Career Concerns in a Simple Experimental Labour Market

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Abstract

We experimentally investigate a simple version of Holmström's career concerns model in which firms compete for agents in two consecutive periods. Profits of firms are determined by agents' unknown ability and the effort they choose. Before making second-period wage offers firms are informed about first-period profits. In a different treatment firms additionally learn the abilities of agents. Theory unambiguously predicts high first-period equilibrium effort in the hidden ability treatment but no effort elsewhere. However, we find that effort is significantly higher in the revealed ability treatment and therefore conclude that transparency does not weaken, but strengthen career concerns incentives.

Keywords

Incentives, Labour Market, Reputation, Reciprocity, Career Concerns

JEL Classification Codes

C72, C91, J33

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1 Introduction

Since Holmström's (1982) article, building on the work by Fama (1980), the understanding has become well established that career concerns are an important incentive device.[1] Holmström's idea is basically the following: the performance of a manager depends on two main factors, his ability and his effort at each point in time. After each period in the working life of a manager the actual and potential other employers receive some signal on the manager's performance. However, they cannot distinguish directly whether good performance was due to a manager's high ability or a high effort he exerted. Potential employers can make wage offers to a manager, which will be contingent on their beliefs on his ability and effort choice. Their beliefs depend on their observations of past performance. Given an equilibrium effort level, the labour market's beliefs on the manager's ability will be higher, the higher the manager's past output. As a consequence, by exerting effort in the actual period the manager can raise the market's beliefs on his ability and, hence, the wages he receives in the future – therefore this class of models is sometimes described as "signal jamming" models.

One important implication of this theory is that managers will exert higher efforts in the beginning of their career than in the end. In the beginning, there are not so many signals of past performance available to judge the ability of a manager. Hence, initial performance has a high impact on the labour markets assessment of the manager's ability and therefore the manager's marginal return of effort is high. In the end of his career, there has been a large number of signals on a manager's ability. Then current performance has only a small effect on the market's assessments. In addition, the number of remaining periods is small in which the manager would receive wages raised by current higher performance.

This mechanism seems to be highly plausible and might well explain certain aspects of career concerns as an incentive device. However, it builds on one important assumption, namely that the market cannot distinguish between a manager's ability and his effort choice. If such a distinction is feasible the manager is not able to "fool" the labour market into believing that he is of high ability when he is not. A backward induction argument then leads to the conclusion that a rational agent with self-regarding preferences will never exert any positive effort. Hence, if the labour market is able to differentiate between ability and effort of a manager the mechanism should break down entirely. However, it is doubtful whether this

1 Other articles building on this idea are for instance Gibbons and Murphy (1991), Dewatripont, Jewitt and Tirole (1999a) and (1999b), see also Gibbons and Waldman (1999).

undistinguishability assumption is appropriate in all cases as firms do screen managers and their expertise may often be transparent.

In addition, recent literature in experimental economics (e.g. Fehr, Kirchsteiger and Riedl 1993; Berg, Dickhaut, and McCabe 1995, Fehr, Gächter and Kirchsteiger 1997) has pointed out that the assumption that economic agents are guided by narrow self-interest and maximisation of monetary payoffs has to be rejected in many cases. Fairness and reciprocity play an important role in explaining human behaviour. Since a principal may have a preference for hiring an agent who is willing to reciprocate generous wages with non-zero effort even in the end of the game, we should expect that it is attractive for agents to reciprocate wage offers right from the beginning. Hence, it is likely that agents exert strictly positive effort levels even when ability and effort can be distinguished.

To analyse the functioning of the career concerns mechanism empirically, we have designed an experimental setting which to our knowledge is the first attempt to implement a career concerns model in a laboratory experiment. The experimental approach has the advantage that it provides data of real behaviour in situations which differ only in the strategic variation which we are interested in. We examine two different settings. In a first setting we implement a simple version of Holmström's model, making the key assumption that a managers ability and effort cannot be observed separately. We contrast this with a second setting where effort and ability are revealed. The latter setting serves two purposes: First of all, it is an appropriate test of the theory to examine the consequences of omitting the essential "undistinguishability" assumption. Additionally, as we have discussed above, a higher transparency might often be given in reality. Therefore it appears to be quite interesting to know whether incentives are provided even in those cases. Note that the second setting still allows for building a reputation for reciprocating positive wage offers.

In our experiment four firms can bid for the service of three managers in each of two consecutive periods. The managers' abilities are initially randomly drawn, but fixed for both periods. A manager can accept only one offer in each period. After having accepted an offer he can choose an effort level. The firm, whose bid he has accepted, receives simply the sum of his ability and his effort. In the first setting only this sum is conveyed, in the second the manager's ability is revealed in addition to all potential employers. Theory predicts high effort in the first period of the setting with hidden abilities and no effort at all in all other cases.

We basically find two interesting observations. First, in *both* settings effort levels are positive and they are higher in the first than in the second period, i.e. even if the ability is revealed.

Hence, it is not only the strategic "signal jamming" motive to make the labour market think that oneself is of high ability that induces high efforts. Second and most surprisingly, it turns out that this effect is much stronger when abilities are revealed. First period efforts are significantly higher in that case. Hence, the experimental results turn the normative view upside down: we observe even *higher* efforts in the treatment where according to standard theory the absence of uncertainty prevents effort!

The paper proceeds as follows. In section 2 we present a simple version of a Holmström-type career concerns model and give equilibrium solutions in section 3 for both the hidden ability and the revealed ability setting. In section 4 the experimental design is described. After this we report the experimental results in section 5. Finally, possible interpretations are discussed in section 6.

