2001/1 The ex ante incentive compatible core in the absence of wealth effects.
Françoise FORGES, Jean-François MERTENS and Rajiv VOHRA.

In a differential information economy with quasi-linear utilities, monetary transfers facilitate the fulfillment of incentive compatibility constraints: the associated ex ante core is generically non-empty. However, we exhibit a well-behaved exchange economy in which this core is empty, even if goods are allocated through random mechanisms.
JEL Classification: C71, D82, D51
Keywords: core, exchange economy, asymmetric information, incentive compatibility, ex ante, transferable utility, absence of wealth effects, quasi-linear.

2001/2 Lobbying in public decision making.
Philippe JEHIEL and Jacques-François THISSE

The lobbying process is modelled as an auction with externalities in which lobbies bid to get implemented their most-preferred policy. Furthermore, the government may influence the lobbying process itself by biasing the auction among organized interests. We identify the following trade-off: competition yields a higher transfer to the government, but the outcome of the game tends to be less efficient than what it is when lobbies negotiate. We extend and illustrate the model by means of a public good game involving several regions. Lobbying by regions may yield a quantity of public good that may vastly differ from that chosen by a majority of regions. This is so when the regions with the highest financing shares lie at the extremes of the distribution.

2001/3 On the evolution of a multi-regional system.
Takatoshi TABUCHI, Jacques-François THISSE and Dao-Zhi ZENG

We study the effects of a decrease in trade costs on the spatial distribution of industry in a multi-regional economy, when a rise in the regional population of workers generates higher urban costs. We show that high and low trade costs imply that all regions involve a positive share of the industrial sector. When urban costs are linear, there exists a stable equilibrium for almost all values of trade costs. Furthermore, as trade costs fall, there is a path of stable equilibria such that the industry is, first, agglomerated into a decreasing number of regions and, then, dispersed among a growing number of regions. The second phase arises because of the increasing urban costs associated with the process of agglomeration.
JEL Classification: F12, L13, R13
Keywords: multi-regional system, economic geography, agglomeration, transport costs, urban costs.

2001/4 Strategic inter-regional transfers.
Jean HINDRIKS and Gareth D. MYLES

In this paper we derive the equilibrium level of redistribution from one mobile factor (say, the rich or capital) to another possibly mobile factor (say, the poor or labour) when regions choose both their inter-regional transfers and redistributive policies non-cooperatively. We find that inter-regional transfers are always desirable (to mitigate the fiscal competition), but cannot be sustained (as a Nash equilibrium) when chosen simultaneously with the redistributive policy. On the other hand if regions can precommit to inter-regional transfers before setting their redistributive policy, the strategic effect of inter-regional transfers makes them sustainable. However there are also equilibria with partial or no inter-regional transfers at all. The effects of regional asymmetries are analyzed. Interestingly enough, evidence suggests that predictions of our model accord very closely with the pattern of transfers in the EU across member states.
JEL Classification: C72, D62, H77, R50
Keywords: inter-regional transfers, mobility externality, redistribution.

2001/5 Constraining equitable allocations of tradable greenhouse gases emission quotas by acceptability
Marc GERMAIN and Vincent VAN STEENBERGHE

Allocations of tradable greenhouse gases (GHG) emission quotas among countries may take place according to several sharing rules corresponding to a certain perception of equity. For instance, allocating quotas in direct proportion to population, in inverse relation to GDP or according to past emissions has been advocated. Taking a long term perspective, we compute such allocations of tradable quotas with a dynamic model developped on the basis of the RICE model (Norhaus and Yang, 1996). The total amount of quotas to be distributed in each period corresponds to the total optimal amount of emissions to be realised at each period. We observe that the 'equitable' quotas allocation rules the most often referred to are not acceptable by every country at every period: some of them would be better off by not co-operating. We then propose a mechanism which determines allocations of GHG emission quotas that satisfy as much as possible each 'equitable' allocation rule while keeping acceptability for each country.
JEL Classification: C73, F42, H23, Q25, Q28
Keywords: environmental economics, climate change, dynamic games, tradable permits, equitable allocations.

2001/6 A multi-item production planning model with setup times: algorithms, reformulations, and polyhedral characterizations for a special case
Andrew J. MILLER, George L. NEMHAUSER and Martin W.P. SAVELSBERGH

We study a special case of a structured mixed integer programming model that arises in a number of applications. For the most general case of the model, called PI, we have earlier analyzed the polyhedral structure (Miller et al. [2000a]), including identifying facet–defining valid inequalities. PI is $\mathcal{NP}$–hard; in this paper we focus on a special case, called PIC, that is polynomially solvable. We describe a polynomial algorithm for PIC, and we then use this algorithm to derive an extended formulation of polynomial size for PIC. Projecting from this extended formulation onto the original space of variables, we show that the set of inequalities presented for PI in Miller et al. [2000a] is sufficient to enable us to solve the special case PIC by linear programming. Finally, for PIC, we describe fast combinatorial separation algorithms for these inequalities.
Keywords: Mixed integer programming, polyhedral combinatorics, production planning, capacitated lot-sizing, fixed charge network flow, setup times.

2001/7 Dominance solvability of second-price auctions with differential information
Ezra EINY, Ori HAIMANKO, Ram ORZACH and Aner SELA

We study a class of common-value second-price auctions with differential information. This class of common-value auctions is characterized by the property that each player's information set is connected with respect to the common value. We show that the entire class is dominance solvable, and that there is a natural single-valued selection from the resulting set of sophisticated equilibria. Additionally, it is shown that bidder's information advantage over others is rewarded in sophisticated equilibria.
JEL Classification: C72, D44, D82
Keywords: common-value second-price auctions, differential information, connectedness with respect to common value, dominance solvability, sophisticated equilibria, information advantage.

