

- 9901 On the existence of spatial monopolies under free entry.  
Sébastien STEINMETZ and Yves ZENOU.

In a model of horizontal product differentiation, we show that local monopolies may exist under free entry when capital is perfectly mobile. In contrast both with the situation of restricted entry and with the zero-profit approach to free entry outcomes of Salop (1979), the unit profit rate of incumbent monopolists is positive and bounded above in equilibrium. The upper bound we find decreases with the size of unserved market areas and with the number of incumbent monopolists.

**JEL Classification:** L12, L13, D42, DR3, R32

**Keywords:** horizontal product differentiation, entry, local monopolies, spatial contestability.

- 9902 Agglomeration economies in European and American cities.  
Yves ZENOU.

We consider two types of cities. In the European one the amenities are located at the city-center (like e.g. Paris or London) whereas in the American-type city the amenities are at the city-edge (like e.g. Detroit, Los Angeles). We first show that the unemployed reside at the vicinity of the city-center in the American-type city while they locate at the outskirts of the city in the European one. We then establish conditions for the endogenous formation of monocentric European and American cities and compare them. It turns out that the employed workers are better off in European cities whereas the unemployed and firms are worse off, that land rent is cheaper in American cities and that the number of trips devoted to amenities and to work affect differently workers' utilities and firms' profits in the two cities.

**JEL Classification:** R14, R23

**Keywords:** agglomeration, endogeneous location of workers and firms, location of amenities, urban unemployment.

- 9903 International treaties on trade and global pollution.  
Parkash CHANDER and Ali KHAN.

The paper shows that global pollution need not rise under free trade in goods and/or emissions even in the complete absence of income effects. Differences in environmental concerns across the countries lead to differences in the pollution-intensity of production and thus generate the possibility of increasing world output and income without increasing the world pollution by shifting the production of the polluting good from the country with higher pollution-intensity of production to the country with lower one. We show that free trade in goods and/or emissions can induce precisely such a shifting of production with the country with greater environmental concern exporting the polluting good.

The paper also demonstrates the possibility of a first-best international treaty on global pollution in which each country or group of countries is better-off.

- 9904 On the dynamics of supply-constrained equilibria.  
Jacques DREZE.

The paper defines a simple tâtonnement process of adjustments in prices and quantities, where excess demand results in nominal price increases and excess supply results in quantity rationing of supply at unchanged prices. Under reasonable assumptions, the process converges to a supply-constrained equilibrium. The result contributes to our understanding of how supply-constrained equilibria come about.

- 9905 A remark on the number of trading posts in strategic market games.  
Leonidas C. KOUTSOUGERAS.

In market games the one to one correspondence between commodity types and trading posts would be justified if it were true that the set of equilibria is not affected by the number of trading posts postulated at the outset of the model. We show that this is not true. We develop an example which features equilibria where a commodity is simultaneously exchanged in two trading posts at different prices, i.e., equilibria where the 'law of one price' fails when the one to one correspondence between commodities and trading posts is abandoned. Thus, we conclude that the set of equilibria in market games depends non-trivially on the number of trading posts. This conclusion further suggests that an explanation of the structure of trading posts is necessary.

**JEL Classification:** C72

**Keywords:** trading posts, law of one price.

- 9906 Workers' skills and product selection.  
Jean GABSZEWICZ and Alessandro TURRINI.

When the production of high quality goods needs the employment of qualified labour, firms' decisions concerning quality are affected by the extent to which skills are abundant. By means of a comparison between monopoly and perfect competition, we show how market power in such a context may entail a distortion in product selection towards too high average quality.

**JEL Classification:** D4, J24, L13, L15

**Keywords:** product selection, vertical differentiation, market power, human capital.

- 9907 Stable flows in transportation networks.  
Yu. NESTEROV.

In this paper we develop a new theory of static equilibrium in congested transportation networks. Our considerations are based on a physical meaning of the flows rather than on an artificially chosen model of travel time functions. We introduce a concept of the stable equilibrium and prove the existence theorems.

- 9908 Trade fragmentation and coordination in bilateral oligopolies.  
Francis BLOCH and Hélène FERRER.

This paper studies a strategic market game where agents fragment their bids on different markets. Simple conditions for existence of an interior equilibrium point are provided. In equilibrium, all agents are active on the same markets and prices are identical across markets, so that all equilibria are equivalent to an equilibrium where all agents trade on a single market.

- 9909 Optimal redistribution with unobservable preferences for an observable merit good.  
María del Mar RACIONERO.

This paper considers a government that seeks both to redistribute income and to encourage or discourage the consumption of a certain good. This good is assumed to be either a merit or demerit good. Individuals differ in their exogenous income and in their preferences for the merit good. The government can perfectly observe the level of consumption of the merit good. However, it cannot observe neither income nor preferences. The only observable variable is thus each individual's consumption of the merit good. In order to account for merit good considerations, we consider a modification of the utilitarian social welfare function in which the government imposes uniform preferences, despite the heterogeneous individual preferences, at a level which will depend on the merit or demerit nature of the observable good. We derive the optimal nonlinear redistributive policy and compare our results to the ones that would be obtained under a utilitarian social welfare function that respects the own preferences of individuals.

**JEL Classification:** H21, H41

**Keywords:** merit goods, non-linear tax schedule.

- 9910 Direct versus indirect taxation: The design of the tax structure revisited.  
Helmuth CREMER, Pierre PESTIEAU and Jean-Charles ROCHET.

This paper studies the optimal direct/indirect tax mix in a setting where individuals differ in several unobservable characteristics (productivity and endowments). Tax instruments (income and commodity taxes) are constrained solely by the information structure. It presents general expressions for the optimal commodity tax rates and proves that contrary to Atkinson and Stiglitz's (1976) result, differential commodity taxation remains a useful instrument of optimal tax policy *even if* preferences are separable between labor and produced goods. The following, more specific, results are also derived. First, when cross substitution effects are small the expressions resemble traditional (many households) Ramsey rules. Second, if differences in endowments are confined to some of the goods, the tax rate on goods in which endowments are zero is positively related to income elasticity. Finally, in a Cobb-Douglas illustration with two goods, where endowments differ only in good 1 (and are interpreted as "wealth"), the tax on good 2 provides an indirect way to tax the unobservable wealth. It is higher (i) the more significant are the wealth differentials, (ii) the stronger is the correlation between wealth and earning ability and (iii) the larger are the (political) weights attached to low wealth individuals.

