



# Core, equilibria and incentives in large asymmetric information economies

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## Abstract

We consider a perfectly competitive ex ante economy with a continuum of agents and negligible asymmetric information. For such an economy we recast the basic classical results on the existence of Walrasian equilibrium, core equivalence, and the blocking size of coalitions. Moreover, we examine the incentive compatibility of the ex ante Pareto, core and Walrasian allocations.

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## 1. Introduction

The first attempt to introduce uncertainty in the Arrow–Debreu–McKenzie economy was made by Arrow and Debreu, who introduced the model of contingent claims. These authors noticed that if preferences and initial endowments depend on the states of nature, then the classical results on existence and optimality of the Walrasian equilibrium, will continue to hold. In this model agents make trades (contracts) contingent on the realized state of nature, which is known to all the agents. However, this model does not capture the idea of contracts under asymmetric information as all agents face the same uncertainty. Radner (1968) extended the Arrow–Debreu,

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contingent claim model to include private information. In particular, a private (or differential) information economy consists of a set of agents, each of whom is characterized by her random preferences, random initial endowments, a private information set and a prior. This model is richer than the Arrow–Debreu contingent claim model, because it allows trades (or contracts) to take place under uncertainty and private information. Such a model is interesting because it resembles the trades made in the real world.

However, it is well known that in a finite-agent private information economy (as in Radner, 1968), it is in general not possible to write contracts that are incentive compatible, individually rational and fully Pareto optimal. To put it differently, incentive compatible core allocations need not exist (see Glycopantis and Yannellis, 2005, p. vii for an example to that effect). The reason is that in a finite-agent economy, an individual may have an incentive to misreport her private information to become better off. To get around this difficulty, McLean and Postlewaite (2002, 2003a, 2003b, 2005) used a notion of “informational smallness”, and showed that one can obtain positive results in an approximate sense for a countable replica of a fixed finite-agent economy.

In a deterministic Aumann economy (Aumann, 1964), where the set of agents is an atomless measure space, each individual has a negligible effect on the aggregate behavior and thus, will take prices as given. For such an economy, it is known that core and Walrasian allocations coincide and also exist. In Sun and Yannellis (2007), asymmetric information on the Aumann economy was introduced to capture the meaning of negligible information in the sense that the private signals of almost every individual can influence only a negligible group of agents and the individual agents’ relevant signals are essentially pairwise independent conditioned on the true state of nature. In that framework, the existence of incentive compatible, *ex post* Walrasian allocations was shown for such a perfectly competitive asymmetric information economy, which resolves exactly the inconsistency between incentive compatibility and *ex post* Pareto optimality.

The purpose of this paper is to study a perfectly competitive *ex ante* economy with a continuum of agents by using the notion of information negligibility introduced in Sun and Yannellis (2007). For such an economy, we recast the basic results on the existence of Walrasian equilibrium, core equivalence, and the blocking size of coalitions by taking account of incentive compatibility.

The paper is organized as follows. Section 2 introduces the basic measure-theoretic framework for the signal processes in a large economy with asymmetric information (as in Sun and Yannellis, 2007). Section 3 introduces the economic model, including the concepts of a state contingent large economy and information negligibility together with several notions for a private information economy, such as Pareto efficiency, core and Walrasian equilibrium in the *ex ante* sense.

In Section 4, we first introduce the concept of utility equivalence for allocations and show that any *ex ante* efficient allocation in a private information economy is utility equivalent to an incentive compatible allocation. We then show the existence of an *ex ante* core allocation that is incentive compatible, which implies the nonemptiness of incentive compatible core.<sup>1</sup> We also establish the utility equivalence between Walrasian allocations in the state contingent economy

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<sup>1</sup> Note that an incentive compatible core allocation requires a stronger blocking condition for the coalitions than an *ex ante* core allocation that is incentive compatible. Thus, the incentive compatible core is bigger than the set of *ex ante* core allocations that are incentive compatible. The non-existence results of incentive compatible core allocations for a finite-agent economy can be found in the literature; see, for example, Allen (2003), Glycopantis and Yannellis (2005), Maus (2003, 2004), Prescott and Townsend (1984), Vohra (1999), among others.

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