2 A Simple Career Concerns Model

In this section we provide a simple version of a Holmström (1982)-type career concerns model.[2] A manager works for two consecutive periods t=1,2 and produces a certain output in each period. This output is determined by the manager's ability a and the effort he exerts in period t denoted by e_t. The output accrues to the manager's employer in the respective period. The manager's ability is constant over both periods. In the beginning this ability is unknown to all players. It is well-known, however, that the ability is uniformly distributed on the set [0, A]. For simplicity we assume that the output y_t in period t is given by the sum of the manager's ability and the effort he exerted in this period:

$$y_t = e_t + a.$$

There are at least two firms present in the market, who as potential employers compete for the manager's services in each period. In the beginning of each period all firms simultaneously make a fixed wage offer to the manager. Among those offers the manager can accept one.

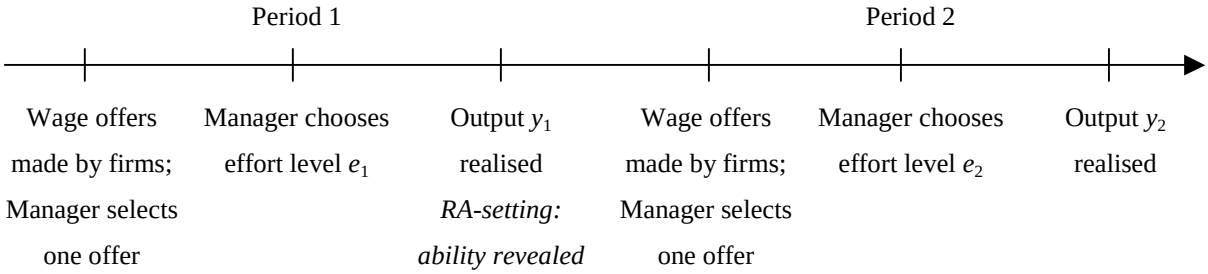
We consider two different settings, which will be implemented in the experiment. The two settings differ in the amount of information the potential employers get on the manager's past performance. In both settings all potential employers get to know the output produced by the

2 Whereas Holmström considers several periods we consider only two. Instead of normally distributed abilities we assume a uniform distribution and omit additional noise terms. This gives us a very clearcut setup containing the basic ingredients of a career concerns model without imposing two much complexity that may not be understood by experimental participants. Especially Bayesian updating of beliefs on a manager's ability is very simple in our case as will become clear below.

manager in the first period before they make their second period wage offers. First, we analyse a standard Holmström type model, which we call the *hidden ability* setting. In this setting although learning the manager's output, the potential employers do not learn to which parts it consists of the manager's ability and effort. Then we look at a second setting, which we will call the *revealed ability setting*, where the employers learn in addition to the output it's exact composition. Hence, before they make their second period wage offers they know precisely a manager's ability. Note that, as the manager himself learns the first period output and knows his own effort choice, he perfectly knows his ability after period 1 in both treatments.

After the manager has chosen one of the offers, he receives the offered wage w_t in period t which is paid by the firm who has made this offer. After this, he can choose an effort level e_t which will lead to private costs $c(e_t)$ for the manager, where $c(0)=0$, $c'(e_t)>0$ and $c''(e_t)>0$.

The timing of events in both settings is as follows:



As described above, the only difference between both settings is that in the *revealed ability setting* all firms perfectly learn the manager's ability in addition to his output.

The profit of a firm when hiring the manager in period t is simply the difference between his output y_t and wage w_t. The utility of the manager in period t is the difference between the received wage w_t and the costs of his effort. For simplicity there is no discounting.

3 Equilibrium Behaviour

We solve for the perfect Bayesian equilibrium of the game described above for both settings. We assume that all players have purely self-regarding preferences and are risk neutral. Risk aversion will not greatly alter the results. We will briefly discuss this at the end of this section.

3.1 The Hidden Ability Setting

Clearly, a rational manager with purely self-regarding preferences will never exert any effort in period 2 as this causes only costs without any return. Hence, the value of a manager for potential employers is only determined by his ability. However, in this setting the potential employers do not learn the agent's ability directly after period 1. But in a pure strategies equilibrium, they can infer the ability from the first period result. With an equilibrium effort of e_1^* a potential employer can easily compute the expected ability of an employee. It is simply the difference between y_1 and e_1^*:

$$E\left[a \middle| y_1, e_1^*\right] = y_1 - e_1^* \quad .$$

Hence, all market participants do precisely know the ability of a manager after period 1 and have a common valuation for his services. Again, the bidding process at the beginning of period 2 results in Bertrand competition. In equilibrium the second period wage must correspond to the conjectured ability of the manager. Hence, we must have that

$$w_2 = y_1 - e_1^*.$$

But this wage setting behaviour is anticipated by the manager in period 1. The market's beliefs on his ability are influenced by his effort choice. By exerting more effort in the first period he can raise the market's expectations and, hence, second period wages as he can raise y_1 and therefore w_2. Recall that e_1^* describes the firms' beliefs on his equilibrium effort. In equilibrium those beliefs must be accurate. Hence, it remains to analyse which values for e_1 can indeed be equilibrium values. For a given conjecture e_1^* the manager chooses e_1 as follows:

$$\max_{e_1} E\left[y_1 \middle| e_1\right] - e_1^* - c(e_1) \quad \Leftrightarrow \quad \max_{e_1} E[a] + e_1 - e_1^* - c(e_1).$$