- 9911 Strategic candidacy and voting procedures.  
Bhaskar DUTTA, Matthew O. JACKSON and Michel LE BRETON.

We study the impact of considering the incentives of candidates to strategically affect the outcome of a voting procedure. First we show that *every* non-dictatorial voting procedure that satisfies unanimity, is open to strategic entry or exit by candidates: there necessarily exists some candidate can affect the outcome by entering or exiting the election, even when they do not win the election. Given that strategic candidacy always matters, we analyze the impact of strategic candidacy effects. We show that the equilibrium set of outcomes of the well-known voting by successive elimination procedure expands in a well-defined way when strategic candidacy is accounted for.

- 9912 Choquet rationality.  
Paolo GHIRARDATO and Michel LE BRETON.

We provide a characterization of the consequences of the assumption that a decision maker with a given utility function is *Choquet rational*: She maximizes expected utility, but possibly with respect to non-additive beliefs, so that her preferences are represented by Choquet expected utility (CEU).

The characterization shows that this notion of rationality allows in general to rationalize more choices than it is possible when beliefs have to be additive. More surprisingly, we find that a considerable restriction on the types of beliefs allowed does not change the set of rational actions. We then remark on the relation between the predictions of CEU model, of a similar model (the maxmin expected utility model), and those of subjective expected utility when the risk attitude of the decision maker is not known. We close with an application of the result to the definition of a solution concept (in the spirit of rationalizability) for strategic-form games.

**JEL Classification:** C72, D81

**Keywords:** revealed preferences, rationalizability, belief functions, Choquet integrals.

- 9913 Racial discrimination and redlining in cities.  
Nicolas BOCCARD and Yves ZENOU.

We propose a model where employers have two types of prejudices: racial and spatial discriminations. Because of the first one, black workers have less chance than white workers to find a job. Because of the second one, workers living closer to the city-center have less chances than suburban workers to find a job. In this context, we show that depending on the importance of access costs to employment centers two urban equilibria may emerge. In Equilibrium 1 (the access cost for blacks is quite large), black and white workers are totally separated while in Equilibrium 2 (the access cost for blacks is relatively small), workers are separated by their employment status (the unemployed versus the employed). We then study the labor market equilibrium and its interactions with the land market. We show in particular that both “race” and “space” matter to explain high unemployment rates among blacks.

**Keywords:** urban equilibrium, access costs, spatial discrimination, urban unemployment.

- 9914 Optimal dynamic antitrust policies.  
Cinzia ROVESTI.

In a two period model with asymmetric information we study the optimal antitrust policies carried out by a public agency faced with firms’ horizontal price-fixing behaviour. We analyse the effect on social welfare in case the Antitrust Authority decides to bind itself to follow the same policy, an investigation procedure, over the two periods. We interpret this policy as the adoption of antitrust guidelines. One can show that the introduction of antitrust guidelines does improve social welfare. Intertemporal dynamic effects on industry’s strategies which bring to the ratchet effect do not offset the benefits that accrue to the agency from its commitment to the same policy across the periods.

**JEL Classification:** L41, L51

**Keywords:** dynamic antitrust policy, antitrust guidelines, ratchet effect.

- 9915 Global quadratic optimization on the sets with simplex structure.  
Yu. NESTEROV.

In the first part of this paper we prove that the global quadratic optimization problem over a simplex can be solved with a constant relative accuracy. In the second part we consider some natural extensions of the result.

- 9916 European antidumping policy and firms' strategic choice of quality.  
Hylke VANDENBUSSCHE and Xavier WAUTHY.

In this paper, we consider a European industry characterized by vertical product differentiation. Using a two-stage model with quality choice made before price competition takes place, we show that EU antidumping policy that takes the form of price-undertakings offers a powerful protection to domestic firms, but only at the price competition stage. Once the impact of the A-D policy on quality choices is taken into account, European Welfare as well as profits accruing to the domestic firm decrease whenever the free trade equilibrium is affected. Hence we show that European Antidumping policies may induce "perverse" leapfrogging.

**JEL Classification:** F13, L13

**Keywords:** Bertrand competition, injury, quality, Welfare, European antidumping policy.

- 9917 The uncapacitated lot-sizing problem with sales and safety stocks.  
Marko LOPARIC, Yves POCHE and Laurence A. WOLSEY.

We examine a variant of the uncapacitated lot-sizing model of Wagner-Whitin involving sales instead of fixed demands, and lower bounds on stocks. Two extended formulations are presented, as well as a dynamic programming algorithm and a complete description of the convex hull of solutions. When the lower bounds on stocks are non-decreasing over time, it is possible to describe an extended formulation for the problem and a combinatorial separation algorithm for the convex hull of solutions. Finally when the lower bounds on stocks are constant, a simpler polyhedral description is obtained for the case of Wagner-Whitin costs.

**Keywords:** lot-sizing, production planning, mixed integer programming, integral polyhedra, extended formulations.

- 9918 Market games with multiple trading posts.  
Leonidas C. KOUTSOUGERAS.

We study market games with multiple posts per commodity. We provide some facts that characterize prices of commodities across posts and show the following results: (i) As the number of agents increases, the price variability across posts for a commodity becomes smaller and it becomes zero when the number of agents becomes infinite, irrespectively of the distribution of characteristics in the economy. (ii) The set of equilibrium prices and allocations of a market game is a subset of the set of equilibria of another game with more trading posts per commodity. (iii) We demonstrate via an example that the inclusion can be strict, as there are equilibria with price disparities across posts for a commodity which cannot be captured with less trading posts. (iv) One can pass from an equilibrium of a market game into an equilibrium of a game with less trading posts per commodity, by consolidating posts where the price of a commodity is uniform.

