Overconfidence and asymmetric information: The case of insurance[☆]

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ABSTRACT

This paper contributes to the recent behavioral economics literature by showing that whether or not overconfidence changes qualitative predictions in asymmetric information markets may depend on the market structure itself. We first show that overconfidence may overturn fundamental relations between observable variables in perfect-competition asymmetric information insurance markets. In monopolistic insurance markets, in contrast, we find that overconfidence may be observationally equivalent to variations in the risk composition of the economy. Our analysis provides a number of novel testable implications on (i) price heterogeneity within and across risk classes, (ii) the relationship between ex-post risk and insurance coverage, (iii) the fact that a significant fraction of agents chooses to be uninsured, and (iv) the relationship between underinsurance and age.

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1. Introduction

The recent behavioral economics literature has advanced our understanding of economic problems, often by revising fundamental insights from "fully-rational" economic theory.[2] This paper delivers a basic contribution to this enterprise. We study how overconfidence changes our understanding of simple asymmetric information problems. Indeed, overconfidence is one of the most robust biases uncovered in behavioral economics.[3] At the same time, asymmetric information is a core problem of modern economics, since the seminal work of Akerlof (1970), Spence (1973), and Rothschild and Stiglitz (1976). We find that whether or not overconfidence changes qualitative predictions in asymmetric information markets may depend on the market structure itself. The introduction of overconfident agents overturns fundamental relationships between observable variables in perfect-competition asymmetric information insurance models. In models of monopolistic insurance with asymmetric information, in contrast, the introduction of overconfident agents may be observationally equivalent to changes in the composition of risk in the economy.

Our analysis focuses on insurance markets for two main reasons. First, overconfidence is a first-order issue in insurance markets. Indeed, an extensive empirical literature finds that many individuals underestimate their health, financial, and driving risks, and this often results in underinvestment in insurance.[4] Second, the seminal models of Rothschild and Stiglitz

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[2] A nice survey of the advances in behavioral industrial organization is provided, for example, by Ellison (2006).

[3] According to De Bondt and Thaler (1995, p. 389), "perhaps the most robust finding in the psychology of judgment is that people are overconfident."

[4] An earlier account of the pervasiveness of overconfidence in insurance markets is given by Adam Smith in *The Wealth of Nations* (1776): "That the chance of loss is frequently under-valued, [...] we may learn from [the limited demand for insurance]. Taking the whole kingdom at an average, nineteen

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(1976) and Stiglitz (1977) provide a detailed benchmark for studying the effects of biased beliefs in asymmetric information models. This paper thus studies the implications of overconfidence in insurance markets, both under perfect competition and under monopoly. In addition to uncovering the relevance of market structure for the effect of overconfidence on insurance, this paper provides a number of testable results, thereby laying out a road map for future empirical research on the implications of overconfidence for insurance. To keep matters as transparent as possible, we build our analysis under perfect competition on the basic model of Rothschild and Stiglitz (1976), and our analysis under monopoly on the basic model of Stiglitz (1977). As in those two papers, we assume that insurance companies cannot directly observe their customers' risk. Unlike those two papers, however, we allow for overconfident agents. Some agents believe that their risk is low, when it is in fact high; the other agents know their risk.[5,6]

In the case of perfect competition, overconfidence reverses one of the main results of the Rothschild and Stiglitz (1976) model, namely the result that the equilibrium contracts do not depend on the proportion of high-risk and low-risk agents in the economy. This result holds in the Rothschild and Stiglitz (1976) model because the insurance companies can fully recover the agents' private information (i.e., their risk level) through their choice of contract. Once this is done, no residual information about the agents is of any value to the firms. However, when we introduce biased beliefs into the Rothschild and Stiglitz (1976) model, the information that firms gather by screening consumers may be biased. Hence, the firms may need to adjust their menu of contracts, or attempt to gather hard evidence to correct for this bias. As a result, we show that the equilibrium contracts depend on the composition of perceived and actual risks among agents, when agents' beliefs may be biased. Therefore, introducing overconfidence in perfect-competition models may have implications for the equilibrium contracts that cannot be derived by changing the proportion of unbiased high-risk agents.

