

# Introduction

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A main feature that distinguishes the human species from others on earth can perhaps be best summarized as its ability to design. Other attributes distinguishing humans from other living beings can be regarded as derivatives of being a “designer”. The most tangible form of the designs achieved by mankind so far is that of tools, tools created in order to achieve some objective which precedes the existence of the tool. This notion of design applies to the most primitive as well as the most advanced tools, such as we see in modern production processes based on the so-called information technologies. Although design pertaining to tool-making in this sense is as old as mankind itself, its conscious application in the social and economic sphere is very modern, and a systematic treatment of social and economic design on a scientific basis is even more recent. Social and economic institutions have in many important cases evolved by spontaneous processes based on trial and error. Until the last century conscious social design was confined to certain modifications of already existing institutions. The creation of new institutions so as to achieve a socially targeted objective is very novel and yet awaits future societies to be put into practice with full strength.

One major area where we see conscious economic design in the last century is that of regulation in certain industries. However, it was only in the late Sixties and early Seventies that the objective of regulatory mechanisms was expressed and analyzed in a neat form. Only then did it become clear that certain regulatory mechanisms which had been employed very extensively up to that point were incapable of achieving what was intended. (Meanwhile it had intuitively become pretty clear that this was the case, and we were trying to modify these mechanisms by trial and error.) In fact, this is what gave rise to the need for a precise theoretical reformulation and analysis of the regulation problem.

There is really no exemption among social and economic institutions from the need for design. Whatever belongs within the scope of positive economics – which aims at explaining what already exists – also falls into the realm of design. Every existing institution is one from among many possibilities, and in many cases it is very doubtful that the existing world is the best among all possible worlds that we could have had. Thus, it is no surprise that research in social and economic design covers a very broad spectrum, as reflected also in the contents of this book.

## Part A. Social Choice and Electoral Systems

Electoral systems pertain to democratic procedures according to which a social will is extracted out of individual wills. Each electoral system is a particular method to aggregate profiles of individual preferences into a social preference or arrive at a choice based on such profiles. The electoral systems employed by a society reflect the democratic content of that society and thus should not be left either to historical accident or to narrow or shortsighted considerations of existing power groups.

In designing an electoral system, the first natural question is what the desirable properties are that a society wishes its electoral system to possess. This question can be answered empirically, of course. The paper, "Selecting a Social Choice Rule-An Exploratory Panel Study", by Sertel and Kara is the first extensive study in the literature dealing with this problem. Sertel and Kara design a study to determine the preferences of their subjects over four social choice rules: Plurality, Plurality with a Runoff, the Majoritarian Compromise and Borda's Rule. They confront their subjects with hypothetical preference profiles of a hypothetical electorate over four alternatives at which the four social choice rules all disagree. The subjects are then asked which alternative should be chosen in each case. The major finding is that the Majoritarian Compromise and Borda's rule each receive the support of more than 40% of the subjects as best, where Plurality and Plurality with a Runoff are supported by 12% and 2.3% of the subjects, respectively. The explanations given by the subjects for their choices shed some further light on the findings of these experiments. In particular, the reasons given by the subjects who were classified as having chosen the Borda winner overwhelmingly indicate that what these subjects actually consciously chose is the Social Compromise winner, which coincides with the Borda winner in the profiles in question. Sertel and Kara note that this would tilt overall results, if anything, in favor of the Majoritarian Compromise, against Borda's Rule.

In his paper, "Weighted Scoring Rules that Maximize Condorcet Efficiency", Gehrlein deals with the question of Condorcet efficiency of scoring rules, using computer enumeration techniques. The major aim of this study is to find the range of weights for scoring rules on three candidates that will maximize Condorcet efficiency. For any given system of weights, the Condorcet efficiency is estimated for odd numbers of voters up to 31 by generating profiles and using enumeration techniques in a particular way. The most interesting finding is that the widely held belief that Borda's Rule maximizes Condorcet efficiency among all scoring rules is highly dependent upon the independence of voters' preferences. The introduction of a certain interdependence between voters' preferences, in fact, renders Plurality more Condorcet efficient than Borda's Rule. This result is important, for in real societies it is not too far-fetched to assume that in many contexts the existence of a common culture introduces a certain level of social homogeneity.