**JEL Classification:** C72

**Keywords:** trading posts, law of one price.

- 9919 Monopolistic competition, multiproduct firms and optimum product diversity.  
Gianmarco I.P. OTTAVIANO and Jacques-François THISSE.

This paper tackles the issue of optimum product diversity in an imperfectly competitive market with small or large firms. First, it develops a quadratic utility model of monopolistic competition with horizontal product differentiation which avoids some of the main pitfalls of the S-D-S approach. Second, it extends the model to the case of multiproduct firms showing how product diversity is affected with respect to monopolistic competition. In particular, it is shown that monopolistic competition with single-product firms is the limiting case of oligopolistic competition with multiproduct firms when either varieties gets more and more differentiated or when the entry cost goes further and further down.

- 9920 Coalitional negotiation.  
Ana MAULEON and Vincent VANNETELBOSCH.

We develop a two-stage negotiation model to study the impact of costly inspections on both the coalition formation outcome and the per-member payoffs. In the first stage, the players are forming coalitions and inside each coalition formed the members share the coalition benefits. We adopt the *largest consistent set (LCS)* to predict which coalition structures are possibly stable. We also introduce a refinement, the *largest cautious consistent set (LCCS)*. In the second stage, the inspection game takes place inside each coalition. For games with positive spillovers, many coalition structures may belong to the LCS under costless inspection. The grand coalition, which is the efficient coalition structure, always belongs to the LCS and is the unique one to belong to the LCCS. Under costly inspection, the grand coalition does not always belong to the LCS. Nevertheless, there exists inspection cost parameters such that the LCS singles out the grand coalition.

**JEL Classification:** C70, C71, C72, C78

**Keywords:** coalition formation, inspections, positive spillovers, largest consistent set.

- 9921 Mixed refinements of Shapley's saddles and weak tournaments.  
John DUGGAN and Michel LE BRETON.

We investigate refinements of two solutions, the saddle and the weak saddle, defined by Shapley (1964) for two-player zero-sum games. Applied to weak tournaments, the first refinement, the *mixed saddle*, is unique and gives us a new solution, generally lying between the GETCHA and GOTCHA sets of Schwartz (1972, 1986). In the absence of ties, all three solutions reduce to the usual top cycle set. The second refinement, the *weak mixed saddle*, is not generally unique, but, in the absence of ties, it is unique and coincides with the minimal covering set.

- 9922 Co-integration and leadership in the European off-season fresh fruit market.  
Pierre GIOT, Bruno HENRY DE FRAHAN and Nicolas PIROTTE.

This paper tests market co-integration, market leadership and price margins in the context of the recent development of European markets for imported off-season fresh fruit from countries in the southern hemisphere. The Engle-Granger and Johansen co-integration tests show that the main European markets for off-season fresh apples and table grapes were well integrated during the 1994-97 period. The vector autoregressive - error correction mechanism (VAR-ECM) model form is used to characterise the spatial co-integrating relationships among these markets during the same period. Statistical tests on meaningful restrictions on these VAR-ECM models show that the major import market of Rotterdam significantly leads the wholesale markets for table grapes in Germany down the supply chain but does not lead the wholesale markets in France and Germany for apples. They also show higher price margins between the import and wholesale markets for table grapes than for apples. The table grape variety imported from South Africa was consistently traded at a higher price during the 1994-98 period compared to the same variety from Chile. Using an industry survey, this paper discusses the econometric results and provides recommendations.

**Keywords:** co-integration, market leadership, off-season fresh fruits, European Union.

- 9923 The role of education supply in economic growth and the dynamics of skills.  
Vincent BARTHELEMY and Philippe MICHEL.

This paper analyzes the role of the structure of skills in economic development through investment in human capital. With a lack of credit market for education and the presence of indivisibilities in investment in human capital as well as of congestion in the educational system, the initial distribution of skills affects aggregate output and investment both in the short and the long run, as there are multiple balanced growth paths. This paper provides an additional explanation for the persistent differences in per-capita output across countries. Moreover, it shows that cross-country differences in macroeconomic adjustment to educational policies can be attributed, among other factors, to differences in the distribution of skills.

**JEL Classification:** I21, I28, O11, O4

- 9924 A better way to bootstrap pairs.  
Emmanuel FLACHAIRE.

In this paper we are interested in heteroskedastic regression models, for which an appropriate bootstrap method is bootstrapping pairs, proposed by Freedman (1981). We propose an ameliorate version of it, with better numerical performance.

**JEL Classification:** C1

**Keywords:** bootstrap, heteroskedasticity.

- 9925 The Kyoto Protocol: an economic and game theoretic interpretation.  
Parkash CHANDER, Henry TULKENS, Jean-Pascal VAN YPERSELE and Stephane WILLEMS.

Calling upon both positive and normative economics, we attempt to characterize the issues at stake in the current international negotiations on climatic change. We begin (Section 2) by reviewing the main features of the Protocol.

Then (Section 3), we identify by means of an elementary economic mode the main concepts involved: optimality, non cooperation, coalitional stability. We observe (Section 4) that “business-as-usual”, “no regrets” and other domestic policies are alternative ways to conceive of the non cooperative equilibrium prevailing before the negotiations. Which one should be retained? Data suggest that the prevailing situation is a mixed one, exhibiting characteristics of several of these policies.

We then turn (Section 5) to interpreting the Protocol. While there is no firm basis to assert that the emission quotas chosen at Kyoto correspond to optimal emissions (although they are a step in the right direction), economic and game theoretical arguments are put forward to support the view that for achieving these emission quotas, trading ensures efficiency, as well as coalitional stability for the agreement provided it is adopted at the largest scale *i.e.* worldwide.

Finally, it is argued in Section 6 that beyond the Kyoto Protocol, the achievement of coalitionally stable optimality at the world level is a real possibility with trading, provided agreement can be reached in the future as to appropriate reference emission levels, in particular as far as developing countries are concerned.

