than the utility from choosing the safe task.

Workers of high ability: If a worker of high ability chooses the safe task his or her output is H and his or her wage is H. If a worker of high ability chooses the risky task his or her expected output is $H+k$. The expected wage, however, is lower than H. The wage then depends on whether a worker of high ability is identified as a worker of high or low ability. There are three cases: i) a worker of high ability produces $2H - L + k$ (occurs with probability z) ii) a worker of high ability produces $H + k$ (occurs with probability $1 - 2z$) iii) a worker of high ability produces $L + k$ (occurs with probability z).

i) With probability z a worker of high ability will produce $2H - L + k$ and thus be identified as a worker of high ability. The wage is then H.

ii) With probability $1 - 2z$ a worker of high ability will produce $H + k$. Since this output could, with probability z, have been produced by a worker of low ability the wage will be equal to the expected ability of workers producing $H + k$. Specifically, the wage will be

$$\frac{p(1-2z)}{p(1-2z)+(1-p)z}H + \frac{(1-p)z}{p(1-2z)+(1-p)z}L. \tag{4.21}$$

iii) With probability z a worker of high ability will produce $L + k$. Since this output could, with probability $1 - 2z$, have been produced by a worker of low ability the wage will be equal to the expected ability of workers producing $L + k$. Specifically, with probability z will the wage be

$$\frac{pz}{pz+(1-p)(1-2z)}H + \frac{(1-p)(1-2z)}{pz+(1-p)(1-2z)}L. \tag{4.22}$$

Summarizing we have that the expected wage for workers of high ability if they choose the risky task is

$$zH + (1-2z)\left(\frac{p(1-2z)H}{p(1-2z)+(1-p)z} + \frac{(1-p)zL}{p(1-2z)+(1-p)z}\right)$$

$$+z(\frac{pzH}{pz+(1-p)(1-2z)}+\frac{(1-p)(1-2z)L}{pz+(1-p)(1-2z)}). \qquad (4.23)$$

Since workers of high ability receive $2H$ if they choose the safe task it follows that they will choose the safe task if $2H$ is larger than the above expression plus $H + k$. After some algebra (see Appendix B) we have the following proposition

Proposition 4.5 *Whenever,*

$$k < \frac{H[(1-z)\tau\omega - (1-2z)^2pC - z^2p\tau]}{\tau\omega} - \frac{L(1-2z)z(1-p)[\omega+\tau]}{\tau\omega}, \qquad (4.24)$$

where $\tau = p(1-2z) + (1-p)z$ *and* $\omega = pz + (1-p)(1-2z)$, *workers of high ability will, in the unique PBE, choose the safe task.*

In other words, if the difference between H and L is sufficiently high, workers of high ability will choose a task with zero variance even if this task has a lower expected output. Thus, risk neutral workers of high ability will behave as if they were risk averse.[11] A similar result can be found in Zweibel (1995).

In addition to these characteristics of effective displays of talent one may add that an effective performance must not seem to be motivated by the desire to display talent. A self-conscious concern with impressing others often makes a person less impressive (Cf. Blau, 1964, Ch. 2). To avoid this a performance must be appear to be motivated by the requirements of the tasks at hand. Similarly, accounts of performances must blend naturally into an ongoing conversation. Notice, however, that this can be achieved more or less subtly by approaching the subject indirectly. For example, one may start by praising the performances of someone else in the hope that this person will grant the favor.

4.3 Examples and Applications

The models developed above have numerous applications. To illustrate some of these I discuss a few examples.

4.3.1 Education

Consider first the original example of signaling discussed in Spence (1973): education. Suppose that we accept the following assumptions (Cf. Lave and March, 1993, pp. 29-30): 1) There exists a number of alternative fields of study (for

[11] This is true even if there were more than two types. It is crucial, however, that the maximal ability is bounded.

example, physics, philosophy, sociology, history, mathematics). 2) The value of choosing a certain field of study is a function of a general measure of your ability plus some constant measuring the relevance (or economic value) of this field. 3) The value of choosing a certain field of study also depends on future employers' inferences about your ability. 4) Fields vary in required minimal ability, the amount of groupwork, reliability of evaluation, and the importance of chance or creativity. These assumptions combined with the above models imply that individuals of high ability will sacrifice relevance for rigor. Specifically, individuals of high ability will prefer fields of study in which the required minimal ability is high, few assignments involve groupwork, the reliability of evaluation is high, and, in which the importance of chance and creativity is low, *even if these fields of study are less relevant.* Similar forces operate within each field of study; students of high ability are reluctant to take "softer" courses using subjective grading systems, instead they prefer rigorous courses where the reliability of grading is high.

4.3.2 Corporate management

Several writers have noted the dysfunctional effects of career concerns on the behavior of corporate managers.[12] Examples include discussions about herd behavior (Palley, 1995; Scharfstein and Stein, 1990; Zweibel, 1995) and conservatism (Hirshleifer and Thakor, 1993; Prendergast and Stole, 1996). The above models contribute to this literature by providing additional reasons for why the desire to display talent may lead corporate managers to choose inefficient investments and unproductive activities. For example, the above models suggest that corporate managers of high ability will have a preference for safe tasks. This implies that corporate managers of high ability would prefer investing in old and established industries rather than in new industries even if investments in new industries are expected to have a higher average return. The reason is that performance in new industries may be mostly a function of chance since no one knows what works and what doesn't. In established industries, however, this source of uncertainty has been eliminated and performance is largely a function of the competence of the firm including the ability of the CEO.

The above models also suggest that corporate managers of high ability have a preference for difficult task; tasks which provide a conclusive signal of ability. This suggests that corporate managers of high ability may prefer to acquire a failing business and turn it around even if this investment is less profitable than others. The reason is that turning a failing business around provides ample evidence of the ability of the manager. In addition, turning a business around is also sufficiently dramatic to attract the attention of future employers. A preference for individual tasks also suggests that corporate managers of high

[12]For an overview see Hirshleifer (1993).

ability would prefer to personally make all important decisions even if this type of centralization does not maximize the value of the firm. By making all important decisions themselves they can make sure that a good performance is attributed to their decisions and actions rather than to the decisions and actions of their subordinates.[13]

4.3.3 Academic research

Career concerns are often the only incentives for producing work of high quality within the academic system. The desire to display talent should therefore be expected to be strong among young researchers. This usually implies that their motivation is high. However, as suggested by the discussion regarding "perceived difficulty", it could also imply that PhD. students of high ability will prefer research questions and methodologies which require substantial technical ability. Even if this type of research does not address important problems it provides the PhD. student with an excellent opportunity to display his or her talents. Moreover, the discussion regarding "precision" suggests that PhD. students of high ability may prefer fields of research in which a consensus exists about research questions, methodology and standards of evaluation. This implies that PhD. students of high ability will prefer to work within established paradigms rather than risk developing new paradigms.[14]

This bias towards research questions which can be addressed within an existing paradigm is probably stronger in more anonymous academic systems. In anonymous academic systems, i.e., in academic systems where employers generally do not know future employees but only meet them for a short while, young researchers know that they only have a limited time available in order to make a positive impression. This implies that addressing conventional research questions will be of even greater importance. The reason is that there may not be sufficient time to explain research using new frameworks and an unfamiliar vocabulary. Also the importance of choosing less risky research questions will increase. In an anonymous academic system young researchers know that they only have one chance to prove themselves. Subsequently, there is no room for experimentation. In a less anonymous academic system, however, individuals of high ability may experiment without fear since they know that future employers are already aware of their abilities. One may also add that in a anonymous academic system it will be important to produce tangible evidence of ones abilities; evidence which can be used to impress individuals who never have met you.

[13]If some decisions must be decentralized, however, the CEO may prefer mediocre subordinates, if their mediocrity is well-known. The reason is that only by having mediocre subordinates can the CEO make sure that a superior corporate performance is attributed to his or her actions rather than to the actions of his or her subordinates.

[14]It also implies that individuals of high ability probably will be more attracted to the natural sciences than to the social sciences.

In a less anonymous academic system this may not be required since future employers can rely on personal experience.

4.3.4 Political ambition

The desire to display talent can also be expected to affect ambitious politicians policy choices (Cf. Schlesinger, 1966). Consider, for example, a governor with presidential ambitions. To maximize his or her chances of receiving a presidential nomination the governor may find it beneficial to deviate from the policies which would maximize the probability of reelection as a governor. For example, the governor may favor visible and dramatic projects; projects which would make the governor known to voters in other states. The governor may also favor difficult projects; projects which display the talent of the governor.

4.3.5 Subcultures

The above models can also be used to shed some light on the practices of individuals in various "subcultures". For members of such subcultures it is often important to signal their commitment and competence to other members while signaling their rejection of conventional practices to individuals outside their own culture. However, as the discussion regarding "perceived difficulty" suggests, for a signal to be effective its implications must be well-known. This necessity of using conventional signals may be one reason for why members of subcultures usually are more homogeneous in their practices and clothes than individuals who are not members of any subculture: to signal commitment to the ideals of the subculture members of a subculture will prefer clothes and practices which are conventionally associated with their subculture. This also seems to apply to subcultures in which the emphasis on individuality is strong: to express their individuality and independence all members of such subcultures may feel it to be important to dress in, say, black.