The last paper in Part A is "Incentive Contracts and Elections for Politicians and the Down-Up Problem" by Gersbach. He observes that many efficient policies

whose benefits accrue to a society in the long run are unattractive to politicians who are deterred by the short-term costs of these projects, as incentives for a politician are soon to be re-elected. Gersbach proposes to solve the “underinvestment problem” by combining the re-election mechanism with incentive contracts which allow private returns to politicians if they create social returns above the status quo levels so long as they stay in office. The critical element in designing such incentive schemes is, of course, to make the re-election possibilities as well as the private returns to a politician dependent upon his/her performance. Voters will have observed only first-term returns of the policy implemented when they are to decide whether they should re-elect the politician in question. Thus, they are faced with the problem of inferring what social returns the implemented social policy can be expected to yield in the next term from the returns observed in the initial term. Gersbach shows that these elements can be combined in an appropriate fashion in constructing a mechanism that might alleviate a wide range of inefficiencies occurring in democratic decision-making processes.

## **Part B. Buyers and Sellers**

Modeling and analyzing two-sided markets consisting of buyers and sellers is, of course, one of the most classical and central problems in economic theory. The two most comprehensive and dual frameworks into which almost all problems involving buyers and sellers can be fitted are perhaps supply and demand, on the one hand, and double-sided auctions on the other. Traditionally, economists seem to resort to the framework of supply and demand if there are no revelation problems involved which incite strategic considerations on the part of economic agents in revealing relevant information. If, on the other hand, it is the revelation problem accompanied by the strategic use of supply or demand parameters which forms the major issue, then the auction framework seems to provide the more suitable format. Although all auctions are formally double-sided, the informational structure is often such that, of the buyers and sellers, one side is reduced to a dummy player where the players are assumed to be the genuinely strategic actors. The papers in Part B are representative of the broad spectrum this dual approach leads to, and some deal with genuinely double-sided auctions rather than just one-sided ones.

The paper, “On Determination of Optimal Reserve Price in Auctions with Common Knowledge about Ranking of Valuations” by Elbittar and Ünver considers a particular form of asymmetry in auctions, where the seller treats her reservation price as a strategic variable, and the auction is genuinely double-sided. The bidders’ individual valuations are drawn from one and the same distribution which is common knowledge. Thus, the valuations are *ex ante* symmetric. The *ex post* asymmetry is with reference to bidders’ subsequent valuations, whose exact values are known by neither the seller nor the other bidders. The ordinal ranking of the valuations, however, is assumed to be common knowledge. Elbittar and Ünver

extend results by Landsberger, Rubinstein, Wolfstetter and Zamin (forthcoming), who model the same kind of asymmetry but ascribe to the seller a fixed reservation price of zero to a situation where this price is treated as a strategic variable by the seller. The main result obtained by Elbittar and Ünver is that under the extended model the first price auction remains as desirable as the second price auction from the seller's viewpoint. In cases where the equilibrium outcome cannot be computed analytically, the authors provide numerical evidence for this invariance result.

In his paper, "On Auctions with Interest Linkages among Bidders", Chillemi examines sealed-bid first-price auctions where bidders are linked through common interests. More specifically, to exemplify this kind of externality, he considers a situation where there are the same number of "holdings" and bidding firms. Each "holding" is assumed to have a majority share in exactly one firm along with minority shares in all the remaining firms. The informational structure as well as the strategic role ascribed to the seller are modeled similarly as in the paper above by Elbittar and Ünver. The bidders' valuations are drawn from a common distribution which is public knowledge, while the outcome of the lottery remains private to each individual firm. The seller sets a reservation price above her own valuation of the object to be sold so as to maximize her expected revenue. Each firm is assumed to act in the interest of the holding which controls it. Although explicit collusion among bidders is ruled out, the interest linkages between them are represented by the firms' payoff functions which also assign a positive weight less than one half to the total surplus of the other bidders. Chillemi shows that it makes an immense difference how the individual rationality constraint for bidders is formulated. Referring to the proportion of the weights assigned to others' total surplus and one's own individual surplus as the concern parameter, he first shows that a positive concern among non-collusive bidders definitely damages the seller and may also lead to a decrease in the bidders' total surplus if the individual rationality constraint is taken as the nonnegativity of the expected value of each firm's own surplus. If one allows a bidder's own expected surplus to be negative, however, provided that its total expected payoff is nonnegative, however, the picture changes drastically. Under the selling procedure which is best for the seller, both the seller's revenue and the joint surplus then increase in accordance with the intensity of the concern parameter.

