Status Report
2007 – 2009

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A. History of the Institution

A. A Short History of the Institution

The Max Planck Institute for Research on Collective Goods was founded in 1997 as a temporary project group "Common Goods: Law, Politics and Economics" and transformed into a permanent institute in 2003. Its mission is to study the law, economics, and politics of collective goods, defined to encompass all those goods whose provision and enjoyment are treated as community concerns.

In the early years, the institute had teams of lawyers and political scientists, led by Christoph Engel and Adrienne Héritier. When Adrienne Héritier left in 2003 to accept a joint chair at the European University Institute and the Schuman Centre in Florence, the Max Planck Society appointed the economist Martin Hellwig to replace her. At this point, therefore, the institute consists mainly of lawyers and economists.

In addition, there is a small group of psychologists. Initially brought in by Christoph Engel to support his *behavioral law-and-economics* approach to institutional analysis, in 2007 this turned into an independent Junior Research Group *Intuitive Experts* led by Andreas Glöckner.

From the beginning, the work of the institute had three main goals: It aimed to better understand collective-goods problems, to find better solutions, and to understand the political and legal processes of defining problems and choosing solutions. In the years of the project group, major research efforts concerned

- the law and politics of waste avoidance, recycling, and disposal,
- the governance of the internet, and
- the transformation of the nation state into a multi-level system of governance.

Today, the major research efforts of the institute are concerned with

- the analysis of incentive problems in public-good provision,
- the behaviorally informed design of institutions for the provision of collective goods,
- the organization and regulation of network industries: sector-specific regulation and antitrust
- the regulation of financial markets and financial institutions in order to safeguard financial stability.

The first two lines of research are intended to enlarge our understanding of foundations at a fairly general level. The last two lines of research are concerned with applications. Research objectives and strategies are laid out in this report.

B. The Overarching Framework

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Air, atmosphere, the ozone layer, climate, water, the world's oceans, land, quiet, normal radiation, landscape, fauna and flora, genetic diversity: the policy challenge of providing and distributing such natural resources was the impetus for the Max Planck Society's deliberations to establish a new research facility in the humanities section. However, even in the process of establishing the facility, it became clear that man-made goods also pose structurally related challenges. The protection of our cultural heritage, language, streets, energy networks, the liquidity of markets, the reliability of finance institutions, the stability of the finance system: all these pose very similar problems. This was the reason that the Max Planck Society did not establish an institute for environmental law or environmental policy, but deliberately founded a project group for research on collective goods.

The document on the founding of a research facility describes the problem that needs to be solved as follows: "While, on the one hand, these goods need protection, on the other hand, it is necessary for human life that they remain accessible and are used. This gives rise to a multilayered governance problem: of no slight significance here is an elementary distribution problem, indeed one both between groups or individuals and between states. The common – judicial – characteristic of the natural resources is that they can be placed under the power of disposition of individual legal subjects only to a limited extent. Even when property rights are established, the larger community has the responsibility to suitably proportion the maintenance and use of these goods and to suitably distribute the related costs and benefits. […] The research task of the project group will thus have a public policy orientation."

The multilayered governance problem mentioned in that document arises because collective goods always concern numerous people simultaneously, sometimes the community as a whole, including future generations. Were the dealings with collective goods, their provision and financing, left solely to the decentralized decisions of individuals, it is to be feared that the common dimension would be neglected; insofar, collective decision-making mechanisms are necessary. Paradigmatic for this view is the economic concept of non-excludable public goods. The individual who merely attends to his own use of the public good neglects the use that others draw from it, insofar contributing less to the cost of providing this good than is socially desirable. To take one example, according to this argumentation schema, the dangers to the natural environment because of human activity, including the well-known "tragedy of the commons", arise because individuals give their own use of the environment priority over the maintenance of the environment, which, as a public good, benefits everyone.

The concept of collective goods is, however, more encompassing than the economic concept of public goods. It is in principle possible to make the use of the services of law, schooling, or even streets, excludable, but because open access to these goods is thought superior, it is viewed as a constitutive element of the community. The use of other goods,

such as the services of the large networks of telecommunications and the post, the energy industry and the railways, is tied to the payment of user fees; here too, however, regulations on non-discriminatory access and the universality of services are to ensure that the communal dimension is accounted for. Finally, in a further class of cases, the concern is with the quality of the services and relations, which are in principle left to the decentralized decision-making of individuals in the markets; here, the communal interest, for example in the reliability of financial transactions, can aim to protect both the parties involved and the system, which can hardly function without reciprocal trust in one another.

The negative assertion that the community dimension will be neglected if the dealings with collective goods, their provision and financing remain solely in the hands of decentralized decision-makers still gives us no positive content: It provides no indication of how the community dimension is to be properly dealt with, or which advantages and disadvantages are implicit in the various institutions and rules for dealing with collective goods. In principle, every system for dealing with collective goods faces the difficulty that the required information is not readily available. Insofar as the assessment of the involved parties is relied upon, a dilemma arises: the individual has an incentive to downplay the value that the common good has for him if he expects that he will be required to pay for it, while he has an incentive to exaggerate the value that it has for him if he expects that it will not cost him anything. This dilemma also occurs for purely private goods, but it plays a subordinate role there if the good is provided in a competitive market, in which the individual has no power to influence prices. This mechanism is not available for common goods; the greater and more anonymous the involved community is, the greater the magnitude of the described dilemma.

There are no one-size-fits-all solutions for this dilemma. It is rather necessary to determine in detail which advantages and disadvantages the rules and institutions under discussion have for each of the various collective goods. Under consideration are governmental activities, i.e., political or administrative decision-making, market-based, contractual solutions, or arrangements based on individuals' decisions, yet under the influence of state-determined norms about minimal standards, liability laws, etc. The relative advantages and disadvantages of the various alternatives depend on which characteristics the collective goods under discussion possess and what precisely determines the communal dimension of the good in question.

The institute combines basic research and practical applications, for one, by dealing with the theory of collective goods and their provision under diverse abstractly formulated general conditions, and, for another, by developing concrete proposals for the design of (legal and extra-legal) institutions for the provision of individual collective goods. This is of necessity an interdisciplinary endeavour. Economists are needed to understand and structure the allocation and incentive problems that arise. Political scientists are needed to understand the mechanisms of political decision-making used for these goods. And lawyers are needed to develop proposals for the design of rules and institutions in light of concrete legal norms, so that they fit the legal order. The selective reception of results of

the neighbouring disciplines is not enough. Especially in the analysis of concrete problems, it is important that all three disciplines are intensively engaged with one another. For example, the interplay between decentral market mechanisms and political decision-making mechanisms needs to be studied jointly by economists and political scientists. To judge the allocation effects of certain decisions of substantive law or procedural law, economists and legal scholars must work in collaboration.

C. Research Program

C. Research Program

C.I Public Goods and Welfare Economics: Incentive Mechanisms, Finance and Governance

C.I.1 Introduction

A major part of our research effort is devoted to the development of an appropriate conceptual framework for the normative analysis of public-goods provision when the value that any one person attaches to the public good is known only to that very person. Whereas most of the literature considers the problem of public-good provision with private information in a small economy, we focus on large economies, in which any one individual is too insignificant to affect the level of public-good provision. We have several reasons for choosing this focus:

- Whereas the small-economy models studied in the literature are useful, e.g., for thinking about how the inhabitants of a village can co-ordinate on the installation of an irrigation system, we believe that it is not so useful for thinking about how a country with more than a million inhabitants should choose the level of resources that are devoted to national defense or to the legal system.
- Most models of taxation are models of large economies, as are most models of market equilibrium for private goods. If there is to be any hope of integrating public-goods provision theory with the rest of welfare economics, we need to have a convincing account of public-good provision in a large economy.
- The differences between private and public goods, more precisely, between goods that exhibit rivalry in consumption and goods that do not, emerges most clearly when the number of participants is large.
- As yet, we do not have a good conceptual and formal apparatus for thinking about public-good provision in a large economy. If individual valuations are independent and we treat the large economy as a limit of finite economies, a law of large numbers implies that the cross-section distribution of valuations and therefore the efficient level of public-good provision is common knowledge. To even talk about an information problem involved in the determination of efficient public-goods provision levels in large economies, one must have correlated values. Our understanding of incentive mechanisms with correlated values, however, is unsatisfactory.

Mention of the problem of how a country with millions of inhabitants should decide on spending levels for national defense or for the judicial system undoubtedly raises the question why we are studying this as a problem of normative economics rather than political science. We do so because we want to have a measuring rod by which to assess the strengths and weaknesses of decision procedures that are actually used.

Over the past thirty or so years, normative economics has learnt that simple a simple efficiency standard that abstracts from issues of information and incentives is not very useful. The theory of mechanism design has taught us to take account of information and incentive constraints and to ask what measure of efficiency can be achieved when these constraints are taken into account. This is the very type of question that we are asking about the provision and financing of public goods in large economies.

The importance of the question is readily seen if one goes back to the typical economist's critique that political decision making gives rise to inefficient outcomes because it fails to take account of preference intensities. A majority of people who care just slightly about an issue can impose its will on a minority who care intensely about it. If the disparity between the two groups is sufficiently large, the result is inefficient in the sense that everybody would be better off if the minority was able to "bribe" the majority to vote differently. In this critique of collective decision making by voting, no account is taken of possible information asymmetries. One result of our research shows that, once these information asymmetries are taken into account, it may not even be possible to rely on anything else than a voting mechanism.

The research covered by this report under the general heading of *Public Goods and Welfare Economics* falls into three broad areas:

- Development of a conceptual and formal framework that is suitable for dealing with the revelation, communication and use of private information in a large economy.
- Development of an overarching conceptual and formal framework that can be used to integrate the theory of public-goods provision with the rest of normative economics, in particular, the theories of public-sector pricing and of taxation.
- Development of a conceptual and formal framework that is suitable to address issues concerning incentives and governance on the supply side of public-good provision and that can also be used to integrate the analysis of such issues with the more conventional analyses of demand and funding.

The following Sections C.I.2 – C.I.4 of this report will take up each of these areas in turn.

C.I.2 The Mechanism Design Approach to Public-Good Provision

C.I.2.1 Public Goods versus Private Goods: What is the Difference?

To fix semantics, we define a public good to be one that exhibits *nonrivalry* in the sense that one person's "consumption" of this good does not preclude another person from "consuming" it as well. When several people "consume" the public good, there may be external effects, e.g. negative externalities from crowding or positive externalities from

mutual entertainment, but there is not the kind of rivalry in consumption that one has with private goods where one person's eating a piece of bread precludes another person's eating it as well.

We focus on nonrivalry as the key characteristic because this property is at the core of the allocation problem of public-good provision. Because of nonrivalry, it it efficient for people to get together and to coordinate activities so as to exploit the benefits from doing things jointly. Other characteristics, such as nonexcludability, affect the set of procedures that a community can use to implement a scheme for public-good provision and finance, but such considerations seem secondary to the main issue that nonrivalry is the reason why public-good provision is a collective, rather than individual concern.

The mechanism design approach to public-goods provision asks how a community of n people can decide how much of a public good should be provided and how this should be paid for. If each person's tastes were publicly known, it would be easy to implement an efficient level of public-good provision. If tastes are private information, the question is whether and how "the system" can obtain the information that is needed for this purpose. Because this information must come from the individuals who hold it, the question is whether and how these individuals can be given incentives to properly reveal this information to "the system".

The bottom line of the literature is that it is always possible to provide individuals with the incentive to reveal their preferences in such a way that an efficient level of public-good provision can be implemented. For this purpose, financial contributions must be calibrated to individuals' expressions of preferences for the public good in such a way that there are neither incentives to overstate preferences for the public good in the hope that this raises the likelihood of provision at the expense of others nor incentives to understate preferences for the public good in the hope that this reduces one's payment obligations without too much of an effect on the likelihood of provision. The mechanism design literature shows that one can always find payment schemes which satisfy this condition.[1]

However, there may be a conflict between incentive compatibility, feasibility, i.e., the ability to raise sufficient funds for provision of the public good, and voluntariness of participation. In some instances, it is impossible to have a public good provided efficiently on the basis of voluntary contracting. Some coercion may be needed. The original idea of Lindahl (1919) that the notion of a public good may provide the basis for a contractarian theory of the state is then moot. Samuelson's (1954) conjecture that private, spontaneous arrangements are inappropriate for efficient public good provision is vindicated.

Samuelson (1954) stressed the difference between public and private goods. However, the mechanism design literature is not so clear on the matter. Indeed, if we consider an

[1] This is shown by Clarke (1971) and Groves (1973) for implementation in dominant strategies and by d'Aspremont and Gérard-Varet (1979) for Bayes-Nash implementation.

economy with n participants with independent private values,[2] we get the same kinds of impossibility theorems for private and for public goods: On the basis of voluntary participation and in the absence of a third party providing a subsidy to "the system", it is impossible to have a decision rule that induces an efficient allocation under all circumstances, unless the information that is available ex ante is sufficient to determine what the allocation should be.[3] If coercion is allowed, there is no problem in achieving efficiency for either kind of good.

To find a difference between public and private goods, one must look at the behaviour of such systems as the number of participants becomes large. For private goods, a larger number of participants means that there is more competition. This reduces the scope for dissembling, i.e., acting as if one cared less for a good than one actually does, in order to get a better price. With competition from others, attempts to dissemble are likely to be punished by someone else getting the good in question. Hence, there are approximation theorems showing that, for private goods, there are incentive mechanisms that induce approximately efficient allocations, even with a requirement of voluntary participation, if the number of participants is large.[4]

For public goods, there is no such competition effect. An increase in the number of participants has two different effects. On the one hand, there are more people to share the costs. On the other hand, the probability that an individual's expression of preferences affects the aggregate decision is smaller; this reduces the scope for getting a person to contribute financially, e.g., by having an increase in financial contribution commensurate to the increase in the probability that the public good will be provided. The second effect dominates if individual valuations are mutually independent and if the cost of providing the public good is commensurate to the number of participants, e.g., if the public good is a legal system whose costs are proportional, or even more than proportional, to the number of parties who may give rise to legal disputes. In this case, the expected level of public-good provision under *any* incentive mechanism that relies on voluntary participation must be close to zero.[5]

Samuelson's view about public goods versus private goods, the latter being efficiently provided by a market system, the former not being efficiently provided at all by a "spontaneous decentralized" solution, thus seem to find its proper place in a setting with many participants where, one the one hand, the forces of competition eliminate incentive and information problems in the allocation of private goods, and, on the other hand, incentive and information problems in the articulation of preferences for a public good make it impossible to get the public good financed.

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2 Independent private values: If one person is known to have a high preference for the good in question, this contains no information about any other person's preference for this good. Preferences of different people are stochastically independent.

3 For private goods, see Myerson and Satterthwaite (1983), for public goods, Güth and Hellwig (1986), Mailath and Postlewaite (1990).

4 Wilson (1985).

5 See Mailath and Postlewaite (1990), Hellwig (2003).

However, in the transition from a finite economy to a large economy, the question of what is the proper amount of resources to be devoted to public-goods provision is lost, at least in the independent private values framework that has been used by this literature. In this framework, a version of the law of large numbers implies that cross-section distributions of public-goods valuations are commonly known. Given this information, the efficient amount of public-goods provision, first-best, second-best, or fifty-sixth-best, is also known. The only information problem that remains is the assignment problem of who has a high valuation and who has a low valuation for the public good. This assignment problem matters for the distribution of financing contributions but *not* for the decision on how much of the public good to provide.

C.I.2.2 Do Correlations Make Incentive Problems Disappear?

If one wants to avoid the conclusion that the proper amount of resources to be devoted to public-goods provision is known *a priori* because the cross-section distribution of valuations for the public good is pinned down by the law of large numbers, one must assume that the public-goods valuations of different people are correlated so that the law of large numbers does not apply. However, for models with correlated valuations, the impossibility theorems mentioned above are no longer valid. Indeed, for models with private goods, Crémer and McLean (1988) and McAfee and Reny (1992) have shown that one can use the correlations in order to prevent people from obtaining "information rents", i.e., benefits that they must be given if they are to be induced to properly reveal their information. For public goods, Johnson, Pratt, and Zeckhauser (1990) and d'Aspremont, Crémer, and Gérard-Varet (2004) show that, generically, incentive schemes that use correlations to harshly penalize deviations when communications from different people are too much in disagreement, can be used to implement first-best outcomes – with voluntary participation and without a third party providing a subsidy, at least in expected-value terms. The incentive schemes that these analyses involve are not very convincing. They look more like artefacts of the mathematics than anything that might be used in reality. But then the question is what precisely is deemed to be implausible about them.

One answer to this question has been proposed by Neeman (2004) and Heifetz and Neeman (2006). In their view, the results of Crémer and McLean (1988), as well as the other literature, rest on an implicit assumption, which they deem to be unpalatable, namely, that agents' preferences for a good can be inferred from their beliefs about the rest of the world. Crémer and McLean (1988) do not actually specify people's beliefs. They assume that people's preference parameters are the only source of information asymmetry and heterogeneity. Beliefs about the rest of world are implicitly defined as conditional expectations given their own characteristics and given the overall structure of correlations of characteristics across agents. Generically, preference parameters can be inferred from these beliefs. Moreover, because differences in beliefs induce differences in attitudes towards bets, i.e., state-contingent payment schemes, these differences in atti-

tudes towards bets can be used to extract all rents. According to Heifetz and Neeman (2006), the logic of the Crémer-McLean argument breaks down if people have sources of information other than their preference parameters. In this case, it is quite possible for a given belief about the rest of the world to be compatible with two distinct values of preferences, say a value of zero and a value of ten for the good in question. Because the person with a value of ten for the good in question has the same beliefs as the person with a value of zero, it is then not possible to make the person with a value of ten reveal his high valuation and at the same time surrender the benefit that he obtains if he is actually given the enjoyment of the good; after all, this person could always act as if his value was zero. Neeman (2004) uses a version of this argument in order to prove a version of the Mailath-Postlewaite (1990) theorem on the impossibility of public-good provision in a large economy with voluntary participation, this one with correlated values and under an assumption that, uniformly across economies with varying numbers of participants, there always is a probability that a person holding a certain set of beliefs might assign zero value to the public good. Heifetz and Neeman (2006) argue that, in the set of relevant incomplete information models, the "Beliefs Determine Preferences" (BDP) property of Crémer and McLean is in fact negligible.

Gizatulina and Hellwig (2009a, 2009b) throw some doubts on these results. Gizatulina and Hellwig (2009a) show that the uniformity of violation of BDP which Neeman (2004) assumes, regardless of how many people there are in the economy, is incompatible with the notion that agents might be *informationally small*. The concept of informational smallness has been introduced by Palfrey and Srivastava (1986) and McLean and Postlewaite (2002) in order to articulate the idea that a person's ability to exploit information advantages might be limited if the information held by other agents (collectively) comes close to making this person's information redundant. In Gizatulina and Hellwig (2009a), each person has private information about his preferences, but other people have noisy signals about these preferences. If there are many such people, and they can be induced to reveal these signals, an average of the signals can be used to induce truthful preference revelation at practically no cost. Thus, if the number of participants is large, an approximately efficient allocation rule can be implemented although participation is voluntary, the cost of public-good provision is proportional to the number of participants, and the BDP property is violated.

Gizatulina and Hellwig (2009b) start from the observation that neither Neeman (2004) nor Heifetz and Neeman (2006) make any use of the notion of beliefs as conditional expectations. They do require that there should be a common prior from which the beliefs of different agents in the economy are derived by conditioning on some intervening information, but this requirement does not enter the formal analysis. In particular, no attention is paid to the fact that information about one's preferences is part of the information on which beliefs are conditioned. Gizatulina and Hellwig (2009b) study the genericity of the BDP property under the assumption that each agent observes a certain set of information variables, among them his own preferences. Using methods from differential topology (Whitney's Embedding Theorem), they show that priors exhibiting the

BDP property are in fact topologically generic in the set of all priors with continuously differentiable densities if the set of objects about which agents form their beliefs are sufficiently rich relative to their own information variables, formally if the dimension of the set of objects about which people form their beliefs is more than twice the dimension of their own information variables. This condition is automatically satisfied if the information variables of all participants have the same dimension and there are more than three participants.

We believe, but have not yet been able to show, that this genericity result can be extended to the conclusion that, with correlated values, generically, it is possible to prevent people from earning information rents, and, therefore, generically, it is possible to implement efficient allocations even with voluntary participation. Because BDP has only been shown to be necessary and has not been shown to be sufficient for the elimination of information rents, this is an open question.

In thinking about the relation between beliefs and preferences in models with correlations, we have observed that the standard foundational model for studying strategic interaction when people have incomplete information, the so-called universal type space of Mertens and Zamir (1985), is somewhat less general than has been thought. The Mertens-Zamir formulation does not provide a proper framework for studying the role of information signals that people receive and the impact of these signals on their beliefs, beliefs about beliefs, etc. Gizatulina (2009) has examples to this effect. At this point, the question is what deeper principles or insights may be gained from these examples.

The work discussed in the preceding paragraphs should not be interpreted as saying that we regard Crémer-McLean type mechanisms as plausible, or that we consider the mechanisms of Johnson, Pratt, and Zeckhauser (1990) and d'Aspremont, Crémer, and Gérard-Varet (2004) as an appropriate basis for tackling social choice problems involving public goods. The problem is to understand precisely why these approaches should be considered unsatisfactory. Gizatulina and Hellwig (2009a, 2009b) should be interpreted as saying that the reliance of Crémer-McLean type mechanisms on the BDP property is less problematic than has been suggested and, perhaps, a criticism of such mechanisms must dig deeper.

C.I.2.3 Robustness

The ability to exploit correlations between valuations requires precise information not just about the joint distribution of the different participants' public-good valuations, but also about the different participants' beliefs about the other agents' valuations, the other agents' beliefs about the other agents' valuations, etc. It seems implausible that a mechanism designer should have this information. Ledyard (1979) and Bergemann and Morris (2005) have proposed a *robustness requirement* that would eliminate the dependence of an incentive scheme on this kind of information. According to Bergemann and

Morris, an social choice function, e.g. in the public-good provision problem a function mapping cross-section distributions of valuations into public-good provision levels and payment schemes, is *robustly implementable* if, for each specification of "type spaces", in particular, for each specification of beliefs that agents hold about each other, one can find an incentive mechanism that implements the outcome function in question.

In public-good provision problems with quasi-linear preferences, robust implementability is, in fact, equivalent to *ex post* implementability and to implementability in dominant strategies. This eliminates all social choice functions whose implementation would involve an exploitation of correlations and agents' beliefs about correlations. In particular, social choice functions with first-best outcomes are not robustly implementable. The mechanisms for first-best implementation in Johnson et al. or d'Aspremont et al. make essential use of information about beliefs, beliefs about beliefs, etc.

Given these findings, Bierbrauer and Hellwig (forthcoming) argue that the robustness criterion of Ledyard (1979) and Bergemann and Morris (2005) provides the proper setting for understanding the essence of the difference between public and private goods. All the findings from the independent-private-values case carry over to robust implementation with correlated values. In particular, (i) for private goods, approximately efficient implementation is possible with voluntary participation if the number of participants is large, and (ii) for public goods with provision costs commensurate to the number of participants, hardly any provision at all is possible with voluntary participation if the number of participants is large. These results hold regardless of what is being assumed about correlation structures. In particular, they leave room for an analysis of large economies without a law of large numbers, in which the question of how much of the public good should be provided is not moot.

C.I.2.4 Voluntariness of Participation versus Coercion

As mentioned above, the various theorems concerning the impossibility of implementing efficient allocations under conditions of incomplete information all involve a requirement that participation be voluntary. As such, these theorems provide an insight into why a contractarian approach to public good provision is unsatisfactory. At the same time, they raise the normative question whether it is appropriate to allow for voluntary participation or whether it wouldn't be preferable to coerce people into participating, asking them to contribute even if they do not draw any benefits from the public good in question. Though formulated in the narrow context of allocation theory for the provision of public goods, this question touches the core of the relation between the community (the state) and the individual.

Bierbrauer (2009c, 2009d) develops a framework for posing this question in a nontrivial way. The idea is to endogenize the mechanism designer, introducing a prior stage at which the participants assign to someone the right to propose and to implement a

mechanism for solving the given allocation problem. The question is in what circumstances people at this prior stage would wish to impose a condition requiring the mechanism designer to respect participation constraints or, equivalently, in what circumstances they would wish to retain a right of vetoing the mechanism that will be subsequently proposed and implemented.

Bierbrauer (2009c) shows that a right of veto, i.e., an imposition of participation constraints is undesirable if the mechanism designer is known to be a Pigouvian welfare maximizer. Put differently, a necessary condition for the desirability of participation constraints is that there is an agency conflict between the consumers of the public good and the institution in charge of organizing its supply. This questions the relevance of models that simultaneously assume that the mechanism designer is benevolent and at the same time has to obeye participation constraints. Indeed, the agency conflict must be sufficiently intense to justify the imposition of participation constraints. Participation constraints are desirable if the mechanism designer is known to be a malevolent Leviathan, out to maximize resources that he can extract from the economy, or simply a profit-maximizing firm.

Bierbrauer (2009d) studies the scope for using regulation to reduce or eliminate abuses by a profit-maximizing firm when the regulator is uninformed about the underlying state of the economy, i.e., the distribution of participants' preferences and the production costs. In this setting, too, it may be desirable to have participation constraints, i.e., to give each participant the right to veto the proposed mechanism. This right implies that people who do not benefit from the public good cannot be made to pay for it, and payments must come from distortionary sources of finance, e.g., entry fees when exclusion is possible, but the inefficiency that is thereby induced is less important than the constraint that the veto imposes on the provider.

C.I.2.5 Coalition Proofness

Even if one is not concerned about problems of power abuse, one may be less than convinced by the proposition that, in the absence of participation constraints, it is always possible to implement first-best allocations. Following Bierbrauer (2009a), Bierbrauer and Hellwig (2009) consider the implications of imposing an additional requirement of *coalition proofness*.

The additional requirement is motivated by the observation that robust implementation of first-best allocation rules may have to rely on people giving information that they would be unwilling to give if they appreciated the way it is being used. In a large economy, where no one individual has a significant impact on the level of public-good provision, individual incentive compatibility conditions are trivially met if payments are insensitive to people's communications about their preferences. One can thus use a scheme with equal cost sharing to find out the aggregate valuation for a public good and to implement a

first-best provision rule; this kind of implementation is actually robust in the sense of Bergemann and Morris (2005).

However, this kind of implementation is abusing the notion that, if a person's communication about his or her preferences does not make a difference to either the level of public-goods provision or the payment that the person has to make, then the person is indifferent between all messages and therefore may as well communicate the truth. If there was just the slightest chance that a person's communication would make a difference, at least some people would strictly prefer *not* to communicate the truth.