- 9926 Simulating with RICE coalitionally stable burden sharing agreements for the climate change problem. Johan EYCKMANS and Henry TULKENS.

In this paper we test empirically with the Nordhaus and Yang (1996) RICE model the core property of the transfer scheme advocated by Germain, Toint and Tulkens (1997). This scheme is designed to sustain full cooperation in a voluntary international environmental agreement by making all countries at least as well off as they would be by joining coalitions adopting emission abatement policies that maximize their coalition payoff; under the scheme no individual country, nor any subset of countries would have an interest in leaving the international environmental agreement. The simulations show that the transfer scheme yields an allocation in the core of the carbon emission abatement game associated with the RICE model. Finally, we discuss some practical implications of the transfer scheme for current climate negotiations.

**Keywords:** environmental economics, climate change, burden sharing, simulations, core of cooperative games.

- 9927 A remark on voters' rationality in Besley and Coate model of representative democracy. Francesco DE SINOPOLI and Alessandro TURRINI.

Voting games are characterized by the emergence of dominated strategies, that would be iteratively deleted by rational players. In this note we show, via an example, how applying iterated dominance restricts the set of equilibrium outcomes in Besley and Coate (1997) citizen-candidate model of representative democracy.

**JEL Classification:** C72, D72

**Keywords:** voting games, refinements of Nash equilibrium, citizen-candidate.

- 9928 Subgame perfection in a "divided government" model. Giovanna IANNANTUONI.

Purely non-cooperative principles, as iterated dominance and backward induction, explain divided government.

- 9929 A PTAS for minimizing the total weighted completion time on identical parallel machines. Martin SKUTELLA and Gerhard J. WOEGINGER.

We consider the problem of scheduling a set of  $n$  jobs on  $m$  identical parallel machines so as to minimize the weighted sum of job completion times. This problem is NP-hard in the strong sense. The best approximation result known so far was a  $\frac{1}{2}(1 + \sqrt{2})$ -approximation algorithm that has been derived by Kawaguchi and Kyan back in 1986. The contribution of this paper is a polynomial time approximation scheme for this setting, which settles a problem that was open for a long time. Moreover, our result constitutes the first known approximation scheme for a strongly NP-hard scheduling problem with minsum objective.

**Keywords:** scheduling theory, approximation algorithm, approximation scheme, worst-case ratio, combinatorial optimization.

- 9930 Further remarks on strategic stability in plurality games. Francesco DE SINOPOLI.

In this note we show that, for generic plurality games (i.e., voting games under plurality rule), an equilibrium that induces a mixed distribution over the outcomes (i.e., with two or more candidates elected with positive probability), is regular and, hence, a Mertens' stable set. Furthermore, we show that stronger equilibrium concepts, than stability, do not guarantee the existence of a solution for some generic plurality games. A final example shows the weakness of the simple sophisticated voting principle.

**JEL Classification:** C72, D72

**Keywords:** Plurality rule, regular equilibria, sophisticated voting, stable sets.



- 9931 Two examples of strategic equilibria in approval voting games.  
Francesco DE SINOPOLI.

In this note we discuss two examples of approval voting games. The first one, with six voters and three candidates, has a unique stable set, where each voter approves only his most preferred candidate. This strategy coincides with the sophisticated one, while other strategy combinations, leading to different outcomes, are selected by the perfect equilibrium concept. Moreover, this example shows that sophisticated voting, as well as strategic stability, does not imply the election of a Condorcet winner, even if it exists. The second example, with four voters and four candidates, shows that strategic stability does not exclude non sincere strategies. Furthermore, the same results hold in complete neighborhoods of the games considered.

**JEL Classification:** C72, D72

**Keywords:** Approval voting, sophisticated voting, perfect equilibrium, stable set.

- 9932 Cyclical effects of the composition of government purchases.  
Jahangir AZIZ and Luc LERUTH.

This paper constructs a general equilibrium model with monopolistically competitive firms and endogenous markups where government spending consists of both consumption and investment goods. It is shown that when markups are countercyclical, an increase in the share of investment goods in total public expenditure, raises output, employment, and capital stock in the long-run leading to increases in welfare and productivity. However, this also raises the short run cyclical variability of the economy. In particular, variance of output and employment arising from technological and aggregate demand shocks increase as the long run share of government investment goes up implying a trade-off between greater long-run efficiency and higher short-run volatility. We apply our methodology to the postwar US economy and other OECD countries.

- 9933 The identification of preferences from the equilibrium prices of commodities and assets.  
Felix KÜBLER and Heracles M. POLEMARCHAKIS.

The competitive equilibrium correspondence, which associates equilibrium prices of commodities and assets with allocations of endowments, identifies the preferences and beliefs of individuals; this is the case even if the asset market is incomplete.

**Keywords:** equilibrium, identification.

- 9934 Debt, liquidity and dynamics.  
Heracles M. POLEMARCHAKIS and Céline ROCHON.

Money, which provides liquidity services, is distinct from debt. The introduction of a bank that issues money in exchange for debt and pays out its profit as dividend to shareholders modifies the model of overlapping generations. The set of equilibrium paths, their dynamic properties, as well as the scope and effectiveness of monetary policy are significantly altered: (1) there is a continuum of pareto comparable steady state paths, indexed by the nominal rate of interest; (2) monetary policy, which is effective, can set, alternatively, the nominal rate of interest, the circulation of real balances or the rate of inflation; and (3) though low rates of interest are associated with superior steady state allocations, they may account for unstable steady states or stable endogenous cycles.

**JEL Classification:** E30, E32, E50, E52

**Keywords:** money, liquidity, debt, overlapping generations, dynamics.

- 9935 Asymmetries of information in centralized order-driven markets.  
Nicolas BOCCARD and Riccardo CALCAGNO.

We study the efficiency of the equilibrium price in a centralized, order-driven market where many asymmetrically informed traders are active for many periods. We show that asymmetries of information can lead to suboptimal information revelation with respect to the symmetric case. In particular, we assess that the more precise the information the higher the incentive to reveal it, and that the value of private information is related to the volume of exogenous trade present on the market. Moreover, we prove that any informed trader, whatever his information, reveals its private signal during an active phase of the market, concluding that long pre-opening phases are not effective as an information discovering device in the presence of strategic players.