2001/8 Discrete lot-sizing and convex integer programming.
Andrew J. MILLER and Laurence A. WOLSEY

We study the polyhedral structure of variants of the discrete lot-sizing problem viewed as special cases of convex integer programs. Our approach in studying convex integer programs is to develop results for simple mixed integer sets that can be used to define integral linear programming formulations for the discrete lot-sizing problem in which backlogging and/or safety stocks are present, and to give extended formulations for other cases. Our results help significantly to solve test cases arising from an industrial application motivating this research. differential information, connectedness with respect to

2001/9 Fiscal policy in a growth model with bequest-as-consumption
Philippe MICHEL and Pierre PESTIEAU

This paper analyses a growth model wherein saving results from bequest-as-consumption. It first looks at the market equilibrium and at the optimal solution. Then it turns to the issue of decentralizing the optimal solution with various taxes and transfers. Depending on the available instruments, either a first-best or a second-best optimum can be achieved. Throughout the paper the results are contrasted with those obtained in the standard altruistic (dynastic) model and in the overlapping generation model without intergenerational transfers.
JEL Classification: D64, H21, E62
Keywords: bequests, fiscal policy, optimal growth.

2001/10 Persistent inequality through schooling: the role of limited school capacity
Elena DEL REY

Children of educated parents systematically perform better at school than children of uneducated parents. It is then natural, if the location of families in the city follows a socially stratified pattern, to observe differences in public school's performances even when they are identically financed. Free school choice is not enough to change this outcome. Capacity cannot be changed overnight and schools facing an excess demand may be forced to turn applications down. If the aim of the school is to maximize expected achievement of children, those from a less favored environment will be rejected first and segregation will increase. In order to overcome this negative result we propose a system of grants to disadvantaged children as a means to finance public schools.
JEL Classification: I22
Keywords: educational finance.

2001/11 The art of making everybody happy: how to prevent a secession
Michel LE BRETON and Shlomo WEBER

In this paper we examine compensation schemes that prevent a threat of secession by all country's regions and in the same time provide no incentives for citizens' migration within the country. We prove that, under quite general assumptions on the distribution of citizens' preferences, there exist transfer schemes that are both *secession-proof* and *migration-proof*. Moreover, we show that these compensation schemes entail a degree of *partial equalization* among the regions: the gap between advantageous regions has to be reduced but it should never be completely eliminated. We demonstrate that in the case of a uniform distribution of the nation citizens', the secession-proof and migration-proof conditions generate the 50% compensation rule for disadvantageous regions.
JEL Classification: D70, H20, H73
Keywords: transfer schemes, secession, migration, efficiency, stability.

2001/12 Economic growth and CO_2 emissions: a nonparametric approach
Théophile AZOMAHOU and Nguyen VAN PHU

This paper examines the empirical interplay between economic growth and greenhouse gas emissions using panel data. Relying on nonparametric methods, we find evidence supporting specifications which assume the constancy of the relationship between CO_2 emissions and GDP per capita during the period of the study. Moreover, the usually adopted polynomial functional form is rejected against our nonparametric modelling. It is shown that the relationship between gas emissions and GDP displays more complex patterns, despite its monotonous shape, than the well-known Kuznets curve obtained from ad hoc parametric specifications. The economic development process has a negative effect on gas emissions, especially for the early and the advanced stages of development. As a result, developed countries as well as developing countries should make efforts to reduce CO_2 emissions.
JEL Classification: C14, C23, O10, O40
Keywords: CO_2 emissions, economic development, environmental Kuznets curve, nonparametric estimation, panel data.

2001/13 The option of joint purchase in vertically differentiated markets
Jean J. GABSZEWICZ and Xavier Y. WAUTHY

Within the framework proposed by Mussa and Rosen (1978) for modelling quality differentiation, we allow consumers to buy simultaneously different variants of the same indivisible good. We call this the "joint purchase option". We show that this option dramatically affects price competition: while a unique equilibrium always prevails when consumers are assumed to make mutually exclusive purchases, either uniqueness, or multiplicity, or absence of price equilibrium arise when the joint purchase option is opened depending on the utility attached to joint purchase relative to separate purchases.
JEL Classification: L13

2001/14 A note on inequality criteria
Ernesto SAVAGLIO

The *absolute differentials ordering* (ADO) and the *relative differentials ordering* (RDO) have been introduced as suitable alternative inequality criteria to *Lorenz ordering* (LO). We provide two new alternative proofs that ADO and RDO are sub-orderings of LO. Furthermore, we point out some "paradoxical situations", where these two different partial orderings fail to rank alternative income distributions.
JEL Classification: D31, D63, I31
Keywords: inequality orderings transfers.

2001/15 Revenue sharing versus expenditure sharing
Charles FIGUIERES, Jean HINDRIKS and Gareth D. MYLES

Problems of intergovernmental policy coordination can take many forms and are becoming increasingly important with continuing economic integration. In this paper we focus on the fiscal competition problem where the non-cooperative choice of taxes and transfers among government typically leads to suboptimal outcome. We look at the effect of two widely used corrective policies: revenue sharing and expenditure sharing (or intergovernmental matching grants). Our main result is that these two corrective policies have opposite effects depending on the form of competitive between governments, namely whether governments compete in taxes or expenditures. More precisely, for any form of competition, revenue sharing is desirable exactly when expenditure sharing is not and vice versa. The implication is that the choice of the optimal corrective policy requires a complete understanding of the underlying non-cooperative behaviour among governments. Our second main result is that neither revenue sharing or expenditure sharing can be sustained as a Nash equilibrium among governments, although all governments would benefit from one of these two corrective policies. Central intervention is therefore inevitable unless governments can pre-commit to the optimal corrective policy before setting their fiscal policies.
JEL Classification: C72, H71, H77, R50
Keywords: fiscal competition, revenue sharing, matching grants.