The paper, "Substitutes, Complements and Equilibrium in Two-Sided Market Models" by Danilov, Koshevoy and Lang examines a two-sided market with two disjoint sets of agents, buyers and sellers. Each seller can trade with as many buyers as he wishes, subject to a transaction cost. Similarly, every buyer can contract any subset of sellers, while trade within the same group is ruled out. Given a pair of a seller and a buyer, if trade takes place between these agents, there is a uniquely determined indivisible object which is sold by the seller to the buyer at an exogenously given market price. Sellers are net gain maximizers and buyers, endowed with quasi-linear utilities, aim at maximizing net utility. Now the question is to find sufficient conditions under which a competitive equilibrium will

exist in this market structure, i.e. a price system under which the buyers' and the sellers' optimal decisions will clear the market. Danilov, Koshevoy and Lang show that if all buyers and sellers agree upon which goods are substitutes and which are complements – called the Compatibility Principle – then a competitive equilibrium exists. The cases where all goods are pure complements or all pure substitutes are treated as two interesting special subcases. These complementarity and substitution requirements turn out to be ultimately related to the discrete convexity or concavity of the cost and utility functions of the sellers and buyers.

The last paper in Part B is “Core Convergence in Two-Sided Matching Markets” by Feldin, where she examines the impact of keeping agents' preferences at a fixed length upon the size of the set of agents who are matched with different mates at different stable matchings. She shows that the number of stable matchings is finite even in infinite two-sided markets, and that the number of agents who are matched differently under “men-optimal” and “women-optimal” matchings stays bounded even as the size of the market grows indefinitely, so long as agents' preference lengths are kept fixed. These results are achieved mainly by relating the number of certain cycles rooted in stable matchings to the length of agents' preference lists and the size of the market. The author thereby provides a theoretical as well as a computational explanation for the observation made in Roth and Peranson (1999) about the smallness of the number of applicants who would have received a different match under the new applicant proposing mechanism than under the previous hospital proposing mechanism in the U.S. intern-hospital market.

## **Part C. Bargaining**

Bargaining is no doubt an ancient tool employed throughout a long history of human societies to resolve both economic and social conflicts. Regarding variants of this social institution as “mechanisms” and asking what can be “implemented” through such mechanisms, however, is very recent, although quite natural once one notes how pervasively bargaining is used as a social institution. Two of the papers in this part focus on this important aspect of bargaining, and they seem to complement each other in a fundamental way. Sertel and Yıldız show the impossibility of a Walrasian bargaining solution, so long as one does not alter the classical framework for a bargaining problem set by Nash (1950), while Sotskov modifies the said framework in a particular way so as to “implement” the Walrasian rule through bargaining.

A most natural environment for a bargaining problem seems to be one where monetary transfers are possible. In such an environment, however, the question of manipulability of a bargaining solution through transfers comes to the forefront. An interesting setup to model such a manipulability is through “predonations” as introduced by Sertel (1991). The fourth paper in this part concerns this problem.

In his paper, “Can and Should the Nash Program Be Looked at as a Part of Mechanism Theory?”, Trockel addresses the question of whether the Nash Program can be related to mechanism theory. The Nash Program is introduced as a research agenda whose goal is to provide a non-cooperative equilibrium foundation for axiomatically defined solution concepts of cooperative games. The axiomatic method of defining cooperative solution concepts takes social desirability as its point of departure, whereas one tries to make negotiations in the cooperative context into moves in the noncooperative model to reach cooperative payoff vectors non-cooperatively. Linking these two approaches is expected to provide an “insight into the interrelation between institutionally determined non-cooperative strategic interaction and social desirability based on welfaristic evaluation”.

Nash’s own contribution to the Nash Program is summarized as the introduction of the so-called demand and smoothed demand games, where the Nash solution is achieved as the only limit of equilibria of a sequence of smoothed demand games.

Trockel aims at clarifying the relationship between the Nash Program and mechanism theory, by showing how results that provide a non-cooperative foundation for cooperative solution concepts can be extended to proper implementation results. He deals with weak rather than full Nash implementation, and exemplifies the general construction he uses to embed the Nash Program into mechanism theory in the specific context of the Nash bargaining solution. The most crucial step in the embedding process seems to be defining an appropriate outcome space, which is then to be followed by the specification of a restricted set of preference profiles which need not be a product set. The social choice rule which is to represent the cooperative solution concept in question is defined on this set of preference profiles, so that one has a pseudo-game form, rather than a game form, used in Nash implementation.

