# Research Summary: Stefan Behringer

Stefan Behringer's theoretical research falls into the areas of mechanism design and dynamic games. In his work on mechanism design he has been treating the issue of how it is that some public goods are provided (such as Open Source Software) despite the fact that theory starting with Mancur Olson's (1965) work has predicted that the free-riding effect is stronger if there are many participants. He shows that this "paradox" can be explained by noting that for such public goods users and providers are identical. He also has a strong interest in repeated and dynamic games as well as optimal control theory. Results with Thorsten Upmann published 2014 in the *Journal of Economic Dynamics and Control* on optimal spatial harvesting are currently extended to a model of product differentiation, Cournot competition, and discrete resources patches.

In his more applied work he has been working on implications of "two-sidedness" of markets (e.g. newspapers who generate revenue from both readers and advertisers) on price theory, in particular on the issue of alleged predatory pricing by The Times raised in the UK newspaper price war in the 90s. In a sequel to this paper the standard Hotelling model is extended to 4 firms with endogenous locations and prices. Equilibria reveal interesting comparative statics, e.g. that the Daily Telegraph may be benefited from the alleged price war due to its location on the political far Right. These papers are joint with the econometrician Lapo Filistrucchi. Stefan Behringer has also worked on extending the models of mobile telecommunications of Laffont, Rey, & Tirole (1998) to allow for asymmetries and investigated the implications of such asymmetries on the possibilities for collusion with Edmond Baranes and Jean-Christophe Poudou. This work has just been accepted as the *Annals of Economics and Statistics*.

# a) Mechanism Design

### Direct Provision of a Public Good with many Agents

Abstract:
The literature on the private provision of public goods suggests a proportional relationship between incentives to free-ride and group size. However recent empirical research and casual observation of modern information technologies suggests otherwise. This paper purports a solution to the apparent paradox within a mechanism design framework tailored to modular developments within these technologies and provides a positive limit result as the number of agents gets large.

**Public Good Provision with many Agents: The $k_n$-Success Technology** (with Yukio Koriyama, Ecole Polytechnique).

Abstract:
In this paper, we consider a class of public good provision problems in which the production function takes the form of k-$_n$success technology, an extension of the direct provision technology considered in Behringer (2013). These models are suitable to describe the free-rider problems in which there are a large number of agents who are both users and beneficiaries of a public good at the same time, e.g. open-source software or social networks. We provide results on asymptotic efficiency which connect a negative result of Mailath and Postlewaite (1990) and a positive result of Hellwig (2003), as well as a set of examples which allow us welfare comparison with the standard technologies.

# b) Dynamic Games and Control

**Optimal Harvesting of a Spatial Renewable Resource** (with Thorsten Upmann, Bielefeld University)

In this paper we investigate optimal harvesting of a renewable natural resource. While in the standard approach the resource is located at a single point in space we allow for the resource to be distributed over the plane. Consequently, an agent who exploits the resource has to travel from one location to another. For a fixed planning horizon we investigate the speed and the time path of harvesting chosen by the agent. We show that the agent adjusts the speed of movement so that he accomplishes to visit each location only once, even in the absence of travelling cost. Since he does not come back to any location for a second harvest, it is optimal for him to fully deplete the resource upon arrival. A society interested in conserving some of the resource thus has to take measures suitable to limit the exploitative behaviour of the agent.

Published: *Journal of Economic Dynamics and Control*, 2014, Vol. 42, p.105-120.

**Cournotian Dynamics of Spatially Distributed Renewable Resources** (with Sebastian Anita & Ana-Maria Mosneagu, University of Iasi, and Thorsten Upmann, University Bielefeld)

We extend modern Walrasian economics and in particular the results on Cournot convergence and dynamics by focusing on renewable resources in a spatial setting. Building on the harvesting model of Behringer and Upmann (2014) we endogenize prices using a linear inverse demand function and investigate the cases of durable and non-durable renewable commodities. We find that endogenizing prices is sufficient to prevent the full exploitation result and look at how competition affects not only the stock but also the temporal incentives for exploitation. We derive convergence results in static and dynamic settings which suggest that the classical Cournotian outcomes may prevail.

**Exploitation of a Renewable Resource Situated at Discrete Patches** (with Peter Kort Tilburg University & Thorsten Upmann, Bielefeld University).

We contribute to the analysis of optimal harvesting of a renewable natural resource. While in the usual approach the resource is located at a single point, recent contributions challenge this view and assume that the resource is continuously distributed in space (see, e. g. Behringer and Upmann, 2014; Belyakov et al., 2015). In the continuous approach, the agent is allowed to do harvesting in an en passant manner, that is, the agent gathers the resource while simply passing it. In this paper, we dispense with both views: we assume that the resource is localised at discrete patches, and that at any of those patches the process of harvesting takes time. This implies that upon arrival at a patch the agent has to reduce speed, to stop and to stay there for some time, as these are prerequisites for any harvesting process. While these technical features enhance the realism in natural resource modelling, they substantially affect the optimal path of movement and harvesting. Finally, a numerical analysis demonstrates that this modification may affect this path quite significantly.

