Journal of Economic Behavior & Organization 71 (2009) 486–494

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

Bargaining under incomplete information, fairness, and the hold-up problem☆

Ferdinand A. von Siemens*

Amsterdam School of Economics, University of Amsterdam, Roetersstraat 11, 1018 WB Amsterdam, The Netherlands

ARTICLE INFO

Article history:
Received 28 March 2007
Received in revised form 11 February 2009
Accepted 11 February 2009
Available online 25 February 2009

JEL classification:
L2
C78
D82

Keywords:
Hold-up
Relationship-specific investments
Fairness
Reciprocity
Asymmetric information
Signalling

ABSTRACT

In the hold-up problem incomplete contracts cause the proceeds of relationship-specific investments to be allocated by bargaining. This paper investigates the corresponding investment incentives if individuals have heterogeneous fairness preferences. Individual preferences are taken to be private information. Investments can then signal preferences and thereby influence beliefs and bargaining behavior. In consequence, individuals might choose high investments in order not to signal information that is unfavorable in the ensuing bargaining.

1. Introduction

Over the past decades the study of incomplete contracts has generated numerous insights into the functioning of organizations. Most of this literature is based on the famous hold-up problem as pioneered by Williamson (1975) and formalized by Klein et al. (1978) and Grout (1982). Incomplete contracts cause the proceeds of previously sunk, relationship-specific investments to be allocated by bargaining. Since each investor reaps only part of his investment's proceeds but incurs all costs, investment incentives are inefficiently low. Although many real-world contracts are clearly incomplete, they appear to be quite effective: professors prepare classes even though their wages do not condition on their teaching record, and customized goods are traded to mutual satisfaction although most trade contracts are silent on many important details. Following Hackett (1994) several articles have studied hold-up situations in controlled laboratory experiments.[1] Supporting the casual empiricism above, they find that investments tend to be higher than expected. Consistent with numerous other bargaining experiments, the authors predominantly propose fairness concerns or social preferences as explanations for their

☆ The paper is based on Chapter 1 of my Ph.D. thesis. I would like to thank two anonymous referees, Björn Bartling, Michael Kosfeld, Sven Rady, Ray Rees, Markus Reisinger, and Klaus Schmidt for very helpful comments. Financial support from the German Research Foundation (DFG) through the SFB/TR 15 and the Postdoc-Programme of the German Academic Exchange Service (DAAD) is gratefully acknowledged.

* Tel.: +31 20 525 5639; fax: +31 20 525 4254.
E-mail address: f.a.vonsiemens@uva.nl.

[1] More recent examples are Ellingsen and Johannesson (2004a,b).

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doi:10.1016/j.jebo.2009.02.007

results; but their experiments also suggest that subjects differ widely in their bargaining behavior, where individual preferences seem to be private information.[2] Surprisingly, any possible interactions between fairness preferences and incomplete information have not been fully analyzed thus far.

The present paper studies investment incentives in a hold-up situation if individuals have heterogeneous fairness preferences that are private information. A buyer and a seller bargain over the division of a trade surplus that is generated by a relationship-specific investment of the seller. Ex-post bargaining is modeled as an ultimatum game in which the buyer holds all bargaining power. Buyers are assumed to have standard "selfish" preferences, but sellers differ in their preferences and thus in their bargaining behavior: a "selfish" seller accepts all offers that give him a weakly positive share of the trade surplus, whereas a "fair-minded seller" refuses to trade unless he receives a share that exceeds some strictly positive "fair" threshold. Most importantly, the seller's preferences are private information.

Results are as follows. Because the seller's preferences are private information, the ex-post bargaining over the surplus takes place under incomplete information. The buyer's beliefs about the seller's preferences determine his bargaining behavior, but beliefs are updated after observing investments. Incomplete information thus links the otherwise sunk investment to bargaining outcomes: it can be optimal for both selfish and fair-minded sellers to choose a particular investment in order not to signal information on their type that is unfavorable in the ensuing bargaining. Together with incomplete information fairness can thus generate very strong or even efficient investment incentives.

