

# **Mathematical Models in Economy/Modelos Matemáticos em Economia**

Session Organizers/Organizadores da Sessão:

Liliana Garrido da Silva (Faculdade de Economia e Centro de Matemática da Universidade do Porto);

Filipe Martins (Centro de Matemática da Universidade do Porto).

## **Shared market equilibria in duopolies with positive network effects**

**Renato Soeiro**<sup>1</sup>

<sup>1</sup> Inesc Tec and University of Porto, Portugal

The study of network effects in models of price competition is usually a perturbation of an (equilibrium) demand function, which is either a primitive or a specification arising from a standard model. When network effects are positive and depend on the aggregate of choices, such a construction is necessary to control the bandwagon effect and avoid ending up in a corner solution. We show that in duopolies where network effects depend on a partition into groups, some influence structures produce a local (pure price) duopoly equilibrium where both firms profit. The local solution can be part of a subgame-perfect equilibrium if firms' are sufficiently afraid that a price outside the interval that supports the local optimum will tip the market to their rival. It may be particularly suitable for some fickle popularity phenomena. It also shows it is possible to take network effects as the microeconomic foundation for demand and then perturb that solution with other effects if deemed necessary.

# Coalitions and the paradox of cooperation in a public good model with homogeneous agents

Bruno M. P. M. Oliveira<sup>1</sup>

<sup>1</sup> Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto (FCNAUP) e Inesc Tec

Following Baliga and Maskin [1], we consider a model of homogeneous agents with quasi-linear utilities with respect to the quality of the public good. We study the existence of stable coalitions of agents willing to cooperate for the preservation of the public good. We show that membership of the stable coalitions grows up to attaining the grand coalition as the preservation of the public good becomes a more urgent need, as measured by the intensity preservation parameter, which was fixed in Baliga and Maskin's original work. However, this occurs with a much greater loss of the cooperators' utilities when compared to the free-riders' utilities, which leads to a possible instance of the paradox of cooperation: the welfare of the stable coalitions is much smaller than the welfare of the grand coalition, except when the grand coalition becomes stable. On the other hand, we also obtain that the welfare of stable coalitions is much higher than the welfare achieved by the competitive equilibrium described by Baliga and Maskin [1]. We will, if time allows, discuss some additional partial results on coalitions in a broader heterogeneous agents context, and how these stable coalitions may be formed through a dynamic bargaining Markov chain process.

## References

- [1] BALIGA, SANDEEP AND MASKIN, ERIC, *Mechanism design for the environment*, in K. G. M aler and J. Vincent (editors), Handbook of environmental economics, pp. 306–324, Elsevier Science/North Holland, 2003.

# Innovation through inter-regional interaction in a spatial economic model

José M. Gaspar<sup>1</sup>

<sup>1</sup> CEGE and Católica Porto Business School, Universidade Católica Portuguesa

This paper analyses a two-region model with vertical innovations that enhance the quality of varieties of the horizontally differentiated manufactures produced in each of the two regions. We look at how the creation and diffusion of knowledge and increasing returns in manufacturing interact to shape the spatial economy. Innovations occur with a probability that depends on the inter-regional interaction between researchers (mobile workers). We find that, if the weight of interaction with foreign scientists is relatively more important for the success of innovation, the model accounts for re-dispersion of economic activities after an initial stage of progressive agglomeration as transport costs decrease from a high level.