**JEL Classification:** D, G

**Keywords:** asymmetric information, pre-opening, insider trading.

- 9936 Financial transfers to sustain international cooperation in the climate change framework.  
Marc GERMAIN and Jean-Pascal VAN YPERSELE.

This paper deals with a cooperative game theoretic analysis of the economics of international agreements on climate change. To cope with the question of the voluntary implementation of the international optimum, a financial transfer scheme is proposed under which no countries nor subgroup (coalition) of countries would have an interest not to join to the international agreement. The transfer scheme presents the originality to be designed in a closed-loop dynamic framework where cooperation is renegotiated at each period taking account of the current stock of pollutant. The transfer scheme is applied to the climate change problem, making use of a simple model inspired by Kverndokk (1994) and Nordhaus and Yang (1996). The results show that with the proposed sidepayments, international cooperation is indeed individually rational and rational in the sense of coalitions.

**JEL Classification:** C73, D62, F42, H23, Q2

**Keywords:** climate change, dynamic games, cooperative games, coalitions, sidepayments.

- 9937 Approximate edge splitting.  
Michel X. GOEMANS.

We show that, in any undirected graph, splitting off can be performed while preserving all cuts of value at most  $4/3$  times the minimum value, and this is best possible. This generalizes a classical splitting-off result of Lovász.

- 9938 Museum assessment and FDH technology: A global approach.  
François MAIRESSE and Philippe VANDEN EECKAUT.

This paper presents a global approach for museum assessment. We define a museum as an entity which needs to be evaluated according to three well defined tasks: preservation, research and communication, and outcomes. We propose a methodology based on the determination of efficiency frontiers. This method assumes a deterministic non parametric and non convex technology (Free Disposal Hull). We analyse technical efficiency, but also scale efficiency with a new restrictive scale approach. We present an ordering of museums into classes representing a level of performance with respect to the three required tasks. We illustrate our analysis using a three year database of museums from the French speaking region of Belgium.

**JEL Classification:** D24

**Keywords:** FDH, technical efficiency, scale efficiency.

- 9939 Bartlett identities tests.  
Andrew CHESHER, Geert DHAENE, Christian GOURIEROUX and Olivier SCAILLET.

In this note we propose a general testing procedure for parametric models based on Bartlett Identities. A well-known example is the Information Matrix test, which is based on the Bartlett Identity of order 1. The Identities are shown to induce a sequence of testable restrictions on the data generating process. When all the restrictions are considered jointly, they are often complete, in the sense that they are satisfied if and only if the model is correctly specified. We show that this is the case for normal, exponential and Poisson models. A test of the joint validity of an arbitrarily chosen subset of restrictions is proposed, and its first order asymptotic properties are presented. An interpretation of the test as a score test for neglected parameter heterogeneity is also given.

**JEL Classification:** C12, C52

**Keywords:** Bartlett Identities, information matrix test, specification test.

- 9940 Dictatorial domains.  
Navin ASWAL, Shurojit CHATTERJI and Arunava SEN.

In this paper, we introduce the notion of a linked domain and prove that a non-manipulable social choice function defined on such a domain must be dictatorial. This result not only generalizes the Gibbard-Satterthwaite Theorem but also demonstrates that the equivalence between dictatorship and non-manipulability is far more robust than suggested by that theorem. We provide an application of this result in a particular model of voting. We also provide a necessary condition for a domain to be dictatorial and characterize dictatorial domains in the cases where the number of alternatives is three and four.

- 9941 Agglomeration and trade revisited.  
Gianmarco OTTAVIANO and Jacques-François THISSE.

The purpose of this paper is twofold. First, we present an alternative model of agglomeration and trade that displays the main features of the recent economic geography literature while allowing for the derivation of analytical results by means of simple algebra. Second, we show how this framework can be used to adopt a forward-looking approach to the dynamics of migration in the process of agglomeration instead of the myopic Marshallian model used so far in this literature.

**JEL Classification:** F12, L13, R13

**Keywords:** agglomeration, trade, self-fulfilling expectations, monopolistic competition.

- 9942 Corporate governance structures, control and performance in European markets: a tale of two systems.  
Yves CRAMA, Luc LERUTH, Luc RENNEBOOG and Jean-Pierre URBAIN.

Traditionally share price returns and their variance have been explained by factors linked to the operations of the company such as systematic risk, corporate size and P/E ratios or by factors related to the influence of the macroeconomic environment. In these models, the institutional environment in terms of concentration and nature of voting rights, bank debt dependence and corporate and legal mechanisms to change control have rarely been included. In this paper we have a dual objective. We first highlight the large discrepancies among corporate governance environments. We conclude that there is a need for a theoretically well-grounded measure of corporate control applicable to all systems and we define such a measure. Secondly, the impact of ownership structure on the share price performance and corporate risk is empirically analysed for companies listed on the London Stock Exchange. Within Europe, the UK corporate landscape is particularly interesting because of its widely held nature and the liquidity of the market for controlling rights. We show that financial performance increases with the level of control held by the second largest shareholder. One possible explanation is that when the largest shareholder owns most of the control, she essentially maximizes her own utility function, which may differ from the firm's profits. When there exists a counterbalancing pole of control in other hands, utility functions are usually different and the best compromise between both poles of control may be to maximize profits. Yet, it was not our purpose to survey the many (sometimes contradictory) theories of corporate governance, nor to test any specific hypothesis. We hope however to have conveyed the message that there exists a link between corporate governance and financial performance and that a sound index, based on game-theoretic arguments, is the appropriate instrument for researchers in the field.

**JEL Classification:** G10, G32, G34

**Keywords:** corporate governance, voting rights, shareholder coalitions, corporate performance.

- 9943 Nash-Walras equilibria of a large economy.  
Enrico MINELLI and Heracles POLEMARCHAKIS.

