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## Moral hazard and bargaining over incentive contracts



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### ABSTRACT

This paper analyses bargaining over an incentive compatible contract in a moral hazard framework. We introduce the Kalai–Smorodinsky bargaining solution and compare the outcome with the commonly applied Nash solution. Whether worker's effort is higher in the Nash or the Kalai–Smorodinsky solution depends on the agents' bargaining power. The social planner can mitigate inefficiencies arising in both bargaining solutions from the moral hazard problem and even achieve the first-best outcome by allocating the agents' bargaining power. If raising the worker's bargaining power is necessary to achieve the first-best solution, this increase must be higher in the Nash solution than in the Kalai–Smorodinsky solution.

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### 1. Introduction

Standard principal-agent models often assume that the principal offers a 'take-it-or-leave-it' contract (Mookherjee and Ray, 2002). For most real-world problems, however, this approach does not seem to be appropriate. Many labour market situations are, rather, determined by some form of bargaining between workers and firms, with both parties holding some bargaining power. Therefore, a 'take-it-or-leave-it' contract might be too restrictive to comprehensively model real labour market processes. Instead of that, introducing bargaining power brings the principal-agent framework closer to reality and allows some more important policy conclusions to be drawn.

Our paper contributes to the literature on bargaining in a moral hazard framework. Based on empirical and experimental evidence, we introduce the Kalai–Smorodinsky bargaining solution (henceforth KS solution) in a principal-agent model suffering from moral hazard. Comparing the KS bargaining outcome with the commonly used Nash solution, we find that the outcome of both bargaining solutions differ significantly although we assume risk-neutral firms and workers. This result is in contrast to bargaining with full information and risk-neutral players, where the familiar 'split-the-difference' result is obtained. Moreover, we find that the allocation of the bargaining power determines the difference between both solutions. If the worker's bargaining power is relatively small, the Nash solution provides a more efficient outcome and induces more effort. If the worker's bargaining power is relatively high, however, the KS solution is more efficient.

Moreover, our paper aims at the normative question of whether and how government should intervene in the labour market. In a principal-agent framework, it is a well-known fact that inefficiencies occur due to moral hazard. The moral hazard problem requires the firm to offer an incentive contract to the worker. When workers are risk-neutral and have

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limited liability, the first-best contract will not be achieved. The firm faces a trade-off between offering a high-powered incentive scheme, leading to high effort but also high payments to the worker, or reducing effort by reducing the incentives and thus having lower payments for the worker. The optimal contract for the firm induces less effort than the first-best contract which maximises social welfare. To achieve this first-best solution, for example, the government may allocate the agent's bargaining power.<sup>2</sup> We find that, apart from some extreme cases, the efficiency of the bargaining outcome can be improved by increasing the worker's bargaining power. This result is in some contrast to the literature on labour market negotiations which often finds that higher worker's bargaining power reduces employment and social welfare. We show that the change in the bargaining power to reach the efficient outcome has to be higher in the Nash than in the KS solution. On a more general level, our findings indicate that the choice of the specific bargaining solution is not innocuous but has important implications for workers' effort incentives and the efficiency of the labour contract.

The paper proceeds as follows. [Section 2](#) provides a brief review of the related literature. [Section 3](#) sets up the model. [Section 4](#) analyses bargaining over an incentive contract if bargaining follows either the Nash or the KS solution. In this section, we also discuss the optimal allocation of the bargaining power. [Section 5](#) concludes.

## 2. Related literature

Our paper is related to two strands of the literature. First, the paper contributes to the literature on labour contracts in principal-agent models. Rather than a 'take-it-or-leave it' contract set by the principal, we assume that the principal and the agent can negotiate the contract terms. [Pitchford \(2002\)](#) shows that when agents have limited liability, the incentive contract depends on the bargaining power of the principal and the agent. [Balkenborg \(2001\)](#) introduces Nash bargaining in a moral hazard model with a risk-neutral principal and a wealth-constrained risk-neutral agent. [Schmitz \(2005\)](#) analyses how workplace surveillance affects the total welfare of an employment contract and whether a law against this surveillance may improve welfare. Extending the basic model, he also discusses the outcome when the contract agreed upon by employer and employee follows the Nash bargaining solution. [Demougin and Helm \(2006\)](#) analyse the impact of bargaining power on contracts in a moral hazard environment. They consider three different approaches—a standard principal-agent model, an alternating offer game and the Nash bargaining solution—and show that all approaches lead to the same set of contracts. This set of contracts is achieved by varying the participants' discount factors (in the alternating offer game) or the participants' bargaining power (in the Nash solution). Moreover, [Demougin and Helm \(2011\)](#) use the Nash bargaining solution in a job matching model with moral hazard. [Bental and Demougin \(2010\)](#) model labour contract negotiations in a Nash bargaining game and derive the optimal bargaining power from the firm's, the worker's, and the social planner's viewpoint in an environment suffering from moral hazard and irreversible investment.

Second, and more specifically, our paper contributes to the literature on bargaining behaviour. When analysing bargaining processes in labour market frameworks, the Nash solution ([Nash, 1950](#)) is by far the most frequently used solution. Other solutions, such as that proposed by [Kalai and Smorodinsky \(1975\)](#), have mostly been ignored by the literature. This negligence is surprising, as both solution concepts are derived axiomatically and have game theoretic foundations ([Binmore et al., 1986](#) for the Nash solution and [Moulin, 1984](#) for the KS solution). Moreover, an increasing number of empirical and experimental studies provide evidence in favour of the KS solution. [Laroque and Salanié \(2004\)](#) find that the KS solution offers a better description of the French labour market than the Nash solution does. [Siegal and Fouraker \(1960\)](#) and [Nydegger and Owen \(1974\)](#) provide experimental evidence that the Nash solution is an unreasonable model of pairwise negotiations as players make interpersonal comparisons of utility gains. Such behaviour cannot be captured by the Nash solution because of its independence of irrelevant alternatives axiom. The experimental results in [Heckathorn \(1978\)](#) and [Dittrich et al. \(2014\)](#) support the KS model over the Nash model.

Only a few theoretical papers, however, build on this evidence and apply the KS solution in labour market models. [Gerber and Upmann \(2006\)](#) introduce the KS solution in a union–firm bargaining framework and point out that a higher disagreement payoff has negative effects on employment if bargaining follows the Nash solution. In the KS solution, however, increasing the disagreement payoff has ambiguous employment effects. [Dittrich \(2010\)](#) shows, in a similar union–firm framework, that the labour market effects of unemployment benefits and minimum wages in the Nash solution differ substantially from the effects if bargaining follows the KS solution. [L'Haridon et al. \(2013\)](#) introduce the KS solution into a matching framework and compare the bargaining outcome with the Nash solution. [Dittrich and Knabe \(2013\)](#) show, in a collective wage bargaining model, that spillover effects from minimum wages can be explained by the KS solution, but not by the Nash solution.

Summing up, these studies suggest that the choice of a specific bargaining solution should not be an arbitrary decision since preferring one bargaining solution over another might not only affect the labour market outcome but also the economic policy conclusions drawn from the model.

<sup>2</sup> To strengthen workers' bargaining power, the government can prohibit employer lockouts or limit the use of permanent replacements to enhance the costs of collective action for employers. To strengthen employers' bargaining power, the government could limit the possibilities of collective action by prohibiting secondary boycotts ([Dau-Schmidt and Traynor, 2009](#)). On a more general level, politics might also decide on the legal status of collective bargaining or to build workers' councils ([Botero et al., 2004](#)). These measures are decisive for collective bargaining power but also affect the bargaining power of single workers.

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