4.4 Signal Jamming

The models in section 4.2 illustrate several ways in which career concerns may lead individuals of high ability to choose unproductive activities in order to display their talents. This section focus on unproductive activities individuals of low ability may engage in to conceal a lack of talent. It focuses on signal jamming rather than signaling. A simple model of signal jamming is developed in section 4.4.1. In sections 4.4.2 to 4.4.5 several variations of this basic model are considered.

4.4.1 Visibility

If workers of high ability want to choose unproductive visible tasks to display their talent, workers of low ability may want to choose unproductive anonymous tasks in order to conceal a lack of talent. Obviously, if all workers of high ability choose the visible task choosing the anonymous task will reveal the ability of the worker even if the worker's output cannot be observed. Suppose, however, that some workers of high ability prefer the anonymous task. Then, by claiming that they prefer the anonymous task, workers of low ability may avoid being revealed as workers of low ability. To illustrate this consider Game 4.6:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: Nature draws the type of the worker. The worker can be of two types: type 1 (t_1) or type 2 (t_2). The type of the worker is private information. It is common knowledge, however, that the probability that the worker is of the second type is q. I assume that q and p are independent.
vspace3mm
Period 3: The worker observes his or her ability and his or her type. The worker then decides between working, for him or herself, at a visible task (V) or at an anonymous task (A). The output from working at the visible task for workers of the first type, x_{V1}, is

$$x_{V1} = \alpha + k, \tag{4.25}$$

where k is a positive constant. The output from working at the visible task for workers of the second type, x_{V2}, is

$$x_{V1} = -\alpha - k. \tag{4.26}$$

The output of a worker working at the visible task is observed by both firms. It follows that the visible task perfectly reveals the ability of the worker.

The output from working at the anonymous task for workers of both types, x_A, is

$$x_A = \alpha. \tag{4.27}$$

While both firms observe the output of a worker working at the visible task no firm will observe the output of a worker working at the anonymous task. The output for workers of type 1 and 2 in Game 6 is summarized in Tables 4.6A and 4.6B.

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Visible	$H+k$	Visible	$L+k$
Anonymous	H	Anonymous	L

Table 4.6A: Output in Game 4.6 for workers of type 1.

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Visible	$-H-k$	Visible	$-L-k$
Anonymous	H	Anonymous	L

Table 4.6B: Output in Game 4.6 for workers of type 2.

Period 4: Both firms observe the worker's choice of task, and, if the worker chose the visible task, both firms observe the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 5: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 6: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the output the worker produces in period 3, and, w is the wage the worker receives in period 5. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To define a perfect Bayesian equilibrium in Game 4.6 denote the strategy of the worker, a mapping from $\{H, L\} \times \{t_1, t_2\}$ into $\{V, A\}$, by $s(\cdot)$, and denote the strategy of firm j, a mapping from $E[\alpha]$, the firms' common belief about the expected ability of the worker, to w_j, by $f_j(\cdot)$. Using this notation a perfect Bayesian equilibrium, in Game 4.6, can be defined in exactly the same way a perfect Bayesian equilibrium was defined in Game 4.1 (see Definition 4.1).

To solve for equilibrium in Game 4.6 consider the strategy of the two firms and the choice of workers of type 1 and 2.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of type 2: In any perfect Bayesian equilibrium workers of type 2 will choose the anonymous task. For if workers of type 2 choose the anonymous task their minimal utility is $L + L$ for workers of low ability and $H + L$ for workers of high ability. If workers of type 2 would choose the visible task, however, their maximal utility would be $-L-k+L=-k$ for workers of low ability and $-H-k+H=-k$ for workers of high ability.

Type 1 workers of high ability: In any perfect Bayesian equilibrium type 1 workers of high ability will choose the visible task. For by choosing the visible task their utility will always be $H+k+H$ while by choosing the anonymous task their utility could be lower.

Type 1 workers of low ability: If a type 1 worker of low ability chooses the visible task his or her output is $L+k$ and his or her wage is L. If a type 1 worker of low ability chooses the anonymous task his or her output is L. The wage, however, is higher than L. The wage is then equal to the expected ability of all workers choosing the anonymous task. The workers choosing the anonymous task would then include: type 2 workers of high ability (probability pq) and all workers of low ability (probability $1-p$). It follows that the wage would be

$$\frac{pq}{pq+(1-p)}H+\frac{(1-p)}{pq+(1-p)}L. \tag{4.28}$$

Since type 1 workers of low ability receive $2L+k$ if they choose the visible task we have that type 1 workers of low ability will choose the anonymous task whenever $2L+k$ is lower than the above expression plus L. After some algebra (see Appendix B) we have the following proposition

Proposition 4.6 *Whenever*

$$k<\frac{pq(H-L)}{pq+(1-p)}, \tag{4.29}$$

all workers of low ability will, in the unique PBE, choose the anonymous task.

4.4.2 Preparation

To conceal a lack of talent people sometimes engage in what has been called "self-handicapping" behavior (Cf. Berglas, 1985). That is, they deliberately reduce their probability of success. For example, they may not try very hard (Harris and Snyder, 1986; Pyszczynski and Greenberg, 1983; Snyder et. al., 1984). Alternatively, they may not prepare or practice (Rhodewalt, Saltzman and Wittmer, 1984). Using these tactics their performance can be attributed to a lack of preparation or to a lack of effort rather than to a lack of talent. To understand how and when this would work consider Game 4.7:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0<L<H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Prepare	$H+k$	Prepare	$L+k$
Not Prepare	L	Not Prepare	L

Table 4.7A: Output in Game 4.7 for workers of type 1.

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Prepare	$-H-k$	Prepare	$-L-k$
Not Prepare	L	Not Prepare	L

Table 4.7B: Output in Game 4.7 for workers of type 2.

Period 2: Nature draws the type of the worker. The worker can be of two types: type 1 (t_1) or type 2 (t_2). The type of the worker is private information. It is common knowledge, however, that the probability that the worker is of the second type is q. I assume that q and p are independent.

Period 3: The worker observes his or her ability and his or her type. The worker then decides between working, for him or herself, at a task without preparation (N) or working at the same task with sufficient preparation (P). If they start working unprepared the output for workers of both types, x_N, is

$$x_N = L. \tag{4.30}$$

It follows that if a worker does not prepare his or her ability is not revealed since both workers of high and low ability produce L.

If workers of the first type prepare their output, x_{P1}, is

$$x_{P1} = \alpha + k, \tag{4.31}$$

where k is a positive constant. If workers of the second type prepare their output, x_{P2}, is

$$x_{P2} = -\alpha - k. \tag{4.32}$$

The output for workers of the first and second type is summarized in Tables 4.7A and 4.7B.

Period 4: Both firms observe the worker's choice of preparation and the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 5: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 6: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the output the worker produces in period 3, and, w is the wage the worker receives in period 5. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for equilibrium in Game 4.7 consider the strategy of the two firms and the choice of workers of type 1 and 2.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of type 2: In any perfect Bayesian equilibrium workers of type 2 will choose not to prepare. For if workers of type 2 choose not to prepare their minimal utility is $L+L$. If workers of type 2 would choose to prepare, however, their maximal utility would be $-L-k+L=-k$ for workers of low ability and $-H-k+H=-k$ for workers of high ability.

Type 1 workers of high ability: In any perfect Bayesian equilibrium type 1 workers of high ability will choose to prepare. For by choosing to prepare their utility will always be $H+k+H$ while by choosing not to prepare their utility could be lower.

Type 1 workers of low ability: If a type 1 worker of low ability chooses to prepare his or her output is $L+k$ and his or her wage is L. If a type 1 worker of low ability chooses not to prepare his or her output is L. The wage, however, is higher than L. The wage is then equal to the expected ability of all workers choosing not to prepare. The workers choosing not to prepare would then include: type 2 workers of high ability (probability pq) and all workers of low ability (probability $1-p$). It follows that the wage would be

$$\frac{pq}{pq+(1-p)}H + \frac{(1-p)}{pq+(1-p)}L. \tag{4.33}$$

Since type 1 workers of low ability receive $2L+k$ if they choose to prepare we have that type 1 workers of low ability will choose not to prepare whenever $2L+k$ is lower than the above expression plus L. After some algebra (see Appendix B) we have the following proposition

Proposition 4.7 *Whenever*

$$k < \frac{pq(H-L)}{pq+(1-p)}, \tag{4.34}$$

all workers of low ability will, in the unique PBE, choose not to prepare.