To see why this might happen, observe that first-best implementation relies on information concerning the intensities of people's preferences. If there is a large number of people whose benefits from the public good are just barely less than their share of the cost, first-best implementation may require that the public good be provided because the large benefits that the public good provides to a few other people are more than enough to outweigh this small shortfall. If, instead, the people who oppose the public good have no benefit at all from it, first-best implementation may require that the public good should not be provided because the shortfall of their benefits relative to their costs is not compensated by the net benefits that are available to others. In this constellation, the overall outcome depends on the information that can only be obtained from people who don't want the public good to be provided at all, namely whether their opposition is mild or strong. Truthtelling is individually incentive compatible because nobody believes the information that he provides to make a difference. However, truthtelling is not coalition-proof: If someone was to organize a coalition of opponents so as to coordinate on a manipulation of the information they provide, the overall incentive mechanism would no longer be able to implement first-best outcomes.

Bierbrauer and Hellwig (2009) provide an abstract formulation of the requirement of coalition proofness and its implications for robust implementability in the public-good provision problem. Following Laffont and Martimort (1997, 2000), in addition to robust incentive compatibility, they require that the incentive mechanism for public-good provision be immune to the introduction of a "manipulation mechanism" whereby a coalition organizer collects information from coalition members and uses this information to distort the information that is provided to the overall mechanism. The introduction of a manipulation mechanism is itself modelled as a mechanism design problem with its own set of incetive and participation constraints. Coalition proofness fails if there exist a manipulation mechanism and a set of agents such that, if all agents in this set subscribe to the manipulation mechanism, and all other agents do not, then all agents in the set are strictly better off than they would be without the manipulation mechanism.

For the simplest version of the public-good provision problem, with a non-excludable public good coming as a single, indivisible unit that costs k, Bierbrauer and Hellwig (2009) show that robust implementability and coalition proofness jointly imply that (i) people's payments must be the same in all states in which the public good is provided and the same in all states in which the public good is not provided, and that (ii) the

decision to provide the public good must be a non-decreasing function of the number of participants for whom the benefits of the public good exceeds the difference between provision-state payments and non-provision-state payments. Information about the intensities of likes and dislikes cannot be used because reports about this information are subject to manipulation by the coalitions concerned. Whereas conditions (i) and (ii) are only shown to be necessary for robust implementability and coalition proofness, they are in fact necessary and sufficient if the requirement of coalition proofness is weakened to the effect that immunity is only required against manipulations by coalitions that are themselves immune to manipulations by further subcoalitions.

Bierbrauer and Hellwig (2009) also show that robustly implementable and (weakly) coalition-proof social choice functions can in fact be implemented by *voting mechanisms*, i.e., by mechanisms where people are simply asked to vote for or against provision of the public good, and the outcome is made to depend on the number of "yes" votes. The standard economist's criticism that voting abstracts from intensities of likes and dislikes and therefore leads to inefficient outcomes is therefore moot, at least if one allows for the formation of coalitions that distort information about the intensities of likes and dislikes.

C.I.2.6 Informative Voting

An alternative approach to articulating what precisely is problematic about first-best implementation in large economies has been pursued by Bierbrauer and Sahm (2006, 2008).

Bierbrauer and Sahm (2006) start from the observation that, in the large economy, with public-good provision decisions and payments unaffected by any one agent's behaviour, people are indifferent as to what they communicate to "the system". Given this observation, they impose the additional requirement that the chosen actions should still be considered optimal if there was even the slightest chance of their affecting aggregate outcomes. This corresponds to the assumption of *informative voting* in political economy, whereby people vote their preferences even though, as individuals, they do not expect their votes to have an effect on aggregate outcomes. In a large economy, this assumption imposes additional constraints on mechanism design. These constraints typically preclude the implementation of first-best allocations. The reasons are roughly the same as for the constraints imposed by coalition proofness.

For a better understanding of their approach, Bierbrauer and Sahm also study incentive mechanisms for public-good provision that condition only on information received from people belonging to a finite sample of the population. Such mechanisms have previously been studied by Green and Laffont (1979) under the assumption that people in the sample are subject to a different payment scheme from the rest of the population. Bierbrauer and Sahm (2008) show that this condition is actually necessary for first-best implementation in this approach. If people in the sample are subject to the same pay-

ment rule as the rest of the population, first-best allocations cannot in general be implemented. In this case, if the sample is large, the optimal mechanism conditioning on information from people in the sample actually yields approximately the same outcomes as the optimal mechanism in the large economy with the informative-voting condition as an additional constraint. Bierbrauer and Sahm (2008) discuss the implications of these findings for a welfare assessment of democratic voting.

C.I.3 Public-Goods Provision, Public-Sector Pricing and Taxation

C.I.3.1 Public-Goods Finance under Participation Constraints

Textbook treatments of public economics are usually split into treatments of mechanism design and public-goods provision, public-sector pricing under a government budget constraint, and redistributive taxation. Relations between these three locks are rarely discussed. Our work over the past few years has attempted to overcome this separation and to provide an integrated framework for public economics within which relations of the different parts to each other can be discussed and potential conflicts and contradictions assessed. As a step in this direction, Hellwig (2004/2009, 2007a) has shown that the traditional three-way split between the theory of mechanism design and public-goods provision, the Ramsey-Boiteux theory of public-sector pricing under a government budget constraint, and the theory of redistributive taxation should be replaced by a two-way split between models with and models without participation constraints. Hellwig (2007a) has integrated the Ramsey-Boiteux theory of public-sector pricing under a government budget constraint with the mechanism design approach to public-goods provision, showing that, if participation constraints are imposed and if, in addition, there is no way to prevent agents from retrading goods among themselves, then Ramsey-Boiteux pricing emerges as a second-best mechanism under incomplete information. Access prices for excludable public goods (or indirect taxes) are needed to finance the public sector when participation constraints preclude the levying of lump sum taxes for this purpose.

The Ramsey-Boiteux approach itself has been criticized by Atkinson and Stiglitz (1976) for not paying sufficient attention to the role of direct taxation as a source of government funds.

The use of income taxes as a source of public-goods finance is studied in Hellwig (2004/2009). This paper allows for endogenous production and for income taxation as a way of extracting some of the surplus from production without violating participation constraints. However, as in Mirrlees (1971), levels of labour productivity differ across people, individual productivity levels are private information, and the scope for income taxation is limited by incentive considerations. Again under the additional assumption that people are free to retrade private goods and unbundled public-goods admission tickets, Hellwig (2004/2009) shows that the Atkinson-Stiglitz critique of the Ramsey-

Boiteux theory is valid in the sense that it is desirable to use nonlinear income taxes as a source of funds for financing public goods and public services. However, Hellwig (2004/2009) also shows that, contrary to the claims of Atkinson and Stiglitz, positive admission fees for excludable public goods as well as nonuniform indirect taxes are desirable, in addition to income taxation, if participation constraints are imposed. Optimal public sector prices and indirect taxes and optimal income tax schedules must satisfy a version of the Ramsey-Boiteux inverse-elasticities rule and a version of the Mirrlees formula for the optimal marginal income tax. This paper is now in its third round with *Econometrica*.

Bierbrauer (2009 d) criticizes Hellwig's (2004/2009) dichotomy between models with and models without participation constraints on the grounds that, if participation constraints are to be taken seriously, they must be derived rather than imposed. For a model of the provision of a single excludable public good, he shows that this can actually be done if the provision is delegated to a profit-maximizing entrepreneur. If the entrepreneur's cost is his own private information, the imposition of participation constraints, i.e., giving each agent a veto right may be the only viable way of limiting the monopoly profits that the entrepreneur might otherwise extract.

C.I.3.2 Public Goods Provision, Income Taxation, and Redistribution Without Participation Constraints

If no participation constraints are imposed, public-good provision can in principle be financed by nondistortionary, lump sum taxation. The Atkinson-Stiglitz (1976) critique of the Ramsey-Boiteux approach to public-sector pricing and indirect taxation is therefore applicable. There remains the question of what can be said about distributive concerns and, in particular, the relation between public-good provision and utilitarian redistribution à la Mirrlees (1971). If differences in earning abilities were the only source of heterogeneity and, hence, the only source of distributive concerns, the Atkinson-Stiglitz theorem would imply that, even with distributive concerns, it is undesirable to charge public-sector prices in excess of marginal costs or to levy distortionary indirect taxes unless, due to complementarities in consumption, these measures help to reduce distortions in redistributive income taxation.[6] As discussed in Hellwig (2004/2009, 2005, 2010 a), however, one must also take account of differences in public-goods preferences as a source of heterogeneity and of distributive concerns. For a single excludable public good, Hellwig (2005) has shown that such distributive concerns can make it desirable to charge access prices above marginal costs in order to facilitate redistribution from people who gain a lot of utility from the enjoyment of the public good to people who do not draw such benefits from it. Hellwig (2010 a) shows that, in this setting, simple pricing mechanisms may actually be dominated by mechanisms with nondegenerate admission lotteries, with higher prices charged for admission lotteries with higher admission probabilities.

[6] Minor extensions of this theorem are given in Hellwig (2009, 2010 b).

Hellwig (2010 a) also provides a sufficient condition for randomization to be undesirable; remarkably, this condition is the same that ensures undesirability of randomization in the literature on price discrimination by a multi-product monopolist.

Whereas Hellwig (2005, 2010 a) deal with the case of a single excludable public good, without any concern for the production side of the economy, Hellwig (2004/2009) studies an integrated model with multiple public goods and endogenous production, with heterogeneity in productivities (earning abilities) as well as public-goods preferences. In this model, each source of heterogeneity gives rise to distributive concerns of its own. If the different sources of heterogeneity are independent, each one of them calls for distortions in pricing or taxation as a basis for redistribution, in admission fees for excludable public goods as well as income taxes. If the different sources of heterogeneity are positively affiliated, the distributive concerns are even stronger. The resulting formulae for optimal public-sector prices and income taxes can be interpreted as a combination of a Ramsey-Boiteux weighted inverse-elasticities and the Mirrlees rule for the optimal marginal income tax. Because of the multiple sources of heterogeneity and distributive concerns, the Atkinson-Stiglitz theorem does not apply.

As an offshoot from Hellwig (2004/2009), Hellwig (2007 b, c) has taken a new look at the standard model of optimal utilitarian income taxation. Hellwig (2007 b) provides a new formulation of the Mirrlees-Seade characterization of the optimal income tax schedule – in a more general model, under weaker assumptions, and with a proof that clarifies the structure of the argument, relating the mathematics to the economics and showing what exactly is the role of each assumption that is imposed. Relying on the analysis of Hellwig (2007 b), Hellwig (2007 c) shows that randomization in income taxation is undesirable if preferences exhibit a property of nondecreasing risk aversion/inequality aversion; examples in the literature, in which randomization is desirable, are thereby put into perspective.

As a further offshoot from Hellwig (2007 b), Hellwig (2006/2009) and Hellwig (2008) develop new techniques for dealing with incentive problems that involve unidimensional hidden characteristics. Hellwig (2008) extends Pontryagin's maximum principle to problems of optimum control with monotonicity constraints on the control variables. Incentive problems with unidimensional hidden characteristics naturally give rise to such constraints as second-order conditions for incentive compatibility. Relying on this mathematical theorem, Hellwig (2006/2009) develops a technique for studying incentive problems with unidimensional hidden characteristics in a unified way, without making any assumption about the presence or absence of bunching or about the continuity of solution functions. The analysis encompasses mixed distributions that involve mass points as well as a continuous part. Interior mass points are shown to be a natural source of bunching as well as discontinuities in solution functions. Otherwise, the standard properties of solutions to such incentive problems are shown to generalize.

Whereas Hellwig (2004/2009, 2005, 2010 a) studies models of large economies with cross-section distributions of taste and productivity parameters satisfying a law of large

numbers (and therefore being common knowledge). In contrast, Bierbrauer (2008, 2009 a, 2009 b) and Bierbrauer and Sahm (2008) study the interdependence of public-good provision and income taxation when there is aggregate uncertainty about public-good preferences, i.e., there is a genuine problem of finding out what level of public-good provision is desirable. Bierbrauer (2009 a) shows that, if a robustness condition is imposed, the standard procedure of having separate analyses of public-good provision and income taxation, effectively neglecting the information problems in public-good provision,[7] is vindicated, at least if preferences are additively separable between consumption and leisure. In this case, the arguments given in Section C.I.2.3 imply that, in a large economy, it is always possible to induce truthtelling about public-good preferences by having payments be independent of reported preferences; moreover, implementation is independent of people's beliefs about each other, i.e., robust. Given the financing needs that arise from efficient public-goods provision, there remains the Mirrlees problem of determining an optimal income tax schedule with a view to these financing needs and redistribution.

The analysis in Bierbrauer (2009 a) is subject to the criticisms that Bierbrauer and Hellwig (2009)[8] raise against the notion that, in a large economy, first-best implementation is trivial because people feel that they are insignificant and therefore may as well tell the truth. Taking account of this criticism, Bierbrauer (2008) takes another look at the model of Bierbrauer (2009 a), imposing requirements of coalition proofness as well as individual incentive compatibility. Coalition proofness typically precludes first-best implementation. The additional constraints that coalition proofness imposes bear a certain formal similarity to incentive requirements for Clarke-Groves dominant-strategy implementation, here, however, applied to coalitions of people with the same types. These requirements destroy the separability of the public-good provision and income tax problems in Bierbrauer (2009 a). Bierbrauer (2009 b) provides a concrete example with two income classes and public-goods preferences that are class-specific, at least from an *ex ante* perspective. In this example, the class-specificity public-good preferences has the consequence that, for some parameter constellations, one must either forego efficient public-good provision or reduce the redistributive scope of income taxation.

The interdependence of public-good provision and income taxation is also central to Traxler (2009 b, 2009 c). These papers study a political-economy model of public-good provision financed by a linear income tax when people can engage in activities that permit them to avoid taxation. The median-voter theorem applies. However, the median voter is defined in terms of after-tax incomes, rather than pre-tax incomes or wage rates. Depending on what one assumes about people's avoidance costs, rankings in terms of after-tax and pre-tax incomes need not be the same. In this case, there can be redistribution from the middle to the top and the bottom of the income distribution. There can be under-provision as well as over-provision the public good, even though the median

7 See, e.g., Boadway and Keen (1993).

8 See Section C.I.2.4 above.

income level is less than the mean. When there is over-provision, the inefficiency is the lower, the higher the average level of tax avoidance in the economy.

C.I.3.3 Enforcement and Compliance

In the past, we have abstracted from issues of enforcement. However, when millions of people are involved, enforcement of payments is a nontrivial matter. With the arrival of Christian Traxler at the institute, we have also begun to develop a competence in this direction. Even before coming to the institute, Christian Traxler had initiated a large-scale project investigating enforcement and compliance with respect to the payment of fees for radio and television in Austria. Results of this project are presented in Traxler and Winter (2009), Rincke and Traxler (2009), and Fellner, Sausgruber and Traxler (2009).

Traxler and Winter (2009) report on the results of a survey that was conducted concerning compliance with respect to the obligation to pay fees for radio and television in Austria. Econometric analysis of the evidence from the survey suggests that compliance behaviour is very much influenced by people's beliefs on the frequency of compliance by others. This finding cannot be explained by sanctions varying with the frequency of compliance; actual sanctions are independent of this frequency and depend mainly on the severity of the delinquency.

Traxler (2009 a) provides a theoretical analysis of the implications of this finding for equilibrium compliance behaviour and for tax and enforcement policies. If compliance behaviour depends on beliefs about the compliance of others, in equilibrium, this norm itself is determined endogenously. A major policy implication suggests that tax and enforcement policies should be targeted towards influencing people's beliefs about the compliance behaviours of others because these beliefs have an immediate effect on their own compliance.

Fellner, Sausgruber, and Traxler (2009) report on a field experiment involving mailings to suspected evaders of television fees in Austria. Some mailings just reminded people of their obligation to pay these fees, some were accompanied by a threat of legal sanctions, some by an appeal to moral norms, and some by information about the compliance behaviour of others. Relative to a control group, there was a strong effect of these mailings on all people receiving such mailings. Mailings threatening legal sanctions had a strong additional effect, mailings appealing to moral norms or containing information about the behaviour of others did not have such an additional effect. For the addressees of the mailings, the findings confirm the economic model of delinquent behaviour as a result of a consideration of costs and benefits, with little regard for moral or social norms. However, the addressees consist of a selected group of the population, namely people who were known to live at a given address and had not previously registered to pay their television fees. Attitudes and behaviours of people in this select group are probably not typical for the population at large, of which more than 90 % are in compliance anyway.

However, when thinking about enforcement policies, the attitudes and behaviours of the potential delinquents may be the thing to focus on, even if these attitudes and behaviours cannot be generalized to the population at large.

Rincke and Traxler (2009) study the effects of enforcement activities on compliance behaviours. Econometrically, the problem is to avoid spurious correlations and simultaneity bias, due to the fact that enforcement officers' choices of where to go and look for potential evaders are endogenous, perhaps driven by information on where suspected evasion rates are high or by the consideration that it is more comfortable to do this job in a densely settled area, e.g., a city, than in a distant mountain valley. To deal with the identification problem, Rincke and Traxler make use of a natural experiment that was provided by extraordinary snow fall in the winter of 2005/2006. The snow fall had a differential impact on enforcement officers' costs of getting to different parts of the country, e.g., more severe effects in remote mountain valleys or in places at higher altitudes. Using such weather-related variables as instruments, Rincke and Traxler find that compliance behaviour is positively affected by enforcement activities, not just directly, because offenders are caught, but also indirectly, because, presumably through word of mouth, information about such activities spreads in the local community and people who have failed to comply so far begin to have second thoughts. To be more precise: Rincke and Traxler find that, following enforcement activities in a given area, registration for television fees in that are goes up, i.e., some non-compliers begin to register even though they have not been directly affected by the enforcement as such.

C.I.4 Governance, Finance, and Efficiency in Public-Goods Production

C.I.4.1 The Research Problem

Most of normative public economic theory, including the work on which we have reported in Sections C.I.2 and C.I.3 does not pay any attention to the supply side of the economy, in particular to the production of public goods. The focus is exclusively on the demand side and on the implications of nonrivalry for preference revelations and finance under conditions of incomplete information. The nature and properties of the public goods are taken as given; the production side is represented by an exogenously given cost function.

The significance of this lacuna is obvious if one considers the financing of production. According to Atkinson and Stiglitz (1976), the government budget constraint is just what the term says, a constraint, whose impact should be minimized. Therefore any need for funds to finance production should be covered from direct taxes, preferably lump sum taxes. According to Hellwig (2004/2009, 2007 a), the scope for direct taxation may be limited by participation constraints, and therefore one may need entry fees as well as direct taxes to finance production. Even so, a subsidization of public-goods provision from direct taxation is desirable, as is some cross-subsidization between the different

public goods.[9] There is no notion that any one public good or any one subset of public goods ought to be self-supporting. Any notion that the production sector should be divided up into separate units, with a proviso that each unit finance itself, is rejected because this would entail replacing the single, integrated budget constraint for the entire production sector by a multiplicity of separate constraints for the different subunits. This would further restrict the set of admissible allocations and would presumably reduce welfare.

However, this line of argument neglects information and incentive problems on the production side of the economy. The notion that welfare is increased by having an integrated production sector with a single, consolidated budget constraint stems from the Pigouvian tradition of welfare economics, in which the planner has complete information about preferences and technologies. The modern theory of normative public economics has done away with the complete-information assumption, but it has done so in a piecemeal fashion, with mechanism design models of the demand for public goods and screening models for the supply,[10] without integrating the two.

Taking account of information and incentive problems in production, one expects subsidization and cross-subsidization schemes to have negative effects on producers' efforts. If a producer knows that any deficit is going to be covered by funds from another source, he may be less concerned about cost efficiency or about tailoring his product to the needs of his customers.[11] The same holds for a producer who knows that any surplus he earns is going to be siphoned off for use in some other part of the system. This should lead to a more critical view of subsidization and cross-subsidization schemes in the financing of production.

However, the insights concerning the benefits of such schemes that have been developed in normative public economics so far do not automatically become obsolete. The mere fact that incentive effects in production matter does not by itself invalidate the arguments underlying the inverse-elasticities rule, e.g., arguments in favour of cross-subsidizing local public transport from profits in electricity distribution. What we need is a framework for comparing such benefits of cross-subsidization with the costs of negative incentive effects. As yet, we do not have a conceptual framework for assessing the trade-offs that are involved.

The problem has been around for a long time. Remarkably, though, hardly any work has been done on it. Laffont and Tirole (1993, Ch. 15) provide an example in which it is better to have average cost pricing, i.e. to have the activity in question finance itself, rather than marginal-cost pricing with a public subsidy covering fixed costs. In the exam-

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9 Fang and Norman (2005) argue that, in addition, the cross-subsidization scheme should encompass all private goods.

10 For the latter, see Baron and Myerson (1982), Laffont and Tirole (1993).

11 This insight is at least as old as the Ramsey-Boiteux theory itself. Indeed, Boiteux (1956) considered a single public enterprise subject to a stand-alone budget constraint precisely because he was aware of the incentive implications of a requirement of cost recovery for this enterprise, without any prospect for cross-subsidization from other parts of the public sector.

ple, the firm has private information about the level of fixed costs, i.e. about the size of the subsidy it can claim under marginal-cost pricing. The supervisory authority has this information as well, but this authority is captured and tends to go along with the firm's demands unless it is under pressure from consumers. Average-cost pricing is a device to make consumers be interested in and to exert pressure with respect to the level of fixed costs that the supervisory authority certifies.

However, this model cannot be regarded as a basis for the development of a more general normative analysis. The analysis and its conclusion are highly dependent on the details of the specification of information and of political interdependence. A general conceptual framework for studying the tradeoffs between negative incentive effects and positive Ramsey-Boiteux effects of subsidization and cross-subsidization schemes has not yet been developed.

Bierbrauer (2009d) also obtains the conclusion that the imposition of a self-financing requirement may be desirable if a regulated firm with private information about costs produces and sells access to an excludable public good. The key assumption is that the relation between the policy maker and the regulated firm is incomplete, i.e., not fully contingent on all possible configurations of technologies and public goods preferences. While access to public funds certainly is in the firm's interest and, moreover, is conducive to achieving undistorted first-best outcomes, as opposed to distorted second-best outcomes, the consumers may prefer the imposition of a self-financing requirement for the firm because this limits the fraction of the surplus that the firm can extract and therefore leads to a higher level of consumer surplus. This analysis, however, involves a single excludable public good and as such is not suitable for studying cross-subsidization.

C.I.4.2 Ingredients of the Analysis: An Overview

It seems appropriate to start by looking at the problem in terms of standard incentive theory. Any one activity requires the effort of a manager as an input, this effort is unobservable, and must be called forth by appropriate incentives. Providing the activity with a separate budget, which is taken out of the general public budget, provides a basis for using profit as a basis for rewarding managerial effort. The incentive effects of subsidization and cross-subsidization schemes will then be similar to the incentive effects of a profit tax or subsidy, which are well known from the literature on moral hazard in insurance and in finance.[12] The problem would be to compare the efficiency losses associated with these incentive effects to the efficiency gains from the allocative effects considered in Ramsey-Boiteux theory.

However, there are a few difficulties that must be dealt with. Most importantly, the notion that *every* activity should self-finance is unrealistic. For some activities, self-financing seems impossible, for others, it is undesirable. An example where self-financing is impos-

[12] E.g. Holmström (1982), Jensen and Meckling (1976).

sible is provided by the railway system in Germany; most experts believe that this system is unable to finance the costs of the railway track network. An example where self-financing is undesirable is provided by the judicial system. Even though the services that the judicial system provides are, in principle, excludable, overriding social and political concerns in a democratic society militate against the use of user fees as a basis for financing this system.

Even in the private sector, private parties' limited ability to pay and limited liability cause problems for incentive provision based on profits. The impossibility of making the manager or entrepreneur participate in large losses tends to weaken incentives for effort and to induce excessive risk taking.[13] The treatment of insolvency therefore figures among the central issues in the theory of financial contracting.[14] Going beyond the discussion of incentive effects *ex ante*, this theory also focuses on the implications of insolvency for governance, e.g. the specification of intervention and control rights of the different claimants to the firm's assets. A major issue concerns the credibility – and the incentive effects – of contractual arrangements *ex ante* when these arrangements are subject to renegotiation, or to breach, *ex post*.

Credibility is likely to be even more difficult to establish when the activities in question serve the public interest. For a company or a person producing a purely private good, especially when in competition with others, insolvency poses a serious threat. New money is unlikely to be forthcoming unless the financiers can expect to recover the opportunity costs of their funds. For a company of person producing a public service, the prospect of insolvency is less threatening, especially if there are no other companies or persons producing the same service. The public at large has some interest in having the provision of the service continued, and the politicians in charge do not want to be blamed for its being discontinued. This makes it likely that, even if, *ex ante*, a self-financing requirement was imposed, in the event of insolvency *ex post*, the public purse would be used to provide continued finance.

The research problem of studying tradeoffs between incentive effects and allocative (Ramsey-Boiteux) effects of subsidization and cross-subsidization in public production must therefore be widened so as to encompass the problem of how to establish the credibility of arrangements that are intended to limit the scope for subsidization and cross-subsidization of individual activities. The scope for subsidization and cross-subsidization in public production must not be regarded as a policy parameter, but must be treated as a consequence of institutions and contracts that govern subsidization procedures and that provide for greater or lesser credibility of budget constraints.

In pursuing these questions, we want to draw on the large literature on soft versus hard budget constraints,[15] as well as the literature on cross-subsidization in private corpora-

13 Jensen and Meckling (1976), Stiglitz and Weiss (1981), Hellwig (2009).
14 Gale and Hellwig (1985), Aghion and Bolton (1992), Hart and Moore (1990, 1998)
15 For a survey, see Kornai, Maskin, Roland (2003).

tions.[16] Combining ideas from financial contracting and governance theory, these literatures investigate how the "hardness" of a budget constraint affects behaviours in different settings with different specifications of information asymmetries, moral hazard, and control rights assignments. Cross-subsidizations arising from soft budget constraints are sometimes treated as desirable and sometimes as the unavoidable consequences of a lack of arrangements that would make *ex ante* commitments credible. Some indications of the different possibilities are given in the analyses that Schmidt und Schnitzer (1993) and Schmidt (1996) provided of the effects of hardening budget constraints by privatization. For private corporations, Inderst and Müller (2003) and Inderst and Laux (2006) have indicated some incentive and governance implications of intra-firm cross-subsidization through internal capital markets. The task will be to adapt and extend the insights from this research so as to provide a basis for the more general welfare theoretic analysis of incentives, governance, and allocative (Ramsey-Boiteux) effects that we are interested in.