The first order condition then yields that we must have that $c'(e_1^*) = 1$. The equilibrium effort is hence uniquely defined. Each unit of additional effort raises the output y_1 by one unit. For a given equilibrium belief of the market this raises second period wages by one unit. Therefore, the marginal product of effort for the manager is exactly one. Note in addition, that the first period equilibrium effort then actually corresponds to the *first-best*-effort, as the marginal product of effort for the manager exactly corresponds to the marginal product of effort for the

agent. Hence, in the simple model considered here career concerns lead to efficient effort levels in the first period although wages are fixed.[3]

It remains to compute the first period equilibrium wage. Again there is Bertrand competition among the potential employers. The wage will correspond to the expected output in period 1 which is simply the sum of the expected ability of the manager $E[a]$ and the equilibrium effort level e_1^*:

$$w_1 = E[a] + e_1^* .$$

These results can be summarised as follows:

Theoretical Result 1: (Hidden Ability Setting)

The unique perfect Bayesian equilibrium in pure strategies has the following properties:

(i) In period 1 the manager chooses the efficient effort level, such that $c'(e_1^*) = 1$. He receives a wage $w_1 = E[a] + e_1^*$.

(ii) In period 2 the manager receives a wage $w_2 = y_1 - e_1^*$ and exerts no effort.

A rational worker chooses a high effort level in the first period to suggest a high ability to the labour market. In equilibrium, however, he does not succeed to deceive the labour market, as his behaviour is anticipated by the potential employers. Nonetheless, the manager cannot escape from this logic. A lower effort level in the first period would make the labour market believe that he is of lower ability and, hence, he would get lower wage offers in the second period.

3.2 The Revealed Ability Setting

In this setting it is very simple to solve for the equilibrium. Analogously to the previous section the manager never has any interest in exerting positive effort in period 2. The game stops afterwards and hence, he cannot gain anything from increasing his output. Again the value of a manager in the second period is only determined by his ability. In this setting, all firms perfectly know the manager's ability before they make their second period wage offers. Again, the bidding process leads to Bertrand competition among firms. In equilibrium the offered wage exactly corresponds to the manager's ability

3 This is due to the fact that in the simple model considered here output only depends on effort and ability of the manager. In Holmström's (1982) model and for instance in the papers by Dewatripont, Jewitt and Tirole (1999)

$$w_2 = a.$$

Otherwise a firm, whose wage offer is not accepted by the agent can raise its offer and still make a positive profit. In this case the manager can neither gain anything by exerting a positive effort level in period 1 as he is not able to affect the firms' beliefs on his ability. Hence, the first period value of the manager to all firms is again simply the expected value of his ability and therefore it must hold in equilibrium that

$$w_1 = E[a].$$

We can summarise those considerations in the following result:

Theoretical Result 2: (Revealed Ability Setting)

The unique perfect Bayesian equilibrium in pure strategies has the following properties:

(i) The manager does not exert any effort in both periods.

(ii) In period 1 the manager receives a wage equal to his expected ability $w_1 = E[a]$ in the second period the wage is equal to his ability $w_2 = a$.

3.3 Summary of Predictions Based on the Theoretical Model

As we have seen in the preceding sections, the model considered yields an unambiguous prediction: In the hidden ability setting we should expect considerably high effort levels in the first period. In contrast, in the revealed ability treatment the theoretical model predicts no effort at all. Hence, in theory it is exactly the fact that the composition of outputs is not transparent that leads to high equilibrium efforts in the first period. The manager is unable to affect the market's beliefs on his ability with a higher effort level. Therefore, in theory transparency destroys effort incentives. It is this prediction that should empirically be analysed more closely.

Note that these results are qualitatively unchanged when participants are risk averse. Risk averse firms will simply make lower wage offers in period one in both settings, as their return is uncertain. However, wage offers in period two are unaffected by the firms risk preferences in both settings. In the revealed ability setting there is no risk as second period returns are always perfectly known. In the hidden ability setting returns are also perfectly known in

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there is additional noise. Hence, the current output has a weaker impact on the market's assessments and the manager therefore exerts less effort.

equilibrium as firms can precisely infer the managers' ability. In both settings managers' risk aversion does not alter the results. With revealed abilities in any case the managers do not exert effort. In the hidden ability setting, although the manager's return in period 2 is uncertain, his expected utility is still maximised when $c'(e_1^*) = 1$.

4 Experimental Design

The experiment is based on the model described above but for a more natural representation of a labour market we implemented three managers on the one side and four firms on the other side of the market. We chose a cost function[4] such that equilibrium effort in the first period was equal to 12.

Table 1 : Experimental Design

	Hidden ability	Revealed ability
# independent observations	6	7
Information revealed after first period	output	output, ability
Equilibrium effort in period 1	12	0
Equilibrium effort in period 2	0	0
Initial capital balance of managers	100	
Initial capital balance of firms	150	
# rounds per session	12	
Integer set of abilities	{0, ..., 19}	
Integer set of wages	{0, ..., 38}	
Integer set of efforts	{0, ..., 19}	

The experiment was conducted in the Laboratorium für experimentelle Wirtschaftsforschung (*eLab*) at the University of Erfurt. In total 112 students participated – most of them were enrolled in the Faculty of Law, Economics, and the Social Sciences. Two treatments were implemented according to the two settings analysed in the last section. For each of the two treatments – the hidden ability treatment and the revealed ability treatment – we conducted four sessions with 14 participants each. A session consisted of 12 identical rounds and lasted for about 2 hours. During the session payoffs were given in our fictitious experimental currency "Taler". After a session payoffs were converted to DM and paid in cash with an exchange rate of 0.1 DM (≈ 0.051 Euro) for 1 Taler.