4.4.3 Perceived difficulty

If individuals of high ability may want to choose tasks whose difficulty are well-known, individuals of low ability have an incentive to choose tasks whose difficulty are not well-known. To see this consider Game 4.8:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: Nature draws the type of the worker. The worker can be of two types: type 1 (t_1) or type 2 (t_2). The type of the worker is private information. It is common knowledge, however, that the probability that the worker is of the second type is q. I assume that q and p are independent.

Period 3: The worker observes his or her ability and his or her type. The worker then decides between working, for him or herself, at a familiar task (F) or at an unfamiliar task (E). The output from working at the familiar task for workers of type 1, x_{F1}, is

$$x_{F1} = \alpha + k, \tag{4.35}$$

where k is a positive constant. The output from working at the familiar task for workers of type 2, x_{F2}, is

$$x_{F2} = -\alpha - k. \tag{4.36}$$

where k is a positive constant. I assume that the difficulty of the familiar task is well-known. Everybody knows that if a worker produces $H + k$ or $-H - k$ his or her ability must be high whereas if someone produces $L + k$ or $-L - k$ his or her ability must be low.

The output from working at the unfamiliar task for workers of both types, x_E, is

$$x_E = \alpha. \tag{4.37}$$

The difficulty of the unfamiliar task is not well-known. Not everybody understands that producing L means that ones ability must be low. Specifically, the probability that both firms understand this is $y \in (0, 1)$. With probability $1 - y$ both firms believe that observing someone producing H or L does not provide any information about the worker's ability. The output for workers of type 1 and 2 is summarized in Tables 4.8A and 4.8B.[15]

[15]Notice that if $y = 0$ Game 4.8 is identical to Game 4.6.

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Familiar	$H+k$	Familiar	$L+k$
Unfamiliar	H	Unfamiliar	L

Table 4.8A: Output in Game 4.8 for workers of type 1.

Workers of high ability		Workers of low ability	
Task	*Output*	*Task*	*Output*
Familiar	$-H-k$	Familiar	$-L-k$
Unfamiliar	H	Unfamiliar	L

Table 4.8B: Output in Game 4.8 for workers of type 2.

Period 4: Both firms observe the worker's choice of task and the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers. Both firms know that if the worker produces $H+k$ or $-H-k$ working at the familiar task his or her ability must be high whereas if the worker produces $L+k$ or $-L-k$ his or her ability must be low. With probability $y \in (0,1)$ both firms understand that if the worker produces H working at the unfamiliar task his or her ability must be high whereas if the worker produces L his or her ability must be low. With probability $1-y$, however, both firms believe that observing the worker producing H or L working at the unfamiliar task does not provide any information about the worker's ability.

Period 5: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 6: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the output the worker produces in period 3, and, w is the expected wage the worker receives in period 5. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.8 consider the strategy of the two firms and the choice of workers of type 1 and 2.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of type 2: In any perfect Bayesian equilibrium workers of type 2 will choose the unfamiliar task. For if workers of type 2 choose the unfamiliar task their minimal utility is $L+L$ for workers of low ability and $H+L$ for workers of high ability. If workers of type 2 would choose the familiar task, however, their maximal utility would be $-L-k+L=-k$ for workers of low ability and $-H-k+H=-k$ for workers of high ability.

Type 1 workers of high ability: In any perfect Bayesian equilibrium type 1 workers of high ability will choose the familiar task. For by choosing the familiar task their utility will always be $H+k+H$ while by choosing the unfamiliar task their utility could be lower.

Type 1 workers of low ability: If a type 1 worker of low ability chooses the familiar task his or her output is $L+k$ and his or her wage is L. If a type 1 worker of low ability chooses the unfamiliar task his or her output is L. The expected wage, however, is higher than L. Specifically, if they choose the unfamiliar task the wage would, with probability y, be equal to L, and, with probability $1-y$, be equal to the expected ability of all workers choosing the unfamiliar task. The workers choosing the unfamiliar task would then include: type 2 workers of high ability (probability pq) and all workers of low ability (probability $1-p$). It follows that the expected wage would be

$$yL+(1-y)[\frac{pq}{pq+(1-p)}H+\frac{(1-p)}{pq+(1-p)}L]. \tag{4.38}$$

Since type 1 workers of low ability receive $2L+k$ if they choose the familiar task we have that type 1 workers of low ability will choose the unfamiliar task whenever $2L+k$ is lower than the above expression plus L. After some algebra (see Appendix B) we have the following proposition

Proposition 4.8 *Whenever*

$$k<\frac{pq(H-L)(1-y)}{pq+(1-p)}, \tag{4.39}$$

all workers of low ability will, in the unique PBE, choose the unfamiliar task.

4.4.4 Teamwork

A model similar to that in section 4.2.1 can also illustrate why individuals of low ability would prefer to work in teams even if this is less productive than working individually. To see this consider Game 4.9:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0<L<H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: Nature draws the type of the worker. The worker can be of two types: type 1 (t_1) or type 2 (t_2). The type of the worker is private information.

It is common knowledge, however, that the probability that the worker is of the second type is q. I assume that q is independent of p.

Period 3: The worker observes his or her ability and his or her type. The worker then decides between working, for him or herself, in a team (T) or working individually (I). The output for workers of type 1 from working individually, x_{I1}, is

$$x_{I1} = \alpha + k, \tag{4.40}$$

where k is a positive constant. The output for workers of type 2 from working individually, x_{I2}, is

$$x_{I2} = -\alpha - k. \tag{4.41}$$

If the worker decides to work in a team he or she is randomly paired with another worker. Specifically, I assume that there is a large but finite number of workers. All workers are in the same position: they all have to decide whether to work individually or in a team knowing that future employers will observe this choice and will observe their output if they work individually or in a team. I further assume that it is common knowledge that the probability that each worker is of high ability is p, and, the probability that each worker is of the second type is q, where q is independent of p.

Consider now the probability that a worker, who has chosen to work in a team, will be paired with a worker of high ability. If the number of workers is large and if we consider only the first worker to be matched this probability can be approximated with

$$\frac{\eta_h p}{\eta_h p + \eta_l (1-p)}. \tag{4.42}$$

Here η_h is the proportion of workers of high ability who decide to work in a team, and, η_l is the proportion of workers of low ability who decide to work in a team.

For the same reasons as above we have that the probability that a worker, who has chosen to work in a team, will be paired with a worker of low ability, can be approximated with

$$\frac{\eta_l (1-p)}{\eta_h p + \eta_l (1-p)}. \tag{4.43}$$

I assume that the output, for each worker, from the resulting team, x_T, is

$$x_T = \max(\alpha_i, \alpha_j). \tag{4.44}$$

I also assume that $H < L+k$. It follows that working in a team is less productive for all workers of the first type. The output for workers of type 1 and 2 is summarized in Tables 4.9A and 4.9B.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Individual	1	$H+k$	Individual	1	$L+k$
Team	$\frac{\eta_h p}{\eta_h p+\eta_l(1-p)}$	H	Team	$\frac{\eta_h p}{\eta_h p+\eta_l(1-p)}$	H
	$\frac{\eta_l(1-p)}{\eta_h p+\eta_l(1-p)}$	H		$\frac{\eta_l(1-p)}{\eta_h p+\eta_l(1-p)}$	L

Table 4.9A: Output in Game 4.9 for workers of type 1.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Individual	1	$-H-k$	Individual	1	$-L-k$
Team	$\frac{\eta_h p}{\eta_h p+\eta_l(1-p)}$	H	Team	$\frac{\eta_h p}{\eta_h p+\eta_l(1-p)}$	H
	$\frac{\eta_l(1-p)}{\eta_h p+\eta_l(1-p)}$	H		$\frac{\eta_l(1-p)}{\eta_h p+\eta_l(1-p)}$	L

Table 4.9B: Output in Game 4.9 for workers of type 2.

Period 4: Both firms observe the worker's choice of whether to work individually or in a team and both firms observe the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 5: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Period 6: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the expected output the worker produces in period 3, and, w is the expected wage the worker receives in period 5. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.9 consider the strategy of the two firms and the choice of workers of type 1 and 2.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of type 2: In any perfect Bayesian equilibrium workers of type 2 will choose to work in a team. For if workers of type 2 choose to work in a team their minimal utility is $L + L > 0$. If workers of type 2 would choose to work individually, however, their maximal utility would be $-L - k + L = -k$ for workers of low ability and $-H - k + H = -k$ for workers of high ability.

Type 1 workers of high ability: In any perfect Bayesian equilibrium type 1 workers of high ability will choose to work individually. For by choosing to work individually their utility will always be $H + k + H$ while by choosing to work in a team their utility could be lower.

