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Hidden action and outcome contractibility: An experimental test of moral hazard theory ☆

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ABSTRACT

In a laboratory experiment with 754 participants, we study the canonical one-shot moral hazard problem, comparing treatments with unobservable effort to benchmark treatments with verifiable effort. In our experiment, the players endogenously negotiate contracts. In line with contract theory, the contractibility of the outcome plays a crucial role when effort is a hidden action. If the outcome is contractible, most players overcome the hidden action problem by agreeing on incentive-compatible contracts. Communication is helpful, since it may reduce strategic uncertainty. If the outcome is non-contractible, in most cases low effort is chosen whenever effort is a hidden action. However, communication leads the players to agree on larger wages and substantially mitigates the underprovision of effort.

1. Introduction

Economic relationships are often governed by contracts. Research in contract theory explores what contracts are optimally signed depending on the prevailing information structure (see Hart and Holmström, 1987).[1] In particular, much attention has been devoted to "moral hazard" environments with post-contractual informational asymmetries due to hidden action (where a party's action, e.g. an effort level, is unobservable) and hidden information (where a party obtains private information about a state of the world, e.g. a realized profit level).[2] Contract theory argues that under certain circumstances,

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[1] For comprehensive textbook expositions of contract theory, see Laffont and Martimort (2002) and Bolton and Dewatripont (2005).

[2] Following Hart and Holmström (1987), in this paper we consider settings in which the contractual parties are symmetrically informed when the contract is signed. While not all authors use the same taxonomy, Hart and Holmström (1987, p. 76) refer to contract-theoretic models in which there is symmetric information at the time of contracting as "moral hazard" models, with the two subcategories "hidden action" and "hidden information" (sometimes called "hidden knowledge"), following Arrow (1985). In contrast, models in which the agent has precontractual private information are categorized under the heading of "adverse selection." For experimental tests of adverse selection theory, see Asparouhova (2006), Cabrales et al. (2011), and Hoppe and Schmitz (2013, 2015).

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suitable contracts can overcome the hurdles posed by these informational asymmetries, while under different circumstances, hidden action and hidden information may lead to second-best results which are inferior to the first-best results that would be achieved under symmetric information. In the present paper, we report about a laboratory experiment with 754 participants that was designed to capture the essence of moral hazard theory. Our aim is to explore to what extent actual human behavior is consistent with the contract-theoretic considerations.

Our paper builds on the important work by Charness and Dufwenberg (2006), who have conducted the most prominent experiment featuring a hidden action problem. In the canonical one-shot hidden action model, the agent chooses an effort level, which stochastically influences the outcome (i.e., the principal's return). Charness and Dufwenberg (2006) have exogenously fixed an outcome-independent contract, since their goal was to study the psychological connections between trust, guilt, communication, and cooperation. In contrast, we allow the players to endogenously negotiate individual contracts. Following the contract-theoretic approach, we compare treatments in which effort is a hidden action with benchmark treatments where effort is verifiable. Moreover, our treatments vary in whether or not the outcome is privately known by the principal and whether or not communication is possible.

Specifically, in the first part of our experiment we focus on the standard hidden action setup in which the principal's return is contractible. We study four treatments. In two treatments, there is no communication, while in the other two treatments, we allow for free-form communication. In each of the two cases, we compare a treatment in which effort is a hidden action with a benchmark treatment in which effort is verifiable. In our experiment, the players can negotiate a contract in an alternating offers bargaining game.[3] It turns out that when the principal's return is contractible and effort is unobservable, the players often overcome the hidden action problem by agreeing on incentive-compatible contracts that correspond closely to theoretically optimal contracts. When we compare our hidden action treatment with the benchmark treatment in which effort is verifiable, then in the absence of communication we find that hidden action somewhat reduces the fraction of cases in which high effort (i.e., the first-best decision) is chosen. Yet, in the presence of communication the chosen effort levels do not differ significantly when we compare the hidden effort and the verifiable effort treatments. Hence, we conclude that the welfare loss due to hidden action that we observe in the absence of communication is mainly driven by strategic uncertainty, which is reduced by communication.[4]

In the second part of our experiment, we conduct four additional treatments in order to study the combination of hidden action (on the side of the agent) with hidden information (on the side of the principal). Specifically, these four treatments correspond to the four treatments of the first part except that only the principal learns her return, such that outcome-contingent wages are no longer feasible. Given that the principal's return is non-contractible, contract theory predicts that a second-best efficient contract inducing low effort will be signed when effort is a hidden action, while high effort would be specified when effort is verifiable.[5] Indeed, while we find that the vast majority of players sign contracts specifying high effort in the treatments in which effort is verifiable, low effort is the most frequently observed decision when effort is a hidden action. In the absence of communication, high effort is extremely rare when effort is a hidden action. In by far most cases, the players do not agree on high wages which might give reason to expect high effort in the presence of distributional fairness preferences or positive reciprocity. In line with Charness and Dufwenberg (2006), communication in the form of promises increases the fraction of high effort significantly, which may be explained by guilt aversion. While they have shown that for an exogenously fixed (large) wage, communication increases the occurrence of high effort, we complement their results by showing that communication increases the wages that the parties negotiate in the first place.[6] Yet, given that the principal's return is non-contractible, low effort remains the most frequent decision even when free-form communication (before and during the negotiations) is possible.

Taken together, standard contract theory assuming risk-neutral preferences correctly predicts the most frequently chosen effort level in all of our eight treatments. However, in particular with regard to the effects of communication, the experimental results also illustrate that it is desirable to enrich contract theory in order to embrace a broader range of human behavior.

Related literature. Contract theory is devoted to incentive problems caused by some form of private information. Hence, contract-theoretic models are notoriously difficult to test using field data, because by definition we do not have access to unobservable variables.[7] For this reason, as has also been pointed out by Landeo and Spier (2009, 2012) and

[3] In line with the theoretical analysis that Charness and Dufwenberg (2006, p. 1581) perform in order to find the wage that they fix exogenously, we thus give both parties approximately equal bargaining powers.

[4] Note that when effort is a hidden action, the principal may feel uncertain about whether the agent has understood that given an incentive-compatible contract, exerting high effort will be in the agent's self-interest (while this is not a problem when effort is verifiable). Communication can reduce this strategic uncertainty.

[5] Combinations of hidden action (on the side of the agent) and hidden information (on the side of the principal) such as the one explored here have been studied theoretically by Schmitz (2002) and Aghion et al. (2012, section V).

[6] Recently, Brandts et al. (2016) have also studied the impact of communication on the design of endogenously negotiated contracts, albeit in a very different context. Building on Hart and Moore (2008), they consider the choice between rigid and flexible contracts in a setting with symmetric information. Yet, they already point out that it is also important to explore the power of communication in contract design in environments with asymmetric information, which is what we do in the present paper.

[7] For empirical evidence supporting the basic premise of contract theory that people do respond to monetary incentives, see e.g. the studies by Lazear (2000), Paarsch and Shearer (2000), Shearer (2004), and the earlier literature survey by Prendergast (1999). See also the recent work by DellaVigna and Pope (2017), who have shown that even small piece rates are more effective than many academic experts had predicted. Note that these papers do not study principal–agent games where contracts are endogenously chosen.