C.I.4.3 Some Research Questions

Along the lines suggested above, the first task would be to study the tradeoff between incentive effects and allocative effects of cross-subsidization mechanisms in a model of incentive contracting. The question is how the consideration of allocative effects changes optimal incentive schemes, in particular, how the effects of different degrees of hardness of budget constraints on output prices are to be taken into account.

In a second step, the analysis should take in the problem of making budget constraints credible.[17] This must be treated as a problem of institutional design. The problem is likely to be most difficult for those activities where hard budget constraints are in principle problematic because (i) the community is dependent on these activities and (ii) these activities cannot or should not be self-financing in the market. Of particular interest will be quasi-market arrangements under which subsidies are not paid to producers directly, but subsidies are paid to users who can then use them to pay for the goods or services in question. Examples would be voucher schemes for subsidizing education or, in the case of Germany, the subsidies which the Länder use to pay in order to maintain railway traffic on certain lines, relying on competition among railway transportation companies to keep the costs down.

In this context, it will be necessary to extend the theory of hard versus soft budget constraints and of privatization. Apart from taking account of the impact that alternative arrangements have on output prices, it will be also important to consider the difficulties of contracting on matters of public interest. "Incomplete-contracts" theory gives many arguments for why the specification and subsequent enforcement of contractual obligations give rise to incentive problems of their own. These arguments apply to obligations

[16] For a survey, see Hellwig, Laux, Müller (2002).

[17] For an analysis of this problem in the context of a federal state, see Crivelli and Staal (2008).

concerning the public interest at least as much as to obligations concerning the delivery of goods of services to another private party. The theory would therefore suggest that control rights are needed as a substitute for effective contractual rules. But then, something like the privatization of a production activity involves a tradeoff between the hardening of budget constraints and the loss of control that are thereby induced. We should develop a framework for studying the determinants of this tradeoff.

An example of these issues is provided by the projected privatization of Deutsche Bahn AG. As mentioned, there seems to be a consensus that the network of railway tracks is not viable on its own, but needs a public subsidy of some 3 billion euro per year. Political discussion of the projected privatization has focussed on whether the company should be privatized as a whole, including the network of railway tracks, or whether the privatization should be limited to the transportation companies, which, in principle, should be economically viable on their own, without direct public subsidies. Underlying this question is the conflict between different concerns about control rights assignments in a world in which contracts are incomplete. Deutsche Bahn AG prefers to retain the integrated structure of railway track and transportation in one company, in combination with a contract determining the Federal Government's yearly subsidies, as well as the track investments that are to be made. The alternative solution of having the railway track continue to be run by a public company, with contracts governing relations between the public railway track company and the privatized transportation company is rejected because the incompleteness of contracting is seen as an impediment to efficiency in relations between the public railway track company and the privatized transportation company. However, the very reasons for being sceptical about a reliance on contracts in relations between the railway track company and the transportation company are also reasons for being sceptical about a reliance on contracts between the Federal Government as a financier and the integrated railway company as a manager of the railway tracks.[18]

Underlying this conflict is the theoretically interesting question how one might balance conflicting concerns about control rights assignments when the vertical chain of relations involves more than two parties (here, the Federal Government, the railway track company, and the railway transportation company), and an overall vertical integration of all three parties is ruled out. What factors determine which control rights assignment is to be preferred? To what extent is it possible to use contractual arrangements in order to implement flexible control rights assignments that provide for a compromise between the two alternatives mentioned above? As a matter of pure contract theory, these questions are of interest and shall be pursued in their own right. In addition, it will be of interest to investigate how the treatment of conflicting control rights concerns affects the tradeoff between the incentive effects of hardening budget constraints and the disadvantages from control loss by privatization.

Apart from contractual arrangements, the analysis must also take account of the possibility of using sector-specific regulation in order to govern conduct so as to take account of

[18] Hellwig (2006 a, 2006 b)

the public interest even after privatization. In practice, sector-specific regulation is used to enforce the provision of network access to other companies so that they can compete in downstream markets. Sector-specific regulation is also used to implement *universal-service* regulations by which an industry is obliged to provide a certain minimum of services at uniform and low prices to everybody. However, the insights of contract theory concerning the limits of "complete contracting" for incentive provision apply to such regulation as well; the assignment of intervention rights to the regulator himself raises new questions about incentives and accountability.

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C.I.5 References

Aghion, P., and P. Bolton (1992), An "Incomplete Contracts" Approach to Financial Contracting, *Review of Economic Studies* 59, 473 – 494.

d'Aspremont, C., and L. A. Gérard-Varet (1979), Incentives and Incomplete Information, *Journal of Public Economics* 11, 25 – 45.

d'Aspremont, C., J. Crémer, and L.A. Gérard-Varet (2004), Balanced Bayesian Mechanisms, Journal of Economic Theory 115, 385 – 396.

Atkinson, A. B., and J. E. Stiglitz (1976), The Design of Tax Structure: Direct versus Indirect Taxation, *Journal of Public Economics* 6, 55 – 75.

Bergemann, D., and S. J. Morris (2005), Robust Mechanism Design, *Econometrica* 73, 1771 – 1813.

Bierbrauer, F., (2008), A Unified Approach to the Revelation of Public Goods Preferences and to Optimal Income Taxation, Preprint 2008/39, Max Planck Institute for Research on Collective Goods, Bonn 2008.

Bierbrauer, F. (2009a), A Note on Optimal Income Taxation, Public Goods Provision and Robust Mechanism Design, *Journal of Public Economics* 93, 667 – 670.

Bierbrauer, F. (2009b), Optimal Income Taxation and Public Goods Provision with Endogenous Interest Groups, *Journal of Public Economic Theory* 11, 311 – 342.

Bierbrauer, F. (2009c), On the Legitimacy of Coercion for the Financing of Public Goods, Preprint 2009/15, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Bierbrauer, F. (2009 d), Incomplete Contracts and Excludable Public Goods, Preprint 2009, in press, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Bierbrauer, F., and M. Hellwig (2009), Public-Good Provision in a Large Economy, Preprint 2009, in press, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Bierbrauer, F., and M. Hellwig (forthcoming), The Theory of Incentive Mechanisms and the Samuelson Critique of a Contractarian Approach to Public-Good Provision, Max Planck Institute for Research on Collective Goods, Bonn 2010.

Bierbrauer, F., and M. Sahm (2008), Optimal Democratic Mechanisms for Taxation and Public Good Provision, Preprint 2008/09, Max Planck Institute for Research on Collective Goods, Bonn 2008.

Boadway, R., and M. Keen (1993), Public Goods, Self-Selection, and Optimal Income Taxation, *International Economic Review* 34, 463 – 478.

Boiteux, M. (1956), Sur la gestion des monopoles publics astreints à l'équilibre budgétaire, *Econometrica* 24, 22 – 40.

Brito, D. L., J. H. Hamilton, S. M. Slutsky, and J. E. Stiglitz (1995), Randomization in Optimal Income Tax Schedules, *Journal of Public Economics* 56, 189 – 223.

Clarke, E. H. (1971), Multipart Pricing of Public Goods, *Public Choice* 11, 17 – 33.

Crémer, J., and R. McLean (1988), Full Extraction of the Surplus in Bayesian and Dominant Strategy Auctions, *Econometrica* 56, 1247 – 1257.

Crivelli, E., and K. Staal (2008), Size, Spillovers and Soft Budget Constraints, Preprint 2008/17, Max Planck Institute for Research on Collective Goods, Bonn 2008.

Fang, H., and P. Norman (2005), An Efficiency Rationale for Bundling of Public Goods, Discussion Paper, University of Wisconsin, Madison.

Fellner, G., R. Sausgruber and C. Traxler (2009), Testing Enfordement Strategies in the Field: Legal Threat, Moral Appeal and Social Information, Preprint 2009/31, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Gale, D. M., und M. Hellwig (1985), Incentive-Compatible Debt Contracts: The One-Period Problem, *Review of Economic Studies* 52 (1985), 647 – 663.

Gizatulina, A., and M. Hellwig (2009a), Informational Smallness and the Scope for Limiting Information Rents, Preprint 2009/28, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Gizatulina, A., and M. Hellwig (2009b), Beliefs, Payoffs, and Information: On the Robustness of the BDP Property in Models with Endogenous Beliefs, Preprint 2009, in press, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Gizatulina, A. (2009), Essays in Mechanism Design, Doctoral Dissertation, University of Mannheim, 2009.

Green and Laffont (1979), Incentives in Public Decision-Making. North-Holland Publishing Company, Amsterdam.

Groves, T. (1973), Incentives in Teams, *Econometrica* 41, 617 – 631.

Guesnerie, R. (1995), *A Contribution to the Pure Theory of Taxation*, Econometric Society Monograph, Cambridge University Press, Cambridge, U.K.

Güth, W., und M. Hellwig (1986), The Private Supply of a Public Good, *Journal of Economics/Zeitschrift für Nationalökonomie*, Supplement 5, 121 – 159.

Hart, O., und J. Moore (1990), Property Rights and the Nature of the Firm, *Journal of Political Economy* 98, 1119 – 1158.

Hart, O., und J. Moore (1998), Default and Renegotiation: A Dynamic Model of Debt, *Quarterly Journal of Economics* 113, 1 – 41.

Heifetz, A., and Z. Neeman (2006), On the Generic (Im-)Possibility of Full Surplus Extractioon in Mechanism Design, *Econometrica* 74, 213 – 233.

Hellwig, M. (2000), On the Economics and Politics of Corporate Finance and Corporate Control, in: X. Vives (ed.), *Corporate Governance*, Cambridge University Press, Cambridge, 95 – 134.

Hellwig, M. (2003), Public-Good Provision with Many Participants, *Review of Economic Studies* 70, 589 – 614.

Hellwig, M. (2004/2009), Optimal Income Taxation, Public-Goods Provision and Public-Sector Pricing: A Contribution to the Foundations of Public Economics, Preprint 2004/14, Max Planck Institute for Research on Collective Goods, Bonn, revised 2009.

Hellwig, M. (2005), A Utilitarian Approach to the Provision and Pricing of Excludable Public Goods, *Journal of Public Economics* 89, 1981 – 2003.

Hellwig, M. (2006/2009), Incentive Problems with Hidden Characteristics: A Unified Approach, Preprint 2006/26, Max Planck Institute for Research on Collective Goods, Bonn, revised 2009

Hellwig, M. (2006 a), Wie bringt man einen Verlustmacher an die Börse? Kritische Bemerkungen zum Börsengang der Deutsche Bahn AG, *Wirtschaftsdienst* 86 (2006), 504 – 509.

Hellwig, M. (2006 b), Stellungnahme bei der Öffentlichen Anhörung des Ausschusses für Verkehr, Bau und Stadtentwicklung des Deutschen Bundestages zur Privatisierung der Deutschen Bahn AG am 10. Mai 2006.

Hellwig, M. (2007 a), The Provision and Pricing of Excludable Public Goods: Ramsey-Boiteux Pricing versus Bundling, *Journal of Public Economics* 91, 511 – 540

Hellwig, M. (2007 b), A Contribution to the Theory of Optimal Utilitarian Income Taxation, *Journal of Public Economics* 91, 1449 – 1477.

Hellwig, M. (2007 c), "The Undesirability of Randomized Income Taxation under Decreasing Risk Aversion", *Journal of Public Economics* 91, 791 – 816

Hellwig, M. (2008), A Maximum Principle for Control Problems with Monotonicity Constraints.

Hellwig, M. (2009 a), A Note on Deaton's Theorem on the Undesirablity of Nonuniform Excise Taxation, *Economics Letters* 105 (2009), 186 – 188.

Hellwig, M. (2009 b), A Reconsideration of the Jensen-Meckling Model of Outside Finance, *Journal of Financial Intermediation* 18 (2009), 495 – 525.

Hellwig (2010 a), Utilitarian Mechanism Design for an Excludable Public Good, *Economic Theory*, forthcoming.

Hellwig (2010 b), A Generalization of the Atkinson-Stiglitz (1976) Theorem on the Undesirability of Nonuniform Excise Taxation, *Economics Letters*, forthcoming.

Hellwig, M., C. Laux, and H. M. Müller (2002), Conglomeration: Good, Bad, or Unavoidable? *Schmalenbach Business Review Special Issue 1*, 55 – 78.

Holmström, B. (1982), Moral Hazard in Teams, *Bell Journal of Economics* 13, No. 2 (Autumn), 324 – 340.

Inderst, R., and C. Laux (2005), Incentives in Internal Capital Markets: Capital Constraints, Competition, and Investment Opportunities, *Rand Journal of Economics*.36.

Inderst, R., and H. M. Müller (2003), Internal versus External Financing: An Optimal Contracting Approach, Journal of Finance 58, 1033 – 1062.

Jensen, M. C. und Meckling, W. H. (1976), Theory of the Firm: Managerial Behaviour, Agency Costs and Capital Structure, *Journal of Financial Economics* 3, 305-360.

Johnson, S., J. W. Pratt, and R. J. Zeckhauser (1990), Efficiency Despite Mutually Payoff-Relevant Private Information: The Finite Case, *Econometrica* 58, 873 – 900.

Kornai, J., E. Maskin und G. Roland (2003), Understanding the Soft Budget Constraint, *Journal of Economic Literature* 41, 1095 – 1136.

Laffont, J.-J., und J. Tirole (1993), A Theory of Incentives in Procurement and Regulation, MIT Press, Cambridge, Massachusetts.

Laffont, J.-J., and D. Martimort (1997), Collusion and Asymmetric Information, *Econometrica* 65, 875 – 911.

Laffont, J.-J., and D. Martimort (2000), Mechanism Design with Collusion and Correlations, *Econometrica* 68, 309 – 342.

Ledyard, J. (1979), Incentive Compatibility and Incomplete Information, *Journal of Economic Theory* 18, 171—189.

Lindahl, E. (1919), *Die Gerechtigkeit der Besteuerung*, Gleerupska, Stockholm.

Mailath, G., und A. Postlewaite (1990), Asymmetric Information Bargaining Procedures with Many Agents, *Review of Economic Studies*, 57, 351 – 367.

McAfee, P., and P. Reny (1992), Correlated Information and Mechanism Design, *Econometrica* 60, 395 – 421.

Mertens, J.-F., and S. Zamir (1985), Formulation of Bayesian Analysis for Games with Incomplete Information, *International Journal of Game Theory* 10, 619 – 632.

Mirrlees, J. M. (1971), An Exploration in the Theory of Optimum Income Taxation, *Review of Economic Studies* 38, 175 – 208.

Myerson, R. B., und M. A. Satterthwaite (1983), Efficient Mechanisms for Bilateral Bargaining, *Journal of Economic Theory* 28, 265 – 281.

Neeman, Z. (2004), The Relevance of Private Information in Mechanism Design, *Journal of Economic Theory* 117, 55 – 77.

Palfrey and Srivastava (1986), Private Information in Large Economies, *Journal of Economic Theory* 39, 34 – 58.

Rincke, J., and C. Traxler (2009), Deterrence through Word of Mouth, Preprint 2009/04, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Rochet, J.-C., and P. Choné (1998), Ironing, Sweeping, and Multidimensional Screening, *Econometrica* 66, 783 – 826.

Samuelson, P. A. (1954), The Pure Theory of Public Expenditure, *Review of Economics and Statistics* 36, 387 – 389.

Schmidt, K. M. (1996), The Costs and Benefits of Privatization: An Incomplete Contracts Approach, *Journal of Law, Economics, and Organization* 12, 1 – 24.

Schmidt, K. M., und M. Schnitzer (1993), Privatization and Management Incentives in the Transition Period in Eastern Europe, *Journal of Comparative Economics* 17, 264 – 287.

Stiglitz, J. E., and A. Weiss (1981), Credit Rationing with Imperfect Information, *American Economic Review* 71, 393 – 410.

Traxler, C. (2009 a), Social Norms and Cinditionally Cooperative Taxpayers, *European Journal of Political Economy*, forthcoming.

Traxler, C. (2009 b), Voting over Taxes: The Case of Tax Evasion, *Public Choice* 140, 43 – 58.

Traxler, C. (2009 c), Majority Voting and the Welfare Implications of Tax Avoidance, Preprint 2009/22, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Traxler, C., and J. Winter (2009), Survey Evidence on Conditional Norm Enforcement, Preprint 2009/03, Max Planck Institute for Research on Collective Goods, Bonn 2009.

Wilson, R. (1985), Incentive Efficiency of Double Auctions, *Econometrica* 53, 1101 – 1116.

C.II The Behaviorally Informed Design of Institutions for the Provision of Collective Goods

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C.II.1 General Outline

I. Motivation

Since the last report to the Advisory Council, our work has changed quite profoundly. But the change has almost exclusively been methodological. Now, almost all of us, including many of the lawyers, are running our own experiments. Perhaps in two years' time, we might even reflect the methodological focus by changing the mission of the group into "Experimental Law and Economics". For the time being, however, we have kept the original mission statement: "The Behaviorally Informed Design of Institutions for the Provision of Collective Goods", since our area of interest has not changed. We also see no reason to exclude other empirical methods, or theory, or doctrine, by the very definition of our task. Consequently, the following paragraphs motivate our work as well as they did two years ago.

All research on collective goods asks one of the following three questions: is there a collective-goods problem in the first place? If so, is an existing or a proposed institution able to solve the problem, or at least to improve the situation? Finally, do the normatively appropriate problem definition and the normatively preferable institutional response stand a chance of being implemented?

It is natural to address all these three questions by way of rational-choice analysis. Collective-goods problems are then defined as pure public goods, club goods, or common pool resources. In each case, the analysis focuses on incentives and information, and on the way in which institutions shape incentives and channel the information which is required to address the collective-goods problem. Normative analysis deals with the optimal design of incentives, positive analysis with the actual incentives that are generated in a given institutional context. The mechanism design

approach summarized above does the former kind of analysis, public choice theory the latter. Here the rational-choice paradigm helps us understand why the political process often fails to harness sovereign powers in the interest of changing incentives such that collective-goods problems disappear.

While evidently fruitful, the rational-choice perspective is also limited. This is due to the very same factor that has made the rational-choice model so visibly successful. The model rests on the strict distinction between objectives and constraints. The object of study are utility-maximising individuals reacting to changes in opportunity structures. For methodological reasons, the individual is modeled as Homo Oeconomicus. For sure, these are only assumptions, not claims about reality. They are imposed in order to capture the essence of social phenomena and institutions, and to make predictions for the effect of changing circumstances. However, the scope of this analysis is inherently limited.

An alternative research strategy, which starts with what is known about human behavior, is likely to develop a fairly different depiction of collective goods. Some phenomena that are made visible by behavioral analysis can hardly even be translated back into the world of rational choice. This project focuses on the alternative approach. The behavioral analysis of collective goods is not virgin territory. Suffice it to recall a few of the well-known findings: where (simple) rational-choice models would predict the "tragedy of the commons", in practice it is often conspicuously absent. There are various reasons for this, but the fact that they have a more realistic picture of human motivation is part of the explanation. "Public-goods games" are one of the workhorses of experimental economics. Again, contribution rates found in the laboratory by far exceed the prediction of zero contributions made by rational-choice models. If all beneficiaries of a public good agree on a contribution level, in rational-choice terms this is just "cheap talk". At the level of implementing the agreement, the original social dilemma is repeated. However, psychologists have traced a powerful cheater-detection mechanism, effectively exploiting subtle signals. It has bite, since punishing sentiments kick in when cheating seems patent. Emotions thus trump rationality and help solve the social dilemma. It is in this context that our work on the behavioral analysis of collective-goods problems is situated. We are adding new dimensions, exploring new fields of application, and translating the findings into institutional analysis and design.

Likewise, we are not the first to be interested in the behavioral analysis of institutions. Behavioral effects have never been fully absent from institutional analysis. An obvious illustration is "moral suasion". But the most prominent force in the area is the growing behavioral law and economics movement. It mainly piggybacks on the Kahneman/ Tversky critique of the rational-choice approach. It either interprets legal institutions as remedies to individually or socially detrimental "biases". Or it criticises the legal community for overlooking that biases prevent the law from being effective. Both have obvious value. Suffice it again to recall two well-known findings. It is much easier to get an appropriate understanding of consumer-protection legislation if one understands the psychological underpinnings of strategies like the "foot-in-the-door technique of

salesmen". Environmental policy has long been tempted by torts as a tool for "ex-post regulation", in light of the experiences from concrete cases. This is, however, dubious advice, given the strong "hindsight bias". Once one has seen the evidence of a risk materialising, it is next to impossible to form a proper assessment of its ex-ante likelihood. Consequently, regulation by torts finds itself on a slippery slope towards ever stricter rules.

Some of our work is exactly in this tradition, where it seems helpful to assess the potential of institutions, and of the law in particular, in order to solve collective-goods problems. But in two ways we are going beyond this earlier work. We make a point of not exclusively looking at biases. Related to this, the Kahneman/Tversky literature and experimental economics literature are not the only sources we are tapping. Rather, we try to purchase directly from psychology. And we are particularly interested in the law as a governance tool. We are convinced that, in a behavioral perspective, one is able to gain a much richer understanding of the law's potential. In these ways, we also hope to bridge the gap between (new) behavioral law and economics and (old) law and psychology. While there has for decades been direct interaction between lawyers and psychologists on issues like lie detection or eyewitness testimony, this strand of research has not thus far been very interested in the law as a governance tool.

Interdisciplinarity is never easy. However, in major US law schools, law and economics has almost become a standard approach. Behavioral law and economics is seen as one of the major strands of this approach, and is itself making headway. The situation in Germany is significantly different. Here, antitrust law notwithstanding, economic analysis is still rare, if not actively combated. The behavioral analysis of law is only just tentatively starting. Against this backdrop, it is inevitable that the widespread scepticism about a closer interaction between law and the social sciences be taken seriously. We are trying to respond at two levels. At one level, we are attempting to determine the proper role of input from the social sciences in both legal doctrine and legal science. At the other level, we are comparing alternative paradigms, starting with rational-choice and behavioral analysis, but not confining ourselves to these.

In principle, the third fundamental question regarding collective goods would lend itself to behavioral analysis no less than the first two. The processes leading to the selection of issues, problem definition, the choice of a solution, its implementation, and ultimately its evaluation are all rife with behavioral effects. Suffice it again to recall but one prominent finding. Scandal-driven politics is not surprising, given the power of what has been called the "availability heuristic". It can strategically be exploited by "availability entrepreneurs". Since the political scientists have left the Institute, however, this third question is currently not among our main areas of interest. Nonetheless, we plan to do some work in this area in the future.

II. Summary Report

On this agenda, over the last two years, we have made progress in the following respects.

1. Problem Definition

a) Public Goods

In line with the overall mission of the Institute, the primary focus of our work has been the deepening of our understanding of public goods. A first finding resulted from our inability to replicate a result that, independently of each other, two labs in London (Nikiforakis 2008) and in Rennes (Denant-Boement, Masclet et al. 2007) had established. It is well-known in the experimental literature that contributions to public goods quickly decay if the game is repeated (for a survey, see Ledyard 1995). The trend is reversed, though, if group members have a chance to spend some extra money on punishing each other (Fehr and Gächter 2000). The two labs had shown that the beneficial effect of punishment is dampened, if not muted, if punishees are given a chance to strike back. We initially intended to test various safeguards that are standard in criminal law practice, expecting that such safeguards might get the pernicious effect of counterpunishment under control. However, to our surprise, in Bonn the counterpunishment option almost had no effect. Despite the threat of countersanctions, punishment still stabilized cooperation at a fairly high level.

Our different result turned out very robust. Neither a change in instructions, which made counterpunishment more salient, nor random matching were able to stifle cooperation. Cooperation even survived if we made counterpunishment very powerful. In this treatment, one of 20 points of the endowment destroyed a quarter of the punishee's period income. We could explain the surprising difference between labs by the crucial role of first impressions. If average and/or minimum contributions in the first round are high, this stabilizes contributions, even if there is a risk of counterpunishment. Subsequently, in a reanalysis of data from all over the world, we extended the finding to public goods without institutional backing, and to public goods with punishment only. We related this finding to a metaphor that has been powerful in US criminal policy: "Beware of broken windows!" (Beckenkamp et al. 2009). While first impressions very effectively organise a data set of some 20.000 data points, regression analysis cannot rigorously prove the effect. To that end, in a companion paper we induced the effect by giving subjects, before they started playing the game on their own, graphs from groups where contributions started low and decayed quickly. This manipulation was sufficient to destroy cooperation, even in Bonn (Engel Kube Kurschilgen 2009).

Simple theoretical models of public goods reduce the problem to one of simultaneously choosing a contribution level. In such a setting, all players are fully informed about the composition of the group, and of their own as well as all other players' payoff functions. In the field, people often do know much less. Frequently, all they observe is their own

payoffs; they do not know whether a high individual payoff is detrimental to other players. In other settings, they do not even know that they are engaged in strategic interaction. If one tests experimental subjects in two-person prisoner's dilemmas, the less they know, the less they cooperate. This has a straightforward policy implication: making the game explicit improves welfare (Beckenkamp 2009). Reduced feedback is equally detrimental. If information about other players' contributions is noisy, punishment does a much poorer job in increasing contributions (Grechenig Nicklisch Thöni 2009).

Many socially relevant decisions are not taken by isolated individuals. This also holds for the provision of public goods. Take industrial production contributing to climate change as proof. Despite a substantial amount of research (it is surveyed in Engel 2008), it still is far from clear in which contexts scaling up decision-making to the group or firm level eases the provision of public goods, and when it is counter-productive. In a series of multilateral coordination problems, teams of three outperformed individuals (Feri Irlenbusch Sutter 2009).

In the field, those who could contribute to a collective good are rarely all equal. If agents with heterogeneous (low and high) endowments in a public-goods game are given the possibility to commit to a specific contribution level behind a veil of ignorance, this significantly raises contributions. Contributions increase even more if agents know their type (low or high endowment) before they commit (Tontrup 2009). In the experimental literature, heterogeneity has mostly been studied in the context of team production, which is why many of us have also chosen this context for our contributions. If there are increasing returns to scale, the highest efficiency is obtained if contributors do not receive equal payoffs (Kube Goerg Zultan 2009). However, if some contributors have a direct relation with the principal, while others are only indirectly related by virtue of an intermediary, this reduces contributions of both classes of agents (Alewell Nicklisch 2009); this design is meant to capture the effect of temporary employment. Moreover, the social status of the principal matters. If the principal has low social status, agents are much less likely to exploit the information asymmetry to their advantage than if the principal has high social status (Nicklisch Salz 2008).