4 The cost function can be found in the Appendix. Note that marginal cost of effort less than 12 is less than 1 and marginal cost of effort higher than 12 is higher than 1.

In the beginning the instructions were handed out and read by the experimenters. In addition the participants were instructed how to use the experimental software.[5] In order to reduce the influence of uncontrollable connotations the strategic situation of the experiment was presented in completely neutral terms. Terms like “employer” or “employee” were avoided, instead the roles were referred to as players of type A (managers) and type B (firms). We spoke of “transfers” instead of “wages”, the unknown ability was termed “basic value” and instead of “effort” a “number” could be selected.

After the instructions were read all 14 participants took seat in a cubicle with the number they had previously drawn on a card. The computer software matched participants randomly and anonymously into two equally sized groups. Three participants were assigned the role of a manager and four were assigned the role of a firm. Groups and roles were fixed during the whole experiment. Thus, we could collect two independent observations per session.[6] Communication – other than over the experimental software – was not allowed. In the beginning of each round each manager was assigned a new ability which, however, was not disclosed. In order to facilitate a comparison of groups and treatments we implemented in all groups the same sequence of abilities which we randomly determined once and for all before the experiment. One round consisted of two periods. In the beginning of a period the four firms simultaneously had to make wage offers for each of the three managers. Afterwards a manger could choose to accept one of his four offers or to reject all of them. In case of a rejection the period ended for the respective manager. If the manager accepted an offer the wage was immediately transferred.

After the wage payment the manager had to choose his effort while he had to bear the cost for his choice. The employer whose offer was accepted received the output, i.e. the sum of effort and ability. In both treatments the output was also communicated to the employee which enabled him to easily derive his own ability after the first period. The structure of the second period was identical with that of the first period. However, the amount of information available to the employers was different when they had to make their offers. Whereas employers did not know anything about the mangers when they formulated their offers for the first period, information was provided before the second period. In the hidden ability

5 A translation of the instruction sheet can be found in the appendix. The experimental software was developed by making use of the toolbox zTree (Fischbacher 1998).

6 Unfortunately, we lost two observations in the hidden ability treatment and one in the revealed ability treatment due to computer problems in one session. In two other sessions we had to fill vacancies with people who were familiar with the strategic background of the experiment because some students did not show up although they were registered.

treatment an employer was informed about the first period output of each manager. In the revealed ability treatment, additionally, the ability of each manager was disclosed before the second period. Given this information the employers could specify their wage offers for the second period. It is worth to mention that the order of the screen presentation for the players was fixed only for one round. It was made very clear to the participants that after each round the order was randomly reshuffled. Thus, identification of players over rounds was not possible.

5 Results

We start by reporting our central experimental results of each of the two treatments. Then we outline the differences between behaviour in both settings and provide possible explanations. All of our statistical tests preserve the independence of observations.

5.1 The Hidden Ability Treatment

When analysing the behaviour of the experimental subjects there is some evidence for the importance of career concerns in the sense of Holmström's model: Within the hidden ability treatment average effort levels are significantly higher in period 1 than in period 2 (α=10%, Wilcoxon signed rank test, one-tailed).

Experimental Result 1: (Hidden Ability Treatment)
Effort is higher in period 1 than in period 2.

However, first period effort levels are much lower than the theoretical prediction. The average effort level is 3.54. As it is well below the predicted 12 for all six independent observations, the hypothesis that effort levels attain the theoretical prediction can clearly be rejected (α=1%, Wilcoxon signed rank test, one-tailed). Second period effort levels are on average 2.52 and hence are higher than the theoretically predicted zero effort. This willingness to exert non-zero effort can only be explained by reciprocity motives because strategic considerations do not play a role in the last stage. Figure 1 shows the average effort levels in periods 1 and 2 for the twelve rounds in both treatments. Histograms with the relative frequencies of the effort levels are contained in the appendix.

According to the theoretical model the agent can affect the market's beliefs on his ability in the second period by choosing a high effort level in the first period. The potential employers should infer from a high output in the first period a high ability and, hence, offer higher

second period wages. Therefore, one may expect that high first period outputs go along with high second period wage offers. To test for such a causality, as a descriptive measure, we computed the Spearman rank correlation coefficients between first period outputs and second period wages for each independent observation[7], which are given in Table 2. As an illustration Figure 2 shows all pairs of first period outputs and second period transfers for both treatments.

Table 2 : Correlation between first period output and second period wages (hidden ability)

Group	1	2	3	4	5	6
Spearman	0.706	0.647	0.650	0.804	0.100	0.305

As the coefficients are positive for each group we conclude that there is indeed a significant positive correlation between first period outputs and second period wage offers (α=5%, Binomial test, p = ½, one sided). However, note that this correlation is not as strong as theory would predict.