2001/16 District formation: a co-opetition approach
Antoine SOUBEYRAN and Shlomo WEBER

This paper considers a model of district formation that incorporates a notion of regional industrial systems. Each firm chooses its location from the set of existing industrial districts. The heterogeneous firms are distinguished by its "stand alone" district-dependent production and transportation cost. However, if other firms locate in the same district, the firm's stand alone cost is reduced by a factor that depends on the number of firms in the district. Thus, firms must take into account the reciprocal nature of cost-reduction as by joining a district, they engage in tacit cooperation: the firms reduce their own costs but in the same time reduce the costs of their rivals.
We show that under quite general assumptions this *co-opetition* game that contains the elements of competition and cooperation, yields a subgame perfect equilibrium for any number of firms and districts. We characterize both "agglomeration" equilibria, where all firms locate in the same district, and "dispersed" equilibria, where firms locate in different districts. We show that a dispersed equilibrium can emerge only if firms' and districts' characteristics possess a sufficient degree of heterogeneity.
JEL Classification: C72, D43, D62, L13
Keywords: industrial districts, cost reduction factor, agglomeration and dispersed equilibria.

2001/17 The taxation of trades in assets
Alessandro CITANNA, Heracles M. POLEMARCHAKIS and Mario TIRELLI

When the asset market is incomplete, there typically exist taxes on trades in assets and a redistribution of revenue in the asset market that are Pareto improving.

The policy is anonymous, it economizes on complexity, and it results in *ex post* Pareto optimal allocations; it is publicly announced before markets open, thus fully and correctly anticipated by traders, it does not require that financial markets be shut down, and it does not modify the asset market structure. As such, it improves over previously proposed constrained interventions.
JEL Classification: D52, D60, H20
Keywords: taxes, incomplete asset market, equilibrium, Pareto improvement.

2001/18 Consistent collusion-proofness and correlation in exchange economies
Gaël GIRAUD and Céline ROCHON

We present a feasible strategic market mechanism with finitely many agents whose Nash, semi-strong Nash and coalition-proof Nash equilibria fully implement the Walrasian equilibria. We define a strategic equilibrium concept, called correlated semi-strong equilibrium, and show that the Walrasian equilibria can be implemented by the these equilibria, and also by the coalition-proof correlated equilibria of our mechanism. We show that these two concepts, suitably modified with transfers, fully implement the Pareto optimal allocations. We extend to semi-strong correlated equilibria Aumann's Bayesian interpretation of correlated equilibria.
JEL Classification: C72, D51 + implementation
Keywords: coalition-proofness, correlation, semi-strong equilibrium, implementation.

2001/19 Generic efficiency and collusion-proofness in exchange economies
Gaël GIRAUD and Céline ROCHON

We define a new strategic equilibrium concept - called *strong collusion-proof contract* - designed to characterize stable communication agreements in games with differential information against non-binding, self-enforcing and incentive compatible deviations by coalitions. We then construct a strategic market mechanism which, for quasi-linear economies, is such that its strong collusion-proof contracts generically induce the incentive compatible *interim* efficient allocations. Moreover, it is such that these allocations can be achieved by strong collusion-proof contracts. We show that the internally consistent extension of the strong collusion-proof contracts generically yields the same set of efficient allocations.
JEL Classification: C72, D82, D51 + implementation
Keywords: coalition-proofness, Bayesian implementation, communication equilibrium, *interim* efficiency.

2001/20 Capital income taxation when inherited wealth is not observable
Helmuth CREMER, Pierre PESTIEAU and Jean-Charles ROCHET

This paper extends the Atkinson-Stiglitz model of direct and indirect taxation to a dynamic setting with two unobservable characteristics: productive ability and inherited wealth. Bequests are motivated by the "joy of giving". A child's inheritance is a random variable with a probability distribution that depends on his parent's investment in a "bequest technology". Public borrowing is assumed and implies the modified golden rule. We study the optimal tax policy when two instruments are available: a non-linear (wage) income tax and a proportional tax on capital income. We show that the second instrument ought, in general, to be used but that the tax rate is not necessarily positive. However, a positive tax rate is more likely when there is a positive correlation between inherited wealth and innate ability.

2001/21 Family size and optimal income taxation
Helmuth CREMER, Arnaud DELLIS and Pierre PESTIEAU

This paper studies the role of family size in the design of optimal income taxation. We consider a second best setting where the government observes the number of children and the income of the parents but not their productivity. With a *linear tax* schedule the marginal tax rate is shown to decrease with the number of children, while the relationship between the demogrant and family size appears to be ambiguous. With two ability levels, otpimal *non-linear income tax* implies zero marginal tax rates for the higher ability parents; low ability parents have positive marginal tax rates that decrease with family size.

2001/22 Value-at-risk for long and short trading positions
Pierre GIOT and Sébastien LAURENT

In this paper we model Value-at-Risk (VaR) for daily stock index returns using a collection of parametric models of the ARCH family based on the skewed Student distribution. We show that models that rely on a symmetric density distribution for the error term underperform with respect to skewed density models when the left and right tails of the distribution of returns must be modelled. Thus, VaR for traders having both long *and short* positions is not adequately modelled using usual Normal or Student distributions. We suggest using an APARCH model based on the skewed Student distribution to fully take into account the fat left and right tails of the returns distribution. This allows for an adequate modelling of large returns defined on long and short trading positions. The performances of all models are assessed on daily data for the CAC40, DAX, NASDAQ, NIKKEI and SMI stock indexes. We also compute the expected short-fall and the average multiple of tail event to risk measure for the new model.
JEL Classification: C52, C53, G15
Keywords: alue-at-Risk, expected short-fall, skewed student distribution, APARCH, short trading.

2001/23 Markets for public and private health care: redistribution arguments for a mixed system
Maurice MARCHAND and Fred SCHROYEN

Should health care provision be public, private, or both ? We look at this question in a setting where people differ in their earnings capacity and express an inelastic demand for health care. We assume that illness reduces a person's health status when not receiving immediate treatment. Treatment can be obtained in a competitive private sector or in the National Health Service (NHS) where it is provided free of charge but after some (endogenous) waiting time. The equilibrium in the health care sector consists of a fee for private consultations and a contract offered to NHS physicians such that no physician has an incentive to switch place of work, and in addition a waiting time in the NHS such that no patient wants to switch health care provider. This equilibrium is governed by three public policies: the income tax system, the subsidy of private health care, and the terms of the contract offered to NHS physicians. Our finding are threefold. First, a mixed system with a small public health care sector gives a lower social welfare level than a pure private system. Second, a mixed system with a sufficiently large NHS may improve upon a pure private system if the distribution of earnings capacities in society is sufficiently wide. And finally, whatever the size of the NHS, the doctors working there should be given a contract that specifies a heavier work load than the one their private colleagues choose. This is the way the government can exert its monopsony power on the market for physicians to improve social welfare.

