TOPICS IN MICROECONOMICS I
Universidad Carlos III-Spring 2009
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This course will be divided in three parts, of more or less equal length each. They are not necessarily connected except in that I have worked on them. The course will be evaluated with an exam and a presentation cum essay related to one of the recent research papers in parts II and III of the course.

I. Evolutionary games

This part of the course is intended as a brief introduction to evolutionary game theory.

Since there are quite a few books dealing with learning and evolution in games, let me just list a few textbooks. You will find tons of references therein.

- D. Fudenberg and D. Levine (1998), *Theory of Learning in Games*, Cambridge MA: MIT Press.
- J. Hofbauer, K. Sigmund (1988), *Dynamical Systems and the Theory of*
- *Evolution*, Cambridge: Cambridge University Press.
- J. Maynard Smith (1982), *Evolution and the Theory of Games*, Cambridge:
- Cambridge University Press.
- L. Samuelson (1997), *Evolutionary Games and Equilibrium Selection*, Cambridge MA: MIT Press.
- E. Van Damme (1987), *Stability and Perfection of Nash Equilibria*, Berlin: Springer Verlag.
- F. Vega Redondo (1996), *Evolution, Games and Economic Behavior*, Oxford:
- Oxford University Press.
- F. Vega Redondo (2003), *Economics and the Theory of Games*, Cambridge:
- Cambridge University Press.
- J.W. Weibull (1995), *Evolutionary Game Theory*, Cambridge MA: MIT
- Press.
- H.P. Young (1998), *Individual Strategy and Social Structure*, Princeton:
- Princeton University Press.
- H.P. Young (2004), *Strategic Learning and Its Limits*, Oxford: Oxford
- University Press.

II. Implementation Theory: New approaches

The theory of implementation tries to address the problem of designing game forms (which in this literature are called mechanisms) whose equilibria satisfy certain socially desirable properties but which do not necessitate vast amounts of knowledge by the authorities to put them in place. Instead, these social arrangements should basically self police themselves, and the designer should only make sure that the rules of the game are respected by the players.

The purpose of this part of the course is to introduce students to implementation theory and some recent developments in this literature.

General reference include the following recent surveys:

- Corchón, L.C. (2008), "The Theory of Implementation: What Did we Learn?" Encyclopedia of Complexity and Systems Science, Meyers, Robert A. (Ed.), Springer.
- Jackson, M. O. (2001), "A Crash Course in Implementation Theory," **Social Choice and Welfare** 18, 655-708.
- Maskin, E. S. and T. Sjöström (2002), "Implementation Theory," in Handbook of Social Choice and Welfare (vol. I), ed. by K. J. Arrow, A. Sen and K. Suzumura, New York, Elsevier Science B.V.
- Palfrey, T. R. (2002), "Implementation Theory," in Handbook of Game Theory with Economic Applications (vol. III), ed. by R. J. Aumann and S. Hart, New York, Elsevier Science.
- Serrano, R. (2004), "The Theory of Implementation of Social Choice Rules", **SIAM Review** 46, 377-414.

There is also an excellent textbook:

- Corchón, *The Theory of Implementation of Socially Optimal Decisions in Economics*, McMillan Press, London, 1996.

The papers on *new* approaches that I will talk about (in varying levels of depth) are:

- Artemov, G., T. Kunimotoz and R. Serrano (2008), "Robust Virtual Implementation with Incomplete Information: Towards a Reinterpretation of theWilson Doctrine," mimeo, Brown University.
- Antonio Cabrales and Roberto Serrano (2007), Implementation in Adaptive Better-Response Dynamics, mimeo.
- Antonio Cabrales (1999), *Adaptive Dynamics and the Implementation Problem with Complete Information*. **Journal of Economic Theory**, *86*:159-184.
- Eliaz, K. (2002), "Fault-Tolerant Implementation," **Review of Economic Studies** 69, 589-610.
- Mathevet, L. (2007), "Supermodular Bayesian Implementation: Learning and Incentive Design," mimeo, California Institute of Technology.
- Bergemann, D. and S. Morris (2008), "Strategic Distinguishability and Robust Virtual Implementation," mimeo, Princeton University.
- Sandholm, W.H. (2002), "Evolutionary Implementation and Congestion Pricing," **Review of Economic Studies** 69, 667-689.

III. Game theory and Networks

Networks pervade socio-economic life. They also pervade our discipline. The work in the area has connections with many different sub-fields of game theory, from cooperative games, to refinements, evolutionary games, bargaining and other interesting topics. At the same time there are numerous applications in different fields. Just to name a few: industrial organization, labor economics, organization theory and

information theory. So I expect this course to be of interest to people coming from many different backgrounds.

