

MACQUARIE
UNIVERSITY



FACULTY OF
BUSINESS AND ECONOMICS

ECON490/860
Advanced Microeconomics

Semester 1, 2011

Department of Economics

ADVANCED MICROECONOMICS

1. Aims and Coverage of the Course.

Microeconomics pictures the economy as a collection of agents making supply and demand decisions in order to further their own interests. The collective outcomes of these decisions determine the properties and behaviour of the economy.

Consequently, this course provides an account of: (i) the microeconomics of agents **in** the economy; and (ii) the microeconomics of the economy **as a whole** that follows from what the agents in the economy are up to. This is done using, as an over-arching framework and point of reference, possibly the most fundamental model in economics, namely the Arrow and Debreu model. The course also considers various tests of microeconomic theory – something curiously lacking in most textbooks – along with illustrative applications of microeconomic theory to international trade and finance. Some extensions and generalizations of Arrow-Debreu microeconomics are also presented. The ultimate aim of the course is to fire student interest, enquiry, and learning in microeconomics, by providing an integrated, accessible, rigorous, carefully motivated, relevant and empirically referenced account of advanced microeconomics.

One of the complaints that students sometimes make about their experience in microeconomics courses is that microeconomics ‘appears to be a disjointed collection of topics’ and that it lacks ‘a unifying context and narrative’. From the title page on, this course makes an implicit claim that the presentation and student experience of microeconomics needn’t be like that. This is so because there exists a deep, unifying and beautiful context for the field of microeconomics in the form of the Arrow-Debreu model of general equilibrium.

John Geanakoplos (2008) has recently remarked that: “[i]t is not easy to separate the significance and influence of the Arrow-Debreu model of general equilibrium from that of mathematical economics itself”. In fact it is reasonable to argue that the Arrow-Debreu model – along with its extensions and generalizations – forms the bulk of theoretical economics. Geanakoplos, John. “Arrow-Debreu model of general equilibrium.” *The New Palgrave Dictionary of Economics*. Second Edition. Eds. Steven N. Durlauf and Lawrence E. Blume. Palgrave Macmillan, 2008.

The Arrow-Debreu model pictures the economy as a collection of economic agents (traditionally identified as ‘consumers’ and ‘producers’), who make supply and demand decisions in an environment of complete markets, with the aim of furthering their own interests. Locating the economic agents in an Arrow-Debreu context leads naturally to a detailed discussion of consumer and producer behaviour in such a decision making environment. It also sets the scene for various extensions and generalizations of Arrow-Debreu consumer and producer theory that are treated later in the book. As well it provides an early glimpse at ‘the ultimate purpose’ of consumer and producer theory, which is to help us to better understand the behaviour of the economy as a whole.

With the Arrow-Debreu context for our work in place, outlining the field of microeconomics, and the institutional features of the Arrow-Debreu model becomes the natural subject matter for LECTURE 1.

Developing the microeconomic theory of consumers and producers in a complete market Arrow-Debreu economy follows as the subject matter of LECTURES 2, 3, 4 and 5.

LECTURES 6, 7, 8 and 9 develop the properties of the economy that flow from the underlying microeconomics of the agents in it.

LECTURE 10 considers some applications of Arrow-Debreu microeconomics. One of the surprising things discovered by readers in the applications section is that a great deal of what passes for ‘standard economics’ (e.g. the gains from international trade proposition, some basic results in finance), are highly conditional, and in fact conditional on the world looking a lot like the Arrow-Debreu model of the economy.

LECTURE 11 is motivated by the observation that economics not only has a duty to formulate theories about economic phenomena, but it also has a duty to test those theories. Curiously, at least to me, this step in the ‘scientific method’ is (with one partial exception), never embraced in graduate (or undergraduate) microeconomics texts. The partial exception is Chapter 12 in H. R. Varian, *Microeconomic Analysis* where a brief outline of some the **methods** for evaluating and testing Arrow-Debreu consumer and producer theory (but not of other aspects of Arrow-Debreu microeconomics, such as the market clearing hypothesis), is given. However, even in that very good book, and in the context of his discussion of ‘microeconometrics, Varian (1992, Ch12) fails to give students any indication of the **outcomes** of such tests as have been conducted and reported in the literature. This is a major omission from all currently available graduate texts in microeconomics.

LECTURES 12 and 13 provide a treatment of the microeconomics of uncertainty, both at the individual economic agent level and at the level of the economy as a whole. Together they provide a theoretical foundation for the burgeoning field of financial economics.

In LECTURE 14 some initial steps are taken in the direction of relaxing some of the structural features of the Arrow-Debreu model. Relaxation of features such as ‘the complete markets assumption’, the ‘finitely many agents condition’, the ‘price mediated trading rule’ and ‘the price taking postulate’ are considered. Some of what happens to the microeconomics of agents in the economy and to the properties of the economy as a whole when these conditions are relaxed is considered in this final lecture.

The entire presentation of microeconomics given here is made in the context of and with reference to the Arrow-Debreu model. Hopefully this will give you as students the sense that far from being a ‘disjointed series of topics’, advanced microeconomics is in fact a coherent collection of mutually supporting ideas. Using the Arrow-Debreu model as the explicit framework for our presentation of microeconomics also has a pedagogic advantage because students will generally experience fewer feelings of being lost in any particular argument, because the big picture context of the model can always be referred to in order to see where any particular argument is ultimately heading.