2001/24 Fiscal competition and regional differentiation
Moshe JUSTMAN, Jacques-François THISSE and Tanguy VAN YPERSELE

Regions can benefit by offering infrastructure services that are differentiated. Competition between regions over potential investors is then less direct, allowing them to realize greater benefits from external investors. The two polar cases of full and incomplete information about investors' needs are studied. In both cases, there is regional differentiation. However, fiscal competition is efficient in the former case but not in the latter. Finally, it is shown that free entry in the location market calls for some regulation because of the excessive number of competing regions that would prevail in equilibrium.
JEL Classification: R58, R12, H73, O38
Keywords: fiscal competition, regional development, infrastructure, horizontal differentiation.

2001/25 Optimal redistribution with heterogeneous preferences for leisure
Robin BOADWAY, Maurice MARCHAND, Pierre PESTIEAU and Maria del Mar RACIONERO

This paper examines the properties of the optimal nonlinear income tax when preferences are quasilinear in leisure and heterogeneous. Individuals differ in their ability and in their preferences for leisure. The government seeks to redistribute income. It can perfectly observe the level of endogenous income but cannot observe either ability or preferences. The heterogeneity of preferences leads to problems of comparability between individual utilities which challenge the design of redistributive schemes. In particular, we analyze the consequences of adopting a utilitarian social welfare function where the government is allowed to give different weights to individuals wih different preferences. Under this particular social objective and given the quasilinearity of preferences, we are able to obtain closed-form solutions for the marginal tax rates and to examine the progressivity of the tax system according to the weights used.
JEL Classification: H21, H41
Keywords: optimal income taxation, quasi-linear preferences, asymmetric information.

2001/26 Pension funds and capital accumulation
Pascal BELAN, Philippe MICHEL and Bertrand WIGNIOLLE

This note presents a model in which pension funds, by holding a significant share of capital assets, can exert a non competitive behavior on labor market. This leads to lower wages and higher capital returns, and can reduce capital accumulation and long-run welfare.
JEL Classification: G23, E2, D9
Keywords: pensions funds, capital accumulation.

2001/27 Optimal population growth and social security reform with heterogeneous agents
Gemma ABIO and Ció PATXOT

In this paper we propose a pension policy that would isolate the social security system from any financial crisis resulting from changes in population structure. This policy consists of linking social security benefits to the fertility behaviour of the individual. We present a theoretical analysis to show that this policy restores the optimality of the capital-labour ratio and the population growth rate in an overlapping-generations model with endogenous fertility. We extend this analysis to the case of heterogeneous agents with respect to their preferences towards children.
JEL Classification: H55, J13, J18
Keywords: pay-as-you-go social security system, overlapping-generations model, endogenous fertility, heterogeneous agents, optimal population growth.

2001/28 Price discovery in international equity trading
Joachim GRAMMIG, Michael MELVIN and Christian SCHLAG

This study addresses two questions: where does price discovery occur for internationally-traded firms and how do international stock prices adjust to an exchange rate shock ? These questions are answered by analyzing quotes originating in New York and Frankfurt for three large German firms, DaimlerChrysler, Deutsche Telekom, and SAP, during overlapping trading hours. A high-frequency sample of quotes from both locations along with the dollar/euro exchange rate yields evidence of one cointegrating relation among the three variables. Vector error correction models are estimated for each firm and the associated vector moving average representations are utilized to infer the share of price discovery coming from the exchange rate, New York, and Frankfurt quotes. The evidence suggests a structure of the international equity market that has the home-market largely determining the random walk component of the international value of a firm along with an independent role for exchange rate shocks to affect prices in the U.S. markets. However, there is a significant information share for New York in the case of DaimlerChrysler and an even bigger role for New York with respect to SAP. Following a shock to the exchange rate, we find that almost all of the adjustment comes through the New York price.
JEL Classification: F30, G15
Keywords: international finance, price discovery, high frequency data.

2001/29 Sincere and strategic voters in a model of proportional representation
Francesco DE SINOPOLI and Giovanna IANNANTUONI

In this paper we analyze a model of proportional representation that allows for both sincere and strategic voting. We prove that strategic voters vote only for the extreme parties in any equilibrium, if the electorate is large. Moreover, we show that there is an effect of sincere voters' behavior on the equilibrium outcome, for which strategic voters cannot fully adjust.

2001/30 Consistency, converse consistency, and aspirations in coalitional games
Toru HOKARI and Özgür KIBRIS

In the problems of choosing "aspirations" for coalitional games, we study two axioms, "MW-consistency" and "converse MW-consistency", introduced by Moldovanu and Winter (1994). We mainly consider two domains: the domain of all NTU games and the domain of all TU games. In particular, we study which subsolutions of the aspiration correspondence satisfy *MW-consistency* and/or *converse MW-consistency*. We also provide axiomatic characterizations of the aspiration kernel and the aspiration nucleolus on the domain of all TU games.
JEL Classification: C71
Keywords: aspirations, coalitional games, consistency, converse consistency, reduced games.

2001/31 Social insurance competition between Bismarck and Beveridge
Helmuth CREMER and Pierre PESTIEAU

The European Union consists of a wide variety of welfare states with social insurance schemes ranging from those providing earnings related benefits (Bismarckian) to flat rate benefits (Beveridgean) systems. The conventional wisdom is that with factor mobility poor people have incentives to move towards Beveridgean countries and rich individuals to move out of them. Consequently, Beveridgean regimes would not be sustainable; they would have to adapt or to perish. This paper studies the validity of such a conjecture within a simple model. It is shown that mobility does have a significant impact on social protection. However, the equilibrium patterns that can emerge are more complex and diversified than the initial conjecture suggests. In some cases, the equilibrium may even imply that all the poor move to the Bismarckian country.