After characterizing all possible equilibrium investments, the paper describes the sufficient and necessary conditions under which there exists an efficient perfect Bayesian equilibrium. On the one hand, the ex-ante probability that the seller is fair-minded must be sufficiently high so that the buyer bargains less aggressively if he does not learn anything about the seller's type. On the other hand, the "fair" share of the trade surplus must be large enough to foreclose profitable deviations. The following is noteworthy. First, the seller might invest efficiently although he does not get the entire trade surplus in equilibrium. Second, when both types of seller invest efficiently, they invest more and therefore do not simply mimic the fair-minded seller under complete information. Third, the seller must be selfish with strictly positive probability as otherwise information is complete and investment incentives are inefficiently low. As in most dynamic games with incomplete information, there are multiple equilibria. The intuitive criterion by Cho and Kreps (1987) is shown to have no bite, but a refinement proposed by Mailath et al. (1993) generates sharp predictions: if the buyer's prior belief is sufficiently high, fairness preferences unambiguously improve investment incentives. However, full efficiency cannot be attained unless the seller's investment choice is discrete.

The present study is most closely related to the following papers on fairness and the hold-up problem. Just as in the current setup, Ellingsen and Johannesson (2004b) consider a situation in which the trade surplus is allocated in an ultimatum game with the buyer as proposer.[3] They show that inequity aversion à la Fehr and Schmidt (1999) increases equilibrium investments only if many buyers are inequity averse and thus make generous offers. Since in reality rather few subjects are inequity averse, they conclude that inequity aversion has difficulties in explaining the experimental evidence. The present study considers fairness preferences that are based on reciprocity.[4] Investment incentives can then be efficient even if all buyers are selfish and the bargaining is modeled as an ultimatum game. Ewerhart (2006) demonstrates that inequity aversion can solve the hold-up problem if the trade surplus is divided in an alternating-offer bargaining game with infinite horizon: if traders are patient and account for investment costs in their comparisons, they essentially divide the net surplus equally so that investment incentives are approximately efficient. However, this result hinges on the bargaining game and thus cannot explain all the experimental evidence.[5] Finally, only the present paper focuses on the signalling incentives that arise if fairness preferences are private information. Tirole (1986) and Gul (2001) argue that investment incentives can improve if investments are private information. Contrary to the present paper, they cannot explain the high investments as documented in experiments with observable investment. Experiments by Hackett (1994) and Sloof et al. (2007) strongly suggest that making investments unobservable does not increase their value.

The remaining paper is organized as follows. Section 2 introduces the model, Section 3 describes all possible equilibrium investments, and Section 4 characterizes the impact of fairness and incomplete information on investment incentives. Section 5 discusses equilibrium refinements, and Section 6 summarizes the main results.

2. The model

A buyer and a seller can trade one unit of a good. The good's quality $i \in \mathbb{R}_+$ is determined by an investment of the seller. Producing a good of quality i cost the seller i. Once these costs are sunk, the absence of a complete contract causes terms of trade to be determined by bargaining. The bargaining process is modeled as an ultimatum game. First, the buyer proposes a share $p \in \mathbb{R}$ of the trade surplus to be given to the seller. Second, the seller can accept or reject the buyer's offer. Let $a \in \{0, 1\}$

[2] See Güth et al. (1990) or Camerer and Thaler (1997) for a summary of the literature on bargaining and social preferences.

[3] Ellingsen and Johannesson (2004a, 2005) differ in their specification of the bargaining process.

[4] Experiments such as Falk et al. (2008), Charness and Rabin (2002), or Nelson (2002) suggest that intention-based reciprocity strongly influences bargaining behavior.

[5] von Siemens (2004) shows that inequity aversion can also generate efficient investment incentives in an alternating-offer bargaining game with finite horizon if preferences are private information. The present paper studies the same signalling incentives as in von Siemens while referring to preferences that are based on intention-based reciprocity. This simplifies the analysis while offering a better fit to the experimental evidence.