2. Textbook and References.

The **textbook** for the course is:

Mas-Colell, A., M. D. Whinston and J. R. Green (1995), *Microeconomic Theory*. Oxford University Press, Oxford and New York.

Reference will also be made from time to time to the following works:

Blad, M. C. and H. Keiding (1990), *Microeconomics: Institutions, Equilibrium and Optimality*. North-Holland, Amsterdam.

Bryant, W. D. A. (2010), *General Equilibrium: Theory and Evidence*, World Scientific and Imperial College Press, Singapore and London.

Cornes, R. (1992), *Duality and Modern Economics*. Cambridge University Press, Cambridge.

Durlauf, S. N. and L. E. Blume (2008) eds., *The New Palgrave Dictionary of Economics*, (2nd Edition) London: Palgrave-Macmillan. This is abbreviated throughout this reading list as *NPDE2*. It is available on-line through the generosity of the University Library and the agitation of former Honours and Masters students and some Faculty members.

Jehle, G. A. and P. J. Reny (2010), *Advanced Microeconomic Theory*, FT Press.

Kreps, D. M. (1990), *A Course in Microeconomic Theory*. Harvester-Wheatsheaf, N.Y.

Luenberger, D. G. (1995), *Microeconomic Theory*, McGraw-Hill, New York.

McKenzie, L. W. (2002), *Classical General Equilibrium Theory*, MIT Press, Cambridge Mass.

Varian, H. R. (1992), *Microeconomic Analysis*. Norton, N.Y. (3rd Edition).

3. Tutorials.

For details see the separate Tutorial handout.

4. Assessment.

Assignment 1: Tutorials

You need to submit *any ten (10)* of the twelve (12) Tutorials in the course. These will be marked on the basis S^+ ('Satisfactory plus' = 2 marks), or S ('Satisfactory' = 1 marks) or S^- ('Satisfactory minus' = 0 marks). The maximum value of the Tutorials is 20 marks.

Assignment 2 : Essay

The essay topic should be in your hands by now. Submit the essay by the due date, which is: **@ the beginnng of the second last Lecture in the course**. The total value of the Essay is 20.

Assignment 3: Final exam

For ECON490 (i.e. Honours students) taking this course, there will be two (2) three hour (3 hr) final exams in this subject (details of the structure and content of the examination will be supplied nearer the time).

For ECON860 (i.e. Masters students) taking this course, there will be one (1) three hour (3hr) final exam (details of the structure and content of the examination will be supplied nearer the time). A copy of the examination paper is provided for you.

The arithmetic of assessment is as follows: Exam is worth 60 marks, Tutorials are worth 20 marks, Essay is worth 20 marks. Final grade expressed out of 100.

Coarse Diary¹

Teaching Week	Lecture	Other things happening
1	1	
2	2	Tute 1 Due
3	3	Tute 2 Due
4	4	Tute 3 Due
5	5	Tute 4 Due
6	6	Tute 5 Due
7	7	Tute 6 Due
8	8	Tute 7 Due
9	9	Tute 8 Due
10	10	Tute 9 Due
11	11	Tute 10 Due
12	12	Tute 11 Due; Essay Due
13	13	Tute 12 Due

FIRST WEEK OF EXAMINATIONS
SECOND WEEK OF EXAMINATIONS

All the best and I hope you learn something from the course.

¹ “Misspelling” intended because this dairy is intended to be a rough guide to the rate at which I think we will progress through the material. However, it will not be adhered to at the expense of your understanding. If something is taking a bit longer to deal with than is envisaged in this diary (or if we get through some topic faster than I imagined we would), then so be it. Your learning is what matters here, not a regimented march through the subject.

COURSE OUTLINE

Lecture 1: Microeconomics and the Arrow–Debreu model.

Lecture 2: Arrow–Debreu Consumers I (Choice).

Lecture 3: Arrow–Debreu Consumers II (Demand).

Lecture 4: Arrow–Debreu Consumers III (Duality and Revealed Preference).

Lecture 5: Arrow–Debreu Producers.

Lecture 6: The Existence of equilibrium.

Lecture 7: Uniqueness and Stability of equilibrium.

Lecture 8: Comparative Statics of equilibrium.

Lecture 9: Optimality and the Welfare Theorems.

Lecture 10: Some applications of Arrow–Debreu general equilibrium theory.

Lecture 11: Testing Arrow–Debreu general equilibrium theory.

Lecture 12: Arrow–Debreu and Uncertainty I (Choice).

Lecture 13: Arrow–Debreu and Uncertainty II (GE and Finance).

Lecture 1 Introduction, motivation and the Arrow-Debreu model

1.1 The Field of Microeconomics

See *Journal of Economic Literature* 'Classification System' for Articles and is available at http://www.aeaweb.org/journal/jel_class_system.php

This standard classification may give you some idea of the scope of the subject.

1.2 The Framework of Microeconomics

A. Mas-Colell, M. Whinston and J. Green (1995), *Microeconomic Theory*, Oxford, pp. 3-4.

Very brief introduction to and overview of the nature and structure of Microeconomics.