Individuals exchange contracts for the delivery of commodities in competitive markets and, simultaneously, act strategically; actions affect utilities across individuals directly or through the payoffs of contracts. This encompasses economies with asymmetric information. Nash - walras equilibria exist for large economies, even if utility functions are not quasi - concave and choice sets are not convex, which is the case in standard settings; the separation of the purchase from the sale of contracts and the pooling of the deliveries on contracts guarantee that the markets for commodities clear.

**JEL Classification:** D50, D52, D82

**Keywords:** Nash, Walras, equilibrium, asymmetric information.

- 9944 Time transformations, intraday data and volatility models.  
Pierre GIOT.

In this paper, we focus on the trade and quote data for the IBM stock traded at the NYSE. We present two different frameworks for analyzing this dataset. First, using regularly sampled observations, we characterize the intraday volatility of the mid-point of the bid-ask quotes by estimating GARCH and EGARCH models, with intraday seasonality being accounted for. We also highlight the impact of characteristics of the trade process (traded volume, number of trades and average volume per trade) on the volatility specifications. Secondly, we deal directly with the irregularly spaced data. We review two time transformations that allow a thinning of the original dataset such that new durations are defined. The newly defined price and volume durations are characterized and the performance of the Log-ACD model for modelling these durations is assessed. Moreover, price durations allow an easy computation of intraday volatility and this method compares favorably to ARCH estimations. **Keywords: Intraday data, trades and quotes, intraday volatility, market liquidity.**

- 9945 Some consequences of the unknottedness of the Walras correspondence.  
Stefano DEMICHELIS and Fabrizio GERMANO.

Two basic properties concerning the dynamic behavior of competitive equilibria of exchange economies with complete markets are derived essentially from the fact that the Walras correspondence has no knots.

- 9946 Arbitrage and equilibrium with exchangeable risks.  
Aviad HEIFETZ, Enrico MINELLI and Heracles M. POLEMARCHAKIS.

In an economy with a non-atomic measure space of assets and exchangeable risks, the Arbitrage Pricing Theory (APT) holds exactly; and factors are structurally specified, which allows for an economic interpretation.

**JEL Classification:** G12, D52

**Keywords:** arbitrage, exchangeability.

- 9947 A faster capacity scaling algorithm for minimum cost submodular flow.  
Lisa FLEISCHER, Satoru IWATA and S. Thomas McCORMICK.

We describe an  $\mathcal{O}(n^4 h \min\{\log U, n^2 \log n\})$  capacity scaling algorithm for the minimum cost submodular flow problem. Our algorithm modifies and extends the Edmonds–Karp capacity scaling algorithm for minimum cost flow to solve the minimum cost submodular flow problem. The modification entails scaling a relaxation parameter  $\delta$ . Capacities are relaxed by attaching a complete directed graph with uniform arc capacity  $\delta$  in each scaling phase. We then modify a feasible submodular flow by relaxing the submodular constraints, so that complementary slackness is satisfied. This creates discrepancies between the boundary of the flow and the base polytope of a relaxed submodular function. To reduce these discrepancies, we use a variant of the successive shortest path algorithm that augments flow along min cost paths of residual capacity at least  $\delta$ . The shortest augmenting path subroutine we use is a variant of Dijkstra’s algorithm modified to handle exchange capacity arcs efficiently. The result is a weakly polynomial time algorithm whose running time is better than any existing submodular flow algorithm when  $U$  is small and  $C$  is big. We also show how to use max mean cuts to make the algorithm strongly polynomial. The resulting algorithm is the first capacity scaling algorithm to match the current best strongly polynomial bound for submodular flow.

**Keywords:** submodular flow, shortest paths, strongly polynomial time algorithm.

- 9948 A strongly polynomial-time algorithm for minimizing submodular functions.  
Satoru IWATA, Lisa FLEISCHER and Satoru FUJISHIGE.

This paper presents a combinatorial polynomial-time algorithm for minimizing submodular set functions. The algorithm employs a scaling scheme that uses a flow in the complete directed graph on the underlying set with each arc capacity equal to the scaled parameter. The resulting algorithm runs in time bounded by a polynomial in the size of the underlying set and the largest length of the function value. The paper also presents a strongly polynomial-time version that runs in time bounded by a polynomial in the size of the underlying set independent of the function value. These are the first combinatorial algorithms for submodular function minimization that run in (strongly) polynomial time.

**Keywords:** submodular function, combinatorial optimization, strongly polynomial-time algorithm.

- 9949 Optimal strategies in  $n$ -person unilaterally competitive games.  
Olivier DE WOLF.

In this paper, we prove that the concept of value traditionally defined in the class of two-person zero-sum games can be adequately generalized to the class of  $n$ -person weakly unilaterally competitive games introduced by Kats & Thisse [KT92b]. We subsequently establish that if there exists an equilibrium in a game belonging to the latter class, then every player possesses at least an optimal strategy (i.e., a strategy yielding at least the value to this player). Furthermore, we show that, in all unilaterally competitive games that have a Nash equilibrium profile, a strategy profile is an equilibrium if and only if it is an optimal profile. From these results, we deduce a very strong foundation to the Nash equilibrium concept in unilaterally competitive games.

- 9950 Alternative models of restructured electricity systems. Part I: no market power.  
Jacqueline BOUCHER and Yves SMEERS.

Different equilibrium concepts have been proposed by various authors (Schweppe et al, Hogan, Chao and Peck, Wu et al) to analyse competitive electricity systems. We establish correspondences between these different models through a single framework and provide additional interpretations of these equilibrium concepts. This unifying conceptual view also provides a computationally feasible approach to simulate the market. It also opens the way to the modelling of some imperfect markets.

- 9951 Social security and early retirement in an overlapping-generations growth model.  
Philippe MICHEL and Pierre PESTIEAU.

This paper explains why workers retire earlier, and earlier at the same time as society becomes more and more indebted through increasing pay-as-you-go pension liabilities. To do so, we extend the standard two-overlapping-generations growth model to allow for endogenous labor participation in the later period of life. We show that the rate of participation declines as the size of social security system increases. We also show that mandatory early retirement may be socially desirable in case of underaccumulation.