Type 1 workers of low ability: If a type 1 worker of low ability works individually his or her output is $L + k$ and his or her wage is L. If a type 1 worker of low ability choose to work in a team and if he or she is paired with a worker of high ability his or her output is H. If a type 1 worker of low ability choose to work in a team and is paired with a worker of low ability his or her output is L. To calculate the expected output for type 1 workers of low ability, if they choose to work in a team, consider first the probability that a worker in a team will be paired with a worker of high and low ability. Since only type 2 workers of high ability will choose to work in a team, and thus $\eta_h = q$, but, if type 1 workers of low ability choose to work in a team, both types of workers of low ability will choose to work in a team, and thus $\eta_l = 1$, it follows that the probability that a worker will be paired with a worker of high ability is

$$\frac{qp}{qp + (1-p)}, \tag{4.45}$$

and, that the probability that a worker will be paired with a worker of low ability is

$$\frac{(1-p)}{qp + (1-p)}. \tag{4.46}$$

Since a type 1 worker of low ability produce H if paired with a worker of high ability and L if paired with a worker of low ability it follows that the expected output for type 1 workers of low ability, if they choose to work in a team, is

$$\frac{qp}{qp + (1-p)}H + \frac{(1-p)}{qp + (1-p)}L. \tag{4.47}$$

It will be convenient to denote $qp/(qp+1-p)$ by ψ, and, to denote $(1-p)/(qp+1-p)$ by $1-\psi$. Using this notation the expected output for type 1 workers of low ability can be written as

$$\psi H + (1-\psi)L. \tag{4.48}$$

Notice that since I assumed that $H < L+k$ it follows that the above expression, which is less than H, also must be less than $L+k$. In other words, the expected output for type 1 workers of low ability, if they choose to work in a team, is lower than the expected output if they choose to work individually.

If they choose to work in a team, however, the expected wage type 1 workers of low ability receive is higher than the wage they receive if they choose to work individually. The expected wage a type 1 worker of low ability receives if he or she chooses to work in a team depends on whether he or she is identified as a worker of high or low ability. There are two cases: i) a type 1 worker of low ability is paired with a worker of low ability ii) a type 1 worker of low ability is paired with a worker of high ability.

i) With probability $1-\psi$ a type 1 worker of low ability would be paired with another worker of low ability. His or her output would then be L and since only two workers of low ability could have produced this output their wage would be L.

ii) With probability ψ a type 1 worker of low ability is paired with a worker of high ability. Their output will then be H. Since also a team consisting of a type 2 worker of high ability paired with another worker of high ability could have produced this output the wage will be equal to the expected ability of a worker in a team producing H. To calculate the expected ability of a worker in a team producing H notice that a type 2 worker of high ability will always produce H, working in a team, irrespective of who he or she is paired with. A worker of low ability, however, will only produce H, working in a team, if he or she is paired with a worker of high ability, which occurs with probability ψ. Since the probability of a worker of high ability, given that the worker has chosen to work in a team, is ψ, and, since the probability of a worker of low ability, given that the worker has chosen to work in a team, is $1-\psi$, we have that the probability that a team will produce H is $\psi+(1-\psi)\psi$, and, that the expected ability of a worker in a team producing H is

$$\frac{\psi}{\psi+(1-\psi)\psi}H+\frac{(1-\psi)\psi}{\psi+(1-\psi)\psi}L. \tag{4.49}$$

Summarizing we have that type 1 workers of low ability will choose to work in a team if

$$\begin{aligned}&[\psi H+(1-\psi)L]\\ +(1-\psi)L+\psi[&\frac{\psi}{\psi+(1-\psi)\psi}H+\frac{(1-\psi)\psi}{\psi+(1-\psi)\psi}L],\end{aligned} \tag{4.50}$$

is larger than $2L+k$. After some algebra (see Appendix B) we have the following proposition

Proposition 4.9 *Whenever*

$$k<\frac{(H-L)\psi(2\psi+(1-\psi)\psi)}{\psi+(1-\psi)\psi}, \tag{4.51}$$

all workers of low ability will, in the unique PBE, choose to work in a team.

4.4.5 Ambiguity

While individuals of high ability prefer tasks in which performance is a matter of skill rather than luck, individuals of low ability prefer tasks in which performance is more a matter of luck. In fact, given a choice between a safe task with a high expected value and a more risky task with a lower expected value individuals of low ability would sometimes prefer the last. To see why consider Game 4.10:

Period 1: Nature draws the ability, α, of the worker. The ability of the worker can be high H or low $0 < L < H$. The ability of the worker is private information. It is common knowledge, however, that the probability that the worker is of high ability is p.

Period 2: Nature draws the type of the worker. The worker can be of two types: type 1 (t_1) or type 2 (t_2). The type of the worker is private information. It is common knowledge, however, that the probability that the worker is of the second type is q. I assume that q is independent of p.

Period 3: The worker observes his or her ability and his or her type. The worker then decides between working, for him or herself, at a safe task (S) or at a risky task (R). The output from working at the safe task for workers of the first type, x_{S1}, is

$$x_{S1} = \alpha + k, \tag{4.52}$$

where k is a positive constant. The output from working at the safe task for workers of the second type, x_{S2}, is

$$x_{S2} = -\alpha - k. \tag{4.53}$$

The output from working at the risky task for workers of both types, x_R, is

$$x_R = \alpha + \varepsilon, \tag{4.54}$$

where ε is a random variable with distribution:

$$\varepsilon = \begin{cases} H - L & \text{with probability } z \\ o & \text{with probability } 1 - 2z \\ -(H - L) & \text{with probability } z \end{cases}$$

Thus, the risky task is a less precise signal of ability. The output for workers of type 1 and type 2 of working at the safe and the risky task is summarized in Tables 4.10A and 4.10B.

Period 4: Both firms observe the worker's choice of task and the worker's output. The two firms then simultaneously make wage offers to the worker. Let w_j denote the wage firm j offers.

Period 5: The worker accepts the higher of the wage offers, accepting each with probability one half if indifferent. Let w denote the wage the worker accepts.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Safe	1	$H+k$	Safe	1	$L+k$
Risky	z	$2H-L$	Risky	z	H
	$1-2z$	H		$1-2z$	L
	z	L		z	$2L-H$

Table 4.10A: Output in Game 4.10 for workers of type 1.

Workers of high ability			Workers of low ability		
Task	*Prob*	*Output*	*Task*	*Prob*	*Output*
Safe	1	$-H-k$	Safe	1	$-L-k$
Risky	z	$2H-L$	Risky	z	H
	$1-2z$	H		$1-2z$	L
	z	L		z	$2L-H$

Table 4.10B: Output in Game 4.10 for workers of type 2.

Period 6: Payoffs are determined. The von Neuman-Morgenstern utility of the worker is $U = x + w$, where x is the expected output the worker produces in period 3, and, w is the expected wage the worker receives in period 5. The profit of firm j, if the worker accepts the offer of firm j, is $\pi_j = \alpha - w$. If the worker does not accept the offer of firm j the profit of firm j is zero.

To solve for the equilibrium in Game 4.10 consider the strategy of the two firms and the choice of workers of type 1 and 2.

Firms: For the same reasons as above we have that in any perfect Bayesian equilibrium $w_j = E[\alpha]$.

Workers of type 2: In any perfect Bayesian equilibrium workers of type 2 will choose the risky task. For if workers of type 2 choose the risky task their expected utility is at least $L + L$. If workers of type 2 would choose the safe task, however, their maximal utility would not be more than $-L-k+L=-k$ for workers of low ability and $-H-k+H=-k$ for workers of high ability.

Type 1 workers of high ability: In any perfect Bayesian equilibrium type 1 workers of high ability will choose the safe task. For by choosing the safe task their utility will always be $H + k + H$ while by choosing the risky task their utility could be lower.

Type 1 workers of low ability: If a type 1 worker of low ability chooses the safe task his or her output is $L + k$ and his or her wage is L. If a type 1 worker of low ability chooses the risky task his or her expected output is L. The expected wage, however, is higher than L. The wage then depends on whether a type 1 worker of low ability is identified as a worker of high or low ability.

There are three cases: i) a type 1 worker of low ability produces H (occurs with probability z) ii) a type 1 worker of low ability produces L (occurs with probability $1-2z$) iii) a type 1 worker of low ability produces $2L-H$ (occurs with probability z).

i) With probability z a type 1 worker of low ability will produce H. Since this output, with probability $1-2z$, could have been produced by a type 2 worker of high ability the wage will be equal to the expected ability of a worker producing H. To calculate the expected ability it will be convenient to denote $qp/(qp+1-p)$, the probability of a type 2 worker of high ability, by ψ, and, to denote $(1-p)/(qp+1-p)$, the probability of a worker of low ability, by $1-\psi$. Using this notation the probability that a worker will produce H is $\psi(1-2z)+(1-\psi)z$, and, the expected ability of a worker producing H is

$$\frac{\psi(1-2z)}{\psi(1-2z)+(1-\psi)z}H+\frac{(1-\psi)z}{\psi(1-2z)+(1-\psi)z}L. \tag{4.55}$$

ii) With probability $1-2z$ a type 1 worker of low ability will produce L. Since this output could have been produced, with probability z, by a type 2 worker of high ability, the wage will be equal to the expected ability of a worker producing L. Since the probability of a type 2 worker of high ability is ψ and the probability of a worker of low ability is $1-\psi$ we have that the probability that a worker will produce L is $\psi z+(1-\psi)(1-2z)$, and, that the expected ability of a worker producing L is

$$\frac{\psi z}{\psi z+(1-\psi)(1-2z)}H+\frac{(1-\psi)(1-2z)}{\psi z+(1-\psi)(1-2z)}L. \tag{4.56}$$

iii) With probability z a type 1 worker of low ability will produce $2L-H$ and thus be identified as a worker of low ability. His or her wage will then be L.

