Microeconomic Analysis

Module 2 – AY 2026/2027

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Syllabus of the Course

The course is the second in the micro sequence. Following the theory of individual decisions by economic agents (consumers and firms) that was covered in the first module, the course will cover how these choices fit together in what is called a Walrasian general equilibrium. We will assume a non strategic setting, i.e. a situation in which agents do not anticipate the reaction of other agents to their own actions, price-taking behavior – agents base their consumption and production decisions on the assumption that they can buy and sell as much as they want at the market price – and common information.

Students are expected to understand, and be able to reproduce, formal proofs of the various claims of the theory. They are also expected to actively participate in class, asking and answering questions. There will be periodic homework assignments. Students will be asked to present in class their solution to the exercises in the assignments. This is an integral part of the course and of the learning process, and will carry a weight in the final score.

1. **Walrasian equilibrium without time and uncertainty: background, definitions and properties**
    - An important notion of "goodness" of economic systems: ***Pareto efficiency***
    - Where would an unrestricted and costless trading process with a lot of information lead? ***Barter equilibria***
    - Barter equilibria are Pareto Efficient
    - Representation of barter equilibria for a two-person, two good economy via the Edgeworth box. The ***contract curve***.
    - Barter equilibria are Pareto efficient, but not all the Pareto efficient allocations are barter equilibria given the initial endowments. The ***Core*** of an exchange economy.
    - A different trading protocol, with much less information: all trades occur in markets and are mediated by a price. Does it lead to different outcomes compared to barter?

- Formal definition of an economy (with production and pure-exchange) and of the ***Walrasian Equilibrium***.
- The properties of a Walrasian equilibrium (assuming that there is one).

2. **Walrasian equilibrium without time and uncertainty: examples and existence**

   - Detailed construction of Walrasian equilibrium for two simple economies, with and without production and firms.

     In an Edgeworth box, a first hint of the relationship between Walrasian equilibria and Pareto efficiency.
   - Proofs of existence of Walrasian equilibria, following two approaches: with consumers and firms explicitly in the picture, in a generalized game; with consumers and firms implicitly subsumed in an aggregate excess demand correspondence.
   - The first approach, in three steps: a general theorem of existence for a bounded generalized game; applying the theorem to a bounded economy; showing that, under appropriate conditions, an unbounded economy has the same equilibria of the bounded one.
   - The second approach.
   - Appendix: quick reminder of some mathematical notions needed in the proofs (***continuity of a correspondence***, ***Berge's theorem***, ***Kakutani fixed-point theorem***).

3. **Welfare Analysis: Pareto efficiency of Walrasian equilibrium and implementation of Pareto efficient allocation as Walrasian (quasi) equilibrium**

   - Remember the question: Does a trading process mediated only by prices lead to different (and less efficient) outcomes compared to an unrestricted, costless and information-intensive barter process? We provide here a detailed answer.
   - The ***First Theorem of Welfare Economics***: under appropriate conditions, any Walrasian equilibrium is Pareto efficient. A proof for a pure-exchange economy and a proof for an economy with production. Discussion of the conditions required.
   - The ***Second Theorem of Welfare Economics***: under appropriate conditions, and allowing a (costless) redistribution of endowments and firms' ownership, any Pareto efficient allocation can be obtained, using the markets, as Walrasian quasi-equilibrium.

Under further conditions, a Walrasian quasi-equilibrium is a Walrasian equilibrium. Discussion of the conditions required. The importance of market completeness.

- Walrasian equilibria and the Core: any Walrasian equilibrium is in the Core, but not all Core allocations can be obtained as Walrasian equilibria (without redistribution).
- Core allocations shrinking in the (appropriate) limit to Walrasian equilibrium allocation. Replica economies.
- ***Externalities*** as an example of market incompleteness. Welfare properties of Walrasian equilibrium with externalities: the equilibrium is no longer necessarily Pareto efficient. The Lindahl equilibrium, as a way to restore efficiency.
- How to find the set of all Pareto efficient allocations.
- Appendix: quick reminder of some mathematical notions needed in the proofs (the ***Separating Hyperplane theorem***).

4. **Top Trading Cycle Mechanism and equilibrium prices**

   - A different trading mechanism, with indivisibilities, that still achieves a Pareto efficient allocation. The mechanism departs from the non strategic setting that is maintained in the rest of the course, and would be most appropriately studied in the context of *mechanism design*. The simple version presented here does not need much of the technical machinery of mechanism design.
   - The strategy-proofness of the mechanism.
   - The allocation produced by the mechanism can be supported as a competitive equilibrium by an appropriately chosen set of prices, which have a clean and simple economic interpretation.

5. **General Equilibrium with Time and Uncertainty**

   - The specification of a time/uncertainty/information structure. The idea of ***contingent commodities***: interpreting the same physical good or service at different points in time and in different contingencies as different goods. Extending the markets to these contingent commodities.
   - If there are, all at once, markets for all possible contingent commodities, the properties of the Walrasian equilibrium survive intact: time and uncertainty can be encompassed in the formal theory developed so far, with virtual no changes.
   - Dynamic economies: not all markets are open at the beginning, but securities can be traded to move resources across time and contingencies, with trading of goods taking place in contingent

spot markets. Dynamic economies have a ***sequence of budget constraints***.

- Market completeness achieved through securities trading: when this is possible, when it is not.
- The simplest case of ***Arrow-Debreu securities***. Equivalence between the economy with all contingent markets at once and a dynamic economy with a number of Arrow-Debreu securities equal to the number of contingencies (minus 1). Security prices indeterminacy if securities payout is in terms of the numeraire (nominal securities); the indeterminacy is solved if securities payout is in terms of a physical good (real securities).
- The case of general securities. The notion of market completeness for general securities. Again, the problem of indeterminacy.
- The problems that might arise with market incompleteness, in a simple example.

6. **Arrow's Impossibility Theorem**

   - Is it possible to aggregate the preferences of the agents in a society in such a way that they produce a well defined (i.e. complete and transitive) *societal preference*?
   - The answer is trivially positive if we impose no restrictions on the societal preference: pick the preference of anyone agent in the society and make her a dictator, so that her preferences are also the societal one!
   - But suppose we impose some restrictions to the societal preference. For example, we do not want a dictator, and we want that whenever *everybody* in the society prefers x to y, also the societal preference considers x better than y, i.e. the aggregation satisfies unanimity. Is the answer still positive?
   - Under an additional requirement, known as *independence of irrelevant alternatives*, Arrow proved that the answer is negative. This is a remarkable result in the theory of social choice.
   - Proof of the theorem.
   - Some examples of rules to aggregate individual preferences (they necessarily fail at least one of Arrow's requirements).
   - Appendix: a quick reminder of the notion and properties of orderings.

References:

I will provide fairly detailed and broadly self-contained ***lecture notes***. These are based to a large extent on the book by Kreps listed below, but

any standard textbook will contain most of the material I will cover. More detailed references will be given during lectures and in the lecture notes.

1. ***Kreps: Microeconomic Foundations***, (volume I). Rigorous, yet lively and thought provoking.

2. Mas-Colell, Whinston, Green: Microeconomic Theory. This is the standard, most comprehensive reference. Rigorous, very detailed.