- 9952 A comparison of standard multi-unit auctions with synergies.  
Gian-Luigi ALBANO, Fabrizio GERMANO and Stefano LOVO.

In an example with two objects and four bidders, some of which have superadditive values, we characterize the equilibria of a simultaneous ascending auction and compare the revenue and efficiency generated with ones generated by the sequential, the one-shot simultaneous, and the Vickrey-Clarke-Groves auctions.

- 9953 Cutting planes in integer and mixed integer programming.  
Huges MARCHAND, Alexander MARTIN, Robert WEISMANTEL and Laurence WOLSEY.
- This survey presents cutting planes that are useful or potentially useful in solving mixed integer programs. Valid inequalities for i) general integer programs, ii) problems with local structure such as knapsack constraints, and iii) problems with 0-1 coefficient matrices, such as set packing, are examined in turn. Finally the use of valid inequalities for classes of problems with structure, such as network design, is explored.
- JEL Classification:** MSC (1991): 90C10, 90C11  
**Keywords:** Mixed Integer Programming, Cutting Planes.
- 9954 How does selfishness affect well-being ?  
Igal MILCHTAICH.
- Is selfishness always a bad thing, in the sense that people can only be better off when everyone is concerned with the well-being of others as well as with his own, or are there situations in which altruism can actually make things worse for all people involved ? This paper tackles this question in the context of two-person symmetric games, which are modified by making the payoff of each player a weighted average of that player's true payoff and the true payoff of the other player. The exogenously given degree of selfishness, which determines the weight a player attaches to his own payoff, is the same for both players. It is shown that it is not impossible for the equilibrium payoffs in the modified game to be lower than *every* equilibrium payoff in the original game. For example, in a symmetric Cournot duopoly competition, if the two firms move only halfway towards monopoly then their profits may be lower than those of both a monopolist and a duopolist. However, this can happen only if the symmetric equilibria in the original game are, in the appropriate sense, unstable. Thus, the effect of selfishness on the symmetric equilibrium payoffs in a symmetric two-person game depends crucially on the stability of these equilibria.
- JEL Classification:** C7, D7.  
**Keywords:** altruism, symmetric games, Cournot duopoly, evolutionary stability.
- 9955 The political economy of social security.  
Georges CASAMATTA, Helmuth CREMER and Pierre PESTIEAU.
- We consider a two-period overlapping generations model in which individual voters differ not only according to age but also productivity. In such a setting, a (redistributive) Pay-As-You-Go system is politically sustainable, even when the interest rate is larger than the rate of population growth. The medium wages workers (not the lowest) join the retirees to form a majority and vote for a positive level of social security. This level depends on the difference between population growth and interest rate and on the redistributiveness of the benefit rule.
- JEL Classification:** H55, O41, O9.  
**Keywords:** social security, majority voting.
- 9956 Relaxing Bertrand competition: capacity commitment beats quality differentiation.  
Nicolas BOCCARD and Xavier WAUTHY.
- Both product differentiation through quality and capacity commitment have been shown to relax price competition. However, they have not been considered simultaneously. To this end we consider a three stage game where firms choose quality then commit to capacity and finally compete in price. We show that in equilibrium, firms differentiate their products less than if they were not able to commit to limited capacities. This is because they are able to enjoy Cournot profits at the stage where capacity are chosen. Furthermore if the cost of quality is low, capacity pre-commitment completely eliminates the incentives to differentiate.
- JEL Classification:** L13.  
**Keywords:** Vertical Differentiation, Capacity, Bertrand Competition.

- 9957 Adaptive polar sampling with an application to a bayes measure of value-at-risk.  
Luc BAUWENS, Charles S. BOS and Herman K. VAN DIJK.

Adaptive Polar Sampling (APS) is proposed as a Markov chain Monte Carlo method for Bayesian analysis of models with ill-behaved posterior distributions. In order to sample efficiently from such a distribution, location-scale transformation and a transformation to polar coordinates are used. After the transformation to polar coordinates, a Metropolis-Hastings algorithm is applied to sample directions and, conditionally on these, distances are generated by inverting the CDF. A sequential procedure is applied to update the location and scale.

Tested on a set of canonical models that feature near non-identifiability, strong correlation, and bimodality, APS compares favourably with the standard Metropolis-Hastings sampler in terms of parsimony and robustness. APS is applied within a Bayesian analysis of a GARCH-mixture model which is used for the evaluation of the Value-at-Risk of the return of the Dow Jones stock index.

**JEL Classification:** C11, C15, C63

**Keywords:** Markov chain Monte Carlo, simulation, polar coordinates, GARCH, ill-behaved posterior, Value-at-Risk.

- 9958 The stochastic conditional duration model:  
A latent factor model for the analysis of financial durations.  
Luc BAUWENS and David VEREDAS.

A new model for the analysis of durations, the stochastic conditional duration (SCD) model, is introduced. This model is based of the assumption that the durations are generated by a latent stochastic factor that follows a first order autoregressive process. The latent factor is perturbed multiplicatively by an innovation distributed as a Weibull or gamma variable. The model can capture a wide range of shapes of hazard functions. The estimation of the parameters is performed by quasi-maximum likelihood, after transforming the original nonlinear model into a space state representation and using the Kalman filter. The model is applied to stock market price-durations, looking at the relation between price durations, volume, spread and trading intensity.

**JEL Classification:** C10, C41, G10.

**Keywords:** Duration, High frequency data, Market microstructure, Factor model.

- 9959 On the effects of entry in Cournot markets.  
Rabah AMIR and Val E. LAMBSON.

In the framework of symmetric Cournot oligopoly, this paper provides two minimal sets of assumptions on the demand and cost functions that imply respectively that, as the number of firms increases, the minimal and maximal equilibria lead to (i) decreasing industry price and increasing or decreasing per-firm output; and (ii) increasing industry price (and decreasing per-firm output.) In both cases, per-firm profits are decreasing.