Thus, Trockel shows that it is technically possible to regard the Nash Program as part of mechanism theory, and discusses the meaning of implementation in the light of this result.

In their paper, “The Impossibility of a Walrasian Bargaining Solution”, Sertel and Yıldız regard a bargaining solution as an “institution”, and ask whether the Walrasian welfare correspondence is “implementable” via a bargaining solution. By simply constructing distinct exchange economies which give rise to exactly the same bargaining problem but whose Walrasian equilibrium payoffs disagree, they show that there is no bargaining solution in the sense of Nash (1950) which pays out the Walrasian welfare for exchange economies. The simple reason for this is pinned down as the loss of certain pieces of information pertaining to physical aspects of the actual problem in transforming it into a bargaining problem in the classical sense where the payoffs are the only relevant factors. This lost information is “visible” to the Walrasian solution, while it goes unnoticed by bargaining problems and solutions. The actual lesson the authors draw is the inadequacy of the classical framework of bargaining theory, rather than the non-existence of a Walrasian bargaining solution. [Indeed, in a follow-up, Yıldız (2002) found just that, a Walrasian bargaining solution, for properly defined bargaining problems.]

The problem dealt with by Sotskov in his paper, “Characterization of Competitive Allocations and the Nash Bargaining Problem”, is complementary to the main result of “The Impossibility of a Walrasian Bargaining Solution” by Sertel and Yildiz. Sotskov obtains Walrasian allocations as “Nash agreement points” in general, and as “Nash bargaining points” in the case of smooth preferences. His bargaining model and solution are not a bargaining model and solution in the sense of Nash (1950) any more, as they use information about the physical aspects of the underlying problem, and it is feasible alternatives themselves rather than just utility allocations which are considered as solutions to bargaining problems by Sotskov. Starting with a nonempty compact convex set of feasible alternatives, a status quo point and “bargaining powers”, Sotskov defines a “local” Nash bargaining problem at each feasible alternative through a specific linearization of agents’ utilities around that point. It is this particular linear utility profile that is used to transform the physical framework into a Nash bargaining problem. The preimages of the Nash bargaining solutions are regarded as “local” solutions to the original bargaining problem, and they are generally referred to as “Nash agreement points”, as “Nash bargaining points” in the case of smooth utilities. Sotskov also constructs a price-allocation Maskin mechanism to Nash-implement the Walrasian rule.

In her paper, “Kalai-Smorodinsky and Maschler-Perles Solutions Under Predonation”, Orbay examines the manipulability of the Kalai-Smorodinsky and Maschler-Perles solutions through predonations and extends Sertel (1991) to a larger class of bargaining problems. In a two-person bargaining model with transferable utilities, a pre-bargaining stage is introduced, in which parties are allowed to unilaterally donate shares of their future payoffs to the other party, thereby changing the bargaining problem which is to be resolved according to a bargaining solution commonly known in advance. Orbay shows that under both the Kalai-Smorodinsky and the Maschler-Perles solution, the bargainer with the higher ideal payoff has incentives to predonate before the bargaining takes place, except in one special case where the threat payoff of the bargainer with the lower ideal payoff is zero while the other’s threat point is not sufficiently high to merit predonation. This result extends Sertel’s (1991) result on the predonational manipulability of the Kalai-Smorodinsky and Maschler-Perles solutions in “simple” bargaining problems to bargaining problems with arbitrary threat points. The final outcomes of both bargaining solutions with predonations turn out to coincide.

## **Part D. Coalitional Stability and Efficiency**

It is no exaggeration to regard coalitions rather than individuals as the basic acting units in a game-theoretic situation. Whether players will turn out to behave separately as “singleton coalitions” or form larger units of joint action is something which should emerge endogenously from the context considered along with its informational, institutional, and legal constraints. In most economic environments,

including oligopolistic contexts and public goods economies, coalition formation seems to be a nonnegligible matter for analysis from the viewpoint of both positive economics and economic design. In some instances, how a society is organized may involve, however, more than the mere specification of a coalitional structure, where coalitions are simply unstructured sets. Many interactions, both economic and social, can best be reflected by network relationships, where the worth of a “coalition” as well as the relative importances of its members are represented through graphs. The papers in Part D focus on coalition formation, with or without a network structure, and in particular are concerned with the stability and efficiency of the coalition structures which form in various environments.