Rather than being exhaustive, we will try to cover a few topics in depth, and hope that you get interested and do more exploration on your own. The reading list contains a sample of papers that I find interesting and some textbooks. The starred readings are the ones we will cover in class.

Textbooks
- M.O. Jackson (2008), *Social and Economic Networks*, Princeton: Princeton University Press.
- S. Goyal (2000), *Connections: An Introduction to the Economics of Networks*, Princeton: Princeton University Press.
- F. Vega-Redondo (2007), *Complex Social Networks*, Econometric Society Monograph Series, Cambridge University Press.

Network formation: stability and efficiency.
- * M.O. Jackson and A. Wolinsky (1996), "A Strategic Model of Economic and Social Networks," *Journal of Economic Theory*, 71:44-74.
- B. Dutta and S. Mutuswami (1997), "Stable Networks," *Journal of Economic Theory*, 76:322-344.
- V. Bala and S. Goyal (2000), "A Non-Cooperative Model of Network Formation," *Econometrica*, 68:1181-1231.

Games played on fixed networks.
- * S. Morris (2000), "Contagion," *Review of Economic Studies*, 67:57-78.
- M. Chwe (2000), "Communication and Coordination in Social Networks," *Review of Economic Studies*, 67:1-16.
- * Y. Bramoullé and R. Kranton (2007), "Public Goods in Networks" , *Journal of Economic Theory* , 135:478-494.
- C. Ballester, A. Calvó-Armengol and Y. Zenou (2006), "Who's Who in Networks. Wanted: The Key Player," *Econometrica* 75:1403-1418.
- * Antonio Cabrales, Antoni Calvó-Armengol and Yves Zenou (2006), *Efforts and Synergies in Network Formation.*
- Andrea Galeotti and Sanjeev Goyal (2007), *The Law of the Few.*

Learning and Evolution in Networks.
- V. Bala and S. Goyal (1997), "Learning from Neighbours," *Review of Economic Studies*, 65:595-621.
- M. Jackson and A. Watts (2002), "The Evolution of Social and Economic Networks," *Journal of Economic Theory*, 106:265–295.
- S. Goyal and F. Vega-Redondo (2005), "Learning, Network Formation and Coordination," *Games and Economic Behavior*, 50:178-207.

Networks and foundation of solution concepts in coalitional games.
- R. B. Myerson (1977), "Graphs and Cooperation in Games," *Mathematics of Operations Research*, 2:225-229.

- R. B. Myerson (1981), "Conference Structures and Fair Allocation Rules," *International Journal of Game Theory*, 9:170-182.
- A. Kirman, C. Oddou and S. Weber (1986), "Stochastic Communication and Coalition Formation," *Econometrica*, 54:129-138.

The statistical mechanics approach to networks (a little physics).
- D.J. Watts (1999), *Small Worlds*, Princeton NJ: Princeton University Press.
- M.E.J. Newman, C. Moore and D.J. Watts (2000), "Mean-Field Solution of the Small World Network Model," *Physical Review Letters* 84:3201-3204.
- *R. Albert and A.-L. Barabási (2002), "Statistical Mechanics of Complex Networks," Review of Modern Physics, 74, 47.

Applications 1 – Industrial organization.
- K. Hendricks, M. Piccione and G. Tan (1999), "Competition in airline networks," *Econometrica* 67:1407-1434.
- R.E. Kranton and D. F. Minehart (2000), "Networks versus Vertical Integration," *Rand Journal of Economics* 31:570-601.
- R.E. Kranton and D. F. Minehart (2001), "A Theory of Buyer-Seller Networks," *American Economic Review*, 91:485-508.

Applications 2 – Labor and bargaining.
- J. Montgomery (1991), "Social networks and labor market outcomes: toward and economic analysis," *American Economic Review* 81:1408–1418.
- M. Corominas (2004), "Bargaining in a Network of Buyers and Sellers," *Journal of Economic Theory* 115:35-77.
- A. Calvó-Armengol (2004), "Job Contact Networks," *Journal of Economic Theory* 115:191-206.
- A. Calvó-Armengol and M.O. Jackson (2004), "The Effects of Social Networks on Employment and Inequality," *American Economic Review* 94: 426-454.

Applications 3 – Organization and information theory.
- R. Radner (1993), "The Organization of Decentralized Information Processing," *Econometrica* 61:1109-1146.
- P. Bolton and M. Dewatripont (1994), "The Firm as a Communication Network," *Quarterly Journal of Economics* 109:809-839.
- L. Garicano (2000), "Hierarchies and the Organization of Knowledge in Production," *Journal of Political Economy* 108:874-904.
- Roger Guimerà, Albert Díaz-Guilera, Fernando Vega-Redondo, Antonio Cabrales and Àlex Arenas (2002), "Optimal network topologies for local search with congestion," *Physical Review Letters*, *89*:248701.