Summarizing we have that the expected wage for a type 1 worker of low ability choosing the risky task is

$$\begin{aligned} z[&\frac{\psi(1-2z)}{\psi(1-2z)+(1-\psi)z}H+\frac{(1-\psi)z}{\psi(1-2z)+(1-\psi)z}L] \\ +(1-2z)[&\frac{\psi z}{\psi z+(1-\psi)(1-2z)}H+\frac{(1-\psi)(1-2z)}{\psi z+(1-\psi)(1-2z)}L] \\ &+zL. \end{aligned} \tag{4.57}$$

Since a type 1 worker of low ability receives $2L+k$ by choosing the safe task it follows that whenever the above expression plus L (the expected output from working at the risky task) is higher than $2L+k$, type 1 workers of low ability will choose the risky task. After some algebra (see Appendix B) we have the following proposition

Proposition 4.10 *Whenever*

$$k < \frac{Hz\psi(1-2z)[\gamma+\phi]}{\phi\gamma} - \frac{L[(1-z)\phi\gamma - z^2(1-\psi)\gamma - (1-2z)^2(1-\psi)\phi]}{\phi\gamma}, \quad (4.58)$$

where $\phi = [\psi(1-2z) + (1-\psi)z]$ *and* $\gamma = [\psi z + (1-\psi)(1-2z)]$, *all workers of low ability will, in the unique PBE, choose the risky task.*

In other words, if the difference between H and L is sufficiently high workers of low ability will choose a task with positive variance even if this task has a lower expected output. Thus, risk neutral workers of low ability will behave as if they were risk lovers.

4.5 Examples and Applications

To illustrate the implications of the above models this section presents a few examples.

4.5.1 Education

The above models illustrate that failing publicly is not the only option for individuals of low ability. Instead they may engage in, say, self-handicapping behavior. This tactic is not uncommon in the educational system. Individuals of low ability may ignore school and homework. In this way failure at exams can be attributed to a lack of preparation rather than to a lack of ability. Individuals of low ability may also choose less rigorous courses using subjective grading systems, emphasizing groupwork and "creativity".[16]

4.5.2 Corporate management

The above models can also illustrate several tactics corporate managers may use to conceal a lack of talent. For example, the discussion regarding "ambiguity" suggests that, in contrast to corporate managers of high ability, corporate managers of low ability may prefer new and risky industries in which performance is more a matter of chance than skill. Moreover, the discussion regarding "team work" suggests that managers of low ability may prefer to delegate important decisions. Then, if the manager's subordinates happens to be of high ability, the performance of the whole corporation may be the same as if it would have been if the manager's own ability was high. In other words, decentralization and

[16]Individuals may also reject those academic criteria they fail to meet. Thus, student deficient in logic, mathematics, and science may denounce its "sterile" and "quantitative" methods.

team work may be one way of concealing a lack of talent. Finally, the discussion regarding "self-handicapping" suggests that corporate managers of low ability may prefer to work in firms and industries in which there is a considerable risk of failure. In this way failure can be attributed to external events rather than to a lack of talent.

4.5.3 Academic research

The above models can also illustrate some ways in which legitimate and at times productive research strategies also can be used to conceal a lack of talent. Consider, for example, research attempting to establish new "paradigms". Obviously, with such an ambition there is a considerable risk of failure. This, however, may be one advantage of such a design. In fact, as the discussion regarding "self-handicapping" suggests, it may be an advantage for individuals of low ability to eliminate their chances of success. In this way failure can be attributed to exaggerated ambitions rather than to a lack of talent.[17]

[17] One may add in the social sciences another tactic is becoming widespread. A study is claimed to be "explorative". And "interpretation", "inter-subjectivity", or "understanding" (*verstehen*) rather than generalizability and verifiability are to be the relevant criteria for evaluating the results of the study. In this way the results of the study are often made immune to criticism. The attractiveness of this philosophy is probably not independent of such "added benefits".

Appendix A: List of Symbols

α	The ability of the worker
$E[\alpha]$	The expected ability of the worker
H	The ability of a worker of high ability
L	The ability of a worker of low ability
p	The probability that the worker's ability is high
t_i	Workers of type $i \in [1, 2]$
q	The probability that the worker is of type 2
k	A positive constant
V	A visible task
A	An anonymous task
P	Preparing for a task
N	Not preparing for a task
F	A familiar task
E	An unfamiliar task
I	Working at a task individually
T	Working at a task in a team
S	A safe task
R	A risky task
U	The utility of the worker
x_V	Output at the visible task
x_A	Output at the anonymous task
x_P	Output if the worker is prepared
x_N	Output if the worker is not prepared
x_F	Output at the familiar task
x_E	Output at the unfamiliar task
x_I	Output from working individually
x_T	Output from working in a team
x_S	Output at the safe task
x_R	Output at the risky task
x_{Vi}	Output at the visible task for workers of type $i \in [1, 2]$
x_{Pi}	Output if workers of type $i \in [1, 2]$ are prepared
x_{Fi}	Output at the familiar task for workers of type $i \in [1, 2]$
x_{Ii}	Output from working individually for workers of type $i \in [1, 2]$
x_{Si}	Output at the safe task for workers of type $i \in [1, 2]$
π_j	The profit of firm j
w_j	The wage offered by firm j
w	The wage the worker accepts
η_h	The proportion of workers of high ability working in a team
η_l	The proportion of workers of low ability working in a team
d	Probability that prepared workers of low ability produce $H + k$

y	Probability that the difficulty of the unfamiliar task is known
z	Probability of an output above and below average
$s(\cdot)$	The strategy of the worker
$f_j(\cdot)$	The strategy of firm j
τ	Identical to $(1-2z)p + z(1-p)$
ω	Identical to $zp + (1-2z)(1-p)$
ψ	Identical to $qp/(qp+1-p)$
ϕ	Identical to $\psi(1-2z) + z(1-\psi)$
γ	Identical to $\psi z + (1-2z)(1-\psi)$

Appendix B: Derivations of Propositions

Derivation of Proposition 4.1: Workers of high ability will choose the visible task whenever

$$2H > H + k + Hp + L(1-p). \tag{4.59}$$

Subtracting $2H + k$ we have

$$-k > -H + Hp + L(1-p), \tag{4.60}$$

or,

$$-k > -H(1-p) + L(1-p) = -(H-L)(1-p). \tag{4.61}$$

Multiplying with -1 we have

$$k < (H-L)(1-p). \tag{4.62}$$

Derivation of Proposition 4.2: Workers of high ability will choose not to prepare whenever

$$2H > H + k + \frac{pH}{p+(1-p)d} + \frac{(1-p)dL}{p+(1-p)d}. \tag{4.63}$$

Subtracting $2H + k$ and multiplying with $p + (1-p)d$ we have

$$-k(p+(1-p)d) > -H(p+(1-p)d) + pH + (1-p)dL, \tag{4.64}$$

which is equal to

$$-k(p+(1-p)d) > -Hp - H(1-p)d + pH + (1-p)dL. \tag{4.65}$$

Collecting terms we have

$$-k(p+(1-p)d) > -(H-L)(1-p)d. \tag{4.66}$$

Multiplying with -1 and dividing by $p+(1-p)d$ we have

$$k < \frac{(H-L)(1-p)d}{p+(1-p)d}. \tag{4.67}$$

Derivation of Proposition 4.3: Workers of high ability will choose the familiar task whenever

$$2H > H + k + yH + (1-y)(Hp + L(1-p)). \tag{4.68}$$

Subtracting $2H + k$ we have

$$-k > -H + yH + (1-y)Hp + (1-y)L(1-p). \tag{4.69}$$

Collecting terms we get

$$-k > -(1-y)H + (1-y)Hp + (1-y)L(1-p), \tag{4.70}$$

which is equal to,

$$-k > -(H-L)(1-y)(1-p) \tag{4.71}$$

Multiplying with -1 we have

$$k < (H-L)(1-y)(1-p). \tag{4.72}$$

Derivation of Proposition 4.4: Workers of high ability will choose to work individually whenever

$$2H > H + k + \frac{p}{p+(1-p)p}H + \frac{(1-p)p}{p+(1-p)p}L. \tag{4.73}$$

Subtracting $2H + k$ and multiplying with $p + (1-p)p = p(2-p)$ we have

$$-kp(2-p) > -Hp(2-p) + pH + (1-p)pL. \tag{4.74}$$

Dividing with p we have

$$-k(2-p) > -H(2-p) + H + (1-p)L, \tag{4.75}$$

which is equal to

$$-k(2-p) > -H(1-p) - (1-p)L. \tag{4.76}$$

Multiplying with -1 and dividing by $2-p$ we have

$$k < \frac{(H-L)(1-p)}{2-p}. \tag{4.77}$$

Derivation of Proposition 4.5: Workers of high ability will choose the safe task whenever

$$\begin{aligned} 2H > H + k + zH \\ +(1-2z)(\frac{p(1-2z)}{p(1-2z)+(1-p)z}H + \frac{(1-p)z}{p(1-2z)+(1-p)z}L) \\ +z(\frac{pz}{pz+(1-p)(1-2z)}H + \frac{(1-p)(1-2z)}{pz+(1-p)(1-2z)}L). \end{aligned} \tag{4.78}$$

