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Incorporating unawareness into contract theory [☆]

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ABSTRACT

Asymmetric awareness of the contracting parties regarding the uncertainty surrounding them is proposed as a reason for incompleteness in contractual forms. An insurance problem is studied between a risk neutral insurer, who has superior awareness regarding the nature of the uncertainty, and a risk averse insuree, who cannot foresee all the relevant contingencies. The insurer can mention in a contract some contingencies that the insuree was originally unaware of. It is shown that there are equilibria where the insurer strategically offers incomplete contracts. Competition among insurers who are symmetrically aware of the uncertainty promotes awareness of the insuree.

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1. Introduction

In a world where insurance companies spend a lot of resources to compute the facts that are material to the risk, the relevant contingencies lie largely in the knowledge of the insurers. Insurance companies which have been in the industry for a long time may have a better understanding of the realities of nature than an insurance buyer. The buyers trust the insurance companies and proceed upon the confidence that the companies do not hold back any circumstances in their knowledge to mislead the judgment of the buyers. Moreover, policies are usually drafted by insurers, giving them a strong opportunity to manipulate (see [Harnett, 1950](#)). This asymmetry between the insurance buyer and seller in foreseeing all the relevant contingencies is the key reason for ex post conflicts. However, the standard contracting models do not allow for agents having asymmetric awareness regarding the nature of the uncertainty. This paper incorporates unawareness in contractual settings in order to understand how insurers use their superiority in terms of understanding the relevant contingencies against buyers. It questions whether such an insurer will mention in the contract those contingencies that the insuree does not foresee originally or he will remain silent on them. Moreover, if the insuree reads a clause about a contingency that did not cross her mind initially, how she evaluates this information is part of the solution concept we propose. Finally, we search for an instrument that leads to disclosure of the unforeseen contingencies.

We address these questions by generalizing an insurance setting between an insurer (he) and an insuree (she) such that each agent may take into account a different set of contingencies. We call these subjective sets of contingencies awareness sets. When the insuree reads a contract offered by the insurer, she may become aware of some new aspects of the uncertainty and start taking them into account. For example, a home insurance buyer who has never thought about a tsunami before becomes aware of it when the contract offers insurance against tsunami as well. Hence, the contract can be used as a communication device by the insurer in order to extend the awareness of the insuree.

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If reading a contract adds new contingencies for the consideration of the insuree, the question is how she is going to assign probabilities to the new contingencies in order to evaluate them. In this study, a priori, there is no imposition on how the insuree generates a belief when her awareness is extended. Belief formation of the insuree is a part of the equilibrium concept. We require progressively more restrictions on belief formation. We start with compatible belief, then we will consider consistent beliefs. The definitions of these concepts will be given and discussed extensively in the paper. Roughly, we call a belief *compatible with a contract* if, with respect to this belief, the insuree thinks that the insurer is better off by making this offer rather than staying out of business. We require equilibrium beliefs to be compatible with the corresponding contracts whenever it is possible. Under this solution concept, we show that hiding some contingencies from the insuree is always part of some equilibria while mentioning all the possible contingencies may not be. Next, we refine this possibly large equilibrium set with a consistency requirement. A belief held after a contract is *consistent* if the contract is the best one for the insurer according to the insuree with respect to this belief. We show that consistent equilibrium always exists and there are situations where this refinement eliminates all complete contract equilibria.

In this setup, the contract that mentions an unforeseen contingency and promises zero coverage when it materializes and the contract that does not mention that contingency at all are different. Since the first one provides a complete list of relevant contingencies and the second one fails to do so, the second one is called incomplete. Complete and incomplete contracts correspond to different awareness sets of the insuree, and therefore, their subjective evaluations are not the same. If an incomplete contract is agreed to, then experiencing that contingency and learning that the damage is not covered by the contract is an ex post surprise for the insuree. In reality, in such situations insurees feel deceived and go to court. Although it is the role of the court to protect the deceived ones, and apply the doctrine of concealment, it still needs to be proved that the insurer intentionally left the contract incomplete. This is not an easy task since the subjective status of the insurer needs to be determined objectively. This is the main reason for the debate on the doctrine of concealment in law literature (see [Harnett, 1950](#), and [Brown, 2002](#)). We argue that this problem is due to monopolistic power of insurance provider and show that competition among insurance companies is an instrument to reach complete contracts in equilibrium. Competition promotes awareness of the insuree.