2001/32 Revisiting "On nations' size and transportation costs"
Joe THARAKAN

In international trade as well in the "New Economic Geography", country size is represented solely by the size of the country's population. A notable exception is the paper by Shachmurove and Spiegel (1995). Applying the Hotelling model to international trade and using the geographical interpretation of the Hotelling line, the authors propose a model where countries differ not only in population size but also in terms of their geographical extent. However, under certain assumptions on the locations of the firms, a pure strategy Nash equilibrium does not exist. In this paper, an alternative way to circumvent this existence problem and to make the analysis possible is presented. The pure strategy Nash equilibrium is restored by changing the assumption on the pricing policies used by the firms. The analysis indicates that while the small country gains from free trade the overall welfare of the larger country is unaffected by the opening of the border. The analysis is also extended to include a discussion of the long run equilibrium locations of firms in the integrated market. The importance of both the population and the geographical size of the countries are shown to be determining in establishing the effect of free trade.

2001/33 An axiomatization of the inner core
Geoffroy DE CLIPPEL

We axiomatize the inner core in a similar way as the one proposed by Aumann (1985) in order to characterize the NTU value.
JEL Classification: C71

2001/34 Optimal growth models with bounded or unbounded returns: a unifying approach
Cuong LE VAN and Lisa MORHAIM

In this paper we propose a unifying approach to study optimal growth models with bounded or unbounded returns (above/below). We prove existence of optimal solutions. We prove also, without using contraction method, that the Value function is the unique solution to the Bellman equation in some classes of functions. The value function can be obtained by the usual algorithm defined by the operator provided by the Bellman equation. The well-known results, and those in Alvarez and Stokey (1998) can be obtained from this paper.

2001/35 Optimal policy with tradable and bankable pollution permits: taking the market microstructure into account
Marc GERMAIN and Vincent VAN STEENBERGHE

This paper analyses how the way emission permits are traded -their market microstructure-impacts the optimal policy to be adopted by the environmental agency. The microstructure used is one of a *quote driven market* type, which characterizes many financial markets: market makers act as intermediaries for trading the permits by setting a ask price and a bid price. The possibility of permit banking is also introduced in our dynamic two-period model.
We show that when the market makers and the agency do not know the technology of the producers with certainty, a positive spread may be set by market makers and that, under some conditions, banking increases the expected welfare given this market microstructure.
If such a microstructure takes place or is organised on markets for pollution permits, we recommend to allow for banking (a) if the marginal willingness to pay for the environment increases much over time, (b) if the pollutant is rather a stock than a flow one, and/or (c) if the incomplete information faced by the intermediaries and by the agency is severe. In the first period, the environmental agency will then have to define and allocate a larger amount of permits than if banking is not allowed, but a lower or a same amount of permits in the second period.

2001/36 A family of autoregressive conditional duration models
Marcelo FERNANDES and Joachim GRAMMIG

This paper develops a family of autoregressive conditional duration (ACD) models that encompasses most specifications in the literature. The nesting relies on a Box-Cox transformation with shape parameter λ to the conditional duration process and a possibly asymmetric shocks impact curve. We establish conditions for the existence of higher-order moments, strict stationarity, geometric ergodicity and β-mixing property with exponential decay. We next derive moment recursion relations and the autocovariance function of the power λ of the duration process. Finally, we assess the practical usefulness of our family of ACD models using NYSE price duration data on the IBM stock. While the in-sample results warrant the extra flexibility provided either by the Box-Cox transformation or by the asymmetric response to shocks, we find no specification that entails satisfactory out-of-sample performance.**JEL Classification:** C22, C41
Keywords: Asymmetry, Box-Cox transformation, mixing property, price duration, shocks impact curve, stationarity.

2001/37 Design and performance analysis of a heavily loaded material handling system
Philippe CHEVALIER, Yves POCHET and Laurence TALBOT

We consider the problem of designing a 2-stations Automated Guided Vehicle System (AGVS). The AGV System consists of a pool of vehicles that transports products from one station to the other station through an unidirectional guidepath. We seek a model to estimate the minimal number of vehicles needed to guarantee some target service level expressed in terms of mean waiting time. To achieve this we also need to design dispatching rules in order to utilize the vehicles in the best way. Our solution procedure starts by computing the necessary fill rate in order to respect the maximum mean waiting time. We use a Reorder Point Inventory Policy and Markov Chain Theory to determine the dispatching rules and to estimate the minimum number of vehicles required to guarantee the fill rate. Our computer simulations indicate that the model offers a good degree of approximation.
Keywords: Automated guided vehicle system, number of vehicles, queueing theory, Markov chain theory, simulations.

2001/38 On the effects of conjectures in a symmetric strategic setting
Charles FIGUIERES, Mabel TIDBALL and Alain JEAN-MARIE

This paper deals with the effect of conjectures in a strategic setting. To do this it focuses on the so-called Conjectural Variation Equilibrium (CVE). According to this concept, each agent chooses his most favorable action taking into account that rival strategies are a conjectured function of his own strategy. In the existing literature, a central role is played by the comparison between the CVE and the Nash Equilibrium (NE). The purpose of such a comparison is to appraise the impact of non zero conjectures on agents' behaviors. The existing results suggest that it is not possible to know, in advance, the consequences of non zero conjectures on behaviors. Our aim is: i) to identify situations where it is indeed possible, a priori, to know which kind of non cooperative concept Pareto dominates the other, ii) to provide out the corresponding theoretical explanations. The economic situations can be divided into two families, depending on whether they admit a stable Nash equilibrium and an interior Pareto solution (family 1) or not (family 2). Within each family it is shown that the sign of the externalities (positive or negative effect of the rival actions on a player's payoffs) together with the properties of conjectures (their sign and their absolute value) : i) indicates how to rank the action levels associated with the NE and the CVE, ii) allows one to predict which kind of behavior leads the players to the most favorable outcome. It turns out that the qualitative results prevailing for family 1 are reversed for family 2. This classification is useful in that outcomes and payoffs need not be calculated to assess the impact of conjectures on players' payoffs; the only relevant pieces of information are the sign of second order derivatives of the payoff function and the properties of conjectures, i.e. the description of the game. We then study in which kind of game reasonable conjectures, i.e. consistent conjectures, belongs to the set of conjectures that produces superior outcomes.
JEL Classification: C72, D43, D62, E61, H41
Keywords:Conjectural Variations, Nash Equilibria, Consistency.