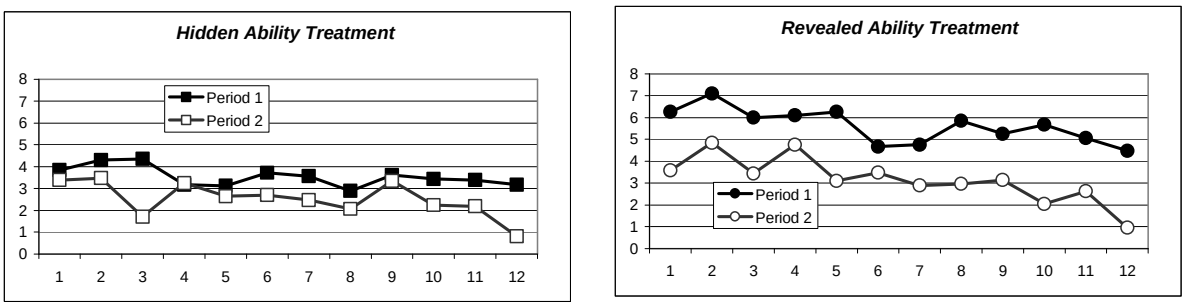

Figure 1: Average effort levels in both treatments over all rounds

5.2 The Revealed Ability Treatment

Surprisingly, also in the revealed ability treatment effort levels are higher in period 1 than in period 2 (see Figure 1). Whereas the average effort level in period 1 is 5.60, in period 2 it is 3.14. This difference is highly significant (α=1% Wilcoxon signed rank test, one-tailed).

Experimental Result 2: (Revealed Ability Treatment)

Effort is higher in period 1 than in period 2.

7 We collected pairs of first period output of an agent and the transfer payment this agent received in the second period of the same round. For each group we computed a Spearman rank correlation coefficient with all such pairs across all rounds and players in the group.

Hence, even if ability is revealed to potential employers at the beginning of period 2 there is a career concerns effect which is quite surprising from the viewpoint of the theoretical model. Again, as a descriptive measure we computed the Spearman rank correlation coefficients between first period outputs and second period wages for each independent observation to see whether high outputs in the first period indeed lead to high wage payments in the second period. The coefficients indicate a correlation that is at least as strong – if not stronger – than in the hidden ability treatment.[8] This clearly shows that career concerns do exist even if abilities are revealed.

Table 3 : Correlation between first period output and second period wages (revealed ability)

Group	1	2	3	4	5	6	7
Spearman	0.608	0.486	0.557	0.795	0.735	0.615	0.866

Even more important and in stark contrast to the theoretical prediction, the difference in effort levels across both periods appears to be unambiguously stronger than in the hidden ability treatment! As this observation is quite interesting and very surprising we will analyse it more closely in the subsequent section.

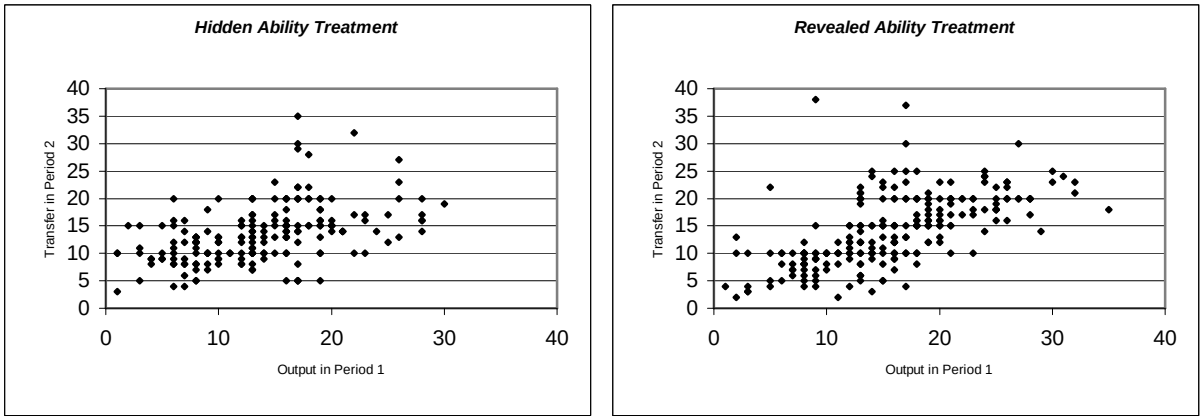

Figure 2: First period outputs and second period transfers in both treatments

5.3 A Comparison of both Treatments

Indeed, there is not only a high first period effort in the revealed ability treatment, in addition this effort is significantly higher than the effort in the hidden ability treatment (α=5%, Mann-Whitney-U test, one-tailed).

8 There is no significant difference in the magnitude of the Spearman rank correlation coefficients between the two treatments (Mann-Whitney-U test).

Experimental Result 3:

In the revealed ability treatment first period effort is higher than in the hidden ability treatment.

Figure 1 shows the average first period effort over time in both treatments. Observed behaviour is exactly opposite to the theoretical prediction. In the revealed ability treatment where – according to theory – there should be no career concerns at all, we do observe stronger incentives to exert effort in the first period than in the hidden ability treatment. The following table summarises average values for efforts and wages for both treatments and both periods.

Table 4 : Average wages and efforts

	Hidden ability treatment	Revealed ability treatment
Effort Period 1	3.54	5.60
Effort Period 2	2.52	3.14
Wage Period 1	13.56	15.62
Wage Period 2	13.23	13.74

Before we discuss possible explanations, we will briefly state some other results. First, note that second period efforts seem to be slightly higher in the revealed ability treatment than in the hidden ability treatment, but this relation is not significant (Whitney-Mann-U test, one-tailed). In addition, it is interesting to look at the profits of both types of players to understand the structure of the stylised labour market considered in our setting. In Table 5 the average profits of all firms are given for both treatments.