Let $\tau = p(1-2z)+(1-p)z$ and let $\omega = pz+(1-p)(1-2z)$. Subtracting $2H+k$ we have

$$\begin{aligned} -k > -H(1-z) + \frac{(1-2z)^2 pH}{\tau} \\ +\frac{(1-2z)z(1-p)L}{\tau} + \frac{z^2 pH}{\omega} + \frac{z(1-2z)(1-p)L}{\omega}. \end{aligned} \tag{4.79}$$

Multiplying with $\tau\omega$ we get

$$\begin{aligned} -k\tau\omega > -H(1-z)\tau\omega + (1-2z)^2 pH\omega \\ +(1-2z)z(1-p)L\omega + z^2 pH\tau + z(1-2z)(1-p)L\tau. \end{aligned} \tag{4.80}$$

Collecting terms we get

$$\begin{aligned} -k\tau\omega > -H[(1-z)\tau\omega - (1-2z)^2 p\omega - z^2 p\tau] \\ +L(1-2z)z(1-p)(\omega+\tau). \end{aligned} \tag{4.81}$$

Multiplying with -1 and dividing by $\tau\omega$ we have

$$\begin{aligned} k < \frac{H[(1-z)\tau\omega - (1-2z)^2 p\omega - z^2 p\tau]}{\tau\omega} \\ -\frac{L(1-2z)z(1-p)(\omega+\tau)}{\tau\omega}. \end{aligned} \tag{4.82}$$

Derivation of Proposition 4.6: Type 1 workers of low ability will choose the anonymous task whenever

$$2L + k < L + \frac{pq}{pq+1-p}H + \frac{1-p}{pq+1-p}L. \tag{4.83}$$

Subtracting $2L$ and multiplying with $pq + 1 - p$ we have

$$k(pq + 1 - p) < -L(pq + 1 - p) + pqH + (1 - p)L, \tag{4.84}$$

or,

$$k(pq + 1 - p) < (H - L)pq. \tag{4.85}$$

Dividing by $pq + 1 - p$ we have

$$k < \frac{(H - L)pq}{pq + (1 - p)}. \tag{4.86}$$

Derivation of Proposition 4.7: Identical to the derivation of Proposition 4.6.

Derivation of Proposition 4.8: Type 1 workers of low ability will choose the unfamiliar task whenever

$$2L + k < L + yL + (1 - y)[\frac{pq}{pq + (1 - p)}H + \frac{1 - p}{pq + (1 - p)}L]. \tag{4.87}$$

Subtracting $2L$ and multiplying with $pq + (1 - p)$ we have

$$\begin{aligned} k(pq + (1 - p)) < &-L(pq + (1 - p)) + yL(pq + (1 - p)) \\ &+(1 - y)pqH + (1 - y)(1 - p)L, \end{aligned} \tag{4.88}$$

or,

$$\begin{aligned} k(pq + (1 - p)) < &-Lpq - L(1 - p) + yLpq + yL(1 - p) \\ &+(1 - y)pqH + (1 - y)(1 - p)L. \end{aligned} \tag{4.89}$$

Rearranging we have

$$\begin{aligned} k(pq + (1 - p)) < &-(1 - y)(1 - p)L - (1 - y)pqL \\ &+(1 - y)pqH + (1 - y)(1 - p)L, \end{aligned} \tag{4.90}$$

which equals,

$$k(pq + (1 - p)) < -(1 - y)pqL + (1 - y)pqH, \tag{4.91}$$

or,

$$k(pq + (1 - p)) < (H - L)pq(1 - y). \tag{4.92}$$

Dividing by $pq + (1 - p)$ we have

$$k < \frac{(H - L)pq(1 - y)}{pq + (1 - p)}. \tag{4.93}$$

Derivation of Proposition 4.9: Type 1 workers of low ability will choose to work in a team whenever

$$\begin{aligned}2L + k < [\psi H + (1-\psi)L] + (1-\psi)L + \\ \psi[\frac{\psi}{\psi + (1-\psi)\psi}H + \frac{(1-\psi)\psi}{\psi + (1-\psi)\psi}L].\end{aligned} \tag{4.94}$$

Subtracting $2L$ we have

$$\begin{aligned}k < \psi H + -\psi L - \psi L \\ +\psi[\frac{\psi}{\psi + (1-\psi)\psi}H + \frac{(1-\psi)\psi}{\psi + (1-\psi)\psi}L].\end{aligned} \tag{4.95}$$

Multiplying with $\psi + (1-\psi)\psi$ we get

$$\begin{aligned}k(\psi + (1-\psi)\psi) < \psi H(\psi + (1-\psi)\psi) \\ -2\psi L(\psi + (1-\psi)\psi) + \psi^2 H + \psi^2(1-\psi)L.\end{aligned} \tag{4.96}$$

Expanding terms we have

$$\begin{aligned}k(\psi + (1-\psi)\psi) < \psi^2 H + \psi^2 H(1-\psi) \\ -2\psi^2 L - 2L\psi^2(1-\psi)) + \psi^2 H + \psi^2(1-\psi)L.\end{aligned} \tag{4.97}$$

Collecting terms we get

$$k(\psi + (1-\psi)\psi) < 2\psi^2 H + \psi^2 H(1-\psi) - 2\psi^2 L - L\psi^2(1-\psi)), \tag{4.98}$$

which is equal to

$$k(\psi + (1-\psi)\psi) < (H-L)\psi(2\psi + (1-\psi)\psi). \tag{4.99}$$

Dividing by $\psi + (1-\psi)\psi$ we get

$$k < \frac{(H-L)\psi(2\psi + (1-\psi)\psi)}{\psi + (1-\psi)\psi}. \tag{4.100}$$

Derivation of Proposition 4.10: Type 1 workers of low ability will choose the risky task whenever

$$\begin{aligned}2L + k < \\ L + z[\frac{\psi(1-2z)}{\psi(1-2z) + (1-\psi)z}H + \frac{(1-\psi)z}{\psi(1-2z) + (1-\psi)z}L] \\ +(1-2z)[\frac{\psi z}{\psi z + (1-\psi)(1-2z)}H + \frac{(1-\psi)(1-2z)}{\psi z + (1-\psi)(1-2z)}L] \\ +zL.\end{aligned} \tag{4.101}$$

Let $\phi = [\psi(1-2z) + (1-\psi)z]$ and let $\gamma = [\psi z + (1-\psi)(1-2z)]$. Subtracting $2L$ and multiplying with $\phi\gamma$ we have

$$\begin{aligned} k\phi\gamma < -L(1-z)\phi\gamma + z\psi(1-2z)H\gamma + z^2(1-\psi)L\gamma \\ +(1-2z)\psi z H\phi + (1-2z)^2(1-\psi)L\phi, \end{aligned} \tag{4.102}$$

Dividing by $\phi\gamma$ and rearranging we have

$$\begin{aligned} k < \frac{Hz\psi(1-2z)[\gamma+\phi]}{\phi\gamma} \\ -\frac{L[(1-z)\phi\gamma - z^2(1-\psi)\gamma - (1-2z)^2(1-\psi)\phi]}{\phi\gamma}. \end{aligned} \tag{4.103}$$

Chapter 5

Incompetence and Indifference

5.1 Introduction

Many public services could be supplied by single individuals. Examples include department chairing, making coffee, queuing for tickets, programming the VCR, doing the dishes, and driving a car. In situations like these all individuals may have a positive payoff from performing the public service if they had to. But, of course, all individuals, to avoid the costs of providing the public service, would rather that someone else provided it.

In this type of conflict, incompetence may provide a strategic advantage. For example, it can be an advantage to be an incompetent driver if this implies that one can sleep during longer trips. Similarly, if you know nothing about the VCR you do not have to spend time programming it but can leave this to other people. Such benefits of incompetence also imply that the incentives for learning are low.

Indifference can also provide a competitive edge. If you value a fresh cup of coffee less than your colleagues you may not have to brew a new can. And if you care less about having a clean house you may be able to avoid the housework. Conversely, if you do value having a clean home you may end up doing almost all of the housework. Similarly, a conscientious and loyal worker may end up doing almost all the work.