In contrast, we show for the case of monopoly that the introduction of overconfident agents in the Stiglitz (1977) model is qualitatively indistinguishable from an increase in the fraction of unbiased high-risk agents. This result follows from the following two insights. First, the monopolist cannot screen between overconfident and low risk agents, because their beliefs are the same at the moment they purchase the insurance contract. Second, the incentive compatibility constraint and the individual rationality constraint must bind independently of the presence of overconfident agents in the monopolist profit maximization problem. Given that these binding constraints fully describe the space of possible profit-maximizing contracts, the introduction of overconfident agents is equivalent to a change in the fraction of high-risk agents in the Stiglitz (1977) model without overconfidence.

The stark contrast between the implications of overconfidence in perfect-competition insurance markets and in monopolistic insurance markets implies that the testable implications of overconfidence on asymmetric information models may also depend on market structure. Overconfidence overturns essential testable relationships in perfect competition, but does not lead to major changes in testable implications in the case of monopoly. Specifically, our analysis focuses on the following empirical matters: (i) price heterogeneity within and across risk classes, (ii) the relationship between ex-post risk and insurance coverage, (iii) the stylized fact that a significant fraction of agents chooses to be uninsured, and (iv) the relationship between underinsurance and age. We identify a number of novel testable implications, and show that overconfidence may help in reconciling theoretical predictions with empirical stylized facts.

Consider perfect competition first. In our model, price schedules depend on hard information about subscribers (i.e., their risk class).[7] This result is in stark contrast with the Rothschild and Stiglitz (1976) model of perfect competition. In that model, the pricing schedule offered by firms does not depend on the proportion of low and high risk subscribers in the risk class, as the individual risk of subscribers is recovered through the equilibrium screening pricing schedule, which is independent of the agent's risk class. Further, in our model, agents with different levels of perceived risk choose different contracts, within each risk class. In direct contrast with models of insurance with symmetric information such as the benchmark model by Mossin (1968), we show that prices differ within risk classes when some agents are overconfident. In sum, our model accounts for price heterogeneity both within and across risk classes. These two stylized facts are seldom accomodated simultaneously in alternative models of insurance with perfect competition.

We also show that biased beliefs reverse the relationship between ex-post risk and insurance coverage in asymmetric information models.[8] A general and robust implication of asymmetric information (without overconfidence) is a positive relationship between ex-post risk and insurance coverage, within each risk class (Chiappori et al., 2006). When overconfidence is sufficiently pervasive, agents who perceive that their risk is low may in fact be riskier on average. In this case, the relationship between insurance coverage and ex-post risk becomes negative, and the insurance contracts display quantity discounts (as has been observed, for example, by Cawley and Philipson (1999)). Our results may account for the fact that no

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houses in twenty, or rather, perhaps, ninety-nine in a hundred, are not insured from fire. [. . .] Many sail [. . .] at all seasons, and even in time of war, without any insurance. [. . .] *The neglect of insurance [. . .], is, in most cases, the effect [. . .] of mere thoughtless rashness and presumptuous contempt of the risk.*" We discuss the evidence for overconfidence in Section 2. The interested reader may also consult Sandroni and Squintani (2004), for a survey.

[5] Our simple model is inspired by the general continuum type model, where each agent is identified by a true risk p and perceived risk $\hat{p}$. Such a model simultaneously allows for heterogeneity in beliefs conditional on true risk, and heterogeneity in true risk given beliefs. Further, in the general model, for any level of risk perceived by an overconfident agent, there will be an unbiased agent with the same beliefs. These key features are present also in our 3-type model, and drive most of our results.

[6] Our model can be related to the axiomatic theory of optimism and anticipated utility proposed by Quiggin (1982).

[7] Different subscribers are said to belong to the same risk class if they are observationally equivalent at the time they purchase the insurance contract.

[8] An agent's ex-post risk consists of the actual frequency of accidents measured after she purchased her insurance contract.