D. Kreps (1990), *A Course in Microeconomic Theory*, Harvester-Wheatsheaf, Ch. 1.

Introduces the “Actors, behaviour, institutions and outcomes” picture, which can be a very useful organising device.

M. Blad and H. Keiding (1990), *Microeconomics: Institutions, Equilibrium and Optimality*, Ch. 1.

Gives an overview of Microeconomics with particular emphasis on the environment in which agents are imagined to be operating and introduces some of the available equilibrium concepts by which their behaviour might be modelled.

Frank Hahn (2003), “Macro foundations of micro-economics” *Economic Theory* 21, 227–232

No this is not typo – he actually called the paper this. It is worth reading for the elegance of expression alone – but also for the context it gives to the study we are about to undertake.

1.3 Methodology and Scientific Method

E. Silberberg (1978), *The Structure of Economics*, pp. 1-20.

Introduces the idea that Microeconomics exploits the information contained in the maximisation hypothesis to make predictions about the comparative statics of economic agents, (‘the Samuelson program’).

A. Jehle (1992), *Advanced Microeconomics*, pp. 1-3.

Useful summary of basic scientific method.

C.W.J. Granger (1992), "Fellows Opinion: Evaluating Economic Theory", *Journal of Econometrics*, pp 3-5.

Presents an interesting perspective on 'testing the theory'.

1.4 The Framework of the Arrow-Debreu Model

Mas-Colell, Whinston and Green (1995), pp. 511-513.

Very brief introduction to the A-D model and the field of general equilibrium theory.

J. Geanakoplos (2008), "Arrow-Debreu model of general equilibrium", (in) *NPDE2*.

A very useful guide to the Arrow-Debreu model. At this stage it is probably easiest for you to read just the first three pages and glance at the rest. You might like to retain the article as a map of where we are going.

Lecture 2 Arrow-Debreu Consumers I (Choice Theory)

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 5-9, 17-22, 40-50.

This introduces the basic notions of "commodity", "preference relation", "budget set" and "utility function".

L. W. McKenzie (2002), pp. 13 – 15.

This section presents a nice discussion of the classic Sonnenschein theorem on choice without transitivity. Such discussions are hard to find outside the research literature and this one in particular would repay careful study.

C. Blackorby (2008), "Lexicographic orderings", (in) *NPDE2*.

Nice discussion of an interesting (and widespread?) class of preferences.

Lecture 3 Arrow-Debreu Consumers II (Demand Theory)

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 50-56, 23-28.

This section presents some of the basic results which make up neo-classical or Arrow-Debreu consumer demand theory.

L. W. McKenzie (2002), pp. 15 – 22.

Gives a very nice, compact treatment of demand theory via what we have called the 'primal' approach. Includes a neat derivation of the Slutsky equation. See also pp. 36 – 38 for a discussion of the remarkable Mitiushin-Polterovich theorem.

M. Blad and H. Keiding (1990), Ch. 2.

Defines the notion of a “consumer”; writes down neoclassical choice theory and derives the comparative statics of neoclassical consumers acting in an Arrow-Debreu environment.

Lecture 4 Arrow-Debreu Consumers III (Duality and Revealed Preference Theory)

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 28-36, (optional pp. 91-92).

Presents information about the Slutsky matrix and also introduces the Weak Axiom of Revealed Preference (and optionally the Strong Axiom of Revealed Preference).

L. W. McKenzie (2002), pp. 22 – 25.

Gives a thorough and uncluttered account of the revealed preference approach.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 56-63 and 67-75 (pp. 64-67 optional).

This introduces the “Duality” approach to consumer theory. There are in a sense no new results here, but there are number of new techniques which are now pervasive in economic analysis.

L. W. McKenzie (2002), pp. 1 – 13.

Discusses the dual approach to consumer demand. Note there are some notational differences between the approach of McKenzie and that of Mas-Colell *et. al.*, Varian and co.

V. Bohm and H. Halket (2008), "Demand theory", (in) *NPDE2*.

Compliment to Mas-Colell, Whinston and Green and gives a very complete (reference level) account of consumer choice and demand theory.

E. Silberberg (2008), “Hicksian and Marshallian Demand Curves”, (in) *NPDE2*.

A nice account of Arrow – Debreu consumer theory.

Lecture 5 Arrow-Debreu Producers

Mas-Colell, M. Whinston and J. Green (1995), pp. 127-154.

An account of Arrow-Debreu producer theory from the “Primal” and “Dual” points of view.

M. Blad and H. Keiding (1990), Ch. 3.

Presents the theory of production in an Arrow-Debreu environment from the set theoretic, production function and dual points of view. Notice the attention given to the question of the existence of profit maximising decisions.

G. Debreu (1959), *Theory of Value*, Ch. 3.

Classic and fairly easy to follow treatment of firm behaviour in an Arrow-Debreu environment written by the second part of the famous team.

D. W. Jorgensen (2008), “Production functions”, (in) *NPDE2*.

A nice presentation of producer theory from the ‘primal’ point of view.

W. E. Diewert (2008), “Cost Functions” (in) *NPDE2*.

Surveys producer theory with particular emphasis on the duality between production, cost and profit functions. Also contains some interesting material on ‘empirical testing’ that we will return to later in the course.

Lecture 6 Existence of Market Equilibrium

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 578-589 (optionally pp. 632-641).

Introduction to the basic existence question for market or Walrasian equilibrium.