# c) Theoretical Industrial Organization

### Network Effects, Spillovers, and Market Structure

The paper investigates the effect of spillovers in a model of endogenous technical change resulting from network effects, e.g. in the market for hand-held video consoles on the existence of a lower bound to market concentration.

Published: *The Manchester School*, 2013, Vol 82, Issue 2, p.143-159.

# d) Price Theory and Two-Sided Markets

### Equilibrium Market and Pricing Structures in Virtual Platform Duopoly: Coexistence on Competing Online Auction Sites revisited.

We investigate the equilibrium market structure in virtual platform duopoly such as that of eBay and Yahoo! auctions. Building on the model of Ellison, Fudenberg, & Möbius (2004) we take full account of the complexity of network effects on such platforms. We extend the model by looking at the implication of exogenous and endogenous buyer and seller charges (i.e. vertical product differentiation) making use of the concept of insulating tariffs. This extension brings in line the theory with the empirical findings of Brown & Morgan (2006). Eventually we investigate welfare effects, look at the viability of duopoly with size differentials, and the implications for large markets.

Published: *Analysis of Competition Policy and Sectoral Regulation*, CRESSE, eds. Peitz, M. and Spiegel, Y. 2014, World Scientific.

### Hotelling Competition and Political Differentiation with more than two Newspapers (with Lapo Filistrucchi, University of Florence).

We analyse a market where media firms compete for advertising as well as for readership. Firms first choose their political differentiation, then set cover prices and advertising tariffs. We build on the duopoly model of Gabszewicz, Laussel, and Sonnac (2001, 2002) who show that advertising financing can lead to minimum political differentiation of the newspapers and hence a lack of plurality of political views or pensée unique. We extend their model to more than two newspapers and show that, contrary to popular belief in competition policy, concern for such lack of plurality may diminish but does not disappear as the number of firms increases.

Published: *Information Economics and Policy*, 2015, Vol. 30, p.36-49.

### Price Wars in Two-Sided Markets: The case of the UK Quality Newspaper Industry (with Lapo Filistrucchi, Tilburg University).

This paper investigates the price war in the UK quality newspaper industry in the 1990s. We show that the empirical evidence is in accordance with a substantial change in the optimal finance mix of newspapers as advertising becomes the dominant source of newspaper revenue. The evidence brought forward at the time is not sufficient to establish a case of predatory pricing as it has neglected the critical two-sidedness of firms and necessitates further study.

**Areeda-Turner in Two-Sided Markets** (with Lapo Filistrucchi, University of Florence)

We first extend the Areeda-Turner rule to two-sided markets. Since prices below marginal cost on one side of the market cannot be considered a sign of predation, our proposed extension takes into account revenues and costs from both sides. We then analyse two alleged cases of predatory behaviour in the market for daily newspapers. These examples highlight that applying a one-sided Areeda-Turner rule may lead to assess a perfectly legitimate profit-maximizing pricing policy as a predatory attempt or, on the contrary, to consider legitimate prices that should be deemed predatory in the spirit of the original Areeda-Turner rule.

Published: *Review of Industrial Organization*, 2015, Vol. 46, pp.287-306.

# e) Telecommunications

**Mobile Access Charges and Collusion under Asymmetry** (with Edmond Baranes and Jean-Christophe Poudou, University of Montpellier)

This paper considers collusion between asymmetric networks in the telecommunications industry. Its primary purpose is to fill the gap between the literature on collusion between asymmetric firms and the literature on collusion in the telecommunications industry. Employing the standard Hotelling framework of horizontal product differentiation with non-linear tariffs and network based price discrimination we allow for differentiation in a second dimension. Modulo the locations, the consumers of each network operator face an asymmetry parameter that directly impacts their demands and can capture asymmetries in demand elasticities, in demand size, or even both. The implications of these asymmetries for the possibility of sustaining collusion are investigated under alternative access pricing regimes.

Forthcoming: *Annals of Economics and Statistics* (formerly Annales de l'INSEE www.annales.ensae.fr)

**Entry, Access Pricing, and Welfare in the Telecommunications Industry**

The paper looks at the effects of entry on welfare in the Telecommunications industry. The equilibrium pricing parameters for an incumbent (state) monopoly and for a duopoly situation are determined. A welfare comparison between the monopoly and duopoly equilibrium situation is undertaken and the welfare consequences of alternative access pricing regimes are investigated.

Published*: Economics Letters*, 2009, Vol. 102(3), p.185-188.

**Asymmetric Equilibria and Competitive Access Pricing in the Telecommunications Industry**

This paper looks at competition in the Telecommunication industry with non-linear tariffs and network based price discrimination where one of the networks has a relative advantage. We look at profit-maximizing network pricing behaviour, in particular competitively chosen unregulated non-reciprocal access prices at potentially asymmetric market equilibria.

Published: *Int. J. of Management and Network Economics*, 2012, Vol. 2, No. 3, p.257-281.

All Paper are at www.stefanbehringer.com

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