# 10th Seminar
# Ordered Structures in Games and Decisions
# (OSGAD 2016)

# Abstracts

## November 8th, 2016

Université Paris I — Panthéon-Sorbonne

Centre d'Économie de la Sorbonne
106-112, Bd. de l'Hôpital, 75013 Paris

# PROGRAM

♦ **9:00 Welcome to participants**

❑ 9:20-10:10 : Marina NÚÑEZ

*Exactness, dual games and extreme points: the case of assignment games*

❑ 10:10-11:00 : Clemens PUPPE

*Towards a classification of Condorcet domains*

♦ **11:00-11:20 Coffee break**

❑ 11:20-12:10 : Bruno TEHEUX

*Strongly barycentrically associative and preassociative functions*

❑ 12:10-13:00 : Francis BLOCH

*Centrality measures in networks*

♦ **13:00-14:30 Lunch**

❑ 14:30-15:20 : Encarnación ALGABA

*Cooperation on structures with communication and hierarchical features*

❑ 15:20-16:10 : Sylvain BÉAL

*An axiomatization of the iterated h-index and applications to sport ranking*

♦ **16:10-16:30 Coffee break**

❑ 16:30-17:20 : Miguel COUCEIRO and Michel GRABISCH

*Integer-valued means*

1. **Marina NÚÑEZ (Departament de Matemàtica Econòmica, Financera i Actuarial and Barcelona Economic Analysis Team (BEAT), Universitat de Barcelona, Spain)**

*Exactness, dual games and extreme points: the case of assignment games*

Several lexicographic allocation procedures for coalitional games with transferable utility are considered, where the payoffs are computed following an externally given order of the players. Some of these procedures make use of the dual coalitional values instead of the ordinary coalitional values. The common feature of the methods is that if the allocation is in the core, it is an extreme point of the core. We first investigate the general relationships between these allocations and obtain two hierarchies on the class of balanced games.

Secondly, we focus on assignment games and sharpen some of these general relationships. Our main result is the coincidence of the sets of lemarals (vectors of lexicographic maxima over the set of dual coalitionally rational payoff vectors), lemacols (vectors of lexicographic maxima over the core) and extreme core points. As byproducts, we show that, similarly to the core and the coalitionally rational payoff set, also the dual coalitionally rational payoff set of an assignment game is determined by the individual and mixed-pair coalitions, and we present an efficient and elementary way to compute these basic dual coalitional values. This provides a way to compute the AL-value (the average of all lemacols) with no need to obtain the whole coalitional function of the dual assignment game.

(joint work with Tamás Solymosi)

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Paper available at http://econ.core.hu/file/download/mtdp/MTDP1425.pdf.

2. **Clemens PUPPE (Karlsruhe Institute of Technology, Germany)**

*Towards a classification of Condorcet domains*

Condorcet domains are sets of linear orders with the property that, whenever the preferences of all voters belong to this set, the majority relation has no cycles. We observe that, without loss of generality, such domain can be assumed to be closed in the sense that it contains the majority relation of every profile with an odd number of individuals whose preferences belong to this domain.

We show that every closed Condorcet domain is naturally endowed with the structure of a median graph and that, conversely, every median graph is associated with a closed Condorcet domain (which may not be a unique one). The subclass of those Condorcet domains that correspond to linear graphs (chains) are exactly the preference domains with the classical single crossing property. As a corollary, we obtain that the domains with the so-called 'representative voter property' (with the exception of a 4-cycle) are the single crossing domains.

Maximality of a Condorcet domain imposes additional restrictions on the underlying median graph. We prove that among all trees only the chains can induce maximal

Condorcet domains, and we characterize the single crossing domains that in fact do correspond to maximal Condorcet domains.

Finally, using Nehring's and Puppe's (2007) characterization of monotone Arrowian aggregation, our analysis yields a rich class of strategy-proof social choice functions on any closed Condorcet domain.

(joint work with Arkadii Slinko and Tobias Dittrich)

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Two papers available at http://micro.econ.kit.edu/downloads/1507.08219v1.pdf and http://micro.econ.kit.edu/downloads/Charact-SP.pdf.