H. Varian (1992), *Microeconomic Analysis*, (3rd. Edition) pp. 313-323.

Gives an account of an approach to the existence question, originally due to Arrow and Hahn (1971), which exploits the properties of the excess demand map in an Arrow-Debreu economy to achieve an existence result. Note that Varians' approach appears to be for the exchange case, but as we will see in the lectures, it easily generalises to the production case.

M. Allingham (1987), "Excess Demand and Supply", *NPDE1* (2), pp. 201-222.

Also comes at the existence problem from the “excess demand end”.

M. Blad and H. Keiding (1990), pp. 156-162.

Existence from the “primitives” point of view.

G. Debreu (2008), "Existence of General Equilibrium", *NPDE2*.

A nice account of the existence problem which allows you to get a feel for what has to be assumed about the primitives of the economy if an existence argument is to go through.

W. D. A. Bryant (1997), “Conditions for the existence of market equilibrium”
Journal of Economic Education, 28(3), pp. 230-254.

This is a critical survey of the available sufficient conditions for the existence of market equilibrium, in particular the conditions which appear in the ‘third level’ proofs of the equilibrium existence theorem. The paper also discusses an apparently little known necessary condition due to Arrow and Debreu (1954) as well as providing an introduction to the recent and emerging literature on necessary and sufficient conditions for the existence of market equilibrium.

L. W. McKenzie (2002), pp. 189 – 214.

Has an extensive discussion of issues associated with the existence of competitive equilibrium. Also discusses in detail some of the issues discussed in Bryant (1997).

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 598-606 (optionally Chapter 4.)

A fundamental result which tells us something about the “aggregate” implications of Arrow-Debreu Microeconomics and also conditions the search for conditions which yield Uniqueness, Stability and Comparative Static properties of market equilibrium.

M. Blad and H. Keiding (1990), pp.173-176.

Nice treatment of the classic Sonnenschein-Mantel-Debreu theorem, which apart from being interesting in its own right, underpins a lot of the work to be discussed in the sections to follow.

L. W. McKenzie (2002), pp. 25 – 33.

Contains a discussion of the properties of market demand functions that is slightly more accessible than that presented in Mas- Colell, Whinston and Green (1995).

W. D. A. Bryant (2010), Ch 2 and 3.

Presents more detail on sufficient, necessary and necessary and sufficient conditions for the existence of equilibrium. Recommended reading only if you are having trouble sleeping!

Lecture 7 Uniqueness and Stability of Market Equilibrium

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 589 - 615.

Presents a thorough analysis of the conditions needed for uniqueness (and local uniqueness) and does so from a number of “angles”. Also gives a thorough account of the remarkable ‘Sonnenschein-Mantel-Debreu Theorem’.

M. Blad and H. Keiding (1990), pp. 162-166.

Gives a nice introduction to the “conditions on excess demand functions” approach to the uniqueness question.

H. Varian (1992), pp. 394-397.

Presents a reasonably accessible summary of the modern “index analysis” approach to the uniqueness question.

L. W. McKenzie (2002), pp. 229 – 235.

Provides a unified view of some relatively recent work on the uniqueness of equilibrium.

W. D. A. Bryant (2010), Ch 7.

Gives an overview of the uniqueness problem, particularly in a production context – and suggests a potentially new approach to getting uniqueness conditions via contraction mappings.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 620-626.

Interesting account of price and quantity adjustment processes.

M. Blad and H. Keiding (1990), pp. 169-173.

Are there forces at work in the economy that will take the prevailing price vector to equilibrium, supposing that one exists? This is the “stability question” for market equilibrium and in these pages Blad and Keiding present an introduction to the field of answers to this question.

H. Varian (1992), pp. 398-402.

Gives an account parallel to that in Blad and Keiding for the first few pages, but then introduces the important ‘Non-Tatonnement’ adjustment processes.

F. H. Hahn (2008), “Auctioneer”, (in) *NPDE2*.

In teresting discussion of the stability problem. Also, if you get interested in this problem, then a place where you might start a serious study is Hahn (1982), both for details about known results and for 'attitude'.

D.G. Saari and C.T. Simon (1978), "Effective price mechanisms", *Econometrica*, pp. 1097-1125.

This is an extremely important paper in the Stability literature. A summary of the main conclusion will be presented in lectures.

L. W. McKenzie (2002), pp. 45 – 96.

Proides a unified treatment of numerous important issues in stability analysis.

W. D. A. Bryant (2010), Ch 8.

Provides a discussion of the stability properties of some tatonnement, non-tatonnement and 'agent driven' adjustment processes, in a GE context.

Lecture 8 Comparative Statics of Market Equilibrium

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 616-620.

What happens to (equilibrium) prices and quantities if the economy is "shocked" (\neq morally outraged) by a variation in the parameters which define it, in particular, tastes, endowments and technologies? This is a fundamental applied issue and also one of considerable theoretical and "methodological" significance.

M. Blad and H. Keiding (1990), pp. 166-168.

If we are serious about the "Samuelson-program" and also if we want to make bread and butter predictions about the effects on prices and quantities traded of various parameter changes, then we need to be able to extract from our multi-market models, so called comparative static predictions. Blad and Keiding give an introduction to the circumstances in which this might be possible.