Table 5 : Average profits

	Hidden ability treatment	Revealed ability treatment
Profit of Firms Period 1	-0.01	0.03
Profit of Firms Period 2	-0.70	-0.60
Profit of Managers Period 1	11.95	12.73
Profit of Managers Period 2	12.00	12.31

Note that firms make profits close to zero in all treatments and periods. Recall, that firms had a weak position as there is always at least one firm left, that is not able to hire a manager. The theoretical prediction of Bertrand-like competition among the firms for each manager, hence, is well established. Firms do indeed bid up until they earn no profits. Furthermore, the fact that average profits are mainly negative indicates the relevance of a *winner's curse* effect: A firm that overestimates the output of a manager will win the competition and, hence, makes losses. In the Figure 3 the average profit of all firms are plotted for the 12 rounds for both treatments.

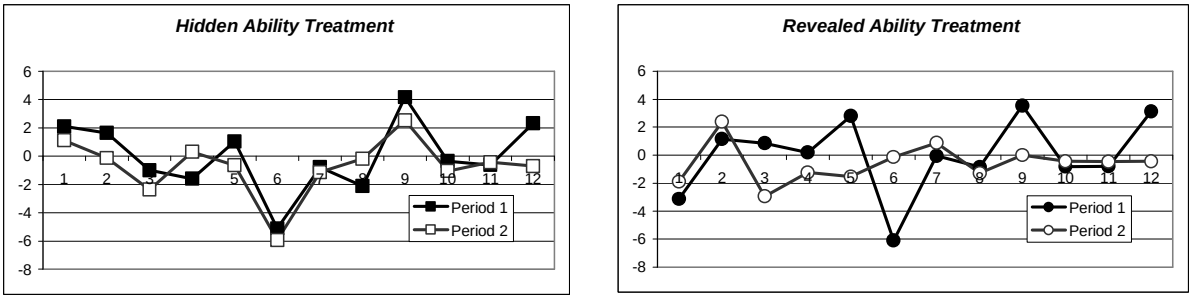

Figure 3: Average profit of firms in both treatments over all rounds

The movement in the structure of profits is due to the average values of the abilities drawn in each round. Therefore, the development of profits is very similar in both treatments, as the sequence of random abilities was the same in all sessions. Observe that peaks are smaller in the second period of the revealed ability treatment. In that treatment firms had more information as they knew the ability perfectly before the beginning of period 2. Hence, their estimates of the "true" value of a manager are better and profits are closer to zero. An analogous effect is also present in the hidden ability treatment, as is confirmed by looking at the managers' profits. As can directly be seen from Figure 4, in the hidden ability treatment the profit curve is flatter in period 1 as compared to period 2. In period 1 the firm has no information and, hence, takes all the risk from the uncertain ability of the manager. Due to the exact knowledge of the ability in period 2 this effect is stronger in the revealed ability treatment. Note, that – as predicted by theory – the managers on the strong side of the market absorb all profits.

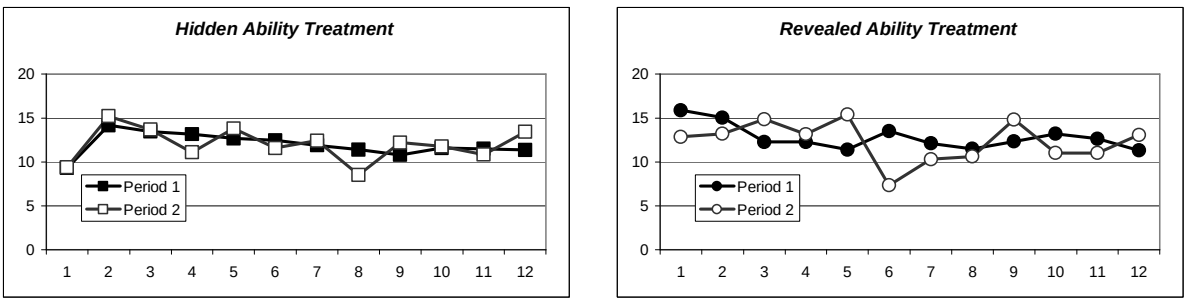

Figure 4: Average profit of managers in both treatments over all rounds

6 Discussion

We observe that there is also a career concerns effect in the revealed ability treatment. Although contrasting the theoretical prediction this observation is in line with previous

experimental findings. Indeed many experiments have shown that there is a certain share of subjects who behave fair or reciprocal by investing effort after having received a positive wage even if the subgame perfect equilibrium predicts an effort level of zero (for excellent overviews see Fehr and Gächter 2000 and Fehr and Schmidt, forthcoming). Hence, one explanation for the observed behaviour is that in the first period subjects want to signal their readiness to exert high effort. Someone who has not exerted a high effort in the first period will of course not be expected to exert a high effort in the second period. Therefore, high effort in the first period is a precondition for wage offers higher than ability in the second period.[9] We conclude that with high outputs in the first period subjects not only try to signal a high ability, but also a high readiness to exert effort.