2001/39 Volatility impulse response functions for multivariate GARCH models
Christian M. HAFNER and Helmut HERWARTZ

In the empirical analysis of financial time series, multivariate GARCH models have been used in various forms. As it is typical for nonlinear models there is yet no unique framework available to uncover dynamic covariance relationship for vector return processes. We introduce a new concept of impulse response functions tracting the effects of independent shocks on volatility through time. The advocated methodology avoids typical orthogonalization and ordering problems. Theoretical properties of volatility impulse response functions are derived and compared with conditional moment profiles introduced by Gallant, Rossi and Tauchen (1993) for semi-nonparametric models. In an empirical study of a bivariate foreigh exchange rate series we use volatility impulse response functions to compare alternative parametric volatility specifications. It is shown that for shocks affecting foreign exchange rates in an asymmetric way, the difference between our methodology and conditional volatility profiles can be substantial.
JEL Classification: C22
Keywords: Multivariate GARCH, impulse response, exchange rate, volatility.

2001/40 Social welfare functionals and interpersonal comparability
Claude d'ASPREMONT and Louis GEVERS

This chapter reviews the SWFL approach to social choice. It does not attempt to be a complete and systematic survey of existing results, but to give a critical assesment of the main axioms and their role in filtering the ethically relevant information, in particular the measurability and comparability properties of individual evaluation functions. Social welfare functionals are defined formally together with closely related concepts. After adducing a good number of examples, we elaborate on the meaning of the SWFL domain of definition and we sketch some alternative approaches. Several types of axioms are considered; some of them are used to filter the relevant information while others express collective efficiency or equity requirements. Then, to illustrate the various tradeoffs among these axioms, selected characterisation results are presented; most of them are cast in what we call the formally welfarist framework. Finally, we have assembled some other characterisations which eschew either invariance properties or the formally welfarist framework. We discuss the treatment of two sets of social alternatives endowed with an enriched structure, viz. the set of classical exchange economies and the complete set of lotteries one can define on an abstract set of pure alternatives. As an introduction to the latter discussion, we elaborate on the difficulties raised by social evaluation when risks and uncertainty are taken explicitly into account.
JEL Classification: D71, D81
Keywords:social welfare functionals, social welfare orderings, invariance axioms, utilitarianism, welfarism.

2001/41 Social insurance and redistribution
Robin BOADWAY, Manuel LEITE-MONTEIRO, Maurice MARCHAND and Pierre PESTIEAU

This paper studies optimal linear income taxation and redistributive social insurance when the former has the traditional labor distortion and the latter generates both *ex ante* and *ex post* moral hazard. Private insurance is available and individuals differ in labor productivity and in loss probability. We show that government intervention in insurance markets is welfare-improving, and social insurance is generally desirable particularly when there is a negative correlation between labor productivity and loss probability.

2001/42 A discussion of production planning approaches in the process industry
Yves CRAMA, Yves POCHET and Yannic WERA

In this paper, we discuss the literature on production planning approaches in the process industry. Our contribution is to underline the differences, as well as the similarities, between issues and models arising in process environments and better known situations arising in discrete manufacturing, and to explain how these features affect the optimization models used in production planning. We present an overview of the distinctive features of process industries, as they relate to production planning issues. We discuss some of the difficulties encountered with the implementation of classical flow control techniques, like MRP or JIT, and we describe how various authors suggest to solve these difficulties. In particular we focus on the concept of "recipe", which extends the classical Bill of Materials used in discrete manufacturing, and we describe how the specific features of recipes are taken into account by different production planning models. Finally,we give a survey of specific flow control models and algorithmic techniques that have been specifically developed for process industries.
Keywords: production flow control, process industry, blending models.

2001/43 Incentives and the core of an exchange economy: a survey
Françoise FORGES, Enrico MINELLI and Rajiv VOHRA

This paper provides a general overview of the literature on the core of an exchange economy with asymmetric information. Incentive compatibility is emphasized in studying core concepts at the ex ante and interim stage. The analysis includes issues of non-emptiness of the core as well as core convergence to price equilibrium allocations.
JEL Classification: C71, D82, D51
Keywords: core, asymmetric information, incentive compatibility, exchange economy.

2001/44 Taste heterogeneity, labor mobility and economic geography
Takatoshi TABUCHI and Jacques-François THISSE

This paper investigates the impact of the heterogeneity of the labor force on the spatial distribution of activities. This goal is achieved by applying the tools of discrete choice theory to an economic geography model. We show that taste heterogeneity acts as a strong dispersion force. We also show that the relationship between the spatial distribution of the industry (the wage differential) and trade costs is smooth and bell-shaped. Finally, while Rawlsian equity leads to the dispersion of industry, our analysis reveals that efficiency leads to a solution close to the market outcome, although the latter is likely to involve too much agglomeration compared to the former.
JEL Classification: R13, O15, O18
Keywords: logit, agglomeration, migrations, wage differential, spatial equity.