J. Nachbar (2010), "Comparative Statics" *NPDE2*.

Excellent survey of what is involved in obtaining comparative static results in disaggregated systems.

L. W. McKenzie (2002), pp. 133 – 153.

Ties up a number of the issues associated with comparative statics in GE systems as well as providing an introduction to some of the emerging modern techniques for tackling this task.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 652-673.

When does price taking behaviour make sense and what precisely is meant by the term “competitive”? A fundamental result due to Aumann answered these questions and that answer and the associated extensions is presented here.

W. D. A. Bryant (2010), Ch 10.

Discusses the major approaches to, and results for, comparative statics in a GE context.

Lecture 9 Optimality of Market Equilibrium and the Welfare Theorems

A. Mas-Colell, M Whinston and J. Green (1995), (background: pp. 515-525; see also the course notes.)

Provides the geometric intuition for what is going on with the Welfare Theorems.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 545-566.

Extensive account of the First and Second Fundamental Theorems of Welfare Economics.

M. Blad and H. Keiding (1990), Ch. 4.

Market or Walrasian equilibrium might be an interesting solution concept for certain abstract games and even a way of understanding market prices, trades and sometimes a vehicle for obtaining comparative static predictions. Possibly even more interesting is the fact that under certain conditions Walrasian equilibrium decentralises a Pareto optimal allocation. This chapter deals with the optimality of equilibrium.

G. Debreu (1959), Ch. 6.

Classic treatment of the first and second fundamental theorems of Welfare Economics. Note in particular the hypotheses *and* conclusions of these theorems.

L. W. McKenzie (2002), pp. 165 – 171.

Gives a very nice account of the Welfare theorems and their context.

W. D. A Bryant (1994), "Misinterpretations of the Second Fundamental Theorem of Welfare Economics", *Journal of Economic Education*, 25(1), pp. 75 – 80.

The informal and semi-formal literature which interprets the SFTWE often claims more than the theorem does. “Support” is not analogous in English to “achieve”. This distinction matters when policy design is considered.

L. Kaplow (2008), “Pareto principle”, (in) *NPDE2*.

An interesting and insightful discussion of the optimality principle that has come to dominate thinking about welfare economics, at least at the undergraduate level.

W. D. A. Bryant (2010), Ch 9.

Discusses both the First and Second welfare theorems. Explores some circumstances where they hold and also some circumstances where they fail.

Lecture 10 Some Applications of the Arrow-Debreu Model

This LECTURE aims to show that far from being an arcane piece of theory, Arrow-Debreu microeconomics informs a great deal of economic analysis – both ‘pure’ and ‘applied’.

Application 1: The first application involves a relatively careful analysis of **The Gains from Trade Proposition**.

M. Kemp (1987), "Gains from Trade", *NPDEI* (2), pp. 453-454.

There are numerous applications of Arrow-Debreu model. Here Kemp shows how the model underpins standard “gains from trade” arguments.

M. Kemp and K. Shimomura (1997), “Trade gains: A unified exposition based on duality”, *The Japanese Economic Review*, Volume 48, No. 2, pp. 121 – 131.

This paper provides an in depth look at the propositions which constitute the gains from trade proposition in international trade.

Newbery, D. and J. Stiglitz (1984), “Pareto inferior trade”, *The Review of Economic Studies*, 51(1), pp. 1 – 12.

Shy, O. (1988), “A general equilibrium model of Pareto inferior trade”, *Journal of International Economics*, 25(1/2), pp. 143 – 154.

Shy, O. (1989), “External effects and Pareto inferior trade”, *Southern Economic Journal*, 56(1), pp. 56 – 63.

Willmann, Gerald (2004), “Pareto gains from trade: a dynamic counterexample” *Economics Letters* Volume 83, Issue 2, Pages 199-204.

Grandmont, J. M. and D. McFadden (1972), “A technical note on the classical gains from trade”, *Journal of International Economics*, 2, pp. 109 – 125.

Grinols E. (1991), “Increasing returns and the gains from trade”, *International Economic Review*, 32(4), pp. 973 – 984.

Kemp, Murray C. and Koji Shimomura (2002), "Recent Challenges to the Classical Gains-from-Trade Proposition", *German Economic Review*, November 2002, v. 3, iss. 4, pp. 485-89.

Fachini G. and G. Willmann (2001), "Pareto gains from trade", *Economia et Politica*, 18(2), pp. 207 – 215.

Calvo-Pardo, Hector (2009), "Are the Antiglobalists Right? Gains-from-Trade without a Walrasian Auctioneer", *Economic Theory*, v. 38, iss. 3, pp. 561-92

Application 2: The second application involves studying the fascinating subject of **Picemeal reform**. This approach to economic policy formulation turns out to be widely applicable to task of finding welfare improving policies. This LECTURE provides a discussion of the foundations of the approach in Arrow-Debreu microeconomics, along with some applications.

Debreu, G. (1951), "The coefficient of resource utilization", *Econometrica*, 19, 273 – 92.

Dixit, A. (1975), "Welfare effects of price changes", *Journal of Public Economics*, 4, pp. 103 – 25.

Dixit, A. (1979), "Price changes and optimum taxation in a many-consumer economy", *Journal of Public Economics*, 11, pp. 143 – 57.