In his paper, “The Stability and Efficiency of Economic and Social Networks”, Jackson deals with the formation of networks, focusing on the tension between pairwise stability and different levels of efficiency. Along with illustrating this tension through a wide spectrum of examples, the paper surveys the most recent general results and open problems regarding network formation. The main assumption concerning the rights structure is that it takes the consent of both parties in order for a link to form, whereas existing links can be severed unilaterally. The stability notion employed by Jackson here is pairwise stability according to which only deviations on a single link at a time are considered under the rights structure specified above. Although this is a rather weak stability notion, it narrows down the class of networks sufficiently for the tension between stability and efficiency to become clearly observable. It turns out that constrained efficiency and pairwise stability cannot be achieved together for all value functions in the presence of component balanced allocation rules satisfying equal treatment of equals. On the other hand, if there exists an efficient network where each vertex has at least degree two, then there exist anonymous and component balanced allocation rules under which efficient and pairwise stable networks are possible. These general results conjoined with the analysis of certain specific examples lead the author to the conclusion that the relationship between the stability and the efficiency of networks is context-dependent. The inefficiencies of some pairwise stable networks are seen to arise from externalities, while there are other contexts where certain power-based incentives seem to lead to inefficiencies in network formation.

In her paper, “Stable Cartel Structures in a Dismantling Game”, Thoron deals with the stability of cartels in a Cournot oligopoly. The heart of the problem lies in the trade-off between the size of the cartel a firm belongs to and the total number of the competitors in a Cournot oligopoly. A firm’s profit is a decreasing function of both the size of the cartel it belongs to and the total number of competing cartels. The coalition formation game proposed by Thoron to analyze cartel stability is such that cross deviations from different coalitions are possible, so long as every firm ends up in a cartel smaller than the one it was previously part of. Referring to such deviations as “dismantling”, Thoron assumes that deviating firms are able to forecast every dismantling deviation on the part of their initial partners, but simply regard the rest of the structure as unaffected by their deviation. Given an initial partition of firms, a cartel is said to be profitable in that structure, if and only if the per-member profit is greater when the cartel is formed than when it breaks up.



Moreover, a cartel is referred to as just profitable, if and only if it is profitable, but becomes non-profitable when a single firm leaves it and acts independently. It turns out that, in a dismantling game, the stable cartel structures are those which consist of independents and the just profitable cartel structures. Thoron also gives a characterization of the set of just profitable cartel structures.

In deriving a coalitional game from a strategic-form game, a crucial question is how one models the coalition formation procedure, as the payoff of each forming coalition depends upon how the rest of the society is organized. The approach Currarini and Morelli adopt in their paper, "A Sequential Approach to the Characteristic Function and the Core in Games with Externalities", is based on the assumption that forming coalitions can exploit a "first mover advantage", where the agents belonging to the rest of the society are regarded as followers who react simultaneously and noncooperatively as singleton coalitions. This coalition formation rule, given *ex ante*, is meant to capture situations where coalitions deviate from the status quo by directly choosing an alternative strategy in the underlying game, as typically exemplified by firms defecting from an industrial cartel by setting a lower price. The main result of the paper establishes sufficient conditions for the nonemptiness of the core of the resulting coalitional game. The most critical one among these sufficient conditions turns out to be strategic complementarity of the underlying normal form games. The role played by strategic complementarity in obtaining a nonempty sequential core is carried out by inducing "nondecreasing best responses" to the leading move of the forming coalition on the part of the agents in the complementary coalition. The results achieved in the paper are illustrated through applications to Cournot and Bertrand oligopolies and public goods economies.

In their paper, "Coalition Structural Games and the Voluntary Provision of Public Goods", Asan and Sanver consider an economy with a single private and a single pure public good, where the public good is produced through agents' voluntary contributions, and every subsociety has the option of separating itself from the rest of the society in both producing and consuming its own public good. The focus of the paper is on stability and efficiency of institutions leading to coalition structures in producing a public good under a given allocation rule, rather than on efficiency of the allocation rule itself. Allowing only individual moves in deviating from a given coalition structure and assuming that exit from and entry into coalitions is free for every individual, Asan and Sanver show that the grand coalition is the unique stable coalition structure, coinciding with the unique efficient partition of the society in this context. The simple wisdom upon which this result is based derives from the fact that, crowding effects being absent, incumbents do not mind newcomers in any coalition, while no individual needs the consent of his/her former partners to leave a coalition. Following the terminology of Sertel (1994) on membership rights, however, the institution of "approved exit" in individual deviations from a given coalition structure has only a tightening effect upon the status quo, leading to more stable coalition structures some of which are inefficient.