2001/45 Old age consumption and pension policy in a two-tier developing economy
Oliver PADDISON and Pierre PESTIEAU

In a number of developing countries, an important part of the economy is informal both in terms of production and of social protection. In this paper we consider introducing a universal pension system in the formal sector. It is shown to have two main effects: first, it makes the formal sector more attractive to migration and second, it affects capital accumulation in a way which depends on the type of social security introduced, PAYG or funded, and its induced effect on private saving.
JEL Classification: H55, J61

2001/46 Fourth moments of multivariate GARCH processes
Christian M. HAFNER

This paper derives conditions for the existence of fourth moments of multivariate GARCH processes in the general vector specification and gives explicit results for the fourth moments and autocovariances of the squares and cross-products. Results are provided for the kurtosis and co-kurtosis between components. Applications of the results include the definition of impulse response functions for kurtosis and co-kurtosis, the derivation of the spectral density matrix of the squares and cross-products, and a measure for causality in volatility. A bivariate exchange rate example illustrates the applications.
JEL Classification: C22
Keywords: multivariate GARCH, fourth moments, kurtosis, co-kurtosis.

2001/47 On the complexity of coordination
Olivier GOSSNER and Penélope HERNANDEZ

Many results on repeated games played by finite automata rely on the complexity of the exact implementation of a coordinated play of length n. For a large proportion of sequences, this complexity appears to be no less than n. We study the complexity of a coordinated play when allowing for a few mismatches. We prove the existence of a constant C such that if $\frac{m \log m}{n} \geq C$, almost all sequences of length n can be predicted by an automaton of size m with a coordination rate close to 1. This contrasts with Neyman [1997] that shows that when $\frac{m \log m}{n}$ is close to 0, almost no sequence can be predicted with a coordination ratio significantly larger than the minimal one.
Keywords: Coordination, complexity, automata.

2001/48 Matching grants and Ricardian equivalence
Charles FIGUIRES and Jean HINDRIKS

This paper investigates the effectiveness of matching grants to correct for interjurisdictional spillovers in the light of Bernheim general neutrality result. Indeed this result suggests that the usual argument that matching grants are needed to internalize the externality arising from the existence of interjuridictional spillovers is an artifact of the assumption that jurisdictions neglect the impact that their decisions have on the federal budget. Relaxing this assumption and using a classical model where the arbitrage resulting from labor mobility implies that redistribution has the properties of a public good, we find that matching grants are relevant although somewhat less effective. We also find that optimal matching rates are independent of the number of jurisdictions and their strategic variables contrarily to the case where jurisdictions ignore the impact of their decisions on the federal budget.
JEL Classification:H23, H70
Keywords: fiscal federalism, Ricardian equivalence, matching grants.

2001/49 On strategic complementarity conditions in Bertrand oligopoly
Rabah AMIR and Isabel GRILO

For Bertrand duopoly with linear costs, we establish via a single counterexample that: (i) A new monotone transformation of the firms' profit functions may lead to the supermodularity of transformed profits when the standard log and identity transformations both fail, and (ii) Topkis's notion of critical sufficient condition for monotonicity of a Bertrand firm's best-reply correspondence cannot be extended to rely only on positive unit costs.
JEL Classification: C72, D43, L13
Keywords: price competition, supermodularity, singlecrossing property, critical sufficient condition.

2001/50 Noncooperative versus cooperative R&D with endogenous spillover rates
Rabah AMIR, Igor EVSTIGNEEV and John WOODERS

This paper deals with a general version of a two-stage model of R&D and product market competition. We provide a thorough generalization of previous results on the comparative performance of noncooperative and cooperative R&D, dispensing in particular with ex-post firm symmetry and linear demand assumptions. We also characterize the structure of profit-maximizing R&D cartels where firms competing in a product market jointly decide R&D expenditure, as well as internal spillover, levels. We establish the firms would essentially always prefer extremal spillovers, and within the context of a standard specification, derive conditions for the optimality of minimal spillover.
JEL Classification: C72, L13, O31
Keywords: oligopolistic R&D, endogenous spillovers, research joint ventures, R&D cartel.

2001/52 Capacity utilisation and profitability: a decomposition of short run profit efficiency
Tim COELLI, Emili GRIFELL-TATJE and Sergio PERELMAN

The principal aim of this paper is to measure the amount by which the profit of a multi-input, multi-output firm deviates from maximum short-run profit, and then to decompose this profit gap into components that are of practical use to managers. In particular, our interest is in the measurement of the contribution of unused capacity, along with measures of technical inefficiency, and allocative inefficiency, in this profit gap. We survey existing definitions of capacity and, after discussing their shortcomings, we propose a new *ray economic capacity* measure that involves short-run profit maximisation, with the output mix held constant. We go on to describe how the gap between observed profit and maximum profit can be calculated and decomposed using linear programming methods. The paper concludes with an empirical illustration, involving data on 28 international airline companies. The empirical results indicate that these airline companies achieve profit levels which are on average US$815m below potential levels, and that 70% of the gap way be attributed to unused capacity.
Keywords: capacity utilisation, profit decomposition, technical efficiency, allocative efficiency.

2001/53 New formulation and resolution method for the p-center problem
Sourour ELLOUMI, Martine LABBÉ and Yves POCHET

The p-Center problem consists in locating p facilities among a set of M possible locations and assigning N clients to them in order to minimize the maximum distance between a client and the facility to which it is allocated. We present a new integer linear programming formulation for this Min-Max problem with a polynomial number of variables and constraints, and show that its LP-relaxation provides a lower bound tighter than the classical one. Moreover, we show that an even better lower bound LB^*, obtained by keeping the integrality restrictions on a subset of the variables, can be computed in polynomial time by solving at most $O(log_2(NM))$ linear programs, each made of N rows and M columns. We also show that, when the distances satisfy triangle inequalities, LB^* is at least equal to half of the optimal value. Finally, we use LB^* as a starting point in an exact solution method and report extensive computational results on test problems from the literature. For Euclidean instances, our method outperforms the runtime of other recent exact methods by an order of magnitude. Moreover, it is the first one to solve large instances of size up to $N = M = 1817$.
Keywords: Min-Max objective, Facility Location, p-Center, Mathematical Programming.