Dixit, Avinash (1987), "On Pareto-Improving Redistributions of Aggregate Economic Gains", *Journal of Economic Theory*, February 1987, v. 41, iss. 1, pp. 133-53.

Rader, T. (1976), "The Welfare Loss from Price Distortions", *Econometrica*, 44, pp. 1253 – 57.

Guesnerie, R. (1977), "On the direction of tax reform", *Journal of Public Economics*, 7, pp. 179 – 202.

A. Woodland (1982), *International Trade and Resource Allocation*, pp. 341-344.

Presents an introduction to the tax and tariff reform literature which uses the Arrow-Debreu model as its laboratory.

A. Turenén-Red and A. Woodland (1991), "Tariff Reform in a Small Open Multi - Household Economy with Domestic Distortions and Nontraded Goods", *International Economic Review*, pp. 937-957.

Advanced contribution to the Arrow-Debreu tariff reform literature, which relaxes some of the assumptions previously made in the literature.

Quiggin, John (1998), "Micro Gains from Micro Reform", *Economic Analysis and Policy*, March 1998, v. 28, iss. 1, pp. 1-16

Ju, Jiandong and Kala Krishna (2000), "Necessary conditions for welfare improving reforms" *Economics Letters* Volume 67, Issue 2, Pages 121-237

Serra, Pablo (1988), "The excess utility functions and the welfare adjustment process", *Economics Letters*, Volume 26, Issue 1, Pages 1-5

Yun, Kwan Koo (2010), "Efficient, Pareto-improving processes", *Journal of Mathematical Economics*, Volume 46, Issue 3, Pages 326-331

Carvajal, Andrés and H.M. Polemarchakis (2008), "Identification of Pareto-improving policies: Information as the real invisible hand" *Journal of Mathematical Economics* Volume 44, Issue 2, Pages 167-179

Acocella, N. and G. Di Bartolomeo (2006), "Tinbergen and Theil meet Nash: Controllability in policy games" *Economics Letters* Volume 90, Issue 2, Pages 213-218.

Turunen-Red, Arja H. (1990), "On the Hatta Normality Condition and Tax Reforms", *Journal of Public Economics*, v. 43, iss. 2, pp. 253-62

Nakanishi, Noritsugu (1993), "Welfare Analysis of Tariff Change with and without International Transfers" *Journal of International Economics*, November 1993, v. 35, iss. 3-4, pp. 377-87.

Konishi, H. (1995), "Pareto-improving commodity tax reform under a smooth non-linear income tax", *Journal of Public Economic*, 56, 413 – 46.

Mandler, Michael (1999), "Simple Pareto-Improving Policies", *Journal of Economic Theory*, v. 84, iss. 1, pp. 120-33.

Application 3: In LECTURE 8 on Comparative Statics, we developed a general expression for the variation in prices associated with particular changes in the parameters that define the economy. One such parameter is the size, composition and distribution of endowments among consumers in the economy. It is of some interest to study what happens when agents are *transferred* between agents. Our third application of Arrow-Debreu microeconomics therefore considers **endowment transfers, endowment manipulation and The Transfer Problem and the transfer paradox**. Academic interest in the transfer problem, grew out of a debate between Ohlin and Keynes about the likely effects of post WW1 German reparations. Here we outline the classic transfer problem and explore the various 'manipulation *via* endowments' results that have appeared in the literature.

M. Rao (1992), "On the transfer and advantageous reallocation paradoxes" *Social Choice and Welfare*, pp. 131-139.

Presents a nice account of the so-called 'Transfer Paradox', which although it appears to be a highly academic question, actually has historical antecedents in the debates (between Keynes and Ohlin among others) about the appropriate size of post WW1 German reparations. Can be applied in many contemporary situations also..

Kemp, Murray C. and Koji Shimomura (2002), “A Theory of Voluntary Unrequited International Transfers”, *Japanese Economic Review*, v. 53, iss. 3, pp. 290-300

Safra, Z. (1987), “Strategic reallocation of resources”, *NPDEI*, Vol 4., pp. 516 – 518.

Donsimoni, M. P. and H. Polemarchakis(1994), “Redistribution and welfare”, *Journal of Mathematical Economics*, 23, 235 – 42.

Galor, O. and H. Polemarchakis (1987), “Intertemporal equilibrium and the transfer paradox”, *Review of Economic Studies*, 54, pp. 147 – 56.

Dixit, A. (1995), “The multi-country transfer problem”, in *International Trade, Volume 1: Welfare and Trade Policy*, (ed.) J. P. Neary, Edward Elgar, Aldershot.

Goenka, Aditya and Stefano Matta (2008), “Manipulation of endowments and sunspot equilibria” *Economic Theory* 36, pp. 267 – 82.

Hens, Thorsten and Beate Pilgrim (2004), “Sunspot Equilibria and the Transfer Paradox”, *Economic Theory*, Vol. 24, No. 3, pp. 583-602.

Lane, Philip R. and Gian Maria Milesi-Ferretti (2004), “The transfer problem revisited: net foreign assets and real exchange rates”, *Review of Economics & Statistics*, Vol. 86 Issue 4, p841-857.

Brock, P. (2008), “Transfer problem”, in *New Palgrave Dictionary of Economics*, 2nd Edition, S. Durlauf and L. Blume (eds.), Palgrave Macmillan, London.