### 3. Bruno TEHEUX (Université du Luxembourg, Luxembourg)

*Strongly barycentrically associative and preassociative functions*

Let $X$ be a nonempty set and $X^*$ be the free monoid generated by $X$ (that is, $X^*$ is the set of finite words over $X$ equipped with the concatenation operation). Recall that a function $F\colon X^* \to X \cup \{\varepsilon\}$ is barycentrically associative if the function value of a string does not change when replacing every letter of a substring of consecutive letters with the value of this substring. This property is involved in Kolmogoroff-Nagumo's characterization of quasi-arithmetic means.

In this talk, we investigate the stronger property of *strong barycentric associativity* which says that the function value of a string does not change when replacing every letter of *any* substring with the value of this substring. Equivalently, a function $F\colon X^* \to X \cup \{\varepsilon\}$ is strongly barycentrically associative if and only if it satisfies the equation

$$F(\mathbf{xyz}) \;=\; F(F(\mathbf{xz})^{|\mathbf{x}|}\mathbf{y}F(\mathbf{xz})^{|\mathbf{z}|}), \qquad \mathbf{xyz} \in X^*.$$

We also investigate a weaker version of strong barycentric associativity called *strong barycentric preassociativity* which does not involve any composition of functions in its definition. We establish links between strong barycentric associativity and strong barycentric preassociativity. We recall a variant of Kolmogoroff-Nagumo's characterization of the class of quasi-arithmetic means based on the strong barycentric associativity property, and we provide an analog of this characterization that involves strongly barycentrically preassociative functions.

(joint work with Jean-Luc Marichal)

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4. **Francis BLOCH (University Paris I, Paris School of Economics)**

*Centrality measures in networks*

We show that although the prominent centrality measures in network analysis make use of different information about nodes positions, they all process that information in an identical way: they all spring from a common family that are characterized by the same simple axioms. In particular, they are all based on a monotonic and additively separable treatment of a statistic that captures a nodes position in the network.

(joint work with Matthew Jackson et Pietro Tebaldi)

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5. **Encarnacion ALGABA (Department of Applied Mathematics and Research Institute of Mathematics, University of Seville, Spain)**

*Cooperation on structures with communication and hierarchical features*

The most common types of network structures that are applied in the literature are represented by an undirected or directed graph. However, many economic and social network structures cannot be described by such graphs. Although they can be described by the more general hypergraphs, this last class may not capture some essential features of certain network structures. Agents participating in different kinds of organizations, usually take different positions in some network structure. Two well-known network structures are hierarchies and communication networks. The aim of this paper is to introduce a new type of structure having both communication and hierarchical features. We describe a network by the feasible sets of network positions (nodes). We compare these new network structures with other structures from the literature, and study its basis, i.e. the 'smallest' representation of the network. Finally, we apply these network structures to model cooperation restrictions in cooperative games.

(joint work with Rene van den Brink and Chris Dietz)

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6. **Sylvain BÉAL (CRESE, Université de Franche-Comté)**

*An axiomatization of the iterated h-index and applications to sport ranking*

A variant of the h-index introduced in Garcia-Pérez (2009), called the iterated h-index, is studied to evaluate the productivity of scholars. It consists of successive applications of the h-index so as to obtain a vector of h-indices. In particular, the iterated h-index fixes a drawback of the h-index since it allows for (lexicographic) comparisons of scholars with the same h-index. Two types or results are presented. Firstly, we provide an axiomatic characterization of the iterated h-index, which

rests on a new axiom of consistency and extensions of axioms in the literature to a richer framework. Secondly, we apply the h-index and iterated h-index to offer alternative sport rankings in tennis, football and basketball. These applications clearly demonstrate that the iterated h-index is much more appropriate than the classical h-index.

(joint work with Sylvain Ferrières, Eric Rémila, and Philippe Solal)

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7. **Miguel COUCEIRO (LORIA (CNRS - Inria Nancy Grand Est - Université de Lorraine) and Michel GRABISCH (Université Paris I, Paris School of Economics)**

*Integer-valued means*

Integer-valued means, satisfying the decomposability condition of Kolmogoroff/Nagumo, are necessarily extremal, i.e., the mean value depends only on the minimal and maximal inputs. To overcome this severe limitation, we propose an infinite family of (weak) integer means based on the symmetric maximum and computation rules. For such means, their value depends not only on extremal inputs, but also on 2nd, 3rd, etc., extremal values as needed. In particular, we show that this family can be characterized by a weak version of decomposability.

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