2001/54 The politics of redistributive social insurance
Jean HINDRIKS and Philippe DE DONDER

This paper analyses the political support for a social insurance that includes elements of redistribution when there exists an imperfect private insurance alternative. Individuals differ both in their income and risk. The social insurance is compulsory and charges an income-related contribution with pooling of risks. The private insurance is voluntary and charges a contribution based on individual risks. However due to the adverse selection problem, private insurance companies provide only partial insurance. Adopting a non-expected utility model, we show that there is a general majority support for social insurance and that this support is increasing with risk aversion. We also show that a mixed insurance is politically impossible, regardless of the degree of redistribution of social insurance and the joint distribution of risk and income in the population. Lastly, we analyse how the political support for social insurance is affected by any change in its redistributive component and the possibility of using genetic tests.
JEL Classification: H23, H50
Keywords: majority rule, social insurance, redistribution, adverse selection.

2001/55 The econometrics of airline network management
Joachim GRAMMIG, Reinhard HUJER and Michael SCHEIDLER

The task of airline network management is to develop new flight schedule variants and evaluate them in terms of expected passenger demand and revenue. Given the industry's trend towards global cooperation, this is especially important when evaluating the potential synergies with alliance partners. From the econometric point of view, this task represents a discrete choice modeling problem in which the analyst has to account for a large number of dependent alternatives. In this paper we discuss the applicability of recently proposed approaches and introduce a new multinomial probit specification designed for the airline network management task. The superior performance of the new model is demonstrated both in a simulation study and in a real-world application using airline bookings data.
JEL Classification: C15, C25, L93
Keywords: airline industry, transportation, discrete choice models, multinomial probit model.

2001/56 A general heuristic for production planning problems
Mathieu VAN VYVE and Yves POCHET

We consider production planning problems with the restriction that all integer variables model setups. Since finding a feasible solution of such problems is in general NP-complete, the classical approaches have been the use of heuristics to find good feasible solutions on the one hand, or Branch&Cut on the other hand. In the case of the former, a dual bound is not available, and there is no guarantee of solution quality. For the latter, the accent has been on improving the dual bound and only the simplest schemes have been used to find good feasible solutions.

Here we first show that such simple schemes may run into trouble, even when applied to very simple problems. This motivates the proposed heuristic, IPE, which is designed to be used within a Branch&Cut approach. We test the performance of the heuristic on various published lotsizing and network design problems, with and without tightened reformulations. We compare these results with other heuristics and with time truncated B&B searches. IPE appears to be the best choice for large problems with weak formulations.
Keywords: production planning, heuristic, Branch&Cut, setup times, multilevel.

2001/57 Information, the internet and competitive equilibrium
Damien GAUMONT and Philippe MICHEL

We analyse the consequence of an increase of information (say as a consequence of the internet), on the equilibrium of a pure exchange economy with n goods and m agents. We assume that such an increase modifies th characteristics of goods *à la* Lancaster and has a positive effect on utility. We show that in equilibrium an increase of information increases a linear combination of the utilities of the agents. The different possibilities of gains and losses are explicitly analysed in an example with two goods and two agents.
JEL Classification: D50, D89

2001/58 Indeterminateness of equilibria and macroeconomics
Jacques H. DRZE

The paper reviews results on indeterminateness of equilibria in two extensions of the standard (Arrow-Debreu) model of general equilibrium. These extensions, motivated by macroeconomic interpretations, concern money and price rigidities. In a natural extension to money (held for transaction purposes), if monetary policy fixes either nominal interest rates or money supply (but not both), the variability of inflation rates is unrestricted, at equilibrium. In the absence of initial nominal asset positions, the indeterminateness of inflation rates is harmless, in the complete-markets framework of Arrow-Debreu. When some relative prices are predetermined, there exists generically a continuum of real equilibria, indexed by the overall degree of rationing. In a model combining money and nominal price rigidities, the fixed nominal prices limit the indeterminateness of inflation rates, but the real indeterminateness subsits. When one introduces in addition a tâtonnement process of nominal price formation, incorporating some downward nominal rigidities, both the nominal and the real indeterminateness may be eliminated (through the initial conditions), in the complete-markets framework. It is argued that macroeconomic interpretations call for an incomplete-markets framework, hence for expectations, another source of indeterminateness. A concluding section offers some heuristic remarks on the open problems associated with market incompleteness.
Keywords: indeterminateness of equilibria, inflation, price rigidities, incomplete markets.

2001/59 Stochastic games in economics: the lattice-theoretic approach
Rabah AMIR

This chapter considers a recent trend in the application of stochastic games to economics characterized by the use of the lattice-theoretic approach to capture the monotonic properties of Markovian equilibria. The topics covered are: (i) a general framework for discounted stochastic games with Liptchitz-continuous and monotone equilibrium strategies and values, (ii) a model of capital accumulation, (iii) two classes of games with perfect information, in strategic bequests and oligopoly with commitment. In view of the restriction to pure-strategy equilibria and of the natural monotonicity property of strategies and value functions in most economic applications, this approach appears most promising.
JEL Classification: C72, L13, O31

2001/60 Stochastic games in economics and related fields: an overview
Rabah AMIR

This survey provides an extensive account of research in economics based on the stochastic games paradigm. Its area-by-area coverage is in the form of an overview, and includes applications in resource economics, industrial organization, macroeconomics, market games, experimental and empirical economics. For methodologically defined frameworks, the coverage is somewhat more detailed (to the extent that the material is not covered elsewhere in this volume), and includes the open-loop concept, the linear-quadratic model, myopic equilibrium, games of perfect information, and stochastic games with a continuum of players.
JEL Classification: C72, L13, O31

2001/61 An infinitary probability logic for type spaces
Martin MEIER

Type spaces in the sense of Harsanyi (1967/68) can be considered as the probabilistic analog of Kripke structures. By an infinitary propositional language with additional operators "individual i assigns probability at least α to" and infinitary inference rules, we axiomatize the class of (Harsanyi) type spaces. We show that our axiom system is strongly sound and strongly complete. To the best of our knowledge, this is the very first strong completeness theorem for a probability logic of the present kind. The result is proved by constructing a canonical type space.