Yano, M. and J. Nugent (1999), “Aid, nontraded goods and the transfer paradox in small countries”, *American Economic Review*, 89, pp. 431 – 49.

Application 4: Our fourth application is to **optimal taxation**.

Atkinson, A. and J. E. Stiglitz (1972), “The structure of indirect taxes and economic efficiency”, *Journal of Public Economics*, 1, pp. 97 – 119.

Atkinson, A. and N. Stern (1980), “The switch from direct to indirect taxation”, *Journal of Public Economics*, 14, pp. 195 – 224.

Sandmo, A. (1974), “A note on the structure of optimal taxation”, *American Economic Review*, 64, pp. 701 – 06.

Sandmo, A. (1976), “Optimal taxation- - an introduction to the literature”, *Journal of Public Economics*, 6, pp. 37 – 54.

Sandmo, A. (1987), “A reinterpretation of elasticity formula in optimum tax theory”, *Economica*, 54, pp. 89 – 96.

Stiglitz, J. E. (1987), “The theory of Pareto efficient and optimal redistributive taxation”, in P. G. Hare (ed.), *Surveys in Public Sector Economics*, Blackwell Publishers, Oxford, pp. 71 – 114.

Saez, E. (2000), “Optimal Income Tax Rates and Elasticities: A Summary”, *Proceedings: Ninetysecond Annual Conference on Taxation*, Atlanta, Georgia, October 24-26, 1999, pp. 64-71, Washington, D.C.: National Tax Association

Saez, E. (2001), “Using Elasticities to Derive Optimal Income Tax Rates”, *Review of Economic Studies*, v. 68, iss. 1, pp. 205-29.

Laroque, G. R. (2005), “Indirect Taxation Is Superfluous under Separability and Taste Homogeneity: A Simple Proof”, *Economics Letters*, 87, pp. 141 – 44.

Hellwig, Martin F. (2010), “A generalization of the Atkinson–Stiglitz (1976) theorem on the undesirability of nonuniform excise taxation” *Economics Letters*, Volume 108, Issue 2, Pages 156-158.

Robledo, Julio R. and Andreas Wagener (2007), “No spurious welfare gains from taxation: A further argument for the equivalent variation”, *Economics Letters* Volume 96, Issue 3, Pages 325-330.

Facchini, Giovanni, Peter J. Hammond and Hiroyuki Nakata (2001), “Spurious deadweight gains”, *Economics Letters* Volume 72, Issue 1, Pages 33-37

Keen, Michael and David Wildasin (2004), “Pareto-Efficient International Taxation”, *American Economic Review*, Vol. 94, No. 1, pp. 259-275.

Application 5: One of the parameters that defines an Arrow-Debreu economy is the number of economics agents in it. One way in which that number can vary is via **migration**. The effects of migration on the equilibrium and welfare of an economy is our fifth application.

Kemp M. (1993), “The welfare gains from international migration”, *Keio Economic Studies*, 30(1), pp. 1 – 5.

Euwals, Rob and Hans Roodenburg (2004), “A note on the redistributive effect of immigration”, *Economics Letters* Volume 85, Issue 2, Pages 241-246.

Hammond, Peter J. and Sempere, Jaume (2006), “Gains from Trade versus Gains from Migration: What Makes Them So Different?”, *Journal of Public Economic Theory*, v. 8, iss. 1, pp. 145-70.

Application 6: Thanks to a result known as Sperner’s Lemma, is a close relative of Brouwer’s Fixed Point Theorem, it is possible to compute Arrow-Debreu prices (and quantities). Our sixth application

will explore and explain some of what is involved in the **computation of equilibrium prices and quantities**.

Scarf, H. E. (2008), "Computation of general equilibria", in *The New Palgrave Dictionary of Economics*, 2nd Edition (rds.), S. Durlauf and L. Blume, Palgrave MacMillan, London.

Richter, Marcel K. and Kam-Chau Wong (1999), "Non-computability of Competitive Equilibrium", *Economic Theory*, v. 14, iss. 1, pp. 1-27.

Brocker, Johannes (1998), "Operational Spatial Computable General Equilibrium Modeling", *Annals of Regional Science*, v. 32, iss. 3, pp. 367-87

Caucutt, Elizabeth M. (2001), "Peer Group Effects in Applied General Equilibrium", *Economic Theory*, Vol. 17, No. 1, pp. 25-51

Deng, Xiaotie and Ye Du (2008), "The computation of approximate competitive equilibrium is PPADhard", *Information Processing Letters*, Vol. 108 Issue 6, p369-373.

Kubler, F. (2008), "Computation of general equilibrium (new developments)", (in) *New Palgrave Dictionary of Economics*, 2nd Edition (eds.), S. Durlauf and L. Blume, Palgrave MacMillan, London.

Chia N. and J. Whalley (1997), "A numerical example showing globally welfare worsening liberalisation of international trade in banking services", *Journal of Policy Modeling*, 19(2), pp. 119 – 127.

Lecture 11 Testing Arrow-Debreu Theory

F. Kleibergen (2008), "Testing", (in) *NPDE2*.

Interesting discussion of the testing in an economics context.