In this note I describe these strategies in conflicts over the supply of public services. Specifically, I analyze the incentives of players who know that they will participate in a war of attrition over the supply of a public service. In this waiting game, first analyzed by Maynard-Smith (1974), two players both wait for their opponent to give up and the player who is willing to continue longest receive some prize. In this version, two players wait for their opponent to perform some public service and the player who waits longest gets the benefits of this public service but avoids the costs of supplying it (Bliss and Nalebuff, 1984; Bilodeau and Slivinski, 1996). Using a simple version of this game I show in section 5.2 how incompetence (or desperation) and indifference can provide a strategic advantage. I also show how a player with a first-mover advantage may improve his or her outcome in the ensuing conflict by reducing his or her competence or by reducing his or her dependence on the public service. Section 5.3 applies this analysis to housework, organizations, budgeting, political activism and quarrels.

5.2 A Formal Analysis

5.2.1 The model

There are two players, $i = 1, 2$. Both players wait for their opponent to perform some public service and the player who waits longest gets the benefits of this public service but avoids the costs of performing it. If the public service is performed in period t player i's utility in period t is $v_i - t$, where $v_i > 1$. The cost of performing the public service is $c_i > 1$ (for a complete list of symbols see Appendix A).[1]

Assumption 5.1 *For each player $i \in \{1, 2\}$ we have that*

$$c_i - (1 - \delta)v_i - 1 > 0. \tag{5.1}$$

The timing of the game is the following. At the beginning of each period, $t = 0, 1, \ldots$, each player chooses whether to provide the public service or not. If player i stops at the beginning of period t and provides the public service while player j stops at the beginning of period $t + 1$ or later, then player j receives $v_i - t$ in period t, while player i receives $v_i - t - c_i$ in period t. If players i and j stop at the beginning of period t and provide the public service both players receive $v_i - t - c_i$ in period t. It follows that if player i stops at the beginning of period t while player j stops at the beginning of period $t + 1$, then the von Neuman-Morgenstern utility of player j, denoted U_j, is

$$\delta^t(v_j - t), \tag{5.2}$$

where $\delta < 1$ is the discount factor. Similarly, the von Neuman-Morgenstern utility of player i, denoted U_i, is

$$\delta^t(v_i - t - c_i). \tag{5.3}$$

[1]Thus, the value of the public service is decreasing over time. In many applications this is a reasonable assumption. For example, if the conflict is about who is going to drive a car to a picknick the trip may be more valuable if it is performed sooner rather than later. This specification is also convenient since it reduces the multiplicity of equilibria which exists in a stationary war of attrition (Cf. Fudenberg and Tirole, 1991).

5.2.2 The outcome

To see the value of incompetence and indifference in the above war of attrition consider the case in which $v_i - c_i \neq v_j - c_j$. Define t_i^* as the first period in which the utility for player i of providing the public service, i.e., $v_i - t_i^* - c_i$, is negative. That is, t_i^* is the first period in which the following equation holds

$$v_i - c_i < t_i^*. \tag{5.4}$$

The value of t_i^* matters since it determines the credibility of threats. The player with the lowest value of t_i^* can credibly threaten to quit the game and never perform the public service earlier than a player with a higher value of t_i^* can. In this case a reasonable subgame perfect Nash equilibrium in behavioral strategies is the following: The player with the highest value of t_i^* stops at the begining of period zero and the other player does not stop until after the player with the highest value of t_i^* has stopped. In other words, the player with the highest value of t_i^* will supply the public service immediately. This reasoning is summarized in the following Lemma (the proof is in Appendix B).

Lemma 5.1 *Whenever $t_2^* > t_1^* > 0$ then (i) the unique subgame perfect Nash equilibrium in behavioral strategies is that player 2 stops at the beginning of period zero and player 1 does not stop until after player 2 has stopped (ii) player 1 receives v_1 and player 2 receives $v_2 - c_2$.*

By using Lemma 5.1 and equation (5.4) it is easy to derive the following proposition.

Proposition 5.1 *i) Whenever $c_j < c_i$ player j will, ceteris paribus, stop at the beginning of period zero and receive $v_j - c_j$ while player i receives v_i.*[2] *ii) Whenever $v_j > v_i$ player j will, ceteris paribus, stop at the beginning of period zero and receive $v_j - c_j$ while player i receives v_i.*

In other words, in a conflict over the supply of a public service incompetence or desperation (c_i high) and indifference (v_i low) provide a strategic advantage.

5.2.3 Precommitment

Since the outcome of the conflict depends on the parameters v_i and c_i a player with a first-mover advantage can improve his or her position by manipulating these parameters even if this implies that this player's utility before the conflict is reduced. Consider, for example, a conflict in which $t_i^* > t_j^*$. In this conflict player i receives $v_i - c_i$. However, if player i changed v_i and c_i so that $t_i^* < t_j^*$,

[2]Assuming, of course, that i) the difference between c_i and c_j is sufficiently large so that the integer values of t_i^* and t_j^* differ ii) the values of v_i, c_i, v_j and c_j are such that t_j^* and t_i^* are both positive. These qualifications applies to all parts of Proposition 5.1.

then player i would receive v_i. The utility of player i of changing v_i and c_i is thus c_i. Consider, next a conflict in which $t_i^* < t_j^*$. In this conflict player i receives v_i. However, if player i changed v_i and c_i so that $t_i^* > t_j^*$, then player i would only receive $v_i - c_i$. The utility of player i of not changing v_i and c_i is thus c_i. This reasoning is summarized in the following proposition:

Proposition 5.2 *A player with a first-mover advantage can reduce his or her utility before the conflict by c_i in order to ensure that he or she will win the conflict.*

This implies that it may not be rational for an incompetent individual to increase his or her skills. And it may not be rational for an individual to make herself dependent on a certain public service since he or she then always would have to supply it.

5.3 Examples

5.3.1 Housework

Housework is often a public service most effectively supplied by a single individual. Incompetence can thus provide a strategic advantage. Incompetence was also identified as the main form of resistance in the interviews of couples performed by Hochschild (1989). Men "forgot the grocery list, burned the rice, didn't know where the broiler pan was" in order to "get credit for trying and being a good sport, but so as to not be chosen the next time" (Hochschild, 1989, p. 201). The same strategy, however, was also used by women against men: "Frank paid the bills because Carmen paid the wrong ones. Frank sewed (when Carmen's mother didn't sew for them) because Carmen couldn't sew. Frank worked the automatic teller for Carmen because she 'always forgot' the account's code number. Frank drove them on shopping trips because Carmen couldn't drive." (Hochschild, 1989, p. 71). Indifference and "needs reduction" was also used. For example, one man explained that "he never shopped because 'he didn't need anything'. He didn't need to take clothes to the laundry to be ironed because he didn't mind wearing a wrinkled shirt." (Hochschild, 1989, p. 202).

5.3.2 Organizations

There are several public services in organizations which have not been assigned to specific individuals. Examples include making coffee, handling the copier machine, planning the department party, and, taking care of the plants. Other examples include teaching an extra class or writing the memorandum which has to be delivered tomorrow. In conflicts over the provision of such public services incompetence and indifference can provide a strategic advantage.

Consider, for example, the allocation of teaching assignments. Here the worst teacher may have an advantage in that he or she does not have to teach. Or consider two departments each producing a component to a product. The exact form of each component does not matter much as long as the two components are compatible. Suppose, however, that the designs of the two departments are incompatible. Thus, one department will have to change its design. In this situation incompetence, poor learning skills and a low capability to adapt to new circumstances may be an advantage (Cf. Lave and March, 1993; Levinthal and March, 1993). Consider, next, a situation in which each department can contribute with a public service. In this context the department which values the public service the most will be the one to supply it. In other words, in this context indifference provides a strategic advantage. Or consider two individuals who both can perform a task, which, if completed, would advance the careers of both individuals. In this situation the most ambitious individual, the individual who values his or her career the most, will be the one who will have to complete the task. In other words, in this situation ambition provides a strategic disadvantage. Consider, finally, two individuals who both can perform a task, which, if completed, would benefit the organization they work for. In this context the most loyal individual will be the one who will have to complete the task. In other words, in this context illoyalty provides a strategic advantage.[3]

Such examples suggest that if organizational life is a fight we should not expect that only the most competent and ambitious will survive. Sometimes the incompetent and indifferent will have the advantage. Knowing this, rational players may strive for mediocrity rather than excellence and indifference or illoyalty rather than ambition. That this occurs in reality was verified in a survey of 162 part-time business students (Becker and Martin, 1995). In this survey 56 % of the respondents reported instances in which they or someone else had tried to convey an impression of incompetence or illoyalty. The motive was to avoid additional or unwanted work (60 %) or to obtain concrete rewards such as a transfer (13 %), but also to get laid off (11 %) or just to intimidate superiors (10 %).