## **Part E. Regulating and Organizing Markets**

Regulation can be described as central interference with industrial activities aimed at achieving social efficiency when it cannot be reached through the market itself. This area of economics basically deals with the design of possibly artificial rules under which outcomes that otherwise can only be attained through cooperation can be reached through non-cooperative and decentralized behavior of agents, without requiring information about private particulars of the underlying economy on the part of the designer. The traditional example which gave rise to the need for regulation is that of a natural monopoly. Although the notion of regulation can be traced back to the nineteenth century, it is only in the past three decades that it gained a crucial impetus through its formulation within the framework of mechanism design. The broad coverage that economic theory seems currently to have reached in the area of regulating industries and organizing markets is also exemplified by the papers in this part.

In his paper, "Regulation and Markets for Catastrophe Insurance", Kleindorfer discusses problems associated with the design of markets for catastrophe insurance and the regulation of private companies offering such insurance. The main problem concerning the demand side is stated as the underwillingness, due to a myopic tendency and uninformedness of potential insurance buyers in their purchase of both insurance coverage and mitigation measures. Supply side failures are ascribed to the complexity of understanding and quantifying the risk associated with natural catastrophes. The large uncertainty bounds pertaining to risk estimates, and the correlated structure of losses that result from major events striking a particular region, are established as the two main sources of difficulty which catastrophe insurers face. The former factor complicates the computation of risk-based prices, while the latter requires accumulation of sufficiently large funds over time. It is also argued that these two-sided inadequacies on both the demand and supply sides reinforce each other and, furthermore, the need for regulation they give rise to usually results in regulation going well beyond solvency regulation to cover pricing, entry and exit, and other aspects of insurance, only to add new inefficiencies to the existing ones. The paper concludes that these inadequacies in the catastrophe insurance markets and regulatory ineptness are likely to make this area an important and difficult one for efficient economic design.

Kuhn and Pittel, in their paper, "Incentive-Compatible Regulation of Quality Provision by Natural Monopolies – The Role of Technical Progress", deal with regulating a natural monopoly to raise the quality of the goods and services it provides. Quality is assumed to be unobservable to consumers even after consumption, so that an unregulated monopoly has no sales incentives to get involved in costly activities to raise the quality of its product. However, a failure to meet standards of quality is considered as a social bad, and thus quality regulation is regarded as necessary. The option of generating process innovations by investment in R&D on the part of the monopoly is seen as a potential tool to compensate for the cost- and hence price-raising effect of quality improvements. Informationally,

production costs and therefore the costs of quality enhancement as well as productivity R&D are assumed to be private to the monopoly. On the other hand, both quality and R&D are regarded as observable to the regulator. Kuhn and Pittel consider two different scenarios in their paper, in the first of which decisions of investment in R&D are entirely left to the firm. Although in this setting, where R&D is unregulated, investment in R&D is always efficient, it turns out that social welfare can be improved by also directly regulating R&D so as to reduce the informational rents received by the firm. The “second best solution” which the regulator tries to achieve in the presence of informational rents results in an undersupply of quality as well as underinvestment in R&D, as these form the two sources of information rents.

In their paper, “On the Importance of Sequencing of Markets in Monetary Economies”, Başçı and Sağlam analyze the differences which arise in long-run competitive equilibria from simply changing the order of goods- and labor- market payments in a cash-in-advance model. In an economy with borrowing constraints, if in a production cycle wage payments are made before sales proceed are collected, firms meet the arising financial need through full equity financing conjoined with an optimal dividend policy. Since money is needed as working capital in this context, the output prices turn out to be costs of over-production in a long-run competitive equilibrium, referred to as “working capital premium” by the authors. This premium is accompanied by the real wage being lower than the marginal productivity of labor, as the presence of a cash-in-advance requirement in the labor market limits the demand for labor. On the other hand, if sales revenues can be collected before production costs are paid, then the need for money as working capital and hence the working capital premium both vanish, and the equilibrium wage again reaches the level of marginal productivity of labor. Although both institutional setups lead to Pareto efficient outcomes, neither dominates the other, as the workers prefer an economy where the wages are paid after the good market is closed, while the entrepreneurs prefer that the two markets are sequenced the other way around.