We model competing insurers as symmetric agents who can independently inform the insuree regarding the unforeseen events through their offers. We extend the solution concept that is studied for single-insurer case to this multi-insurer setting. In equilibrium it is required that the insuree holds beliefs that are compatible with all the offers that are made and she acts rationally based on her belief. It is shown that the zero profit offer that fully covers all the contingencies (complete) is always part of some equilibria. Therefore, the strength of competition in standard principal–agent models carries over when there is asymmetric awareness. We note that in some situations, it is still possible to have incomplete contracts in equilibrium. We provide a sufficient condition that leads to an extension of awareness in any equilibria.

The rest of the paper is organized as follows: Next, we discuss the related literature. In Section 2, we introduce the one insurer–one insuree model and necessary notation. In Section 3, we give an equilibrium concept and study the form of equilibrium contracts that can arise in this setting. By introducing competition between insurers in Section 4, we show that the unawareness of the insuree may totally disappear under competition and study the setups where the awareness of insuree is at least partially extended in any equilibrium. In Section 5, we discuss some key points in the construction of our model: other forms of contracts besides the ones we study, the difference between being unaware of an event and assigning zero probability to that event, and robustness of the equilibrium concept under ambiguity aversion. We conclude in Section 6. All the proofs are presented in Appendix A.

Related literature

Unawareness is first studied in economic theory by [Modica and Rustichini \(1994\)](#). In the literature, there are some recent developments in modeling unawareness. Unawareness models by [Heifetz et al. \(2006\)](#) and [Li \(2009\)](#) are the basis of the unawareness concept we use in this paper (see [Ozbay, 2008](#), for more formal connection). In those models, each agent can take into account a projection of the entire situation to the aspects that she is aware of. This set theoretic modeling of unawareness is incorporated into game theory by [Halpern and Rego \(2006\)](#), [Heifetz et al. \(2007\)](#) and [Ozbay \(2008\)](#).

Standard economic theory has been developed within a paradigm that excludes unawareness. Recent studies addressed how accounting for unawareness changes the standard economic theory (see [Modica et al., 1998](#), and [Kawamura, 2005](#), for applications in general equilibrium models; [Tirole, 2009](#), for inefficient investment on cognitive effort that may extend awareness in a contractual problem, and [Masatlioglu et al., forthcoming](#), for choice theoretical foundation for modeling agents who do not pay attention to all the possibilities in the presented decision problem).

Incomplete contracts are extensively studied in economics (see e.g. [Hart and Moore, 1990, 1998, 2005](#); [Aghion and Bolton, 1992](#); [Grossman and Hart, 1986](#); [Bolton and Whinston, 1993](#); [Aghion and Tirole, 1997](#); [Gertner et al., 1994](#); and for a summary of this literature see [Bolton and Dewatripont, 2005](#), and [Salanié, 2005](#)). In this literature, the inability of contracting parties to foresee some aspects of the state of the world is frequently understood as a reason for the incompleteness of some contracts. However, this reasoning leads to well-known discussions in the studies of [Maskin and Tirole \(1999\)](#), [Tirole \(1999\)](#) and [Maskin \(2002\)](#). They argued that in the models motivated by unforeseen contingencies, the parties are rational and able to understand the payoff related aspects of the state of the world, although they are unable to discuss the physical requirements leading to those payoffs. Our model is free from this inconsistency since here neither the agents foresee all contingencies nor they are able to understand payoff related aspects of the unforeseen ones. [Tirole \(1999\)](#) states

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