The analysis relies crucially on lattice-theoretic methods and yields general, unambiguous and easily interpretable conclusions of a global nature. As a byproduct of independent interest, new insight into existence of Cournot equilibrium is developed.

**JEL Classification:** C72, D43, L13.

**Keywords:** Cournot oligopoly, quasi-competitiveness, supemodular games, equilibrium comparative statics.



- 9960 A note on forward induction in a model of representative democracy.  
Francesco DE SINOPOLI.

The citizen-candidate approach, proposed to study the performance of representative democracies, builds on a multi-stage game where the same agents are asked whether or not to become a candidate and, successively, to vote. Consistently, the solution concept adopted in Besley and Coate (1997) conforms to backward induction rationality. In this note we remark that it does not conform to forward induction rationality.

**JEL Classification:** C72, D72.

**Keywords:** Voting games, refinements of Nash equilibrium, citizen-candidate, forward induction, Mertens' stable sets.

- 9961 Single machine scheduling with release dates.  
Michel X. GOEMANS, Maurice QUEYRANNE, Andreas S. SCHULZ, Martin SKUTELLA  
and Yaoguang WANG.

We consider the scheduling problem of minimizing the average weighted completion time of  $n$  jobs with release dates on a single machine. We first study two linear programming relaxations of the problem, one based on a time-indexed formulation, the other on a completion-time formulation. We show their equivalence by proving that a  $O(n \log n)$  greedy algorithm leads to optimal solutions to both relaxations. The proof relies on the notion of mean busy times of jobs, a concept which enhances our understanding of these LP relaxations. Based on the greedy solution, we describe two simple randomized approximation algorithms, which are guaranteed to deliver feasible schedules with expected objective value within factors of 1.7451 and 1.6853, respectively, of the optimum. They are based on the concept of common and independent  $\alpha$ -points, respectively. The analysis implies in particular that the worst-case relative error of the LP relaxations is at most 1.6853, and we provide instances showing that it is at least  $e/(e-1) \approx 1.5819$ . Both algorithms may be derandomized, their deterministic versions running in  $O(n^2)$  time. The randomized algorithms also apply to the on-line setting, in which jobs arrive dynamically over time and one must decide which job to process without knowledge of jobs that will be released afterwards.

**Keywords:** approximation algorithm, LP relaxation, scheduling, online algorithm.

- 9962 Semidefinite programs and association schemes.  
Michel X. GOEMANS and Franz RENDL.

We consider semidefinite programs, where all the matrices defining the problem commute. We show that in this case the semidefinite program can be solved through an ordinary linear program. As an application, we consider the max-cut problem, where the underlying graph arises from an association scheme.

**Keywords:** semidefinite programming, association scheme, maximum cut problem.

- 9963 Convex quadratic and semidefinite programming relaxations in scheduling.  
Martin SKUTELLA.

We consider the problem of scheduling unrelated parallel machines subject to release dates so as to minimize the total weighted completion time of jobs. The main contribution of this paper is a probably good convex quadratic programming relaxation of strongly polynomial size for this problem. The best previously known approximation algorithms are based on LP relaxations in time- or interval-indexed variables. Those LP relaxations, however, suffer from a huge number of variables. As a result of the convex quadratic programming approach we can give a very simple and easy to analyze randomized 2-approximation algorithm which can be further improved to performance guarantee  $3/2$  in the absence of release dates. We also consider preemptive scheduling problems and derive approximation algorithms and results on the power of preemption which improve upon the best previously known results for these settings. Finally, for the special case of two machines we introduce a more sophisticated semidefinite programming relaxation and apply the random hyperplane technique introduced by Goemans and Williamson for the MAXCUT problem; this leads to an improved 1.2752-approximation.

- 9964 On the macroeconomics of uncertainty and incomplete markets.  
Jacques H. DREZE.

Presidential address for the Twelfth World Congress of the International Economic Association, summarising semi-formally the author's recent work and concerns. Uncertainty and incomplete markets breed demand volatility as well as price and wage rigidities. The conjunction of these leads to multiple, volatile supply-constrained equilibria, typically reflecting coordination failures and apt to display persistence - as documented by three supporting theorems. Specific implications are linked to the conclusions that we should take coordination failures seriously, try to obviate demand volatility and try to bypass price and wage rigidities.

- 9965 Divided government and dominance solvability.  
Giovanna IANNANTUONI.

Using the spatial theory of voting, this paper describes an institutional structure where there are two branches of the government: the executive, elected by plurality rule, and the legislative elected by proportional rule. The resulting policy outcome is described through a compromise between these two branches. The parties announce their position on a policy issue and then voters vote. We prove the uniqueness of Nash equilibrium in the subgame, where the election of the president is known. Moreover, this equilibrium can be obtained by the process of iterated elimination of dominated strategies. We then solve the whole game by backward induction. Furthermore, the policy outcome at equilibrium of the two-stage game is the same of the simultaneous game, where voters simultaneously choose the two branches. The results suggest a moderate behavior of the voters, basically due to the will to balance the policy outcome.

- 9966 Variational inequality models of restructured electricity systems.  
Olivier DAXHELET and Yves SMEERS.

The restructuring of electricity systems can follow different paradigms that have different impacts. The objective of this paper is to show that Variational Inequalities Problems provide a natural tool for modeling electricity restructuring in a wide range of relevant situations. Besides being a convenient modeling tool, variational inequalities can also be used as an analytical instrument for assessing properties of different restructuring models. Last but not least, variational inequality models lend themselves to computation and hence to quantitative evaluations.

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- 9967 Agenda control in coalition formation.  
Francis BLOCH and Stéphane ROTTIER.

Theoretical models of government formation in political science usually assume that the head of state is non-strategic. In this paper, we analyze the power of an agenda setter who chooses the order in which players are recognized to form coalitions in simple games. We characterize those sets of players which can be imposed in the equilibrium coalition and show that the only decisive structures where the agenda setter can impose the presence of any minimal winning coalition are apex games, where a large player forms a winning coalition with any of the small players.