In reality, collective goods are often nested. We tested the following setting. Contributions to the public project are worth nothing as long as the threshold is not met. If the threshold is reached, contributions to the public project have a higher group payoff than contributions to the private project. In the first treatment, there is only one such good. In the second treatment, there are two such goods with different threshold levels. Of course, contributions to the public project with the higher threshold are dominated. The presence of the second good had a detrimental effect. It made it more difficult for participants to coordinate on the first project, and there was less over-contribution than in the treatment with only one public project. This led to a decrease in overall contributions (von Heusinger Kube 2009).

Frequently, one man's meat is another man's poison, as the saying goes. If one group successfully provides what for them is a public good, outsiders are harmed. Take a country building a dam on a transnational river to secure irrigation water for its farmers. In other contexts, outsiders receive a windfall profit if insiders provide the public good. For instance, if one country fights a joint enemy, neighboring countries benefit as well. We have shown that knowing about the positive externality does not increase contributions in the lab, while knowing about the negative externality does. If, in the light of these experiences, insiders and outsiders are rematched and have a chance to create a norm endogenously before future roles are revealed, negative externalities are internalised to a remarkable degree, whereas positive externalities are not (Engel Rockenbach 2009).

One way of saying why the provision of public goods is hard relies on property rights theory. If the public good is not excludable, property rights in the good are attenuated. In a colloquial way, one may say that there is a social problem because property rights are "too weak". This formulation of the problem invites the question whether property rights could also be "too strong". This is indeed what the theory of anticommons posits (Heller 1998). A standard illustration is a collection of patents that are cumulatively necessary for the next step of invention. We tested whether the problem is aggravated by the endowment effect. It turned out that the strategic interest in appropriating most of the collective gains from trade dominates the endowment effect for goods with uncertain value (Bechtold Glöckner Kleber Tontrup 2009).

If no institutional framework is provided, it is typical for repeated public-goods experiments that average contributions start relatively high, but decay quickly. It has been shown that this result is driven by the fact that most participants are neither unswerving altruists nor hard-nosed egoists. Most of them are happy to contribute to the public project as long as a sufficient fraction of the remaining group members contributes as well (Fischbacher, Gächter et al. 2001). More specifically, they target what they perceive to be the standard in this group, but try to stay slightly below (Fischbacher and Gächter 2009). We have tested a related situation. The group was composed of one strong and a number of weak players. In one treatment, contributing to the public project was a dominant strategy for the strong player. In the other treatment, it implied a sacrifice. If the strong player was faithful, in the second situation the weak players contributed more (Glöckner Irlenbusch Kube Nicklisch Normann 2009). Leadership research suggests that self-sacrifice might be a crucial mediating factor to generate increased cooperation and reciprocity. In hypothetical public-goods scenarios, it has been shown that leaders' nonmonetary sacrifices increase cooperation (De Cremer and van Knippenberg 2002; see also Choi and Mai-Dalton 1998) and particularly if distributive justice is low (De Cremer and van Knippenberg 2004). Elaborating on these findings we are the first to show that, in a public-goods situation with different MPCRs, a privileged player's sacrifice considerably supports the emergence of reciprocating behavior in other players.

In repeated public-goods experiments, behavior is usually not stable. Absent any institutional framework, contributions decay over time. With appropriate institutional

intervention, like the quintessential punishment option, they increase over time. Such changes over time can only be explained if subjects learn. Standard theory would expect Bayesian learning. We could show that behavioral stationary concepts, resulting from impulse balance learning and payoff-sampling learning, do better at explaining the data (Goerg 2008).

In essence, a public good is a prisoner's dilemma. In a prisoner's dilemma, cooperation is dominated. If they observe or believe that the other player cooperates, this gives players a chance to exploit their partner. In this case, defection is driven by greed. If they observe or believe that the other player defects, cooperation would expose them to exploitation. In this case, defection is driven by fear. To disentangle the two motives, we sequentially tested our subjects on a prisoner's dilemma; on a dictator game variant, where gains were uncertain, but no losses were involved; and on a test for loss aversion. All three tests used the strategy method to increase the outside option or the loss, respectively, step by step. The measure for greed from the dictator game explained choices in the prisoner's dilemma well. The measure for the loss aversion explained why subjects who had been benevolent in the dictator game defected in the prisoner's dilemma (Engel Normann 2009).

In Western cultures, experimental subjects are highly sensitive to perceived intentions. Take the finding from the game with the strong player as proof. The weak players were induced to reciprocate their good intentions, which they learned from the sacrifice. We were able to show that intentions are close to irrelevant in China. Chinese participants punish as severely if another subject has caused harm, although it is crystal clear that the harm was not intended (Ding Tontrup 2009).

b) Oligopoly

It is possible to model oligopoly as a linear public good. Oligopoly, however, is a fairly unusual public good. Gains from the public project (the cartel, that is) are conditional on *all* members making a contribution. The contribution is very different from giving part of the endowment. It has two components. Each member who is loyal to the cartel runs the risk of being exploited by others. This can be interpreted as an out-of-pocket cost. Simultaneously, a loyal member foregoes the chance to exploit the remaining members. This can be interpreted as an opportunity cost. All three differences are likely to matter behaviorally (Engel 2009).

For the future, it is an interesting task to explore if and how these differences play themselves out in the lab. That way, one could investigate how driving forces that are well understood in the context of public goods, like conditional cooperation, influence the stability of cartels. For the time being, though, we have preferred to contribute directly to the experimental literature on antitrust. The meta-study on oligopoly experiments, reported in greater detail in the previous report to the Advisory Council, was meant to make the large body of evidence available to the research community. Although that

paper is not exactly short, it is fairly condensed, and it does not at all contextualise results (Engel 2007). This is done in two later papers. The first one addresses the legal community. It shows how this evidence can be used to test and improve the merger guidelines on both sides of the Atlantic. It also explores to which degree this evidence can help decide cases in court. To that end, further statistical tests are added (Engel 2008). The second paper tries to be even less technical, and to tell the story to German antitrust lawyers (Engel 2009). The reader on Experiments and Competition Policy is written in the same spirit (Normann Hinloopen 2009).

An oddity in the meta-study on oligopoly triggered the already reported experiment on greed and fear in a prisoner's dilemma. Common sense will not be surprised that one finds more collusion the more it pays. Of course, gains from collusion result from the difference between the producer rent if the market clears, compared to the monopoly case. One factor contributing to the size of this difference is the slope of the supply curve. In the meta-study, we had measured both: the ratio between consumer rent and producer rent when the market clears, and the slope of the supply curve. Surprisingly, the effect size of the second, indirect measure was much stronger than the effect size of the former. Inspecting the raw data triggered a hypothesis. Experimenters had not changed the slope of the supply curve gradually. It either had a pronounced positive slope, or it was horizontal, i.e., marginal cost was constant. Moreover, many more experiments had participants compete in price rather than in quantity. Finally, in the majority of oligopoly experiments, products were homogeneous. That is, participants were quite frequently in the situation of a textbook Bertrand paradox. Collusion was the only way towards a positive profit. Initially we planned to test the hypothesis directly. Starting from constant marginal cost, we would have gradually increased the slope of the supply curve. However, we would then have confounded two causes. Along with the slope, we would have changed the absolute gains from collusion. To maintain full experimental control, we opted for the context-free setting of the prisoner's dilemma. In this setting, we established a monotonous relationship between the size of the outside option and the degree of collusion (Engel Normann 2009).

Checking whether the risk of "coordinated effects" substantially increases through a merger is high on the agenda of antitrust authorities on both sides of the Atlantic. In one paper, we demonstrate how the evidence from the meta-study on oligopoly experiments can be used for the purpose (Engel 2008). A second paper provides fresh evidence for a market where, pre-merger, three firms either have symmetric or asymmetric capacity. If two firms merge, prices increase due to the reduction in the number of suppliers, but less so if one of the merging firms was already larger than its competitors before the merger. The first is a static effect, the latter a dynamic one. It results from the fact that the more pronounced the asymmetry, the higher the discount factor required for collusion in the repeated game with uncertain end (Fonseca Normann 2008).

Over the last two years, the European Commission has been engaged in a major exercise on redefining its policy with respect to Art. 82 ECT, i.e., the prohibition to abuse a dominant position. Rebates have come under particularly close scrutiny in this exercise.

According to the European Court of Justice, "rollback rebates" are essentially forbidden per se, whereas they are basically admissible in the US. Under this scheme, the buyer receives a discount on all units bought if and only if, within the stated reference period, she surpasses the threshold set by the seller. European antitrust authorities are concerned that this threshold might have a "suction effect" and that buyers might be placed in a "psychologically weak position". In the lab it turns out that rebates are indeed sticky beyond what rational choice would predict (Glöckner Morell Towfigh 2009).

A natural correlate of oligopoly theory is bargaining theory. We showed that (market) feedback only reduces, but does not erase, the gamblers' fallacy, i.e., the erroneous belief that random events are mean-reversing (Fischer 2009). If, in an ultimatum game setting, the proposer is able to exclude one of two potential responders, this polarizes acceptance by the remaining responder: some decrease, some increase their threshold for acceptance (Fischer Güth Köhler 2009).

c) Other Social Problems

While behavioral law and economics is gaining momentum, the number of labs generating fresh experimental evidence on legal issues is still very limited. This makes it attractive to put our tools to good use on other legal issues as well, even if they do not directly originate from the experimental literature on public goods or oligopoly. One illustration is what, on first reading, might appear a strange whim of German legislation. The statute on copyright gives authors a right to claim additional remuneration if, ex post, their work turns out a huge commercial success. As all market participants know, success and failure are distributed very unevenly in media markets. Why then do authors and publishers not negotiate on the basis of the known expected values? Or why do they not make the licence fee conditional on the later success of the work in the market? The latter seems to be rare because publishing houses have more bargaining power, and because authors do not want to bear market risks. Therefore, the German rule might respond to the fact that fairness perceptions change before the work has been marketed and after. We hypothesized that authors would be happy to sell the copyright substantially below its expected value, but that this outcome would seem patently unfair in the unlikely, but possible, event of a big success. We tested the hypothesis in an ultimatum game with uncertain payoffs and an ex-post punishment option. We compared a setting without to an alternative setting with third party intervention in the case of the big success. The intervention unequivocally increased welfare. The beneficial effect mainly came through lower initial offers, which were accepted with a higher frequency. Third-party interventions almost exclusively considered ex-post fairness and split gains from trade equally (Engel Kurschilgen 2009).

Most legal orders consider betting a dubious activity. In the German case, there is suspicion that the purported paternalistic goals of the legal ban on betting might in fact be motivated by the desire of the prime ministers of the *Länder* to protect a source of

income that they can use without Parliamentary control. But at least officially, the ban is justified by the addiction potential inherent in this activity. Currently, the law draws the borderline between luck and skill. If the skill component is predominant, the activity may be offered by private suppliers. This invites a classic doctrinal conflict: are sports bets more on the luck or more on the skill side? In our experiment, it turned out that the luck component dominates (Glöckner Towfigh 2009).

Equal pay is an old slogan of the unions. Many firms do not follow this policy and make remuneration contingent on relative performance. This creates a risk of sabotage. In the lab, we show that both effort and sabotage increase in the wage spread. However, even in such a setting, agents react reciprocally to higher wages, which mitigates the sabotage problem. It is further reduced if it is called by its name: sabotage, and if the principal and the agents are allowed to communicate (Harbring Irlenbusch 2009).

2. Institutional Intervention

a) Punishment

As mentioned, without institutional intervention, in repeated public-goods experiments contributions decay relatively quickly. The trend reverses if participants are allowed to punish each other, at a cost. Surprisingly, the large criminology literature has not yet drawn the parallel. In a whole line of research, we have seized the opportunity. The criminology literature distinguishes deterrence from prevention. The former explanation of the effect of punishment is exclusively individualistic. A would-be criminal dreads the experience of punishment, and aligns her behavior with legal expectations. The latter explanation supplements this with a genuinely social perspective. It stresses the cognitive effect of punishment. It impacts on citizens' normative orientation, and on their expectations of the behavior of their co-citizens (Magen 2009a). Moreover, if they see that others are punished, they are less afraid of being the sucker if they abide by the law. To test these ideas experimentally, we supplemented the standard four-player public-goods game with a fifth experimental subject. The latter could not contribute to the public project, but could use her endowment for punishing active players. That way, we implemented centralised punishment. We varied feedback. In the baseline, active players were only informed about aggregate contributions. In the first treatment, they also learned about aggregate punishment. In the second treatment, they received full information about individual contributions and individual received punishment. In the last treatment, contributions were much lower, while there was practically no difference between the first two treatments. This shows that those not punished themselves do not care about punishment for its own sake. If they have no chance to express their own anger, punishment only matters indirectly. It helps to stabilize the contribution level, and thereby supports conditional cooperation (Engel Irlenbusch 2009).

Not (fully) informing potential punishees about sanctions is a different matter. In another experiment, we varied feedback about received punishment. In the baseline, punishment

was directly revealed to the recipient. In the first treatment, all punishment remained undisclosed until the end of the group interaction. In the second treatment, punishers were able to choose between disclosed and undisclosed punishment. It turned out that even undisclosed punishment stabilizes cooperation. However, by far the most powerful institution is a combination of disclosed and undisclosed punishment. Apparently, punishees read disclosed punishment as a signal of more severe sanctions looming large (Glöckner Kube Nicklisch 2009).

Another type of uncertainty turns out to be very detrimental. If group members get noisy feedback about other members' contributions, their willingness to punish is not reduced. However, punishment is much less effective in stabilizing cooperation. Therefore efficiency is severely reduced. This is troublesome news for policymakers. For in the field, the degree of pro-social behavior of others is hardly ever fully observable (Grechenig Nicklisch Thöni 2009).

In principle, contributions in a public good monotonically increase in punishment effectiveness. However, if effectiveness is too low, the punishment opportunity even becomes counterproductive (Nikiforakis Normann 2008).

Punishment is not an appealing social institution. If given a choice, experimental subjects predominantly self-select into a group without punishment. Some participants, however, chose the community with the punishment possibility right from the start. In general, they make high contributions and also heavily punish free-riders, thereby succeeding in establishing a cooperative culture in this community. The high contribution rates are observed by the members of the sanction-free community, in which contributions go down over time. In the end, virtually all participants migrate to the community with the sanctioning possibility, and the sanction-free community becomes completely depopulated. We compare this voting with feet setting (in which participants can endogenously choose the institution) with an experiment in which the same migration pattern is exogenously imposed. In such a setting, contributions are significantly lower. Contributions are even lower in a third experiment, in which the population under each institution is fixed (Gürerk Irlenbusch Rockenbach 2009). One finds a similar pattern if a leader can choose between punishment and reward to motivate team members (Gürerk Irlenbusch Rockenbach 2009).

In Western countries, participants are punished for perceived bad intentions. This turns out not to be true in China. Here, punishers are only interested in who caused harm, and they punish with equal severity if it is clear that the harm was not intended (Ding 2009).

We have already reported that, in our lab, counterpunishment did not have the same, strong negative effect on contributions as in London and Rennes. As pointed out, we have shown that the detrimental effect of counterpunishment is conditional on sufficiently poor first impressions in the group in which the participants happen to be (Beckenkamp et al. 2009) (Engel Kube Kurschilgen 2009).

The work of our group on punishment nicely ties into Christian Traxler's interest in sanctions. Using data from the field, he could show that law-abiding behavior increases if people observe enforcement activities in their neighborhood (Rincke Traxler 2009). In a field experiment, he showed that legal threats have much more power than moral appeals or mere social information (Fellner Sausgruber Traxler 2009). He also organised a workshop on the economics of crime and sanctions. Through all these channels, we closely collaborate with the other group at the Institute.

b) Governance by Law

In simple law and economics models, law only matters since it threatens addressees with punishment (Becker 1968). We could show that law has a strong effect even if there is no inside or outside enforcement at all. In a dilemma game, in one treatment participants were allowed to make promises before the interaction started. In the other treatment, they got excerpts from the German Civil Code, informing them that contracts are binding. They then had a chance to conclude a contract, of course without lifting the veil of anonymity. It was made clear that they could not go to court. They were not given the opportunity to punish each other either. Nonetheless, even in the absence of any enforcement, there was much more cooperation in the contract treatment than in the promise treatment (Kurschilgen Tontrup 2009).

With the independent research group *Intuitive Experts*, we mainly cooperate on legal decision-making. We have started a series of experiments to cast light on decision-making in court. Doctrinal problems are hardly ever well-defined. The simplest situation for studying how judges and jury members are nonetheless able to make decisions is a pure problem of facts. In such cases, the law is undisputed, but it is unclear whether the facts match the pertinent provision. In terms of judgement and decision making, this is a problem of inference. Since neither the judge nor the jury have been at the site of the crime, they must infer what really happened from the evidence they hear. In principle, intuition is well-equipped to solve such ill-defined problems. As the psychologists at the Institute have shown, intuition does not only reason in a uni-directional manner from evidence to the judgment. In a series of positive and negative feedback loops of bi-directional reasoning, it constructs consistent mental representations by progressively radicalizing the evidence. This invites a troublesome concern: is intuition so good at forcing the decision that it overrides standards of proof? Procedural law imposes such standards since, depending on the character of the conflict, it weighs false positives very differently to false negatives. If the standard is guilt "beyond a reasonable doubt", the law accepts quite a few false negatives if only wrong convictions are very unlikely. In our experiment, using vignettes that have been repeatedly employed by Dan Simon and colleagues (Simon 2004), we were able to show that, happily, standards of proof are not muted. One way to demonstrate how intuition works is by testing subjects twice. Before they know the problem they will have to solve, one asks them to rate the probative value of the evidence. After they have decided, one asks them to rerate the same evidence.

One typically finds pronounced "coherence shifts". Subjects give supporting evidence slightly more weight, while they strongly decrease the weight they put on conflicting evidence. Interestingly, if the standard was beyond a reasonable doubt, and if participants acquitted the defendant, they downgraded inculpating evidence significantly less. This shows that the standard of proof instruction works as intended. If the evidence was not clear enough, participants did not force the decision, but acquitted the defendant "for want of evidence" (Engel Glöckner 2008).

While the main paper is written as a standard experimental paper, a companion paper tells a much richer story to a legal audience. US law makes a difference between criminal and private law disputes. In criminal law, the standard of proof is "beyond a reasonable doubt". In private law, the much less stringent "preponderance of the evidence" standard is applied. The difference is motivated by the desire of the legal order to remain neutral. In the abstract, the legal order has no reason to side with one of the parties. Many interpret the standard in probabilistic terms. It is met if the jury is convinced that, in the light of the evidence, the probability of the claimant being right is above 50%. Continental European law takes a fundamentally different perspective. Irrespective of the character of the dispute, the court may only hold for the claimant if, to the judge's *intime conviction*, the claim is true. The paper explains why, in the light of the fact that legal disputes are almost always ill-defined, the Continental position is adequate (Engel 2009).

Most people have never read the statutes that are to govern their lives. Even if, occasionally, they get access to the text, they lack the expertise to interpret it properly. How come that, nonetheless, the law is able to guide behavior? Based on the (admittedly still largely incomplete) evidence, we sketch an explanation based on developmental psychology. From the very beginning of their lives, humans are sensitive to normative expectations. This is the main root for culture to shape people's lives. In essence, the law can capitalize on this much more general mental mechanism. All the law has to make sure of is that individual normative expectations reach people in a format that makes it easy to see what the law expects them to do in the situation in which they happen to be. This is done through heavily contextualised social mirror rules. People either learn them by observation, or intermediaries like the press or social organisations make them explicit (Engel 2008).

Our work on governance by law obviously benefits from close collaboration with the independent research group. The closest link is, of course, their work on legal experts, like the study on the role of emotions (Dickert Gansen Glöckner Herbig Portack 2009), or the work on affective information about the defendant (Dickert Horstmann 2009). For more detail, the interested reader is referred to the section of this report on the independent research group.

c) Other Institutions

It is well-known that the willingness to contribute to a public project is sensitive to framing. It is less well-known to which degree these framing effects are contingent on culture. We tested subjects in the West Bank, China, Finland and Israel on a two-person prisoner's dilemma where the effect on the other player was either framed as a positive or as a negative externality. In the West Bank and in China, participants significantly contributed more in the positive externality frame, while in the other two locations framing did not have a significant effect (Goerg Walkowitz 2009).

From a perspective of expected utility, it should not make a difference whether people are asked to contribute a large amount to one public project, or smaller amounts to a number of public projects, if these amounts add up to the same overall contribution. We were, however, able to show that, in the lab, contributions are substantially higher in the second case (Corazzini Kube Maréchal 2009). We turned this finding into a piece of policy advice. The organisation "Doctors for Developing Countries" agreed to send out two different solicitation letters. In the baseline, they simply requested donations for the organisation. In the treatment, donors were given the opportunity to indicate the developing country in which they wanted the organisation to become active. Those donors who seized the opportunity made substantially larger contributions (Aretz Kube 2009).

If participants are given a chance to vote on a desired contribution level, in Germany this increases contributions, while in China it does not (Gaissmaier Tontrup 2009). Apparently, German participants appreciate participation, while Chinese participants are solely interested in outcomes. Chinese and Germans do also differ in their sensitivity to procedural fairness. We explored this difference in a setting where an agent first has to perform a real-effort task. The agent is informed about her performance. There is a publicly-known norm for mapping performance to expected payment. The actual payment, however, is not determined by the experimenter, but by a second experimental subject. This subject only knows a randomly selected sample of the first subject's actions in the real-effort task. If the first subject is discontent with the allotted payment, in the last step of the game she is entitled to appeal against the second subject's decision. Appeal is costly, and it is only effective with a probability of 1/3. In the treatment, first subjects know that the second subject only knows a quarter of the evidence, while in the baseline they do not. In Germany, if the information of the second subject is transparent, appeal is much rarer, while there is no effect in China (Dittrich Tontrup 2009).

3. Tools

a) Experimental Tools

Most of our experiments are in the tradition of experimental economics. To maintain experimental control, the situation is decontextualised. Interaction is anonymous. All

critical action is through the computer. Subjects make choices that are incentivised. Since this apparatus has only been used on a very small number of legal issues, in the near future, this will remain our workhorse.

We have explored a seemingly innocent difference in experimental protocol. In the standard protocol, subjects are invited to choose between two differently risky options. In the alternative protocol, they have to indicate at which point they are indifferent between a risky and a safe option. It turned out that, with the latter protocol subjects are more risk-averse. Likewise, if the benefit from one option is delayed, time preferences change with protocol (Ding 2009).

We have gained experience with a whole series of post-experimental tests. In many experiments, we have elicited social value orientations by the ring value measure test (Liebrand and McClintock 1988). Depending on the research question, we have measured risk aversion (Holt and Laury 2002) or loss aversion (Gächter, Johnson et al. 2007), or both. In the already mentioned experiment on the driving forces of behavior in a prisoner's dilemma, we have added a dictator game variant as a tool for measuring greed (Engel Normann 2009).

We have benefitted from the collaboration with the psychologists to enrich the experimental toolbox. We have started to trace information acquisition by a mouse lab like tool. On their decision screens, participants are offered buttons that lead them to background information and to information about the history of the game. We record which information they consult when, and how much time they spend on it (for a first study, see Engel Glöckner 2009). In the future, we plan to capitalise on the hands-on experience of the psychologists with eye-tracking (Ahlgrimm, Horstmann) as an even more sophisticated technology for tracing information acquisition. We also use tests for the big five personality measures (Rammstedt and John 2007), and questions from the German Socio Economic Panel as a proxy for trust.

Most behavioral experiments start from the assumption that motivational and cognitive forces are human universals. Capitalising on the good international relations across experimental economics labs, and on the fact that two doctoral students from China have joined the Research School, we have explored the remarkable differences between Western and Eastern cultures (Ding Tontrup 2009, Gaissmaier Tontrup 2009, Goerg Walkowitz 2009).

Triggered by the fact that we could not replicate the counterpunishment results from London and Rennes, we have collected a large dataset of some 20.000 data points on cooperation in four-person public goods with marginal per capita rate.4. Experiments were run all over the world, and partly had no institutions at all, partly provided for decentralised punishment, and partly gave punishees a counterpunishment option. We used this dataset to show that first impressions determine contributions to a very large extent (Beckenkamp et al. 2009). That way we also gained experience with the reanalysis of experimental data.

While, at least for the near future, lab experiments will remain our primary approach, in appropriate cases we also run field experiments. We have already reported the experiment with "Doctors for Developing Countries" (Aretz Kube 2009) and the experiment in the virtual "World of Warcraft" (Nicklisch Salz 2008).

b) Analytic Tools

Traditionally, experimental economists have deliberately only used very straightforward statistical tests. If the experimental manipulation has worked out, one ideally should be able to show this in a Mann-Whitney or in a Wilcoxon test, depending on whether the manipulation is between or within subjects. Maybe, if there is more than one treatment, one may also run a Kruskal Wallis test or, if there are a good theoretical reasons to rank treatments, a Jonckhere Terpstra test. We follow this custom. Actually, we have even developed a tool to implement the Epps Singleton non-parametric test in Stata, allowing us to compare differences in distributions induced by an experimental manipulation (Goerg Kaiser 2009). But we do not believe that nothing else but non-parametric tests should ever be done.

More elaborate parametric statistics have two advantages: one is that they are able to trace determining factors, and another one is that they have much more statistical power. Yet a public-goods experiment generates a challenging dataset. The game is repeated, which is why observations per subject over time are not independent. Moreover, subjects interact in (usually fixed) groups of four, which is why we have panel data. If there are no further qualifications, a random effects model which clusters standard errors at the group level does handle this data structure. We must, however, check, by way of a Hausman test, whether the subject-specific error term is indeed uncorrelated with the explanatory variables. If not, we could, in principle, use the fixed-effects estimator. However, it is less efficient. More importantly even, since this is a mean-differences model, time-invariant regressors drop out. This, above all, affects the variables we are most interested in, our treatments. A way out is a Hausman Taylor model (Hausman and Taylor 1981). By another Hausman test we can check whether we have successfully instrumented those variables that initially caused the Hausman test to be significant (Baltagi, Bresson et al. 2003).

Quite often, the data structure is even more complicated. A typical example is punishment. In each period, each group member must decide whether to punish any of the three other group members. Therefore we have punishment decisions nested in periods, nested in subjects, nested in groups. In principle, mixed effects models handle this data structure, but they do not always converge. Another complication is also illustrated by punishment. Most of the time, most subjects do not punish at all. One may be tempted to interpret this as left-censoring and run a (random-effects) Tobit model. This, however, assumes that, were they not hindered by design, many participants would have assigned negative punishment to some group members. In less technical words:

they would have rewarded group members for high contributions. This seems a fairly strong assumption. It is certainly more realistic to assume that the zeros are "real". Then, the cleanest approach would be a two-part model. A first equation estimates the determinants of the decision to punish at all. A second equation estimates what causes the size of punishment, conditional on punishment being positive. Unfortunately, if the error terms of both equations are correlated, for the second equation one may not simply run a random-effects model on the reduced sample. An imperfect solution is a Heckman selection model. It elegantly takes care of the correlation problem. Yet it assumes that negative decisions are unobserved, whereas we do observe if one subject does not punish another.

