I suggest three possible directions (actually three projects).

1. Game theoretic modeling of strategic investments (e.g. competition in advertising).

The aim is to analyze a dynamic model describing the changes to market shares in a duopoly caused by strategic investments in advertising, where firms aim at maximizing the discounted flow of profits. A starting point would be the model proposed in J. M. Binner, L.R. Fletcher, L. Khodarinova, V. Kolokoltsov. Optimal Strategic Investment in a Duopoly. Aston Business School Working Paper Series RP0412, 2006 (submitted for publication), related models of competitive investments being discussed in many places, see e.g. Q. Wang and Z. Wu. A duopolistic model of dynamic competitive advertising. European Journal of Operational Research **128** (2001), 213-226, or the book S. Jorgensen, G. Zaccour. Differential Games in Marketing. Kluwer Academic, 2004. However, in usual models it is often assumed that the firms are correcting their rate of investment continuously, which leads to positional differential games. These game are very difficult to analyze, so that the solutions are usually obtained under strong additional assumptions. In the approach proposed for this project, we shall assume from the beginning that the rate of strategic investment is constant for each firm for a fixed period of time. This allows for a much simpler analysis avoiding the heavy machinery of differential games. From the practical point of view this approach seems to be quite realistic, as it can be used recursively by fixing the rate for a certain (large or small) time and re-evaluating the strategy each planning period.

2. Game theoretic modeling of crime prevention (e.g. in tax evasion).

Starting from learning about a classical model of inspection and related game theory, a student will be then introduced to more recent and more sophisticated models, in particular those that I developed myself in collaboration with my St. Petersburg colleague (see e.g. our book in preparation 'Ideas and Methods of Game Theory') that allow to take into account more subtle effects, say, when the punishment for tax evasion depends on the amount of hidden profit, when there are several instruments for crime prevention, etc. The student will be supposed to first 1) understand existing models, analyze them theoretically and compute solutions numerically, and then 2) improve and extend existing models taking into account real data obtained, from, say WBS (or Law and Crime prevention Units).

3. Game theoretic modeling of price competition for firms and products with variable locations and delivery costs.

Starting from classical Cournot models of price competition, the student will be supposed to concentrate on game models of territorial price building including various transaction costs from production sites to deliveries, the possibility of several production firms on each production site with the price at the production site being increased by the total demand of the selling agents (as well as decreased by the total supply) yielding a game with many players including both selling agents and production firms.

Theoretically the project will be concentrated around the notion of (Nobel price winning) Nash equilibrium, which is central for economics research, various aspects of its calculations (i.e. via quadratic programming or replicator dynamics), and/or a related notion of the compromise set.

As there seemed to be not too much of game theory in lectures (though something was given, in particular on a December School on Evolutionary Games), the project would

involve 1) some learning of the theory, 2) analysis of the models and 3) some numeric experiment or a program. In all three directions there is a potential to compare with real world data.