## **Part F. Designing Rights**

The rights structure of a society is without any doubt one of the most fundamental elements regarding its impact upon the behavior of the agents in that society. In mathematical models, the rights that different groups of members in a society are endowed with can be regarded as constraints which optimizing agents have to take into account. Examining the impact of different rights structures upon the outcomes that a society ends up with, as well as utilizing such structures as “mechanisms” to implement socially desirable outcomes are indeed among the major issues that economic and social design deals with. The papers in Part F exemplify this approach in different contexts.

In their paper, “Designing Severance Payments and Decision Rights for Efficient Plant Closure under Profit-Sharing”, Moretto and Rossini deal with the problem of the assignment of the shut-down decision in a profit sharing firm, to achieve efficiency. In the traditional case where the shut-down decision is exogenously assigned to shareholders of the firm, a deadweight loss may occur if the loss born by employees is larger than the benefit received by the shareholders as a consequence of the decision to stop production. Such a situation is observed to be very well possible when there is market uncertainty, and relation- and firm-specific skills of employees make re-employment elsewhere costly on their part. To escape this kind of inefficiency, Moretto and Rossini examine what happens when employees are delegated the decision to close, conjoined with a compensation scheme, whereby the workers are to bear the burden of keeping the firm viable if they choose to do so when the market price for the firm’s product has gone below the minimal level acceptable to owners. The subgame-perfect Nash equilibrium of the resulting game turns out to lead to a continual nondecreasing flow of payments from employees to owners, subject to a participation constraint on the part of the employees.

In his paper, “Moral Hazard and Linear Contracts: Economies with Idiosyncratic Risks”, Citanna addresses the question of mitigating the moral hazard effects in an asymmetric information framework by solving the feasibility problem of exchanges through the introduction of taxes and transfers. The taxation scheme is seen and used as a means of redistributing profits and losses arising from the working of the market. Citanna thereby provides an alternative method to institutional arrangements of limiting the informed party’s market participation proposed as a solution to the moral hazard problem. The model he uses is that of an exchange economy with individual risks, where agents can affect the probability distribution over the states of the world and exchange financial contracts whose payoffs depend on the individual realization of uncertainty. The introduction of suitable participation fees into this framework leads to the existence of equilibrium with moral hazard and linear prices under the assumption that asset payoffs are limited relative to the size of individuals’ endowments.

In her paper, “Equal Awards Versus Equal Losses: Duality in Bankruptcy”, Herrero offers a characterization of the “constrained equal-losses rule” using the duality between this rule and the “constrained equal-awards rule”, and modifies Chun’s (1989) procedure which achieves the latter bankruptcy rule non-cooperatively to provide a non-cooperative foundation for the constrained equal-losses rule. The way the constrained equal-awards rule resolves a given bankruptcy problem is by dividing the firm’s estate equally among the creditors subject to the condition that no one gets more than her claim. The dual of this rule which first (fictitiously) assigns to everyone her entire claim and then induces a feasible division of the estate by allocating “losses” according to this rule is the constrained equal-losses rule. Herrero characterizes the constrained equal-losses rule as the unique rule satisfying equal treatment of equals, path independence and composition from minimal rights, which are dual to equal treatment of equals,

composition and independence of claims truncation, respectively, which jointly characterize the constrained equal-awards rule.

The author modifies Chun's (1989) diminishing claims procedure for surplus-sharing problems to obtain what she calls the unanimous concessions procedure. In the former procedure, agents propose shares, and if they do not agree unanimously on these proposed shares, the initial claims are truncated by the maximal amount allotted to each agent, the agents now facing the residual problem. The unanimous concessions procedure is dual to this approach in its flavor. Under this procedure, if agents disagree on the proposed shares, then the minimal amounts proposed to each agent are assigned, and the agents again are faced and continue with the residual problem. The Nash equilibrium outcomes of the game induced by the unanimous concessions procedure coincide with the shares recommended by the constrained equal-losses rule, whereas the diminishing claims procedure induces a game whose Nash equilibrium outcomes lead to the division recommended by the constrained equal-awards rule.