A final challenge is serial correlation. Happily, the main causes of serial correlation are the fact that the game is repeated, and that we usually have fixed partner matching. These causes are controlled for anyhow. Yet occasionally there are further reasons for serial correlation. Then the technically correct approach is statistics for dynamic panels, i.e., the Arellano Bond estimator (Arellano and Bond 1991). In the original version, timeinvariant regressors would again drop out. But this can be circumvented by the system GMM version (Roodman 2006). Yet unfortunately, the estimator is made for small T, but large N. We usually only have mid-sized N. Therefore one must heavily restrict the number of instruments to make sure that neither the Sargan test nor the Arellano Bond test for AR(2) in differences are significant.

4. Law and Economics Theory

While the focus of the group is clearly experimental, the proximity of Martin Hellwig's group naturally means that some of us are also interested in law and economics theory. The most frequent application is explicit, formal hypotheses to be tested experimentally (for instance, Engel Rockenbach 2009). But some papers are exclusively theoretical. One fine example has been triggered by a court case. A firm had made it its business to meter interferences resulting from electric current going out of power plants. That way, the firm had near-perfect, timely information on the degree to which these plants worked up to their capacity limits. Buyers of electricity could use this information to appropriate most of the producer rent. In a joint paper that was accepted by the Journal of Law, Economics and Organisation, a member of our group and a member of Martin Hellwig's group modelled the situation (Bechtold Höffler 2009).

Another theory paper explains the absence of shareholder suits in Europe. The stylised fact is traced to the prevalence of the thresholds that shareholders must meet to have standing. In the model, this provides an incentive for larger shareholders to collude with management, to the detriment of small shareholders (Grechenig Stremitzer 2009). Anne van Aaken is also pursuing her work on the economic analysis of public international law. The interested reader is referred to the previous report for a more extensive treatment of the issue.

In response to a model developed by Ben Hermalin, the situations are explored in which the parties should be concerned about poor judicial performance (Engel 2008). In response to an informal paper by Eric Posner, a game-theoretic model for *erga omnes* treaties in public international law is developed (Engel 2009). Further game-theoretic models concern innovation incentives (Engel 2008, 2008a) and the willingness of developing countries to conclude bilateral investment treaties (Engel 2008).

5. Translation into Doctrine

In the US, doctrine is no longer center-stage in the work of most legal scholars. In Germany, the situation is less clear. If one checks habilitation theses, they are hardly ever exclusively doctrinal. However, most of them have a prominent doctrinal part. Young legal scholars thereby try to demonstrate that they are firmly rooted in legal practice, without being intellectually confined to collecting and systematizing the output of courts and administration. This state of affairs explains that there is a lively interest in our work among German legal academics. Take invitations to talk about the principles underlying patent law (Engel 2007, 2008), antitrust law (Engel 2008, 2009), and copyright law (Engel Kurschilgen 2009) for proof. A growing number of German lawyers are particularly interested in behavioral effects. However, the typical German legal scholar, not to mention the legal practitioner, lacks any technical training. To reach this audience, we must therefore write texts that look very different from what is expected in peer-reviewed international journals.

In a quintessential way, this task is taken on by a habilitation thesis. Over the last two years, two of these books have been completed. From the angle of private law, the first book deals with the legislator's choice between mandatory and optional law. On this issue, behavioral assumptions are of particular relevance. If both parties to a contract are fully prevoyant, penalty defaults can lead the way to a separating equilibrium. In this spirit, the legislator would choose defaults such that those whose private information is socially most valuable are induced to reveal it. However, from a behavioral perspective, that much prevoyance is unlikely, the most straightforward explanation being that those favoured by the legislator might consider themselves endowed. Then, in line with the more traditional approach, it might be preferable to design defaults such that they fit the standard case (Bechtold 2009).

The second book is a contribution to public law. Which sounds like a truism: law is about justice, is intellectually highly elusive. This explains why practising lawyers, and legal scholars for that matter, try to avoid talking about justice. While understandable, this reaction deprives legal discourse of a proper language for its very essence. Capitalising on game theory, on experimental work on fairness, and on cognitive theory, this book provides the language. It uses the example of legislation aiming at curbing climate change to demonstrate in doctrinal terms how this language can be put to good use by practising lawyers (Magen 2009a). The third book on state action in the face of risk and

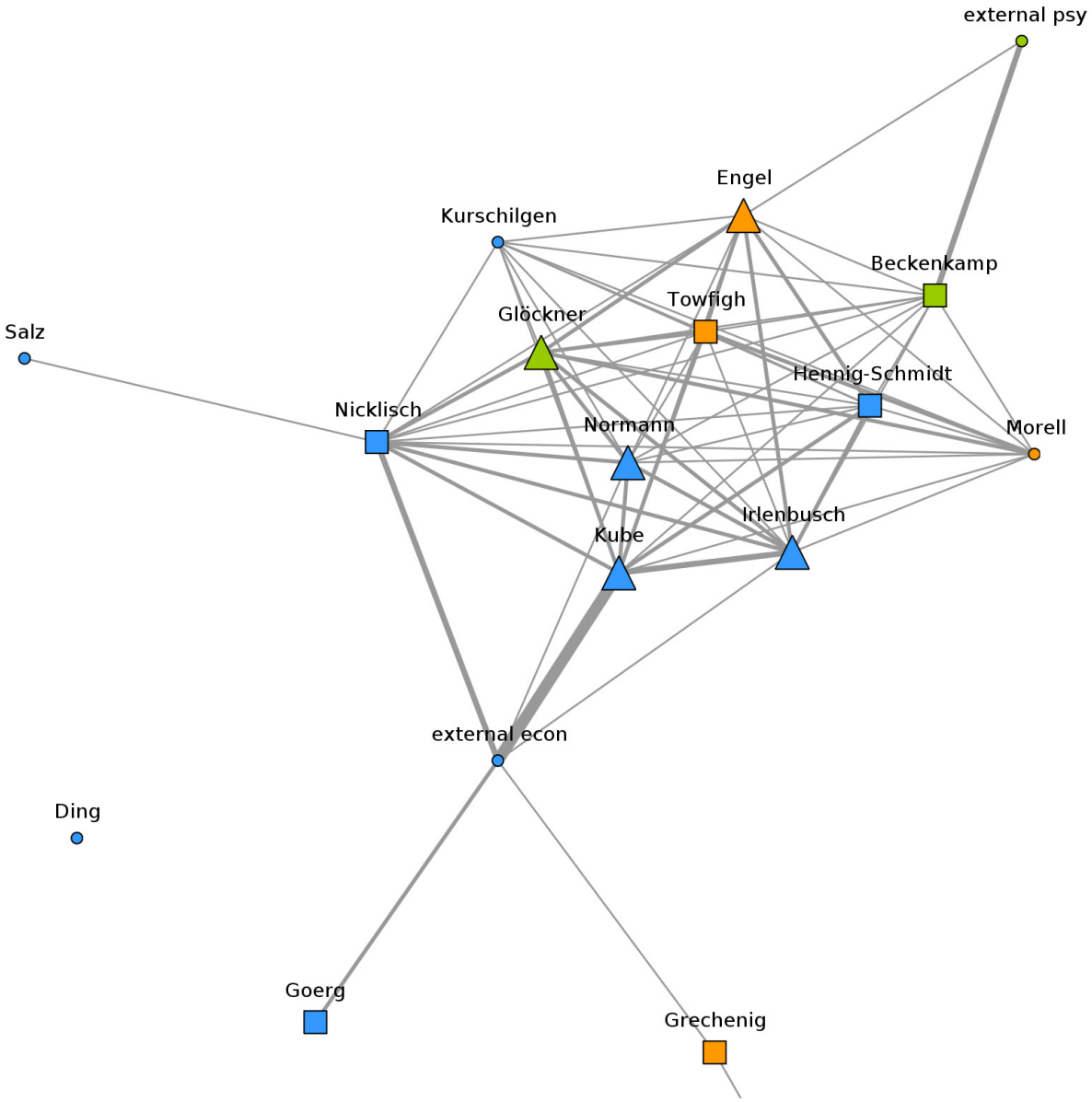
uncertainty has already been covered at some length in the previous report to the council, to which the interested reader is referred (Spiecker 2009).

Further contributions in the same spirit address legal complexity (Towfigh 2008), telecommunications regulation (Lüdemann 2008, Engel 2008), the plans to give the German antitrust authority power to dissolve firms (Engel 2008), leasing by public authorities (Lüdemann 2008), emissions trading (Magen 2009b), state intervention into the information flow (Spiecker 2008, 2009), consumer protection (Lüdemann 2009) and a host of questions in public international law (Petersen 2008, 2009).

III. Research Agenda

Over the last two years, the institute in general, and the group in particular, have continued to develop very positively. The economics group is fully established. Quite a few of its members have research interests that lend themselves to fruitful exchange, if not to collaborative ventures. The research school helps us attract graduate students, gives them additional supervisors from different disciplines and locations, makes it natural for them to start joint work with researchers from the partner institutes, and, most importantly, gives us a platform for formal training. We are sending all newly-arrived legal researchers to that school, whatever their status. The independent research group not only brings stimulating new research to the institute. It first and foremost gives us a chance to conduct truly in-depth research on legal decision-making. Along with this, it helps us advance more appropriate definitions of collective goods. For the academic year 2007/08, two eminent experimental economists joined the group. With their support, the group has made a major step forward into being a recognized center for experimental work on collective goods. The institute has joined the Europe-wide network on antitrust law and economics, started from Tilburg. Together with colleagues from the law and economics faculty of Bonn University, the institute has founded a regular exchange on questions of law and economics. Finally, Urs Schweizer and Christoph Engel continue to organise the yearly seminars on new institutional economics. All of these are fora for getting deeper into classic and behavioral law and economics.

The major change of the last two years is best visible in the following graph. It summarises the collaborative ventures of which the group is part and parcel. The graph is confined to those publications that have either already come out in peer-reviewed journals, or that have been submitted to them. Unsurprisingly, seniority matters. Yet it is particularly remarkable that two PhD students also feature prominently in the core of the network. The graph further shows that indeed all three disciplines have their fair share in the collective enterprise.



What is not yet fully reflected in completed projects is the degree to which the lawyers are engaged in interdisciplinary work. All of them, in some way or other, capitalize on the specific opportunities provided by the institute. Markus Englerth, Jörn Lüdemann, Stefan Magen, Alexander Morell, Emanuel Towfigh and Gaoneng Yu are preparing experiments. Nadine Bläser, Kristoffel Grechenig and Alexander Morell are writing models. Niels Petersen is going to New York to receive hands-on training in econometrics, which he plans to apply to legal issues. Monia Manâa is undertaking a field study. Jörn Lüdemann, Stefan Magen, Niels Petersen and Emanuel Towfigh are working on habilitation projects that translate findings from economics or psychology into law.

In the following, we point to some of the planned or started projects, to illustrate future directions.

1. Problem Definition

Capitalizing on a design originally developed by Gary Bornstein, we intend to study a Bertrand duopoly where each firm is composed of three experimental participants who individually bid asking prices, the sum of which constitutes the team asking price. The lowest pricing team wins the bidding competition. There are two different schemes for the internal sharing of profits: either the equal split, or each group member is rewarded according to the individual asking price. In this setting, we intend to explore three questions: which internal organisation is best for winning the external contest? Which pricing scheme yields higher profits for team members? Is there tacit collusion over the choice of internal organisation, in the interest of safeguarding higher profits for both firms (Kurschilgen Morell Weisel)?

The experiment on greed and fear in a two-person prisoner's dilemma lends itself to an extension that captures how the dilemma of cartelists is embedded in a larger social framework. By bringing a third person into the lab who is negatively affected by internal cooperation, we capture the fact that successful collusion inflicts harm on the opposite market side. By a positive probability of being sanctioned in case of coordination, we capture the fact that antitrust authorities have power to intervene, but are quite often not in a position to exercise their prerogatives. We will again run the dictator game variant and the test for loss aversion to learn more about motivation. We will also elicit beliefs (Engel Zhurakhovska).

Another project explores what different types of discrimination can be observed in labour-market settings. In the experiment, employers receive short CVs of 12 potential employees with different combinations of characteristics. The CVs differ by the applicant's gender, her/his country of origin and the applicant's result in the A-levels. Employers decide about a rank order of the applicants, a wage for each applicant and whether the work of an applicant is controlled (i.e., whether a minimum effort level is imposed). This introduces three dimensions of discrimination and we are interested in the relation between these dimensions. While an employer might have a clear order of preference about the applicants, it is not clear whether this is also reflected in the paid wages. We analyze which dimension of discrimination is activated by which characteristic of an applicant. In addition we investigate the reaction of the employees for a given dimension of discrimination depending on the subject pool affiliation (i.e., the country of origin) (Goerg Hennig-Schmidt Walkowitz).

A psychology project aims at casting light on how people construct prices in consumer decisions. The project will consider endowment effects, social value orientations, and forecasts of affective experiences (Beckenkamp Dickert). We also want to deepen our understanding of conditional cooperation. We expect that cooperation not only depends on beliefs about the intended contribution level of others, but also on beliefs about their preferences (Fischer).

2. Institutional Intervention

In public-goods experiments, punishment is implemented as a reduction of period income by anonymous intervention. This is, of course, very different from punishment through the criminal law system. In an experiment, we wish to test sanctions in the field where their effect is strongest (capital punishment notwithstanding). Using the design from the greed and fear experiment, we want to compare prisoners with a matched non-prison population (Chmura Engel Englerth Pitz).

Sadly, with complete information, sanctions are a more powerful tool for stabilizing cooperation in a public good than rewards. We suspect that the comparison might be tilted by the cleanliness of the test. In the field, occasional mistakes are hard to avoid. Being punished unjustly is likely to trigger strong emotions. Being rewarded unjustly is not likely to unleash equally powerful feelings. We therefore want to compare sanctions and rewards if feedback about other players' contributions is noisy (Goerg Nicklisch). Another experiment will test rewards that increase over time. The more a subject has been faithful to the social goal, the quicker the size of the reward grows (von Heusinger).

Some institutions that are influential in the field are hard to test in the lab. A good illustration is decorations. If there is no context, if nobody observes, decorations are almost pointless. Using the access to the virtual "World of Warcraft", we plan to implement decorations under fully controlled conditions (Frey Neckermann Nicklisch).

Customary law is the most enigmatic source of law. Doctrine requires consistent practice and *opinio iuris*. Public international law, where this source is most important, has added the option to be a "persistent objector". If a state persistently objects to the emerging rule of international law, this state is not bound by it. However, persistent objection does not hinder the formation of the rule for the remaining states. We plan to test these institutions in a public-goods game with punishment and counterpunishment. In the first treatment, we will instruct all subjects that punishment is legitimate only if a justified normative expectation has been violated. We also will instruct them that counterpunishment is legitimate only if punishment has not been justified. That way we intend to capture reprisals and counter-reprisals. Norm formation shall be implemented by requesting participants every period to indicate whether they believe that there is a contribution norm and, if so, at which level. In the second treatment, participants additionally are able to object to the norm (Engel Kurschilgen).

(The following list of references only covers material that is not part of this report. For the latter, please see the bibliography of the report.)

References

ARELLANO, MANUEL and STEPHEN BOND (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies* 58: 277-297.

BALTAGI, BADI H., GEORGES BRESSON and ALAIN PIROTTE (2003). "Fixed Effects, Random Effects or Hausman–Taylor? A Pretest Estimator." *Economics Letters* 79: 361-369.

BECKER, GARY STANLEY (1968). "Crime and Punishment. An Economic Approach. " *Journal of Political Economy* 76: 169-217.

Choi, Y., & Mai-Dalton, R. R. (1998). On the leadership function of self-sacrifice. *Leadership Quarterly, 9*(4), 475-501.

De Cremer, D., & Van Knippenberg, D. (2002). How do leaders promote cooperation? The effects of charisma and procedural fairness. *Journal of Applied Psychology, 87*(5), 858-866.

De Cremer, D., & van Knippenberg, D. (2004). Leader self-sacrifice and leadership effectiveness: The moderating role of leader self-confidence. *Organizational Behavior and Human Decision Processes, 95*(2), 140-155.

DENANT-BOEMENT, LAURENT, DAVID MASCLET and CHARLES NOUSSAIR (2007). "Punishment, Counter-Punishment and Sanction Enforcement in a Social Dilemma Experiment." *Economic Theory* ***: ***.

ENGEL, CHRISTOPH (2007). "How Much Collusion? A Meta-Analysis on Oligopoly Experiments." *Journal of Competition Law and Economics* 3: 491-549.

FEHR, ERNST and SIMON GÄCHTER (2000). "Cooperation and Punishment in Public Goods Experiments." *American Economic Review* 90: 980-994.

FISCHBACHER, URS and SIMON GÄCHTER (2009). "Social Preferences, Beliefs, and the Dynamics of Free Riding in Public Good Experiments." *American Economic Review* ***: ***.

FISCHBACHER, URS, SIMON GÄCHTER and ERNST FEHR (2001). "Are People Conditionally Cooperative? Evidence from a Public Goods Experiment." *Economics Letters* 71: 397-404.

GÄCHTER, SIMON, ERIC J. JOHNSON and ANDREAS HERRMANN (2007). Individual-Level Loss Aversion in Riskless and Risky Choices
http://www.nottingham.ac.uk/economics/cedex/papers/2007-02.pdf.

HAUSMAN, JERRY A. and WILLIAM D. TAYLOR (1981). "Panel Data and Unobservable Individual Effects." *Econometrica* 49: 1377-1398.

HELLER, MICHAEL A. (1998). "The Tragedy of the Anticommons. Property in the Transition from Marx to Markets." *Harvard Law Review* 111: 621-688.

HOLT, CHARLES A. and SUSAN K. LAURY (2002). "Risk Aversion and Incentive Effects." *American Economic Review* 92: 1644-1655.

LEDYARD, JOHN O. (1995). Public Goods. A Survey of Experimental Research. *The Handbook of Experimental Economics*. J.H. Kagel und A.E. Roth. Princeton, NJ, Princeton University Press: 111-194.

LIEBRAND, WIM B. and CHARLESG. MCCLINTOCK (1988). "The Ring Measure of Social Values. A Computerized Procedure for Assessing Individual Differences in Information Processing and Social Value Orientation." *European Journal of Personality* 2: 217-230.

NIKIFORAKIS, NIKOS S. (2008). "Punishment and Counter-Punishment in Public Good Games: Can We Really Govern Ourselves?" *Journal of Public Economics* ***: ***.

RAMMSTEDT, BEATRICE and OLIVER P. JOHN (2007). "Measuring Personality in One Minute or Less. A 10-item Short Version of the Big Five Inventory in English and German. " *Journal of Research in Personality* 41: 203-212.

ROODMAN, DAVID (2006). How to Do xtabond2. An Introduction to "Difference" and "System" GMM in Stata http://repec.org/nasug2006/howtodoxtabond2.cgdev.pdf.

SIMON, DAN (2004). "A Third View of the Black Box. Cognitive Coherence in Legal Decision Making." *University of Chicago Law Review* 71: 511-586.

C.II.2 Independent Research Group: Intuitive Experts

Head: Dr. Andreas Glöckner

PostDoc

Dr. Stephan Dickert (Psychology)

Doctoral Candidates

Andrea Ahlgrimm (Psychology)
Nina Horstmann (Psychology)
Tanja Ostermann (Psychology)
Janet Kleber (Psychology) (joined the group as doctoral candidate in 10/2009)
Stephan Tontrup (Law) (left the group 12/2008)
Milan Djordjevic (Law) (left the group 12/2008)

Visiting Scholars

Dr. Britta Herbig (Psychology) (02/2008-06/2008)
Dr. Benjamin Hilbig (Psychology) (09/2009-)
Daniel Hawes (Economics) (06/2009-09/2009)

Student Research Assistants

Kristina Schönfeldt (Law)
Marie Landsberg (Law)
Maria Gladigau (Psychology)
Esther Kordecki (Psychology)
Susann Fiedler (Psychology)
Selina Scholz (Psychology)
Sebastian Schier (Computer Sciences)

Introduction

We started the group *Intuitive Experts* in summer 2007 to tackle two major challenges of psychological decision research, namely to improve the understanding of the complex interplay between intuitive and deliberate processes and to enhance research in Law and Psychology by providing computationally specified and plausible models of decision making in complex environments which capture processes of judges as well as lay people. We progressed in both issues using a model driven approach to investigate empirically (legal) decision making and behavior in public-goods situations. We used synergetic effects of interdisciplinary research both to test and enhance the psychological model by collecting evidence in complex environments and to provide tailored empirical answers to important legal issues.

According to Herbert A. Simon's classic argument of bounded rationality, until recently the focus of psychological decision research has been on investigating deviations from rationality based on the view that humans' cognitive capacity is limited. We have challenged this view on theoretical and empirical grounds and have shown that individuals draw upon intuitive processes to overcome the obvious limitations of mere deliberate reasoning.

We develop and use advanced empirical methods such as physiological measures and eye-tracking to look deeper into the mechanisms of the mind, and we were able to unravel some fascinating aspects of the complex interplay between automatic and deliberate processes, which is computationally powerful, highly efficient and adaptive. As we expected, personally perceived "intuitions" (i.e., instantly emerging feelings or insights in decisions) are only one observable signal from this complex system; they are just the tip of the iceberg. The same mechanisms seem to be the core operational processes of many – if not all – decisions although individuals become aware of them in only these very few situations. The better understanding of these mechanisms allowed us to derive predictions concerning the efficient design of legal institutions and to identify factors influencing cooperation in public goods.

In specifying the research plan and implementing our investigation, we figured that there is a dire need for empirical investigation in both cognitive decision research on automatic-intuitive processes as well as in legal and economic topics. We had to concentrate on a few of them and to postpone many to the future. In cooperation with lawyers and economists from the institute, we investigated several of the model's predictions empirically. This effort was fruitful and led to initial truly interdisciplinary publications (on top of classic publications). We experienced that interdisciplinary work was particularly time-consuming at the beginning. It starts paying back by an enrichment of methodological tools (particularly between economists and psychologists), a tremendously widened scientific perspective, and by providing a wealth of interesting research questions (particularly by lawyers).

We progressed along four lines of research: 1) model development and testing, 2) methodological developments, 3) behavioral legal studies, and 4) investigating the factors influencing cooperation in public goods. One of our major achievements concerning the first issue lies in having established and improved a process model of the complex interplay between intuitive and deliberate decision making processes. The model is based on a computationally specified neural network and follows the parallel constraint satisfaction approach. It is being successfully applied to a variety of decision-based research questions. Of course, intuition is generally difficult to measure because it operates without conscious awareness. Therefore, concerning the second issue, we had to develop several new methods. To make our acquired knowledge publicly available we edited a book providing "Foundations for tracing intuition". Concerning the third issue, we tackled quite different topics ranging from investigating the consequences of jurors relying on intuition to the question whether rebate schemes might induce stickiness in customers and potentially lead to market foreclosure. Concerning the fourth issue, we investigated, for exam-

ple, the influence of a perceived leaders' sacrifice in public-goods games. In our efforts, we contribute significantly to the institutes' overall agenda and particularly the goals and aims of the group by Prof. Engel for adopting a stronger empirical perspective in investigating collective goods and legal questions.

The following sections outline the developments in the four areas in more detail.

Model Development and Testing

The Parallel Constraint Satisfaction Model

Elaborating on previous work, Andreas Glöckner and Tilmann Betsch were able to establish the parallel constraint satisfaction (PCS) model as a general framework for decision making research that specifies the complex interplay between intuitive and deliberate processes (Glöckner & Betsch, 2008b). According to the PCS model, decision making is an inherently constructivist process. Individuals do not perceive information objectively, but construct interpretations or stories from given information. Based on automatic-intuitive processes, initial tendencies for one or another interpretation are accentuated and contradicting information is devalued. The decision maker becomes aware of the resulting (consistent) mental representations of the decision task, but not of the underlying automatic processes. Additionally, deliberate processes are activated for cases in which the consistency of the resulting mental representation fails to reach a certain threshold. Deliberate constructions are used to generate new information, restructure the mental representation and to consider alternatives. Thereby the overall likelihood of making a globally optimal decision instead of a locally optimal one is increased.

The general model has been specified and applied to decision making tasks involving probabilistic inference (e.g., which product is of higher quality?; Ahlgrimm, forthcoming; Glöckner, 2008a; Glöckner & Betsch, 2008b; Glöckner, Betsch, & Schindler, in press; Glöckner & Hodges, 2009; Glöckner & Moritz, in press; Ostermann, forthcoming), risky choices (see also Glöckner & Betsch, 2008a; e.g., which of two lotteries do you prefer?; Glöckner & Herbold, in press), trade involving personal endowment (e.g., whether to buy or sell a mug for a certain price; Glöckner, Kleber, Tontrup & Bechtold, 2009; Glöckner, Tontrup, & Kleber, under review; Kleber, 2009), base-rate tasks (e.g., how likely was an accident caused by a yellow cab given a certain base-rate and eye-witness reports; Glöckner & Dickert, 2008), as well as for decisions in complex legal cases by lay persons (Ahlgrimm, forthcoming; Glöckner & Engel, 2008; Horstmann, forthcoming) and legal experts (Herbig, Dickert, Glöckner, Gansen, & Portack, under review; Herbig & Glöckner, 2009).

Contributions to the General Developments of Intuition Research

Towards a differentiated view on intuition. The majority of previous research on intuition may be claimed to suffer from loose theorizing and a reliance on underspecified models. The larger body of this literature appears to present an accumulation of partially over-

lapping theories, which seem mainly concerned with distinguishing and describing two decision making processes (i.e., intuition and deliberation). Description of these processes has so far remained superficial, and the strict distinction within the dual-process approach might be criticized for being somewhat artificial. To overcome the dual-process framework popularized by Daniel Kahneman and others, and to provide a theoretical background for empirical investigation of intuition we propose a more differentiated framework for intuition research (Glöckner & Witteman, in press-a, in press-c). We argue that intuition is just a label for many different kinds of automatic processes and suggest a differentiation according to the underlying processes into Associative intuition, Matching intuition, Accumulative intuition, and Constructive intuition.