However, the important question arises why this effect is weaker in the hidden ability treatment than in the treatment where the ability is revealed after the first period. In the hidden ability treatment raising the first period effort level may have a dual purpose as it should increase the market's beliefs on the manager's ability parameter as well as on his degree of reciprocity. However, in the experiment this does not lead to higher effort levels as one might conjecture. In contrast, the *transparency* in the revealed ability treatment raises effort levels. Transparency may have a positive effect in several respects:

- Signalling a high willingness to exert effort may be a more natural behavioural motive than exerting effort to make the market believe that one has a high ability parameter. Our results in the hidden ability treatment indeed show that strategic "signal jamming" considerations play a much smaller role than theory suggests. The former is easier in the revealed ability treatment where the effort is directly observed.
- In the revealed ability treatment reciprocity is directly perceived by the employers as they learn the effort of an agent perfectly after the first period. In the hidden ability treatment this is not the case, hence, managers might feel less inclined to act reciprocally as a bad output may be "excused" with the realization of a low (unknown) ability.
- Transparency makes it easier to pretend being a "Homo reciprocans". In the hidden ability treatment firms cannot distinguish between ability and effort and therefore cannot tell whether an agent behaves reciprocally in the first period or has simply a higher ability.

9 A related reputation effect is observed in Gächter and Falk (forthcoming).

7 Conclusion

The experimental results shown in this paper help to clarify and extend the notion of career concerns. One implication of our analysis is that career concerns should be understood in a broader sense than the strategic motive of making the market believe in a higher ability parameter. Career concerns should encompass all considerations an agent makes that aim at increasing future wages and career perspectives.

In that broader sense our paper reinforces the importance of career concerns as an incentive device. First of all, in the treatment with hidden abilities as in Holmström's original model, we do observe higher efforts in the first than in the second period. But we also observe such behaviour in the revealed ability treatment, where no such thing should happen from the theoretical perspective. Surprisingly, in the latter setting this effect is even stronger. Hence, in environments in which the ability signal jamming mechanism cannot work career concerns do play an even stronger role in generating incentives. Economic agents exert higher efforts in the beginning of their career because that indeed leads to higher wage offers in the future. As we have observed, their motivation to do so is higher when their efforts are directly observed.

This result has an important implication. In the spirit of Holmström's model transparency is detrimental as it destroys incentives: Only if the market *cannot* tell whether a good performance is due to a high ability or a high effort, a manager will work hard to demonstrate high ability. Our observation, however, points in the opposite direction. Only if the market *can* distinguish effort and ability a manager gets the direct opportunity to demonstrate his willingness to exert high efforts. As we have seen, the latter is a more important behavioural motive and hence, leads to higher effort levels. Hence, we conclude that transparency does not weaken, but on the contrary strengthen the incentive generating force of career concerns.

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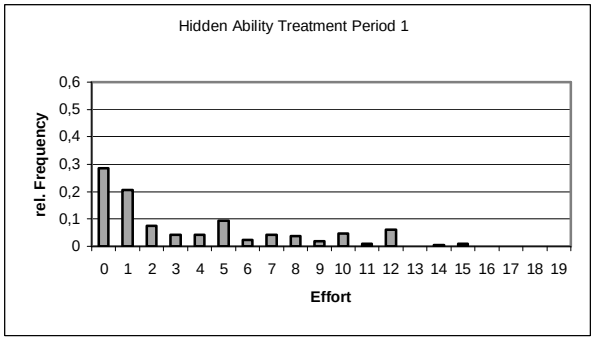
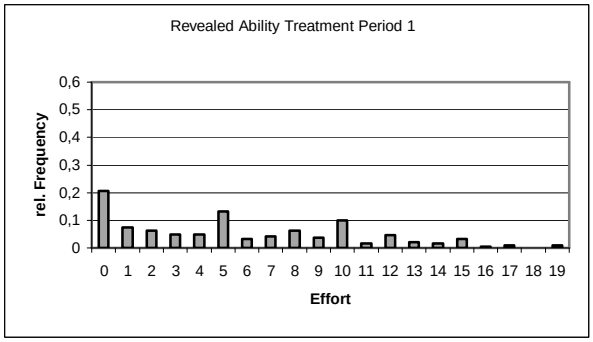
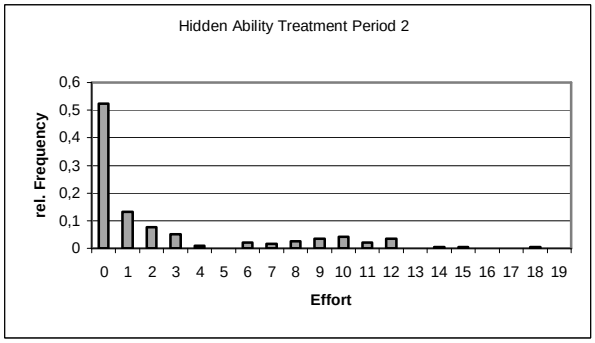
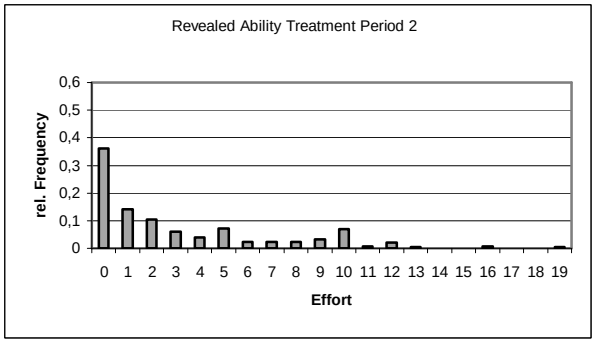
Appendix: Relative Frequency of Effort Levels