## **Part G. Information**

The central role that one has been ascribing to informational efficiency in economic theory recently is one that can be hardly disclaimed in many economic and social contexts. Gathering and processing information is, in general, time-consuming and costly. The informational complexity of a procedure proposed to solve a certain social or economic problem may sometimes be so high that it renders the employment of such a procedure simply infeasible. Given that matter is finite in our universe, this infeasibility may even be an absolute one if one assumes that processing one "unit" of information requires the employment of at least one elementary particle. In short, informational complexity, and the cost and value of information along with its time structure are aspects which cannot be disregarded in problems involving information. In this part there are two papers the first of which Hurwicz deals with informational efficiency in the mechanism context, while Meagher, Orbay, and Van Zandt make a comparative study of different information gathering and aggregation procedures employed by a firm.

In his paper, "Mechanism Design Without Games", after having discussed different origins of the concept of an economic mechanism, Hurwicz considers different frameworks, game-theoretic ones and others, under which such mechanisms are studied. He regards the notion of a mechanism as an "umbrella concept" needed for comparative systems studies. Hurwicz's focus is on informational decentralization, rather than the incentive aspects of a mechanism. To formalize the notion of informational decentralization, the Walrasian tâtonnement process is extended to an abstract setting consisting of individual response functions or, equivalently, of individual equilibrium functions. A system is said to be informationally decentralized, if and only if each agent has a response and an equilibrium

function which depend upon his/her own characteristics. The stationary points of the resulting system of equations represent the equilibrium positions in terms of messages, while it is the outcome function which translates joint messages into actions to be undertaken by the agents.

As the author's main interest here is in informational efficiency, problems of incentive compatibility or disequilibrium behavior are not dealt with in this paper. The main problem ascribed to a designer is to find, among decentralized mechanisms realizing a given goal function, one maximizing informational efficiency as measured roughly by the "size" of the joint message space. When the message space is Euclidean, its dimension is taken to represent its "size". In convex economies, the Walrasian and Lindahl mechanisms are noted to have the lowest dimension among decentralized mechanisms realizing the Walrasian and Lindahl goal correspondences, respectively, while satisfying certain regularity conditions. In non-convex environments, however, it turns out that there are no decentralized mechanisms of finite dimension that satisfy continuity requirements and guarantee efficiency of equilibrium outcomes.

Hurwicz concludes his paper by reporting some results from joint work with Reiter on "idealized mechanism construction". In this context, the designer has only the two objectives of realizing the goal function and informational efficiency. And the yardstick for informational efficiency here is taken as the "coarseness" of the covering generated by the mechanism, rather than the "size" of its message space. Although minimal message space size implies maximal coarseness, the converse turns out not to be true. Finally, Hurwicz reports about algorithms which produce maximally coarse informationally decentralized mechanisms, referring to his joint work with Reiter.

In their paper, "Hierarchy Size and Environmental Uncertainty", Meagher, Orbay and Van Zandt compare different information gathering and aggregation procedures employed by a firm to forecast a stochastic process in an attempt to keep up with a changing environment. The focus of the paper is on the relationship between managerial size and environmental volatility for different computation models ascribed to a firm. A large administrative staff enables the firm to gather and aggregate more information, whereby relatively more precise estimates are obtained about the state of the environment at the time when the information was collected. The delay that this information processing results in is shortened when one has a leaner administration that aggregates fewer but more recent data. The authors explore this trade-off contingent upon the parameters of sample size, the delay between gathering a sample and computing a new forecast and the interval between two consecutive samples. The values of these parameters cannot be chosen freely, of course, but are constrained by the information processing capabilities of the administrative staff.

The authors go through the same exercise under policies with and without recall for two different computation models, both with costless and with costly managers. In a policy without recall, when the firm computes a new forecast from the most recently gathered sample, all previous information is entirely disregarded,

whereas in policies with recall, the new information is combined with previous information to update the forecast. The two computation models considered are the parallel random access machine (PRAM) and a variant of the model of associative information processing introduced by Radner (1993).

For the benchmark case of costless managers, the managerial size turns out to decrease monotonically as environmental volatility rises, making the loss due to the delay in information processing more crucial. In the case of costly managers, however, the relationship between environmental volatility and managerial size is found to be non-monotonic. A decrease in volatility not only makes the loss due to delays less important, but also decreases the value of frequent sampling. This trade-off conjoined with the costliness of managers makes the dominating one among these two effects change from range to range of volatility and managerial size.