Intuition and deliberation are less distinct than usually assumed. In an important recent work, we used advanced eye-movement recording technology and showed that intuitive and deliberate decision modes are less distinct than assumed by most dual-process models (Horstmann, Ahlgrimm, & Glöckner, 2009). In line with the PCS model, it seems that there is a common automatic process that underlies both decision modes.

Cognition modulates feelings. Some models of intuition (i.e., associative intuition) assume intuition to be a result of feelings which reflect previous learning experiences, and behavior to follow somewhat mechanistically from these feelings. In contrast, PCS suggests that previous experiences are quickly integrated with currently provided cognitive cues. In support of PCS our recent study using physiological measures (i.e., peripheral arterial tonus) finds that previous experiences factor importantly in decision tasks, but that the resulting feeling (i.e., anticipatory arousal) is modulated by currently available cognitive cues (Glöckner & Hochman, under review). Specifically, anticipatory arousal increases (vs. decreases) if previous learning experiences and cognitive cues are inconsistent (vs. jointly point towards selecting the same option). Hence, our findings indicate that the relation between feelings and cognition is more complex than assumed by some simple intuition models. In another research project that investigates experience-based decision making, Stephan Dickert and Ellen Peters (forthcoming) show that affective reactivity towards positive and negative events is only helpful for decision performance when information is processed intuitively. In contrast, a more deliberative (cognitive) approach to information processing both decreases the relationship between feelings and choices as well as overall decision performance.

Experts have more complex mental representations but rely on the same decision processes as lay persons. One big challenge for the group has been to theoretically connect the concepts of intuition and expertise. To support this, Britta Herbig, a renowned expertise researcher, was temporarily invited to join the group. Resulting from this cooperation, we were able successfully to apply the PCS model to decision making tasks involving different levels of expertise (Herbig & Glöckner, 2009). We argue that the main differences of how experts and novices make decisions result from the different ways in which they construct mental representations of a decision task. We find first evidence for this claim in a study on premeditation judgments in legal cases comparing lay persons and experienced law students (Herbig et al., under review).

People are lightning calculators – at least sort of. There is a long-standing debate whether and how people might be able to approximately maximize their utility. According to a classic critique by Veblen (1898), neo-classic economics has assumed the rational man to be "a lightning calculator of pleasures and pains". Although this comment was, of course, meant sardonically, we have now collected considerable support for the claim that intuitive-automatic processes enable people to resemble at least partially such lightning calculators. In a study recording eye-movements, we find evidence that people make risky decisions (i.e., selection between gambles with monetary outcomes) based neither on deliberate calculations nor on simplified heuristics. Instead, they show mostly short eye-fixations (thereby indicating the use of automatic-intuitive processes), while still exhibiting quick choices akin to a weighted integration of probabilities and outcomes (see also next section). In line with the predictions of PCS, people shift their attention towards the favoured gamble and the most attractive outcomes to highlight the advantages of the favoured gamble (Glöckner & Herbold, in press).

Shifting the Bounds of Rationality: Intuition enables people to integrate large amounts of information quickly and to approximate rational solutions

Automatic-intuitive processes are operative in a variety of decision making tasks. Elaborating on earlier findings, we find that these automatic-intuitive processes enable people quickly to understand even complex decision tasks and to integrate large amounts of information. Furthermore, we find that information is integrated under consideration of importance as well as its predictive power (Glöckner & Betsch, 2008a, 2008c; Glöckner & Dickert, 2008; Glöckner & Herbold, in press; Glöckner & Hodges, 2009; Hilbig & Pohl, 2009). For example, Andreas Glöckner and Stephan Dickert show that participants are well able to take into account base-rate probabilities and three probabilistic cues. More specifically, in an incentivized environment with repeated feedback, participants showed choices that were in line with the normative solution according to Bayes' theorem in 86% of the cases and made these decisions in less than 3 seconds (on average). It is noteworthy that literally none of our participants could calculate the Bayes' solution deliberately in a highly incentivized post-test which clearly speaks for the usage of well-calibrated intuitive processes.

Andrea Ahlgrimm aimed to find the upper limits for this information integration capacity and could show that even in rather complex decisions between two options with up to 12 cues (e.g., alibi available, DNA trace), people integrated information in a weighted compensatory manner within less than 5 seconds, which also speaks for the usage of partially automatic processes (Ahlgrimm, forthcoming).

Coherence Shifts: Systematic predecisional information distortions

Furthermore, we have extended previous findings concerning systematic predecisional information distortions, which occur automatically in support of the favoured option (*coherence shifts*). We found that the PCS model can predict these coherence shifts quite well not only in the aggregate but also on an individual level (Glöckner, Betsch and Schindler, in press; Glöckner & Betsch, in press; Ostermann, forthcoming). Tanja Oster-

mann additionally showed that the size of coherence shifts differs systematically depended on personality and situational factors: persons with a high decision-related action orientation show larger coherence shifts than state-oriented participants, and coherence shifts increase with an increasing general preference for consistency (Ostermann, forthcoming).

Coherence shifts are potentially problematic in legal decision making contexts, in that contrary facts are devalued, which may lead to overconfidence and an increased number of wrong convictions. Two empirical projects on coherence shifts in juror decision making are reported in more detail below (Fiedler & Glöckner, forthcoming; Glöckner & Engel, 2008).

Methodological Developments

We have shown that classic methods of behavioral decision research (e.g., recording individuals' information search in a hidden information matrix) sometimes hinder the application of intuitive-automatic processes and that these methods might even not be capable to capture them at all (Glöckner & Betsch, 2008c). We edited a book that provides foundations for tracing intuition (Glöckner & Witteman, in press-b). The members of the group contributed several chapters to this book. In the introduction chapter, Andreas Glöckner and Cilia Witteman critically review intuition research (Glöckner & Witteman, in press-a). Additionally the members of the group have succeeded in suggesting a multiple-measure approach to investigate decision processes (Glöckner, in press); describing the use of self-report tools for measuring affective and emotional reactions (Dickert, in press); discussing the application of different physiological measures in intuition research (Hochman, Glöckner, & Yechiam, in press); describing different methods to induce intuitive and deliberate decision modes (Horstmann, Hausmann, & Ryf, in press); and presenting exemplified method applications (Witteman & Glöckner, in press).

Based on the ideas presented in the book, Andreas Glöckner has developed a Multiple-Measure Maximum-Likelihood strategy classification method to test process models for intuitive and deliberate decision making based on a simultaneous investigation of choices, response latencies, and reported confidence (Glöckner, 2009a). In Monte-Carlo simulations, it is shown that the method allows for an unbiased strategy classification for process models and is more efficient than previously used methods.

Furthermore, we suggest several directions for an extended usage of eye-tracking data to investigate cognitive processes in decision making (Glöckner & Herbold, in press; Horstmann, Ahlgrimm & Glöckner, 2009). Elaborating on findings from cognitive psychology, we have shown, for instance, that the length of individual fixations is a good indicator for depth of processing in decisions. Calculation strategies result in many long fixations (>500 ms), whereas people show mainly short fixations (<250 ms) when deciding on the basis of automatic-intuitive processes.

Following a somewhat different approach, Benjamin Hilbig and coworkers (Hilbig, Erdfelder, & Pohl, in press) developed a multinomial model for testing the prevalence of simple heuristics that might rely on automatically activated recognition information only. Finally, it is noteworthy that, inspired by an econometrics workshop at the institute and the joint work with economists, members of the group now use more efficient regression approaches to analyze their empirical data (e.g., multi-level analysis / fixed- and random-effects models, clustering). Additionally, members of the group regularly hold methodological and statistical workshops and seminars with legal scholars at the institute, both to exchange and create ideas for experimental research.

Behavioral Legal Studies

In several cooperation projects, we have applied the PCS view to legal issues. We will sketch some of these studies in the following:

PCS and legal procedure. Taking a very general perspective, Andreas Glöckner has derived predictions of the PCS approach for the design of efficient legal institutions and exemplarily investigated in how far German criminal procedure is in line with these predictions (Glöckner, 2008b, 2008c; see also Glöckner, 2009b). A preliminary analysis finds that core aspects of German criminal procedure adhere closely to the principles suggested by PCS. Predictions are, for instance, that institutions should allow judges to utilize holistic overall evaluations of the case (i.e., PCS-based construction of overall mental representations / "*Judiz*") in order to handle complex cases. However, judges should additionally be obliged a) to use deliberate processes to check thoroughly the components of the mental representation these evaluations are based on, b) to make sure that alternative interpretations are considered, and c) to reveal and document the final mental representations on which they base their judgment. The principles of free evidence judgment (*Freie Beweiswürdigung*), the obligations to take into account holistic impressions that arise during the trial (*Gesamteindruck der Hauptverhandlung*), and the obligation to consider all plausible alternative interpretations of evidence are nicely in line with the predictions of PCS to use the advantages and to circumvent the downside of intuition at the same time.

Intuitive jurors: Investigating the downside of intuition. In an experimental project, we tested possible negative effects of the fact that jurors partially rely on automatic-intuitive processes in their judgments (Glöckner & Engel, 2008). We found that U.S. model jury instructions for preponderance of the evidence and beyond a reasonable doubt influence conviction rates in the intended direction and are not undermined by coherence shifts, although probabilistic estimations of these standards are inappropriate. However, even massive changes in explicitly stated probabilities, while holding the overall constellation of facts constant, do not influence conviction rates and the estimated probability for conviction. We argue that improvements for legal procedure should focus on measures that circumvent the negative side-effects of coherence based reasoning in general and

specifically to make probabilistic information better evaluable for decision makers in the law.

In a related study using the same complex case materials, we investigated whether jury deliberation in groups influences information distortion (Fiedler & Glöckner, forthcoming). Our study finds no general increase or decrease in coherence shifts, but some interesting differential effects: people who changed their opinion in the group deliberation were least biased and showed particularly low coherence shifts.

Sticky rebates and market foreclosure. In another experimental project, we investigated whether and how targeted rebates impede rational switching of consumers from an incumbent to an outside option (e.g., market entrant) (Morell, Glöckner, & Towfigh, 2009). In a real trading problem, participants repeatedly bought tokens and could enter a target rebate scheme. Buying in a rebate scheme considerably reduced the likelihood that they switched to an outside option with higher payoff later. The observed stickiness increased with the increasing length of buying in the rebate scheme. We conclude that targeted rebates might have an underestimated potential to foreclose consumer markets.

Overconfidence and illusion of control in sports bets. The regulation of sports bets is highly debated in German law. Two crucial questions that can only be answered empirically are a) whether winning in sports bets depends more on luck or on skill and b) whether persons correctly estimate their influence on winning probabilities or show illusion of control which might contribute to addictive gambling behavior. In a comprehensive incentivized online study, we investigated peoples' ability to predict real sports bets (1. Bundesliga, the German First League in Soccer) in relation to their self-assessment of skill/expertise (Glöckner & Towfigh, forthcoming). We found clear evidence that speaks for regulating sports bets according to the current legal standards. There was no influence of self-assessed skill on accuracy; indicating that success in sports bets depends highly on luck. Furthermore, we found overconfidence and illusion of control, particularly in people who thought to possess a high skill level. This indicates that sports bets have the potential to lead to addictive gambling.

Anti-commons and endowment effects. In cooperation with Stefan Bechtold and Stephan Tontrup, we investigated the relative influence of endowment effects, social group effects, and strategic incentives in anti-commons situations (Glöckner, Kleber et al., 2009). We show that endowment effects are reduced by 50% in groups and completely disappear in situations with additional strategic incentives to overprice. We argue that it is therefore not sufficient to design transaction rules such that owners of goods do not have strategic incentives to overprice, but that intervention needs to focus on reducing the endowment effect as well.

Decisions by lay-jurors. Although German law does not contain juries, it does not exclusively rely on professional judges either. In some courts, judges decide together with lay jurors (*Schöffen*), who are appointed by the court for relatively long time periods. In an ongoing project by Milan Djordjevic, Stephan Dickert, Andreas Glöckner, and Kristina Schönfeldt, we investigate decision behavior of lay judges (cf. Glöckner & Schönfeldt,

2009). An important legal and political question that we investigate empirically is whether lay jurors should receive access to the whole case file or only to a summary of it (as is currently the case).

Factors Influencing Cooperation in Public Goods and Charitable Behavior

In public-goods problems, individuals have to make decisions in a strategic environment. In cooperation with behavioral economists from the institute, we have investigated several psychological factors that influence individual decisions to cooperate: perceived sacrifice by a privileged group member, the possibility for latent payback, and first impressions. In the first project, we analyzed two team settings, in which one member in a team had stronger incentives to contribute than the others (Glöckner, Irlenbusch, Kube, Nicklisch, & Normann, in press). If contributions constitute a sacrifice for the privileged player, the other team members are more inclined to cooperate than if contributions are strictly dominant for the privileged player. In a second project, we analyzed the effect of immediate and latent feedback on punishment in repeated public-goods games (Glöckner, Kube, & Nicklisch, in preparation). Contributions and efficiency increase significantly when both mechanisms are used simultaneously. The sanctioning efficiency per immediate punishment point, that is, the increase in contribution by punished players in consecutive periods, increases drastically if latent punishment is at hand. This effect enhances within group cooperation significantly. In a third project we could show that first impressions play an important role in contributions (Beckenkamp et al., 2009).

In a fourth project that aimed at investigating the relationship between the underlying pro-self vs. pro-social value structure with cooperation rates in a prisoner's dilemma game, we were able to show that a more pro-social value orientation leads to increased cooperation (Dickert & Beckenkamp, forthcoming). We found that the psychological costs of inequity aversion can be measured and conceptualized by anticipated emotions (happiness and regret). People with a pro-social value orientation exhibit sensitivity to inequity and anticipate greatest happiness and least regret for mutual cooperation; people with a pro-self value orientation base their anticipated emotions solely on the payoffs.

Finally, in work closely related to public goods, Stephan Dickert investigated the affective determinants of charitable giving (Dickert, 2008). Based on a series of experiments, we propose a two-stage processing model where the decision to donate money for a charitable cause depends initially on emotions related to mood management, while the amount of the donation depends on empathy-related emotions (Dickert, Sagara, & Slovic, in press). Additionally, we carefully examined the role that attentional mechanisms play in the generation of such emotions in charitable contexts and found evidence that visual attentional focus is needed to generate empathy related to the willingness to donate money (Dickert & Slovic, 2009).

Research Agenda

In the next two years, we plan to continue and extend our successful research along similar lines: we will continue working according to a model-based approach, concentrating on experimental work with a strong interdisciplinary focus. We will further improve the PCS model and use innovative measurement methods to tackle experimental issues.

Some of the projects described above are still in progress and follow-up studies are planned or have already been conducted. Some other projects are planned or already in preparation. A few of them are worth listing:

– We will extend the work on endowment effects and anti-commons. Persons seem to behave differently if they are endowed with uncertain goods (e.g., lottery tickets, patents) or concrete goods (e.g., mugs, houses). We aim to differentiate our model and to do more empirical testing on that issue. Furthermore, we will investigate how mental representations of the endowed goods change based on endowment status, time constraints, and visual working memory. (Kleber, Glöckner, Bechtold, Tontrup, Dickert, Ashby)

– Currently cooperation in public goods is mainly analyzed relying on persons' contributions only. To understand the underlying processes better, we aim to do an in-depth analysis of cooperative behavior in public goods, using eye-tracking technology and measuring physiological arousal. (Fiedler, Glöckner, Nicklisch)

– Several findings indicate that personality factors (e.g., intelligence, risk aversion, neuroticism) have a time-stable influence on cooperation. We aim to investigate this influence further in repeated prisoner-dilemma games. Additionally, we will expand on our research on social value orientations and the affective side of inequity aversion in economic games. (Hilbig, Ulshöfer, Glöckner, Dickert, Beckenkamp)

– We aim to extend our studies on the decision behavior of lay jurors and legal experts (judges, state attorneys). We will further test our assumption that differences in decision making mainly depend on differences in mental representations of the task and investigate the consequences for legal institutions. (Dickert, Glöckner, Herbig, Landsberg)

– The PCS model for risky choices should be further improved, refined, and tested against expected utility models and cumulative prospect theory. As a crucial distinct prediction, we will test whether the PCS model can successfully predict intransitivities. (Hawes, Glöckner)

– One specific feature of PCS is that unconscious influences play an important role in decisions. We will empirically investigate how unconscious and conscious cues are integrated. (Glöckner, Unkelbach, Bröder)

– A PCS approach to coherence shifts in preferences related to charitable giving will give an insight into the mechanisms that drive donation decisions in situations that

create moral dilemmas (e.g., when only one charitable contribution can be made, but several potential recipients of this donation exist). We will further investigate the facilitating effects of attention on the generation of feelings in charitable behavior, making use of eye-tracking technology to separate the effects of focal and peripheral attention (Dickert, Slovic).

References

Ahlgrimm, A. (forthcoming). *Shifting the bounds of rationality: The capacity of intuitive-automatic information processing in complex decision making*. Dissertation at Max Planck Institute for Research on Collective Goods, Bonn, Germany.

Beckenkamp, M., Engel, C., Glöckner, A., Irlenbusch, B., Hennig-Schmidt, H., Kube, S., et al. (2009). Beware of broken windows! First impressions in public-good experiment. *MPI Collective Goods Preprint, No. 2009/21. Available at SSRN: http://ssrn.com/abstract=1432393.*

Dickert, S. (2008). *Two routes to the perception of need: The role of affective and deliberative information processing in pro-social behaviour*. Dissertation at the University of Oregon, Eugene, OR.

Dickert, S. (in press). Measuring affect and emotions in decision making: The affective side of intuitive information processing. In A. Glöckner & C. L. M. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods*. London: Psychology Press / Routledge.

Dickert, S., & Beckenkamp, M. (forthcoming). Affect and social values as determinants for cooperation in prisoner dilemmas.

Dickert, S., & Peters, E. (forthcoming). Thinking harder and choosing worse.

Dickert, S., Sagara, N., & Slovic, P. (in press). Affective motivations to help others: A two-stage model of donation decisions. In D. M. Oppenheimer & C. Y. Olivola (Eds.), *Experimental approaches to the study of charitable giving*.

Dickert, S., & Slovic, P. (2009). Attentional mechanisms in the generation of sympathy. *Judgment and Decision Making, 4*, 297-306.

Fiedler, S., & Glöckner, A. (forthcoming). Coherence shifts in groups.

Glöckner, A. (2008a). Does intuition beat fast and frugal heuristics? A systematic empirical analysis. In H. Plessner, C. Betsch & T. Betsch (Eds.), *Intuition in judgment and decision making* (pp. 309–325). Mahwah, NJ: Lawrence Erlbaum.

Glöckner, A. (2008b). How evolution outwits bounded rationality: The efficient interaction of automatic and deliberate processes in decision making and implications for institu-

tions. In C. Engel & W. Singer (Eds.), *Better than conscious? Decision making, the human mind, and implications for institutions* (pp. 259-284). Cambridge, MA: MIT Press.

Glöckner, A. (2008c). Zur Rolle intuitiver und bewusster Prozesse bei rechtlichen Entscheidungen [Intuitive and deliberate processes in legal decision making]. In Max-Planck-Society (Ed.), *MPI Annual Report*. München: Max Planck Society.

Glöckner, A. (2009a). Investigating intuitive and deliberate processes statistically: The Multiple-Measure Maximum Likelihood strategy classification method. *Judgment and Decision Making, 4*(3), 186-199.

Glöckner, A. (2009b). "Neurorecht" ohne Psychologie? Die Rolle verhaltenswissenschaftlicher Betrachtungsebenen bei der Ableitung rechtspolitischer Empfehlungen [Neurolaw without psychology? The role of the behavioral sciences perspective for the derivation of legal recommendations]. In S. Schleim, T. M. Spranger & H. Walter (Eds.), *Von der Neuroethik zum Neurorecht?* (pp. 104-131). Göttingen: Vandenhoeck & Ruprecht.

Glöckner, A. (in press). Multiple measure strategy classification: Outcomes, decision times and confidence ratings. In A. Glöckner & C. L. M. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods*. London: Psychology Press & Routledge.

Glöckner, A., & Betsch, T. (2008a). Do people make decisions under risk based on ignorance? An empirical test of the Priority Heuristic against Cumulative Prospect Theory. *Organizational Behavior and Human Decision Processes, 107*(1), 75–95.

Glöckner, A., & Betsch, T. (2008b). Modeling option and strategy choices with connectionist networks: Towards an integrative model of automatic and deliberate decision making. *Judgment and Decision Making, 3*(3), 215–228.

Glöckner, A., & Betsch, T. (2008c). Multiple-reason decision making based on automatic processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 34*(5), 1055-1075.

Glöckner, A., Betsch, T., & Schindler, N. (in press). Coherence shifts in probabilistic inference tasks. *Journal of Behavioral Decision Making*.

Glöckner, A., & Betsch, T. (in press). Accounting for critical evidence while being precise and avoiding the strategy selection problem in a parallel constraint satisfaction approach – A reply to Marewski (in press). *Journal of Behavioral Decision Making*.

Glöckner, A., & Dickert, S. (2008). Base-Rate Respect by Intuition: Approximating Rational Choices in Base-Rate Tasks with Multiple Cues. *MPI Collective Goods Preprint, No. 2008/49. Available at SSRN: http://ssrn.com/abstract=1316848*.

Glöckner, A., & Engel, C. (2008). Can we trust intuitive jurors? An experimental analysis. *MPI Collective Goods Preprint, No. 38. Available at SSRN: http://ssrn.com/abstract=1307580*.

Glöckner, A., & Herbold, A.-K. (in press). An eye-tracking study on information processing in risky decisions: Evidence for compensatory strategies based on automatic processes. *Journal of Behavioral Decision Making*.

Glöckner, A., & Hochman, G. (under review). The interplay of experience-based affective and probabilistic cues in decision making: Arousal increases when experience and additional cues are inconsistent.

Glöckner, A., & Hodges, S. D. (2009). Parallel constraint satisfaction in memory-based decisions. *MPI Collective Goods Preprint, No. 2009/17. Available at SSRN: http://ssrn.com/abstract=1423728*.

Glöckner, A., Irlenbusch, B., Kube, S., Nicklisch, A., & Normann, H.-T. (in press). Leading with(out) sacrifice? A public-goods experiment with a privileged player. *Economic Inquiry*.

Glöckner, A., Kleber, J., Tontrup, S., & Bechtold, S. (2009). The Endowment Effect in Groups with and without Strategic Incentives. *MPI Collective Goods Preprint, No. 2009/35*.

Glöckner, A., Kube, S., & Nicklisch, A. (in preparation). The benefits of latent payback in social dilemmata.

Glöckner, A., & Moritz, S. (in press). A fine-grained analysis of the jumping to conclusions bias in schizophrenia: Data-gathering, response confidence, and information integration. *Judgement and Decision Making*.

Glöckner, A., & Schönfeldt, K. (2009). Ich überlege. Mein Bauch entscheidet? – Intuition und Entscheidung. *Richter ohne Robe, 21*(2), 60-61.

Glöckner, A., Tontrup, S., & Kleber, J. (submitted). *Investigating the query theory for value construction: Endowment effects are caused by bidirectional activation instead of query order*.

Glöckner, A., & Towfigh, E. (forthcoming). Is soccer betting a skill-game or a gamble? Overconfidence and illusion of control in real-world sports-bets.

Glöckner, A., & Witteman, C. L. M. (in press-a). Foundations for tracing intuition: Models, findings, categorizations. In A. Glöckner & C. L. M. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods*. London: Psychology Press & Routledge.

Glöckner, A., & Witteman, C. L. M. (in press-c). Beyond dual-process models: A categorization of processes underlying intuitive judgment and decision making. *Thinking & Reasoning*.

Glöckner, A., & Witteman, C. L. M. (Eds.). (in press-b). *Foundations for tracing intuition: Challenges and Methods*. London: Psychology Press & Routledge.

Herbig, B., Dickert, S., Glöckner, A., Gansen, C., & Portack, R. (under review). Decision making and expertise in law – Determinants of decision quality in legal case studies.

Herbig, B., & Glöckner, A. (2009). Experts and decision making: First steps towards a unifying theory of decision making in novices, intermediates and experts. *MPI Collective Goods Preprint, No. 2009/2. Available at SSRN: http://ssrn.com/abstract=1337449*.

Hilbig, B. E., & Pohl, R. F. (2009). Ignorance- versus evidence-based decision making: A decision time analysis of the recognition heuristic. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 35*(5), 1296-1305.

Hilbig, B. E., Erdfelder, E., & Pohl, R. F. (in press). One-reason decision-making unveiled: A measurement model of the recognition heuristic. *Journal of Experimental Psychology: Learning, Memory, & Cognition*.

Hochman, G., Glöckner, A., & Yechiam, E. (in press). Physiological measures in identifying decision strategies. In A. Glöckner & C. L. M. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods*. London: Psychology Press / Routledge.

Horstmann, N. (forthcoming). *An analysis of affective and cognitive processes underlying intuitive and deliberate decision making*. Dissertation at Max Planck Institute for Research on Collective Goods, Bonn, Germany.

Horstmann, N., Ahlgrimm, A., & Glöckner, A. (2009). How distinct are intuition and deliberation? An eye-tracking analysis of instruction-induced decision modes. *Judgment and Decision Making,* 4(5), 335–354.

Horstmann, N., Hausmann, D., & Ryf, S. (in press). Methods for inducing intuitive and deliberate processing modes. In A. Glöckner & C. L. M. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods*. London: Psychology Press / Routledge.

Kleber, J. (2009). *The endowment effect: Focus and affect as central determinants*. Masters Thesis at the University of Erfurt, Germany.

Morell, A., Glöckner, A., & Towfigh, E. (2009). Sticky rebates: Rollback rebates induce non-rational loyalty in consumers – Experimental evidence. *MPI Collective Goods Preprint, No. 2009/23. Available at SSRN: http://ssrn.com/abstract=1443783*.

Ostermann, T. (forthcoming). *Striving for consistency in decision making: The impact of situational and personal factors*. Dissertation at Max Planck Institute for Research on Collective Goods, Bonn, Germany.

Witteman, C. L. M., & Glöckner, A. (in press). Tracing intuition: Summing up and exemplified method applications. In A. Glöckner & C. L. M. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods*. London: Psychology Press / Routledge.