(Testing Arrow-Debreu Consumer Theory)

A. Deaton (1984), "Demand Analysis", *Handbook of Econometrics*, Vol. 3, Ch. 30.

Presents a summary of the outcome of testing Neoclassical consumer demand theory and some background material on how to conduct such tests.

J. Sabelhaus (1990), "Testing Neoclassical Consumer Theory with Aggregate and Household Data", *Applied Economics*, pp. 1471-1479.

Presents a test of Neoclassical consumer demand theory using the AID demand system and draws attention to the contrast between results for aggregate and individual data.

R. Cooper and K. McLaren (1992), "An empirically oriented demand system with improved regularity properties", *Canadian Journal of Economics*, pp.652- 68.

An important development in the methodology of testing A-D consumer theory is presented here along with an interesting empirical application.

M. Familiarì (1995), "A household-based non-parametric test of Demand Theory", *Review of Economics and Statistics*, pp. 372-382.

A non-parametric test of consumer theory.

A. P. Barten (2003) "The empirical content of consumer theory", *Journal of Agricultural and Applied Economics*, Supplement 2003, v. 35, pp. 7-17

Falsification of nontrivial empirical statements, of a statistical nature or not, is basically destructive. No wonder that it is rarely practiced. Rather than then abandoning a rejected null hypothesis, one tries to salvage it by looking for reasons why the rejection of an otherwise credible, plausible hypothesis occurs. One then attempts to modify the set-up in such a manner that formal rejection is avoided. Testing, in general, but specifically of nonnested hypotheses, can be seen as a kind of model selection. These issues are illustrated with examples from applied demand analysis: the testing of the homogeneity condition and of Slutsky symmetry and the choice of functional form for demand systems.

W. D. A. Bryant (2010), pp. 356 – 76.

Provides a survey of tests of consumer theory.

(Testing Arrow-Debreu Producer Theory)

K. Conrad and R. Unger (1987), "Expost Tests for Short - and Long-Run Optimisation", *Journal of Econometrics*, pp. 339-1479.

Tests Neoclassical producer theory by exploiting consequences of various dual equivalence's.

J. Pencaval and B. Craig (1994), "Empirical Performance of Orthodox Models of the Firm: Conventional Firms and Worker Co-operatives." *Journal of Political Economy*, pp. 718-744.

Cleverly does (at least) two things: (i) See's how well the standard price taking, profit maximising model of the firm performs as far as predicting how firms will react to changes in their economic environment and (ii) check to see how different this behaviour is from that which one observes in firms which have objectives other than straight profit maximisation. Also claims to be doing this work without appeal to restrictive assumptions about returns to scale.

Barnett, William A. (2002), "Tastes and technology: Curvature is not enough for regularity", *Journal of Econometrics*, May 2002, v. 108, iss. 1, pp. 199-202

An interesting discussion of some basic issues in the econometrics of testing producer (and consumer) theory.

W. D. A. Bryant (2010), pp. 377 – 86

Provides a survey of tests of producer theory.

(Testing The Market Clearing Hypothesis)

G. Rudebusch (1989), "An Empirical Disequilibrium Model of Labor, Consumption and Investment", *International Economic Review*, pp. 633-654.

Tests the Walrasian-equilibrium hypothesis using a disaggregated model of the US economy and aggregate data.

Mishra, D. and D. Talman (2006), "Overdemand and underdemand in economies with invisible goods and unit demands", *Tilburg University, Center for Economic Research*, Discussion Paper No. 84.

Considers the possibility of disequilibrium on markets due to various sorts of indivisibilities. Also presents some informal evidence in this direction.

W. D. A. Bryant (2010), pp. 386 – 401.

Presents some empirical evidence derived from tests of market clearing.

Lecture 12 Arrow – Debreu and Uncertainty I (Choice Theory)

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 167-207.

Detailed introduction to the theory of individual behaviour under uncertainty, including a review of some of the modern developments in the field.

D. Kreps (1990), Ch. 3.

There are many ways to model the choice, by an individual, of an action when there is an uncertain connection between any particular action and the resulting outcomes. Kreps provides an introduction and useful discussion of one of the most heavily investigated models of choice under uncertainty, that due to von Neumann and Morgenstern.

P. P. Wakker (2008), "Uncertainty", (in) *NPDE2*.

Provides a very nice treatment of choice under uncertainty.

Lecture 13 Arrow – Debreu and Uncertainty II (General Equilibrium and Finance)

G. Debreu (1959), Ch.7.

Provides a classic treatment of the results obtainable about an economy in which there is a complete set of contingent markets.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 687-724.

Gives a thorough account of the advanced topic of “general equilibrium under uncertainty”. Considers the existence question in some non Arrow – Debreu environments.

M. Majumbar and R. Radner (2008), “Uncertainty and General Equilibrium”, (in) *NPDE2*, Vol. 8. Pp. 439 – 451.

Considers the GE implications of uncertainty and market incompleteness. One of the co-authors is a founder of the field.

J. – M. Grandmont (2008), “Temporary equilibrium” (in) *NPDE2*, Vol. 8, pp. 223 – 226.

Summary and Revision

F. Hahn (1982), "Reflections on the Invisible Hand", *Lloyds Bank Review*, pp. 1-21.

A delightful summary of much of what we have seen, presented with flair and great “attitude”.

W. D. A. Bryant (2010), Ch 12.

An attempts a reflection on some of what GET has to teach us.