



# Perfect competition in asymmetric information economies: compatibility of efficiency and incentives<sup>☆</sup>

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## Abstract

The idea of perfect competition for an economy with asymmetric information is formalized via an idiosyncratic signal process in which the private signals of almost every individual agent can influence only a negligible group of agents, and the individual agents' relevant signals are essentially pairwise independent conditioned on the true states of nature. Thus, there is no incentive for an individual agent to manipulate her private information. The existence of incentive compatible, ex post Walrasian allocations is shown for such a perfectly competitive asymmetric information economy with or without “common values”. Consequently, the conflict between incentive compatibility and Pareto efficiency is resolved exactly, and its asymptotic version is derived for a sequence of large, but finite private information economies.

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## 1. Introduction

The classical Arrow–Debreu–McKenzie model of perfect competition is obviously at odds with itself as the finitude of economy size implies that individuals can exercise some influence on the prices at which goods are either sold or bought in the economy. Aumann [2] resolves this issue by introducing an economy with an atomless measure space of agents. In such an economy, each individual agent has non-negligible consumption in general, but with negligible impact on the aggregate demand, and therefore takes prices as given. Thus, the formulation of an atomless measure space of agents captures precisely the meaning of perfect competition.<sup>1</sup>

The Aumann model is deterministic as each agent's characteristics are non-random. Thus, in this model, contracts (trades) are made under complete information. It is not an exaggeration to say that all economic activities or all contacts among individuals in an economy are made under conditions of uncertainty or incomplete information. To this end, it is of interest to know whether or not one can introduce asymmetric or private information<sup>2</sup> on the Aumann economy, and still be able to capture the meaning of perfect competition. Notice that once private information is introduced in the Aumann model, an agent may have monopoly power on her information, and thus may have an incentive to manipulate her information to become better off. This poses the following question: can one model the idea of perfect competition in an economy with asymmetric information? To put differently, can one model the concept of negligible private information?

It is well-known that there is a conflict between incentive compatibility and efficiency in a finite-agent asymmetric information economy (see, for example, [3, p. vi, Example 0.1]). However, intuition suggests that a perfectly competitive market should still perform efficiently since no single agent has monopoly power on information. In an important paper [9], McLean and Postlewaite showed the consistency of exact incentive compatibility and approximate ex post efficiency by using independent replicas of a fixed asymmetric information economy with finitely many agents. The key point in this approach is that though an individual agent's information is not becoming more accurate, its overall influence is diminishing when the number of agents goes to infinity. In a way, the model considered in [9] can be viewed as capturing the idea of approximate perfect competition in an asymmetric information economy.<sup>3</sup>

The main purpose of this paper is to formulate precisely the idea of perfect competition for an asymmetric information economy so that the incentive for an individual agent to manipulate her private information is negligible. A heuristic way to capture the idea of perfect competition for such an economy is that the private signal of an individual agent can only influence a negligible corner of the market, and the signals associated with the individual agents (for example, used in their utility functions) are essentially independent of each other conditioned on the true states

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<sup>1</sup> See [6] for a systematic development of large economies and extensive references.

<sup>2</sup> When it is appropriate, we shall use the terminologies of private information, differential information, incomplete information and asymmetric information interchangeably.

<sup>3</sup> For an economy with a fixed finite number of agents, McLean and Postlewaite also showed in [9] that the conflict between incentive compatibility and efficiency can be made arbitrarily small when the agents are able to predict the true states of nature with sufficient accuracy in terms of small information size. Krasa and Shafer [7] considered similar questions in terms of convergence of equilibria in a sequence of incomplete information economies of fixed size to equilibria of a complete information economy when the noise in the signals converges to zero. In addition, Prescott–Townsend [11] introduced a lottery model and showed the existence of incentive compatible, ex ante efficient lottery allocations. By restricting allocations to be privately measurable, it was shown in Yannellis [16] (see also [5]) that private core allocations in a finite-agent asymmetric information economy exist and are always incentive compatible. However, the private measurability restrictions result in only a second best efficient outcome.

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