C.II.3 International Max Planck Research School: Adapting Behavior to a Fundamentally Uncertain World

Partners: Max Planck Institute for Economics, Jena (Güth)
Max Planck Institute for Human Development, Berlin (Gigerenzer)
Faculty of Economics, University of Jena (Cantner)
Faculty of Psychology, University of Jena (Mummendey)
Rationality Center, Jerusalem (Kareev)
Workshop in Political Theory and Policy Analysis, Bloomington (Ostrom)
Psychology Department, Bloomington (Todd)

1. Decision-making in a (Sufficiently) Certain World

How should one make a decision? The answer seems obvious: figure out what you want, check your options, and choose the option that comes closest to your desires. Neoclassical economics has developed this program to near perfection. It is the program of optimisation under constraints (Feldman 1980). From this starting point, it is natural to see uncertainty as a problem of information. If more information is available, rational decision-makers use it. If full information is not to be had, rational actors replace it by the best available proxy. In the most comfortable case, the set of possible events is finite and known. Both the range and the distribution of each possible event within the range of possible realizations may be estimated. There is, for instance, reason to believe that the unknown event is taken from a well-defined class of events, and that there is data from a representative sample. If so, the present value of the option may be calculated. If there is no hard data, decision-makers may still be able to come up with educated guesses. The rational choice program still works if they rely on merely subjective probabilities, and on a merely subjective definition of the action space.

The program takes into account information cost. If the acquisition of additional information is costly, decision-makers make an investment decision. They estimate the expected value of improving decision quality, and compare it to the cost. If, ex ante, it is uncertain whether costly search will lead to success, the benefit is multiplied by the (if necessary only subjective) probability of success. By the same token, the solution space for the meta-decision about search may be extended. First, the decision-maker constructs the space of potential outcomes of search. Each outcome is the product of two factors: the probability finding the solution, and its value. Summing up over all weighed outcomes gives the expected value of engaging in search.

The same way, one may introduce decision cost. This is easiest to see if the decision-maker relies on the services of an intermediary. The cost of entrusting the actual decision-making to an outsider is justified in either of two cases. In the first case, the decision-maker could have made the decision herself. But decision-making effort saved on this task may be invested in other, more profitable tasks. In the second case, bringing in the

third party is a way to overcome the decision-maker's own limitations. Either meta-decision rests on comparing expected benefit to cost.

In this (neoclassical) program, decision-making under certainty is the conceptual starting point. Decision cost, complexity, and uncertainty are added as complications. By the steps sketched above, these complications become tractable, provided computational capacity is not bounded. Once the necessary estimations have been made, the actual decision is a mere matter of calculus. Given the right estimates, the right decision is unquestionable. If outsiders accept the estimates, one may prove that one has taken the correct decision.

These features of the neoclassical program have made it attractive to psychologists and lawyers as well. In psychology, the anomalies and biases program has turned what is a mere analytic tool in economics into norms. In experiments, subjects have been tested against the predictions of rational choice theory. Systematic deviations have been dubbed as biases. Indeed, long lists of such biases have been found. Legal scholars have bought into this program from two angles. In law and economics, legal institutions are reconstructed from the perspective of actors who follow the rational choice program. In most of behavioral law and economics, legal institutions are reconstructed as decision aids, helping individuals overcome the empirical deviations from rational choice norms, i.e., biases.

2. Decision-Making in a Fundamentally Uncertain World

There is a radically different way of construing decision-making. It starts from the assumption that the problem is either ill-defined, or complexity transcends decision-making abilities. Of course, not all problems fall into one of these categories. Actually, one of the main purposes of institutions is to narrow down problems such that they become tractable in rational choice terms. Take decision-making in Parliament. At the outset, the factors potentially relevant for making political decisions are overwhelmingly rich. But all that is needed to make a decision on behalf of the entire country is sufficient votes in Parliament. This institutional intervention is already a response to the fact that complexity had been extensive in the first place.

The domain of the alternative approach is extended by the fact that not all decision-makers dispose of perfect cognitive abilities. Yet nonetheless they have to take decisions. Others have to divide their limited cognitive resources among multiple tasks, or to decide in limited time. Yet others cannot afford training or the help of decision-making intermediaries with larger cognitive resources. For all of these reasons, decision-makers might want to content themselves with a more parsimonious method of decision-making under uncertainty, provided the expected results are at least satisfactory.

Once one introduces human interaction into the definition of the situation, further reasons for fundamental uncertainty become visible. People possess the power of

creativity. They can use it for mere technical or institutional innovation. But they may also creatively circumvent what would be a restriction for a mere utility maximiser.

Finally, if the situation is not exceptionally simple, actors must engage in sense making. To that end, they construct mental models. Uncertainty can also be said to be fundamental if actors lose confidence in their mental models.

If uncertainty is fundamental for one of these reasons, decision-making is no longer a matter of calculus. Search must be stopped at some point, and often early on. The decision-maker must take on personal responsibility. It is clear at the outset that the decision may turn out to be suboptimal, after the fact. It does not make sense to strive for the perfect decision. A good illustration is what is known as the secretary problem, i.e., a search problem where former options are foregone. Here one may learn after the fact that a former option would have been preferable. But one has no chance to revert on one's earlier decision not to seize the opportunity. In such situations, the normative goal shifts to coming up with an appropriate move, given the limited abilities of the decision-maker. Depending on the situation, avoiding bad mistakes (e.g., hiring the worst secretary) may be more important than missing theoretical opportunities (e.g., hiring the theoretically optimal secretary). In other situations, taking the risk of small mistakes may be conducive to gradually improving decision quality, and to preparing for situations where decision quality matters more. In the same vein, it may be preferable to split an important decision into small steps, thereby gaining an opportunity to redirect one's course in light of intermediate experiences. It always pays to remain open to surprise. Making good use of feedback becomes paramount.

The hallmark of rational choice theorising is strategic interaction. Many real life problems fall into this category, the two main exceptions being the direct interaction between man and nature, and behavior in markets if competition is workable. The tool for analysing problems of strategic interaction is game theory. If some actors have a chance to design rules for future interaction, game theory takes the form of principle-agent theory and of mechanism design. If the uncertainty is fundamental, this does not make the strategic element and anticipation disappear. Yet if neither actor optimises, strategic interaction takes on a different flavour. Generating predictability is a precondition for gains from cooperation. Complex cascades of mutual anticipation become unlikely. Simple interaction heuristics are more likely to be employed by one's interaction partner. On the other hand, too much predictability is dangerous when "predators" are on the loose. In such situations, a decision-rule must help the individual choose between the prospect for gains from cooperation and the ensuing risk of being exploited.

The best machinery for implementing the traditional rational choice program is formal logic. Logic has its role in the alternative program. But it must be supplemented by different cognitive and motivational tools. On the cognitive side, the decision-maker must be able to comparatively assess the desirability of options on a thin factual basis. Most likely, there is not one all-purpose tool for this. In some contexts, simply repeating past success and avoiding past failure may be enough. In other contexts, it may be more

promising to build a rough mental model of the situation, and to rank the options that come to mind along simple criteria. In yet other contexts, tracing patterns and matching their probabilities may be best policy, and so forth. On the motivational side, two elements are crucial. Decision-makers must be willing to take risks; otherwise they would be immobilised in the face of patent uncertainty. Conversely, decision-makers must feel pressed to change a course of action if there are sufficiently strong signals that they got it wrong. The relatively high willingness to trust others, coupled with fairly strong punishing sentiments, fit this picture well.

IMPRS Summer School 2008, Schedule

1st week	Monday July 28		Tuesday July 29		Wednesday July 30		Thursday July 31		Friday Aug 01		Saturday Aug 02	Sunday Aug 03
8:00	GK	IMPRS	IMPRS	8:00	IMPRS	8:00	IMPRS	8:00	IMPRS	8:00	IMPRS	IMPRS
8:15	Registration			8:15		8:15		8:15		8:15		
8:30	Welcome Session		Anthony Ziegelmeyer Networks	8:30	Eberhard Feess, Law and Economics	8:30	Robin Cowan Network Structures	8:30	Anthony Ziegelmeyer Networks	8:30		
8:45				8:45		8:45		8:45		8:45	E a x m	
9:00				9:00		9:00		9:00		9:00		
9:15	Anthony Ziegelmeyer Networks			9:15		9:15		9:15		9:15		
9:30				9:30		9:30		9:30		9:30	E a x m	
9:45				9:45		9:45		9:45		9:45		
10:00			Christoph Engel, Competition Law and Economics	10:00	Christoph Engel, Competition Law and Economics	10:00	Robin Cowan Network Structures	10:00	Christoph Engel, Competition Law and Economics	10:00		
10:15				10:15		10:15		10:15		10:15		
10:30				10:30		10:30		10:30		10:30	E a x m	
10:45				10:45		10:45		10:45		10:45		
11:00	Christoph Engel, Competition Law and Economics			11:00		11:00		11:00		11:00		
11:15				11:15		11:15		11:15		11:15	Group Assignment Presentation	
11:30				11:30		11:30		11:30		11:30		
11:45			Exercise	11:45	Exercise	11:45	Exercise	11:45	Exercise	11:45		
12:00				12:00		12:00		12:00		12:00		
12:15				12:15		12:15		12:15		12:15		
12:30	Lunch		Lunch	12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30		
12:45				12:45		12:45		12:45		12:45	Lunch	
13:00				13:00		13:00		13:00		13:00		
13:15				13:15		13:15		13:15		13:15		
13:30				13:30		13:30		13:30		13:30		
13:45				13:45		13:45		13:45		13:45		
14:00	Eberhard Feess, Law and Economics		Eberhard Feess, Law and Economics	14:00	Joint Seminar John Hey	14:00	Christoph Engel, Competition Law and Economics	14:00	Eberhard Feess, Law and Economics	14:00		
14:15				14:15		14:15		14:15		14:15		
14:30				14:30		14:30		14:30		14:30		
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15:00				15:00		15:00		15:00		15:00		
15:15				15:15	Robin Cowan Network Structures	15:15		15:15		15:15		
15:30	Coffee		Coffee	15:30		15:30	Coffee	15:30	Coffee	15:30		
15:45				15:45		15:45		15:45		15:45		
16:00	Selection of Groups for the Group Assignment		Joint Seminar John Hey	16:00		16:00	Eberhard Feess, Law and Economics	16:00	Exercises & Group Assignment Presentation	16:00		
16:15				16:15		16:15		16:15		16:15		
16:30				16:30		16:30		16:30		16:30		
16:45				16:45	Coffee	16:45		16:45		16:45		
17:00			Joint Seminar Govanni Dosi	17:00		17:00		17:00		17:00		
17:15	Exercises			17:15	Robin Cowan Network Structures	17:15		17:15		17:15		
17:30				17:30		17:30	Exercise	17:30		17:30		
17:45				17:45		17:45		17:45		17:45		
18:00				18:00		18:00		18:00		18:00		
18:15			Exercise	18:15		18:15		18:15		18:15		
18:30				18:30		18:30		18:30		18:30		
18:45	Dinner			18:45	Dinner	18:45	Dinner	18:45	Dinner	18:45		
19:00			Dinner	19:00		19:00		19:00		19:00		
19:15				19:15		19:15		19:15		19:15		
19:30				19:30		19:30		19:30		19:30		
19:45	Group Assignment		Group Assignment	19:45	Group Assignment	19:45	Group Assignment	19:45	Group Assignment	19:45		
20:00				20:00		20:00		20:00		20:00		
20:15				20:15		20:15		20:15		20:15		

2nd week	Monday Aug 04		Tuesday Aug 05		Wednesday Aug 06		Thursday Aug 07		Friday Aug 8		Sat Aug 09		Sun Aug 10
8:00	IMPRS	8:00	IMPRS	8:00	IMPRS	8:00	IMPRS	8:00	IMPRS	8:00	IMPRS	8:00	IMPRS
8:15	Peter Wakker	8:15	Peter Wakker	8:15	Armin Falk	8:15	Armin Falk	8:15	Excercises	8:15		8:15	
8:30		8:30		8:30		8:30		8:30		8:30		8:30	
8:45		8:45		8:45		8:45		8:45		8:45		8:45	
9:00		9:00		9:00		9:00		9:00		9:00	Exam	9:00	
9:15		9:15		9:15		9:15		9:15		9:15		9:15	
9:30		9:30		9:30		9:30		9:30		9:30	Exam	9:30	
9:45		9:45		9:45		9:45		9:45		9:45		9:45	
10:00	Peter Wakker	10:00	Peter Wakker	10:00	Peter Wakker	10:00	Armin Falk	10:00	Excercises	10:00		10:00	
10:15		10:15		10:15		10:15		10:15		10:15		10:15	
10:30		10:30		10:30		10:30		10:30		10:30	Exam	10:30	
10:45		10:45		10:45		10:45		10:45		10:45		10:45	
11:00		11:00		11:00		11:00		11:00		11:00		11:00	
11:15		11:15		11:15		11:15		11:15		11:15		11:15	
11:30		11:30		11:30		11:30		11:30		11:30		11:30	
11:45	Exercise	11:45	Exercise	11:45	Exercise	11:45	Exercise	11:45	Exercise	11:45		11:45	
12:00		12:00		12:00		12:00		12:00		12:00		12:00	
12:15		12:15		12:15		12:15		12:15		12:15		12:15	
12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30		12:30	
12:45		12:45		12:45		12:45		12:45		12:45		12:45	
13:00		13:00		13:00		13:00		13:00		13:00	Lunch	13:00	
13:15		13:15		13:15		13:15		13:15		13:15		13:15	
13:30		13:30		13:30		13:30		13:30		13:30		13:30	
13:45		13:45		13:45		13:45		13:45		13:45		13:45	
14:00	Robert Goldstone	14:00	Armin Falk	14:00	Armin Falk	14:00	Robert Goldstone	14:00	Robert Goldstone	14:00		14:00	
14:15		14:15		14:15		14:15		14:15		14:15		14:15	
14:30		14:30		14:30		14:30		14:30		14:30		14:30	
14:45		14:45		14:45		14:45		14:45		14:45		14:45	
15:00		15:00		15:00		15:00		15:00		15:00		15:00	
15:15		15:15		15:15		15:15		15:15		15:15		15:15	
15:30	Coffee	15:30	Coffee	15:30	Coffee	15:30	Coffee	15:30	Coffee	15:30		15:30	
15:45		15:45		15:45		15:45		15:45		15:45		15:45	
16:00	Exercises and Group Assignmement	16:00	Robert Goldstone	16:00	Robert Goldstone	16:00	Stefan Stürmer	16:00	Exercises and Group Assignmement Presentation	16:00		16:00	
16:15		16:15		16:15		16:15		16:15		16:15		16:15	
16:30		16:30		16:30		16:30		16:30		16:30		16:30	
16:45		16:45		16:45		16:45		16:45		16:45		16:45	
17:00		17:00		17:00		17:00		17:00		17:00		17:00	
17:15		17:15		17:15		17:15		17:15		17:15		17:15	
17:30		17:30	Exercises and Group Assignmement	17:30	Exercises and Group Assignmement	17:30	Exercises and Group Assignmement	17:30		17:30	GK Farewell Event	17:30	
17:45		17:45		17:45		17:45		17:45		17:45		17:45	
18:00		18:00		18:00		18:00		18:00		18:00		18:00	
18:15	Dinner	18:15	Dinner	18:15	Dinner	18:15	Dinner	18:15	Dinner	18:15		18:15	
18:30		18:30		18:30		18:30		18:30		18:30		18:30	
18:45		18:45		18:45		18:45		18:45		18:45		18:45	
19:00		19:00		19:00		19:00		19:00		19:00		19:00	
19:15	Group Assignment	19:15	Group Assignment	19:15	Group Assignment	19:15	Group Assignment	19:15	Group Assignment	19:15		19:15	
19:30		19:30		19:30		19:30		19:30		19:30		19:30	
19:45		19:45		19:45		19:45		19:45		19:45		19:45	
20:00		20:00		20:00		20:00		20:00		20:00		20:00	
20:15		20:15		20:15		20:15		20:15		20:15		20:15	

3rd week	Monday 08/11	Tuesday Aug 12	Wednesday Aug 13	Thursday Aug 14	Friday Aug 15	Saturday Aug 16	Sunday Aug 17
8:00							
8:15	Andreas Niklisch Advanced Theory of Institutions	Andreas Niklisch Advanced Theory of Institutions	Andreas Niklisch Advanced Theory of Institutions	Andreas Niklisch Advanced Theory of Institutions	Andreas Niklisch Advanced Theory of Institutions		
8:30						Exam	
8:45							
9:00							
9:15							
9:30						Exam	
9:45							
10:00	Joachim Winter Econometric Analysis of Experimental Data	Joachim Winter Econometric Analysis of Experimental Data	Joachim Winter Econometric Analysis of Experimental Data	Joachim Winter Econometric Analysis of Experimental Data	Joachim Winter Econometric Analysis of Experimental Data		
10:15							
10:30						Exam	
10:45							
11:00							
11:15						Free time	
11:30							
11:45	Rene Levinsky Cooperative Game Theory	Rene Levinsky Cooperative Game Theory	Rene Levinsky Cooperative Game Theory	Rene Levinsky Cooperative Game Theory	Rene Levinsky Cooperative Game Theory		
12:00							
12:15							
12:30							
12:45							
13:00						Lunch	
13:15	Lunch	Lunch	Lunch	Lunch	Lunch		
13:30							
13:45							
14:00							
14:15							
14:30	Wolfgang Miltner Introduction and Presentation of fMRT Scanner Rosensääle	Wolfgang Miltner Introduction and Presentation of fMRT Scanner	Exercises + possible talk	Exercises + possible talk	Exercises + possible talk Group assignment presenation		
14:45						Keynote Lecture Max Bazerman Ariel Rubinstein	
15:00							
15:15							
15:30							
15:45							
16:00							
16:15							
16:30							
16:45							
17:00	Demonstration 3 Tesla Scanner Philosophenweg	Luigi Mittone Inter-temporal Decision making					
17:15							
17:30							
17:45							
18:00							
18:15							
18:30			Dinner	Dinner	Dinner		
18:45		Dinner					
19:00	Dinner extern						
19:15							
19:30			Group Assignment	Group Assignment	Group Assignment		
19:45		Group Assignment					
20:00	Group Assignment						
20:15							

4th week	Monday 18/08		Tuesday Aug 19		Wednesday Aug 20		Thursday Aug 21		Friday Aug 22
8:00		8:00		8:00		8:00		8:00	
8:15	Uwe Cantner Advanced Innovation Ecnomics	8:15	Uwe Cantner Advanced Innovation Ecnomics	8:15	Uwe Cantner Advanced Innovation Ecnomics	8:15	Uwe Cantner Advanced Innovation Ecnomics	8:15	Uwe Cantner Advanced Innovation Ecnomics
8:30		8:30		8:30		8:30		8:30	
8:45		8:45		8:45		8:45		8:45	
9:00		9:00		9:00		9:00		9:00	
9:15		9:15		9:15		9:15		9:15	
9:30		9:30		9:30		9:30		9:30	
9:45		9:45		9:45		9:45		9:45	
10:00	Gary Bornstein Intergroup Conflicts	10:00	Gary Bornstein Intergroup Conflicts	10:00	Gary Bornstein Intergroup Conflicts	10:00	Gary Bornstein Intergroup Conflicts	10:00	Gary Bornstein Intergroup Conflicts
10:15		10:15		10:15		10:15		10:15	
10:30		10:30		10:30		10:30		10:30	
10:45		10:45		10:45		10:45		10:45	
11:00		11:00		11:00		11:00		11:00	
11:15		11:15		11:15		11:15		11:15	
11:30		11:30		11:30		11:30		11:30	
11:45	Exercise	11:45	Exercise	11:45	Exercise	11:45	Exercise	11:45	ABC Group Berlin The Psychologists' Toolbox: Statistics and Methodology
12:00		12:00		12:00		12:00		12:00	
12:15		12:15		12:15		12:15		12:15	
12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30	
12:45		12:45		12:45		12:45		12:45	
13:00		13:00		13:00		13:00		13:00	
13:15		13:15		13:15		13:15		13:15	Lunch
13:30		13:30		13:30		13:30		13:30	
13:45		13:45		13:45		13:45		13:45	
14:00	ABC Group Berlin The Psychologists' Toolbox: Statistics and Methodology	14:00	ABC Group Berlin The Psychologists' Toolbox: Statistics and Methodology	14:00	ABC Group Berlin The Psychologists' Toolbox: Statistics and Methodology	14:00	ABC Group Berlin The Psychologists' Toolbox: Statistics and Methodology	14:00	
14:15		14:15		14:15		14:15		14:15	Exam
14:30		14:30		14:30		14:30		14:30	
14:45		14:45		14:45		14:45		14:45	
15:00		15:00		15:00		15:00		15:00	
15:15		15:15		15:15		15:15		15:15	Exam
15:30		15:30		15:30		15:30		15:30	
15:45		15:45		15:45		15:45		15:45	
16:00	Matthias Mahlmann tba	16:00	Exercises + possible talk	16:00	Laura Martignon The Mathematics of fast and frugal heuristics: first steps	16:00	Exercises + possible talk	16:00	
16:15		16:15		16:15		16:15		16:15	Exam
16:30		16:30		16:30		16:30		16:30	
16:45		16:45		16:45		16:45		16:45	
17:00		17:00		17:00		17:00		17:00	
17:15		17:15		17:15		17:15		17:15	
17:30		17:30		17:30		17:30		17:30	
17:45	Exercises	17:45		17:45	Exercises	17:45		17:45	
18:00		18:00		18:00		18:00		18:00	
18:15		18:15		18:15		18:15		18:15	
18:30	Dinner	18:30	Dinner	18:30	Dinner	18:30	Dinner	18:30	Graduation Ceremony
18:45		18:45		18:45		18:45		18:45	
19:00		19:00		19:00		19:00		19:00	
19:15		19:15		19:15		19:15		19:15	
19:30	Group Assignment	19:30	Group Assignment	19:30	Group Assignment	19:30	Group Assignment	19:30	
19:45		19:45		19:45		19:45		19:45	Dinner and Farewell Party
20:00		20:00		20:00		20:00		20:00	
20:15		20:15		20:15		20:15		20:15	

IMPRS Summer School 2009, Schedule

1st week	Sunday July 26		Monday July 27			Tuesday July 28			Wednesday July 29			Thursday July 30			Friday July 31			Saturday Aug 01	Sunday Aug 02
			GK		IMPRS	GK		IMPRS	GK		IMPRS	GK		IMPRS	GK		IMPRS	IMPRS	IMPRS
	GK+IMPRS	8.00	Welcome Address Uwe Cantner and Oliver Kirchkamp																
8:15		8:15	An Introduction to Experimental Economics			An Introduction to Experimental Economics			An Introduction to Experimental Economics			An Introduction to Experimental Economics			An Introduction to Experimental Economics				
8:30		8:30																	
8:45		8:45																	
9:00		9:00	Bachstr. 18, Building K, MKG Hörsaal			Bachstr. 18, Building K, MKG Hörsaal			Bachstr. 18, Building K, MKG Hörsaal			Bachstr. 18, Building K, MKG Hörsaal			Bachstr. 18, Building K, MKG Hörsaal				
9:15		9:15																	
9:30		9:30																Exam	
9:45		9:45	Coffee			Coffee			Coffee			Coffee			Coffee				
10:00		10:00	Innovative Change in Historical Perspective	Workflow of Statistical Data Analysis		Joint seminar: Investing in Capabilities under Knightian Uncertainty			Joint seminar: Group Membership, Team Preferences, and Expectations			Joint seminar: Deliberative and Nondeliberative Processes in Human Behavior			Student Presentation	Workflow of Statistical Data Analysis			
10:15		10:15																	
10:30		10:30	Bachstr. 18, Building K, MKG Hörsaal												Bachstr. 18, Building K, MKG Hörsaal			Exam	
10:45		10:45																	
11:00		11:00		Bachstr. 18, Building K, Room 102		Bachstr. 18, Building K, MKG Hörsaal			Bachstr. 18, Building K, MKG Hörsaal			Bachstr. 18, Building K, MKG Hörsaal				Bachstr. 18, Building K, Room 102			
11:15		11:15													Group Work Experimental Economics				
11:30		11:30	Innovative Change in Historical Perspective															Exam	
11:45		11:45		Experiments Exercise		Student Presentation	Experiments Exercise		Entrepreneurship	Workflow Exercise,		Student Presentation	Experiments Exercise			Workflow Exercise,			
12:00		12:00	Bachstr. 18, Building K, MKG Hörsaal	Bachstr. 18, Building K, Room 102		Bachstr. 18, Building K, MKG Hörsaal	Bachstr. 18, Building K, Room 102		MPI V14	Bachstr. 18, Building K, Room 102		Bachstr. 18, Building K, MKG Hörsaal	Bachstr. 18, Building K, Room 102		Bachstr. 18, Building K, MKG Hörsaal	Bachstr. 18, Building K, MKG Hörsaal			
12:15		12:15																	
12:30		12:30		Lunch			Lunch		Lunch	Lunch			Lunch			Lunch			
12:45		12:45	Lunch			Lunch						Lunch			Lunch				
13:00		13:00																	
13:15		13:15							Lunch										
13:30		13:30																	
13:45		13:45																	
14:00		14:00	Innovative Change in Historical Perspective	Legal Decisionmaking		Student Presentation	Legal Decisionmaking			Legal Decisionmaking		Student Presentation	Legal Decisionmaking		Group Work Experimental Economics	Legal Decisionmaking			
14:15		14:15				MPI V14			The Globalization Process			MPI V14							
14:30		14:30																	
14:45	Registration	14:45	MPI V14						MPI V14	MPI V03					MPI V14				
15:00		15:00		MPI V03			MPI V03					Coffee	MPI V03			MPI V03			
15:15		15:15	Coffee																
15:30		15:30		Coffee		Entrepreneurship	Coffee		Coffee	Coffee		Variety and Growth	Coffee		Coffee	Coffee			
15:45		15:45	The dynamics of environmental innovation																
16:00		16:00		Theme Presentation		MPI V14			The Globalization Process	Workflow of Statistical Data Analysis		MPI V14	Workflow of Statistical Data Analysis		Group Assignment Presentation, MPI V14				
16:15		16:15					Workflow of Statistical Data Analysis												
16:30	Grand Opening; Keynote lecture Max Bazerman	16:30	MPI V03	MPI V14		Coffee			MPI V14	MPI V03								Welcome Tournament: football, volleyball, basketball	
16:45		16:45																	
17:00		17:00				Entrepreneurship	MPI V03					Variety and Growth	MPI V03						
17:15		17:15	The dynamics of environmental innovation	Theme Discussion and Group formation					Variety and Growth			MPI V14							
17:30		17:30				MPI V14													
17:45		17:45								Law Exercise, MPI V03			Group Assignment						
18:00		18:00	MPI V03	MPI V14			Selection of Groups for the Group Assignment		MPI V14										
18:15	Opening Barbecue	18:15																	
18:30		18:30																	
18:45		18:45	Dinner			Dinner			Dinner, BBQ			Dinner			Dinner				
19:00		19:00																	
19:15		19:15																	
19:30		19:30																	
19:45		19:45				Poster Session				Group Assignment			Group Assignment			Group Assignment			
20:00		20:00																	
20:15		20:15				Cafeteria													
20:30		20:30																	