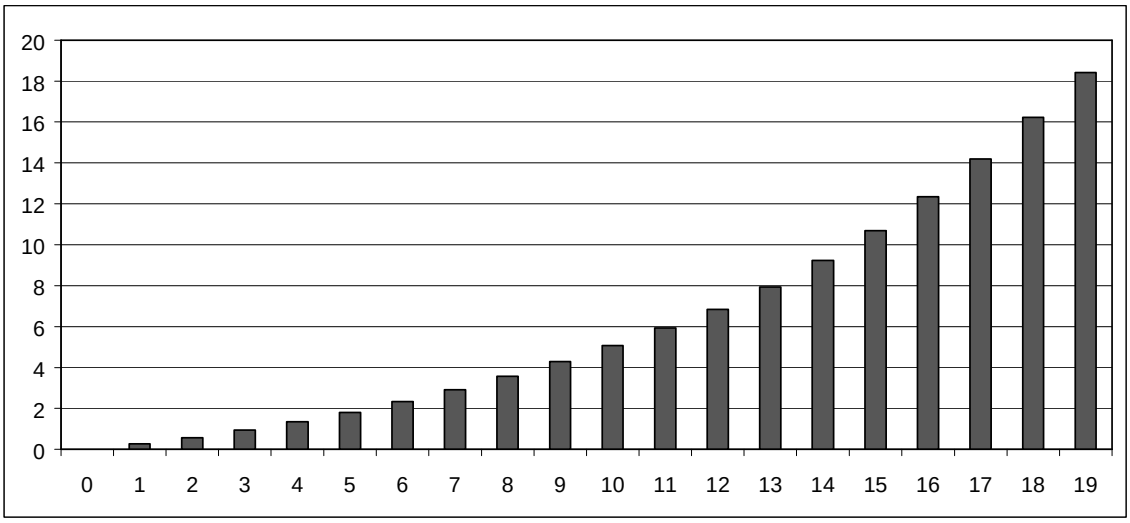








Appendix: Cost Function



Number	0	1	2	3	4	5	6	7	8	9
cost	0.00	0.26	0.57	0.93	1.34	1.80	2.33	2.92	3.57	4.29

Number	10	11	12	13	14	15	16	17	18	19
cost	5.08	5.93	6.84	7.94	9.23	10.70	12.35	14.19	16.22	18.43

Appendix: Experimental Instructions

(original instructions were in German; they are available upon request from the authors; treatment differences in instructions are indicated by {*hidden ability treatment*: "...”; *revealed ability treatment*: “ ...”})

Rounds, Periods and Roles

- The experiment consists of 12 rounds - each comprising 2 periods
- During the experiment you belong to a group of 7 members including yourself. Each player belongs to one of the two groups but nobody knows the identity of the other six members. The composition of the groups does not change throughout the experiment.
- There are two different roles, type A-players and type B-players. There are four players of type A and three players of type B in each group. The different types are assigned at random in the beginning and do not change during the experiment.

The Basic Value

At the beginning of each round, a new **basic value** is fixed for every player of type B. The basic values remain unknown during the whole experiment, i.e. they are not revealed to any of the players – not even to the players of type B themselves. It is only common knowledge that the basic values are chosen at random out of the set of integer numbers {0, 1, ...19}, each number being drawn with the same probability. The basic values are kept constant for the two periods. **New basic values are selected in each new round.**

The Structure of a Period:

- **Offer of transfer payments by the players of type A**
  At the beginning of each period, every player of type A announces a certain amount of the fictitious currency “Taler” out of {0, 1, ...,38} for each of the 3 players of type B in his group and a direction in which he wants the amount to be transferred: either from him to the specific player B or vice versa.
- **Acceptance or rejection of the transfer payment offer by the players of type B**
  Each of the players of type B decides whether he wants to accept one of the four offers proposed to him by the players of type A.
  - In case he rejects all offers, his current period ends.
  - In case he accepts one offer, the offered transfer occurs immediately, i.e. the amount of “Taler” is transferred from the account of the payer to that of the payee.
- **Selection of a number by the players of type B**
  If a player of type B has accepted an offer by one of the players of type A - and the transfer of Taler has occurred - then this player of type B has to select a number out of the integer set {0, 1,

...,19}. The larger the chosen number is, the more costs the type B-player has to pay (s. table of costs).

After the selection of this number, its costs are subtracted from the account of the very type B-player. The so-called **result** is calculated as follows: result = selected number + basic value of this very type B-player. This result is added on the account of the type A-player whose offer has been accepted. Note that the type B-player only has to pay the costs of his selected number. The basic value causes no costs.

Difference between the first and second period

The procedure of both periods in a round is identical. But there is a difference in the information available to type A-players when they make their offers of transfer payments for type B-players. At the beginning of the **first period, there is no information on the type B-players**. However, **before the second period, for each type B-player** who had accepted an offer the {*hidden ability treatment*: "**transfer payment and the result**"; *revealed ability treatment*: "**transfer payment, base value, and the result**"} are revealed. If he had rejected all offers this is also announced.

Order of Appearance of the players

During one round, the order of appearance of the players is kept constant, i.e. the **player's position in the list of all players of his type is always the same in this very round**. Before a new round starts, a new order is chosen at random. Consequently, it is impossible to recognise a player in different rounds by his position in the lists shown on the screen.

Initial Capital and Total Payoffs

At the beginning of the experiment, every participant gets a certain amount of initial capital in the fictitious currency Taler on his account. At the end of the experiment, his account will be changed into DM at an exchange rate of 0,10 DM per Taler and will be paid to the player.

Please note:

- During the experiment no communication is permitted - except via the experimental software.
- All decisions are made anonymously, i.e. no one gets to know the identity of someone else who has made a certain decision.
- In addition the final payment is made anonymously, i.e. no one learns how much another participant has earned.