5.3.3 The politics of budgeting

Consider a budget conflict involving two individuals, two departments, or two political parties. All may agree that one group of individuals have to reduce their claims in order to improve the finances of the project, the firm or the country. But each individual or group of individuals would prefer that the individuals in the other group reduced their claims. Nothing can be done, however, before both sides agree, or, to put it differently, before someone concedes. If we assume that the value of an agreement decreases over time this situation can be

[3]The advantages of illoyalty over loyalty provides a counter-example to Akerlof's (1983) discussion of the benefits of loyalty.

modeled using the above model.[4] For example, v_i may be the value for group i of improving the finances and c_i the loss of utility members of group i would experience if the budget of their group was reduced. In this type of conflict desperation, i.e., a high c_i, may provide a competitive advantage. This implies that a player can improve his position by making himself more desperate (Cf. Schelling, 1960). Consider, for example, a budget conflict over in which state, A or B, the federal support program is going to be cut. In this situation state A can increase its chances by concentrating all funds to a small town thereby making its economic survival dependent on continued funding. Alternatively, state A can borrow to invest in specific assets which only can be used in the federal program.

5.3.4 Political activism

For a group of individuals to achieve their common political goals some individual has to take the time and effort political activism requires. The above model predicts that the activist will be the individual with the lowest opportunity cost of time; the individual who has nothing better to do. In addition, if the cost of participating in political activities decline with experience, the above model suggests that individuals who once have participated in political activities will have a higher probability of doing so in the future. The model also implies that the political activist will be the individual who care most about achieving the political goals of the group. This suggests a "Matthew Effect": poor individuals who value an immediate increase in living standards more than rich individuals will be the ones who will have to be politically active.

5.3.5 The principle of least interest

The above model can also shed some light on what has been referred to as "the principle of least interest": that in "any sentimental relation the one who cares less can exploit the one who cares more" (Ross, 1921, p. 136).[5] Consider, for example, a couple involved in a quarrel. Both partners may want to avoid an escalation of the conflict but no one may want to concede. In this situation the above model predicts that the partner who values a continuation of the present relationship the most will be the one to concede.

5.4 Concluding Remarks

Competence and ambition are usually valuable. However, as this essay has shown circumstances exist in which incompetence and indifference are advanta-

[4]For other models of budget conflicts as a war of attrition see, e.g., Alesina and Drazen (1991).

[5]See also Waller (1937), Waller and Hill (1951) and Homans (1961).

geous. Still, for at least two reasons, these are likely to be special circumstances. First, the advantages of incompetence and indifference seldom dominate the advantages of competence and ambition. Second, in repeated interactions, when individuals expect each to do their share, individuals may have nothing to lose by revealing their competencies and ambitions. Only when interactions are not likely to be repeated will the arguments in this paper apply with full force.

Appendix A: List of Symbols

t	Time
$v_i - t$	The value for player i of the public service
c_i	The cost for player i of performing the public service
δ	Discount factor
U_i	The utility of player i
t_i^*	The first period in which $v_i - t_i^* - c_i < 0$.

Appendix B: Proof of Lemma 5.1

Notice first that player 1 never will perform the public service at the beginning of period $t \in [t_1^*, \infty)$. Knowing this the optimal strategy for player 2 at the beginning of period t_1^* is to provide the public service.

Consider now the choice of player 1 at the beginning of period $t_1^* - 1$. Player 1 knows that player 2 will provide the public service at the beginning of period t_1^*. Subsequently, if player 1 does not stop until after player 2 has stopped at t_1^*, then the expected utility of player 1, at the beginning of period $t_1^* - 1$, is $\delta(v_1 - t_1^*)$. If, on the other hand, player 1 provides the public service at the beginning of period $t_1^* - 1$ his or her utility is $v_1 - (t_1^* - 1) - c_1$. It follows that if

$$\delta(v_1 - t_1^*) - [v_1 - (t_1^* - 1) - c_1] > 0, \tag{5.5}$$

i.e., if

$$c_1 - (1 - \delta)v_1 + t_1^*(1 - \delta) - 1 > 0, \tag{5.6}$$

then player 1 will not provide the public good at the beginning of period $t_1^* - 1$. Since it follows from Assumption 5.1 that

$$c_1 - (1 - \delta)v_1 - 1 > 0, \tag{5.7}$$

it follows that equation (5.6) holds and that player 1 never will provide the public good at the beginning of period $t \in [t_1^* - 1, \infty)$. Knowing this the optimal strategy for player 2 at the beginning of period $t_1^* - 1$ is to provide the public service.

Consider now the choice of player 1 at the beginning of period $t_1^* - 2$. Player 1 knows that player 2 will provide the public service at the beginning of period $t_1^* - 1$. Subsequently, if player 1 does not stop until after player 2 has stopped at $t_1^* - 1$, then the expected utility of player 1, at the beginning of period $t_1^* - 2$, is $\delta(v_1 - (t_1^* - 1))$. If, on the other hand, player 1 provides the public service at the beginning of period $t_1^* - 2$ his or her utility is $v_1 - (t_1^* - 2) - c_1$. It follows that if

$$\delta(v_1 - (t_1^* - 1)) - [v_1 - (t_1^* - 2) - c_1] > 0, \tag{5.8}$$

i.e., if

$$c_1 - (1-\delta)v_1 + t_1^*(1-\delta) - 1 - (1-\delta) > 0, \tag{5.9}$$

then player 1 will not provide the public good at the beginning of period $t_1^* - 2$. Notice that it follows from Assumption 5.1 that

$$c_1 - (1-\delta)v_1 - 1 > 0. \tag{5.10}$$

Moreover, since we are considering the decision of player 1 at the beginning of period $t_1^* - 2$ it must be the case that

$$t_1^*(1-\delta) \geq (1-\delta). \tag{5.11}$$

It follows that equation (5.9) holds and that player 1 never will provide the public good at the beginning of period $t \in [t_1^* - 2, \infty)$. Knowing this the optimal strategy for player 2 at the beginning of period $t_1^* - 2$ is to provide the public service.

Consider now the choice of player 1 at the beginning of period $t_1^* - 3$. Player 1 knows that player 2 will provide the public service at the beginning of period $t_1^* - 2$. Subsequently, if player 1 does not stop until after player 2 has stopped at $t_1^* - 2$, then the expected utility of player 1, at the beginning of period $t_1^* - 3$, is $\delta(v_1 - (t_1^* - 2))$. If, on the other hand, player 1 provides the public service at the beginning of period $t_1^* - 3$ his or her utility is $v_1 - (t_1^* - 3) - c_1$. It follows that if

$$\delta(v_1 - (t_1^* - 2)) - [v_1 - (t_1^* - 3) - c_1] > 0, \tag{5.12}$$

i.e., if

$$c_1 - (1-\delta)v_1 + t_1^*(1-\delta) - 1 - 2(1-\delta) > 0, \tag{5.13}$$

then player 1 will not provide the public good at the beginning of period $t_1^* - 3$. Notice that it follows from Assumption 5.1 that

$$c_1 - (1-\delta)v_1 - 1 > 0. \tag{5.14}$$

Moreover, since we are considering the decision of player 1 at the beginning of period $t_1^* - 3$ it must be the case that

$$t_1^*(1-\delta) \geq 2(1-\delta). \tag{5.15}$$

It follows that equation (5.13) holds and that player 1 never will provide the public good at the beginning of period $t \in [t_1^* - 3, \infty)$. Knowing this the optimal strategy for player 2 at the beginning of period $t_1^* - 3$ is to provide the public service.

By backwards induction we have that at the beginning of each period, $t = 0, 1, \ldots$, the optimal equilibrium strategy for player 2 is to stop and provide the public service. We thus see that in the *subgame* starting at the beginning of each period, $t = 0, 1, \ldots$, the unique Nash equilibrium is that player 2 stops at the beginning of the period while player 1 does not stop until after player 2 has stopped.

The strategies of player 1 and 2 is a so called *subgame perfect Nash equilibrium* if the strategies are a Nash equilibrium in each subgame of the overall game.[6] The unique subgame perfect Nash equilbrium in this game is that player 2 stops at the beginning of period 0, and, that player 1 does not stop until after player 2 has stopped. In this equilibrium player 2 receives $v_2 - c_2$ while player 1 receives v_1.[7] *Q.E.D.*

[6]The concept was introduced in Selten (1965). For a precise definition see Fudenberg and Tirole (1991, Ch. 3).

[7]The proof for Lemma 5.1 relies on backward induction and is therefore open to the critique of backward induction put forward in, e.g., Basu (1988), Binmore (1987, 1988) and Rosenthal (1981). To see the problem, notice that the proof for Lemma 5 1 starts by contemplating the reasoning of players 1 and 2 when they have reached a node which they, according to the equilibrium, will never reach. For an introductory discussion of this problem see Fudenberg and Tirole (1991, Ch. 3).

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