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Competitive insurance markets under adverse selection and capacity constraints

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Abstract

Ever since the seminal work by Rothschild and Stiglitz (Q. J. Econom. 90 (1976) 629) on competitive insurance markets under adverse selection, the problem of non-existence of equilibrium in pure strategies has received much attention in the literature. We extend the original analysis by considering firms which face capacity constraints, which might be due to limited capital. We show that under mild assumptions an equilibrium exists, where every consumer obtains his appropriate Rothschild–Stiglitz contract.

JEL classification: C72; C78; D82; G22

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1. Introduction

Ever since the seminal work by Rothschild and Stiglitz (1976) on competitive insurance markets under adverse selection, the problem of non-existence of equilibrium in pure strategies has received much attention in the literature. The

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origin of this problem lies in the fact that only zero profit making separating contracts can constitute an equilibrium in the sense of Rothschild and Stiglitz, while in some cases a single pooling contract or a pair of cross-subsidizing contracts may be preferred by everyone and will therefore upset the Rothschild–Stiglitz equilibrium contracts.

There are many approaches to this problem in the literature. One way out of it is to allow firms to have mixed strategies (Dasgupta and Maskin, 1986); however, the economic interpretation of this modification is not clear. Another possibility is to propose different equilibrium concepts (Wilson, 1977; Miyazaki, 1977; Spence, 1978; Riley, 1979), which however lack a game-theoretic foundation. There exist a few attempts of introducing some form of dynamics in a non-cooperative model (Jaynes, 1978; Hellwig, 1987, 1988; Asheim and Nilssen, 1996).[1]

In this paper we want to add one aspect to the discussion of the non-existence problem which so far has not received any attention in the insurance literature, and which lies at the heart of the non-existence problem: If a deviating firm offers a new set of contracts, who chooses these contracts? So far it was always assumed that any new contract offer can potentially serve the whole market. Here we assume instead that firms face capacity constraints. In that case it is no longer guaranteed that a new offer may attract a fair selection of the market. Indeed, the distribution of risk types applying for a (deviating) contract at a given firm is now determined endogenously.

One reason for capacity constraints can be solvency regulation: For a given size of capital, only a finite number of risks can be added to the portfolio of the insurer, as otherwise, depending on how the solvency requirement is specified, the ratio of premium income to capital or the ratio of risk exposure to capital exceeds a given size.[2] Another argument why a firm might not serve the whole market could be the mere size of the firm, the number of employees, the size of the computer system, etc., which makes it difficult to process more than a given number of policies.

Under capacity constraints, our main result is that the Rothschild–Stiglitz (RS) contracts are equilibrium contracts, even if they do not form an equilibrium in the original game. For an illustration, consider pooling contracts which were used to destabilize the RS contracts in the original paper. If the new contract is supposed to also attract low-risk types and if the proposer intends to realize a strictly positive profit, the coverage of the low-risk type must increase compared to the RS contract. Observe now that the high-risk type's incentive

[1] Recently, an evolutionary model of the insurance market has been proposed (Ania et al., 1998). If firms copy profit making contracts and experiment with their own contracts locally, the unique long run outcome is that all firms offer the Rothschild–Stiglitz contracts.

[2] Buying reinsurance is a means to increase capacity, however at a cost. If these costs are not negligible, our result remains to hold. See Berger et al. (1992) for an account of the spillover effects from the reinsurance market to the primary insurance market in the liability insurance crisis in the mid-1980s.