2nd week	Monday Aug 03		Tuesday Aug 04		Wednesday Aug 05		Thursday Aug 06		Friday Aug 07		Sat Aug 08	Sun Aug 09
	GK		GK	IMPRS	GK	IMPRS	GK	IMPRS	GK	IMPRS	IMPRS	IMPRS
8:15		Leadership		Leadership		Leadership		Leadership		Leadership		Visit of the Museum of Technology, Berlin
8:30												
8:45												
9:00		MPI V 14		MPI V 14		MPI V 14		MPI V 14		MPI V 14		
9:15	Student Presentation		Student Presentation		Student Presentation		Experiments		Experiments		Exam: Structural Equation Modelling (SEM)	
9:30												
9:45	MPI V 03	Coffee	MPI V 03	Coffee	MPI V 03	Coffee		Coffee		Coffee		
10:00		Biological, Psychological, and Economic Aspects of Law		Biological, Psychological, and Economic Aspects of Law		Biological, Psychological, and Economic Aspects of Law	MPI V 03	Biological, Psychological, and Economic Aspects of Law	MPI V 03	Biological, Psychological, and Economic Aspects of Law		
10:15	Coffee											
10:30	Persistence of Innovation		Student Presentation		Introduction the Community Innovation Surveys'						Exam	
10:45							Experiments		Experiments			
11:00	MPI V 03	MPI V 14	MPI V 03	MPI V 14	MPI V 03	MPI V 14		MPI V 14		MPI V 14		
11:15							MPI V 03		MPI V 03			
11:30		Coffee		Coffee		Coffee		Coffee		Coffee		
11:45	Coffee	**Law** Exercise, MPI V14	Persistence of Innovation	**Leadership** Exercise, MPI V14		**Law** Exercise, MPI V03		**SEM**, Exercise, MPI V14		**SEM**, Exercise, MPI V14	Exam, **Law**	Visit of the Museum of Technology, Berlin
12:00	Persistence of Innovation				The Role of Intangible Assets for Productivity		Group Work Experimental Economics		Innovation Policy			
12:15											Free time	
12:30		Lunch		Lunch		Lunch		Lunch		Lunch		
12:45	MPI V 03		MPI V 03		MPI V 14		MPI V 03		MPI V 03			
13:00	Lunch		Lunch									
13:15					Lunch		Lunch		Lunch			
13:30												
13:45												
14:00			Effects of innovation on employment and productivity	Structural Equation Modeling		Structural Equation Modeling		Structural Equation Modeling		Structural Equation Modeling		
14:15	Joint seminar: The Origin and Growth of Industry Clusters: The Making of Silicon Valley and Detroit				The Role of Intangible Assets for Productivity		Group Work Experimental Economics		Group Work Experimental Economics			
14:30			MPI V 03									
14:45							MPI V 03		MPI V 03			
15:00	Bachstr. 18, Building K, MKG Hörsaal			MPI V 14		MPI V03		MPI V 14		MPI V03		
15:15					MPI V 14							
15:30			Effects of innovation on employment and productivity	Coffee	Coffee	Coffee	Innovation Policy	Coffee	Coffee	Coffee		
15:45	Coffee	Coffee										
16:00				Commitment, Asymmetries and Conflict in Bilateral Bargaining – Static and Dynamic Models		Structural Equation Modeling		Group Assignmement	Group Assignmement Presentation, MPI V 14			
16:15	t.b.a.	Group Assignmement, Bachstraße	MPI V 03		The Role of Intangible Assets for Productivity		MPI V 03					
16:30												
16:45			Coffee				Coffee					
17:00	Bachstr. 18, Building K, MKG Hörsaal			MPI V 14	MPI V 14	MPI V03						
17:15			Effects of innovation on employment and productivity				Innovation Policy					
17:30												
17:45	Dinner			**Leadership** Exercise, MPI V14			MPI V 03					
18:00					Joint seminar: Economics of Science: Old and New						GK Farewell Party	
18:15			MPI V 03									
18:30		Dinner, Bachstraße	Dinner		MPI V 14		Dinner		Dinner			
18:45	Group Work Experimental Economics											
19:00												
19:15					Dinner, BBQ							
19:30		Group Assignmement		Group Assignmement				Group Assignmement		Group Assignmement		
19:45												
20:00												
20:15						Group Assignmement						
20:30												

3rd week	Monday Aug 10		Tuesday Aug 11		Wednesday Aug 12		Thursday Aug 13		Friday Aug 14		Saturday Aug 15		Sunday Aug 16
8:15		8:15		8:15		8:15		8:15		8:15		8:15	
8:30	Working with Experimental Data - Mixed Effects Models	8:30	Working with Experimental Data - Mixed Effects Models	8:30	Working with Experimental Data - Mixed Effects Models	8:30	Working with Experimental Data - Mixed Effects Models	8:30	Working with Experimental Data - Mixed Effects Models	8:30		8:30	
8:45		8:45		8:45		8:45		8:45		8:45	Exam	8:45	
9:00		9:00		9:00		9:00		9:00		9:00		9:00	
9:15	MPI V 14	9:15	MPI V 14	9:15	MPI V 14	9:15	MPI V 14	9:15	MPI V 14	9:15		9:15	
9:30		9:30		9:30		9:30		9:30		9:30	Exam **Law**	9:30	
9:45	Coffee	9:45	Coffee	9:45	Coffee	9:45	Coffee	9:45	Coffee	9:45		9:45	
10:00		10:00		10:00		10:00		10:00		10:00		10:00	
10:15	Law from a Functional Perspective	10:15	Law from a Functional Perspective	10:15	Law from a Functional Perspective	10:15	Law from a Functional Perspective	10:15	Law from a Functional Perspective	10:15		10:15	
10:30		10:30		10:30		10:30		10:30		10:30	Exam	10:30	
10:45		10:45		10:45		10:45		10:45		10:45		10:45	
11:00	MPI V 14	11:00	MPI V 14	11:00	MPI V 14	11:00	MPI V 14	11:00	MPI V 14	11:00		11:00	
11:15		11:15		11:15		11:15		11:15		11:15		11:15	
11:30		11:30		11:30		11:30		11:30		11:30		11:30	
11:45	**Psychology** Exercise, MPI V14	11:45	**Law** Exercise, MPI V14	11:45	**Experimental Data** Exercise, MPI V14	11:45	**Law** Exercise, MPI V14	11:45	**Experimental Data** Exercise, MPI V14	11:45		11:45	
12:00		12:00		12:00		12:00		12:00		12:00		12:00	
12:15		12:15		12:15		12:15		12:15		12:15		12:15	
12:30		12:30		12:30		12:30		12:30		12:30		12:30	
12:45	Lunch	12:45	Lunch	12:45	Lunch	12:45	Lunch	12:45	Lunch	12:45	Departure: Trip to Leipzig	12:45	
13:00		13:00		13:00		13:00		13:00		13:00		13:00	
13:15		13:15		13:15		13:15		13:15		13:15		13:15	
13:30		13:30		13:30		13:30		13:30		13:30		13:30	
13:45		13:45		13:45		13:45		13:45		13:45		13:45	
14:00	The Psychology of Judgment and Decision Making	14:00	The Psychology of Judgment and Decision Making	14:00	The Psychology of Judgment and Decision Making	14:00	The Psychology of Judgment and Decision Making	14:00	The Psychology of Judgment and Decision Making	14:00		14:00	
14:15		14:15		14:15		14:15		14:15		14:15		14:15	
14:30		14:30		14:30		14:30		14:30		14:30		14:30	
14:45	MPI V 14	14:45	MPI V 14	14:45	MPI V 14	14:45	MPI V 14	14:45	MPI V 14	14:45		14:45	
15:00		15:00		15:00		15:00		15:00		15:00		15:00	
15:15	Coffee	15:15	Coffee	15:15	Coffee	15:15	Coffee	15:15	Coffee	15:15		15:15	
15:30		15:30		15:30		15:30		15:30		15:30		15:30	
15:45		15:45		15:45		15:45		15:45		15:45		15:45	
16:00	Group Assignment	16:00	**Psychology** Exercise, MPI V14	16:00	Homo Heuristicus: Why Biased Minds Make Better Predictions	16:00	Context Dependency of Justice	16:00		16:00		16:00	
16:15		16:15		16:15		16:15		16:15		16:15		16:15	
16:30		16:30		16:30		16:30		16:30		16:30	Visiting the Primate Research Center & Zoo Leipzig	16:30	
16:45		16:45		16:45	MPI V 14	16:45	MPI V 14	16:45	Group Assignmement Presentation	16:45		16:45	
17:00	Motivational regulation of automatic affective processing and action: Counter-regulation and control-dependency	17:00		17:00		17:00		17:00		17:00		17:00	
17:15		17:15	Group Assignment	17:15	Group Assignment	17:15	Group Assignment	17:15		17:15		17:15	
17:30		17:30		17:30		17:30		17:30		17:30		17:30	
17:45		17:45		17:45		17:45		17:45		17:45		17:45	
18:00	MPI V 14	18:00		18:00		18:00		18:00		18:00		18:00	
18:15		18:15		18:15		18:15		18:15		18:15		18:15	
18:30	Dinner	18:30	Dinner	18:30	Dinner	18:30	Dinner	18:30	Dinner	18:30		18:30	
18:45		18:45		18:45		18:45		18:45		18:45		18:45	
19:00		19:00		19:00		19:00		19:00		19:00		19:00	
19:15		19:15		19:15		19:15		19:15		19:15		19:15	
19:30	Group Assignment	19:30	Group Assignment	19:30	Group Assignment	19:30	Group Assignment	19:30	Group Assignment	19:30		19:30	
19:45		19:45		19:45		19:45		19:45		19:45		19:45	
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20:15		20:15				20:15		20:15		20:15		20:15	

4th week	Monday August 17		Tuesday Aug 18		Wednesday Aug 19		Thursday Aug 20		Friday Aug 21
8:15	Introduction to the Theory and Application of Fast and Frugal Heuristics MPI V 14	8:15	Introduction to the Theory and Application of Fast and Frugal Heuristics MPI V 14	8:15	Introduction to the Theory and Application of Fast and Frugal Heuristics MPI V 14	8:15	Introduction to the Theory and Application of Fast and Frugal Heuristics MPI V 14	8:15	Introduction to the Theory and Application of Fast and Frugal Heuristics MPI V 14
8:30		8:30		8:30		8:30		8:30	
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9:00		9:00		9:00		9:00		9:00	
9:15		9:15		9:15		9:15		9:15	
9:30		9:30		9:30		9:30		9:30	
9:45	Coffee	9:45	Coffee	9:45	Coffee	9:45	Coffee	9:45	Coffee
10:00	Basic Microeconomics MPI V 14	10:00	Basic Microeconomics MPI V 14	10:00	Basic Microeconomics MPI V 14	10:00	Basic Microeconomics MPI V 14	10:00	Basic Microeconomics MPI V 14
10:15		10:15		10:15		10:15		10:15	
10:30		10:30		10:30		10:30		10:30	
10:45		10:45		10:45		10:45		10:45	
11:00		11:00		11:00		11:00		11:00	
11:15		11:15		11:15		11:15		11:15	
11:30		11:30		11:30		11:30		11:30	
11:45	**Micro,** Exercise, MPI V14	11:45	**Micro,** Exercise, MPI V14	11:45	**Estimating Preferences,** Exercise, MPI V14	11:45	**Estimating Preferences,** Exercise, MPI V14	11:45	Estimating Preferences for Prediction MPI V 14
12:00		12:00		12:00		12:00		12:00	
12:15		12:15		12:15		12:15		12:15	
12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30	Lunch	12:30	
12:45		12:45		12:45		12:45		12:45	
13:00		13:00		13:00		13:00		13:00	
13:15		13:15		13:15		13:15		13:15	Lunch
13:30		13:30		13:30		13:30		13:30	
13:45	Estimating Preferences for Prediction MPI V 14	13:45	Estimating Preferences for Prediction MPI V 14	13:45	Estimating Preferences for Prediction MPI V 14	13:45	Estimating Preferences for Prediction MPI V 14	13:45	
14:00		14:00		14:00		14:00		14:00	Exam
14:15		14:15		14:15		14:15		14:15	
14:30		14:30		14:30		14:30		14:30	
14:45		14:45		14:45		14:45		14:45	
15:00		15:00		15:00		15:00		15:00	Exam
15:15	Coffee	15:15	Coffee	15:15	Coffee	15:15	Coffee	15:15	
15:30		15:30		15:30		15:30		15:30	
15:45	**Heuristics,** Exercise, MPI V14	15:45	**Heuristics,** Exercise, MPI V14	15:45	Damages for Losses of Chances MPI V 14	15:45	Group Assignmement Presentation	15:45	
16:00		16:00		16:00		16:00		16:00	Exam
16:15		16:15		16:15		16:15		16:15	
16:30		16:30		16:30		16:30		16:30	
16:45	Social Psychological Processes in Social Conflict MPI V 14	16:45	Motivational and Cognitive Processes MPI V 14	16:45		16:45		16:45	Free time
17:00		17:00		17:00		17:00		17:00	
17:15		17:15		17:15		17:15		17:15	
17:30		17:30		17:30	Dinner	17:30		17:30	
17:45		17:45		17:45		17:45		17:45	
18:00		18:00		18:00		18:00		18:00	
18:15	Dinner	18:15	Dinner	18:15		18:15	Dinner BBQ	18:15	Graduation Ceremony
18:30		18:30		18:30	Group Assignment	18:30		18:30	
18:45		18:45		18:45		18:45		18:45	
19:00		19:00		19:00		19:00		19:00	
19:15	Group Assignment	19:15	Group Assignment	19:15		19:15		19:15	
19:30		19:30		19:30		19:30		19:30	Dinner and Farewell Party Ricarda Huch Haus
19:45		19:45		19:45		19:45		19:45	
20:00		20:00		20:00		20:00		20:00	
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C.III Applied Topics: Network Industries and Financial Stability

The Institute also continues its tradition of investigating applied topics concerning collective goods. This research is complementary to the more fundamental research summarized in Sections C.I and C.II: On the one hand, the principles that emerge from the more fundamental research provide guidance for the analysis of applied issues; this guidance is needed to avoid the danger of provincialism in studying special applications. On the other hand, the applied issues themselves serve as a proving ground for abstract ideas, also as a source of new ideas. The latter is particularly likely when different applications turn out to involve common themes.

As applied topics we have up to now chosen:

- The organization and regulation of network industries, and
- Financial stability and the regulation of financial markets and financial institutions.

Our choice of these topics was to some extent motivated by considerations of comparative advantage, based on past research expertise, as well as the scope for interdisciplinary research by jurists and economists. Apart from making progress on these topics in their own right, we are also keen to explore the parallels and links between them.

The choice of these topics was and is not meant to be exclusionary. Indeed, in some of the work on which we report under the heading of network industries, we have crossed boundaries and studied questions that properly "belong" to other topics, in particular, competition law and competition policy and the law and economics of innovations and intellectual property rights.

At this point, we are considering the addition of a research focus on

- The law and economics of research, innovations and intellectual property rights

as a full-fledged applied topic with a more focussed research program. Certain aspects of the area have already been studied as part of our theoretical research on competition.[1] The arrival of Susanne Prantl at the institute provides a prospect of addressing the subject more systematically, with an econometric as well as a theoretical capacity.

From a historical perspective, the subject has already been addressed in a research project on "The Market for Patents and Innovations in Imperial Germany 1877 – 1913" that was carried out by Carsten Burhop, a Heisenberg Fellow of Deutsche Forschungsgemeinschaft (DFG), who has been at the institute since 2007, under the auspices of an additional DFG grant. Relevant publications are Burhop (2009) as well as Burhop and Lübbers (2008 a, 2009). Burhop (2009) discusses the respective roles of research by in-house scientists and by outside researchers, in particular at universities, for the pharma-

[1] Note also the participation of Martin Hellwig in Spengel et al. (2009).

ceutical company of E. Merck in the two decades after 1890. The major finding shows that, whereas outside researchers were used to generate new products, in-house researchers were used to improve productive efficiency for given products. Burhop and Lübbers (2008 a) study incentive contracting at seven leading chemical, pharmaceutical and electrical engineering companies in Germany in the late 19th and early 20th century. They find that incentive devices were used, but no significant impact of incentives on innovations can be identified. For the same period, Burhop and Lübbers (2009) study the contracts by which these same companies obtained licenses to use the innovations of outsiders. Three quarters of these contracts involved individuals, one quarter other firms as licensors. Besides fixed payment components, contracts did involve significant variable payment components, most importantly profit sharing agreements.

C.III.1 Network Industries: Sector-Specific Regulation and Competition Policy

C.III.1.1 Introduction

"Network industries" such as telecommunications, electricity, gas, rail transportation and postal sectors have the common feature that the provision of services to customers presupposes the use of a fixed network infrastructure, the costs of which are by and large sunk. Traditionally, these industries have been organized as vertically integrated monopolies under state ownership and/or subject to sector-specific regulation. However, the past two or three decades have seen a paradigm shift concerning the organization and regulation of such industries.

The paradigm shift was due to the recognition that not all parts of the vertically integrated monopolies are "natural" and that, for example, long-distance telecommunication services or electricity generation exhibit no technological features which would preclude workable competition. Developments in telecommunications have also given rise to the notion that some natural monopolies may be transient as technical progress makes room for the establishment of competing networks.

The change in views of network industries has induced a change in views concerning the role of regulation. Whereas in the past, regulation was mainly seen as a constraint on the exploitation of monopoly power, under the new paradigm, it has come to be seen as a promoter of competition – competition in downstream markets, as well as competition among networks themselves, where such competition is feasible and economically sensible. A key tool for this purpose is *access regulation*, the government imposed requirement that the network owner open his network for use by other firms. Such access regulation provides other firms with a basis for offering their services in downstream markets, even against the wishes of the incumbent. It also provides other firms with a basis for building competing infrastructures piecemeal, using their own pieces of infrastructure

where they have already built them and relying on the incumbent's infrastructure where they do not yet have their own.

The organization and regulation of network industries under the new paradigm raise important economic and legal questions. Important *economic questions* are:

- What is an appropriate system for determining access prices?
- What is an appropriate governance system for the relation between the network infrastructure and the various activities in downstream markets?

The first question is closely connected to the issues discussed in C.I concerning the tension between efficiency in access and the need to cover the costs of the network infrastructures. (In principle, we can think of a network infrastructure as an excludable public good, the use of which serves as an input into the provision of final outputs, which themselves are private goods.) Access prices above the marginal costs of use would entail some inefficiencies of exclusion; access prices equal to marginal costs would preclude the recovery of fixed and common costs. In this case, there would be insufficient incentives to invest in the network infrastructures at all. By contrast, if access prices contained a very generous allowance for fixed and common costs, especially one that is based on a cost-plus calculation, investment incentives could well be excessive.

The second question concerns the organization of the industry as well as the organization of statutory oversight over upstream and downstream activities. For the organization of the industry, the key question is what degree of vertical integration is desirable. In the electricity and gas industries, we have for some time had a requirement of legal unbundling of networks from production and sales. Given the lack of competition in these industries, the European Commission has proposed to go further and to require ownership unbundling of the transmission grids. This proposal raises the question how the presumed pro-competitive effects of unbundling compare to the efficiency gains (lower transactions costs, reduced holdup problems) that are usually associated with vertical integration. Because of vehement opposition from Member State Governments, as well as the industry itself, the Commission's proposal was not enacted, but, remarkably, at least some firms in the industry decided to sell their transmission grids anyway. The reasons for these decisions are as yet unclear.

For the organization of statutory oversight, the key question is how the relation between sector-specific regulation and antitrust law should be organized. Which activities should be subject to sector-specific regulation and which activities should be subject to antitrust law? How should one deal with the tradeoff that arises between competition downstream and competition upstream because the attempt to promote competition in downstream markets by imposing access requirements upstream reduces incentives for competing companies to build their own upstream facilities? Should submission to sector-specific regulation pre-empt the application of antitrust law? If not, should antitrust law be applied by the sector regulator, or should the two systems of law be applied by separate

authorities? The latter would make for some competition between authorities, but there might be a loss of coherence in the policy that is applied to the industry.

On the legal side, the new paradigm for the organization and regulation of network industries raises the following questions:

- What are appropriate provisions for administrative and legal procedures?
- What is an appropriate system of governance for the firms in question?
- What is an appropriate system of governance for the regulatory authorities?
- What is the relation between European law and national law in the regulation of network industries?

Most substantive issues in regulation involve an important dose of judgment, rather than the straightforward application of a predetermined rule. Thus, it is well known that the allocation of fixed and common costs to the various services that are being provided and charged for is to some extent arbitrary. From the perspective of welfare economics, as well as management science, the different costs of allocation systems have their advantages and disadvantages, but there is no way of saying *a priori* that one system is best. Given the importance of judgment, one can ask whether the choice should be taken by the political institutions, parliament and the government, whose powers are derived from democratic elections, or whether it should be taken by the regulatory institution, which presumably has greater expertise in assessing the industry in question. If it is taken by the regulatory institution, what recourse to the courts is available to the parties concerned? If the incumbent network owner contests an access pricing decision of the regulatory institution, to what extent does the court procedure focus on the specific price that is being contested? To what extent does it consider the place of this one price in the overall system of prices, which together should permit the recovery of common costs? Which side bears the burden of proof for the appropriateness or inappropriateness of the individual access price or the pricing system? What kind of evidence is accepted as proof in court? Given the need to rely on judgment, rather than predetermined principles, in regulatory decisions, the effective scope of regulation can depend on such procedural issues. Given that hard evidence in either direction may not even exist, in a court proceeding, the side that has the burden of proof is likely to be in a hopeless position from the very beginning.

At this point, the economist is likely to recommend that the regulator be given a significant amount of discretion to exert his judgment where this is necessary and that he bear the burden of proof in legal proceedings only when he can reasonably be expected to do so, e.g., when the question is whether a given rule for allocating common costs has been correctly applied. For the lawyer, this recommendation raises fundamental questions of constitutional legitimacy. From the perspective of constitutional law, it seems problematic that important substantive choices should be taken by an administrative authority, rather than the democratically elected legislature and government. It also seems problematic that legal protection of network owners against abuses by the regulatory institutions

should be undermined by the institutions' having a great deal of discretion, without much of a burden of proof for the appropriateness of their decisions.

Some of these issues are well known from discussions about competition law and competition policy. For close to a decade now, the European Commission has been promoting "a more economic approach". For the implementation of abuse-of-dominance control under Article 82 EC, this reform has been more difficult and more controversial than for other areas of competition law and policy, and is by no means complete. The reason is precisely that a more economic approach to the assessment of a given practice requires the authority to have more discretion in assessing the practice; such discretion is subject to the objection that it exposes the parties to the risk of wilful intervention without sufficient protection by the legal system.

The discussion about abuse-of-dominance control in the European Union is not only paradigmatic for the more general issue of how to deal with the tradeoff between the need to provide the authority with a measure of discretion and the need to provide the private parties with legal protection. This discussion is also directly relevant to the organization of statutory oversight over network industries in Europe. The reason is that sector-specific regulation is implemented under national law, which can void the application of national antitrust law but is itself overruled by EU law, in particular, the antitrust rules of the Treaty. Thus, a few years ago, the Commission ruled – and the European Court of Justice confirmed the ruling – that a certain price that had been charged by Deutsche Telekom – and that had been approved by the national regulator – was in fact predatory and therefore in conflict with the Treaty. At this point, the technical legal question of how to assess the relation between European law and national law in the regulation of network industries is joined with the substantive economic and political question of what is the proper relation between sector-specific regulation and competition law and policy.

C.III.1.2 Completed Research

Topics in Sector-Specific Regulation

The relation between sector-specific regulation and competition policy for network industries is discussed in Hellwig (2009 a). The paper provides first an abstract discussion of the comparative advantages and disadvantages of the two policy regimes, with competition policy as a system of prohibitions, with policy interventions taking place *ex post*, in a piecemeal, somewhat *ad hoc* fashion and sector-specific regulation as a regime which focuses on an industry as a whole, in systematic fashion *ex ante*, but with material choices taken by the regulator, rather than market participants. The basic reasoning is applied in discussions of how to determine which parts of an industry should be subject to sector-specific regulation and which ones should not, as well as questions of how to deal with issues of policy consistency when the same industry is subject to both, sector-specific regulation and competition policy, and to both, European law and national law.

The rationale and appropriate principles for regulation are also discussed by Höffler (2008). Bechtold and Lüdemann (2007) discuss the issue of policy coherence in the European Union. Lüdemann (2008) discusses the relation between European and national competences in telecommunications regulation, beginning with an account of the regulation (or exemption from regulation) for new markets and of the dispute about the new § 9a TKG by which the German government proposed to exempt Deutsche Telekom from sector-specific regulation for new fibre glass infrastructures.

In the energy sector, discussions about network regulation and access pricing have been overlaid by discussions about electricity and gas prices. Drastic increases in these prices have led to interventions by the German competition authority, to various initiatives for changing the Law against Restraint of Competition, and to the European Commission's proposal for ownership unbundling of transmission networks. Engel (2008 c) studies the constitutionality of forced ownership unbundling or forced divestiture of assets under the German constitution. Relying on the observation that the Constitution's protection of private property is not unlimited, he comes to the conclusion that such a possibility could be implemented in ways that are compatible with the Constitution.

Höffler and Kranz (2007) analyse the economic implications of legal as opposed to ownership unbundling of networks and other operations. Whereas, so far, the discussion on vertical integration versus unbundling has mainly focused on technical synergies and exclusionary abuses, Höffler and Kranz focus on the incentives that are driving the incumbent's activities in downstream markets. In their analysis, legal unbundling dominates ownership unbundling because, under legal unbundling, the incumbent retains a financial interest in the network. Because of this interest, the incumbent's subsidiary in downstream markets takes account of the fact that, from the perspective of the mother company, the marginal costs of network use to make additional sales are given by true marginal costs rather than the access price per unit: whereas the downstream subsidiary is paying the access price per unit, the margin of the access price over true marginal cost accrues to the network owner and therefore, under legal as opposed to ownership unbundling, to the mother company as well. In this analysis, legal unbundling appears as a device to overcome the well-known problem of double-marginalization in vertically separated industries.

Issues of vertical integration versus separation are also studied in Jansen et al. (2008). They consider the implications of correlations of efficiency shocks for the desirability of either regime in a regulated industry in which individual firms are protected by *ex post* break-even constraints. *Ceteris paribus,* in such an industry, vertical integration is to be preferred if shocks are negatively correlated across firms, vertical separation, if shocks are positively correlated.

Höffler (2009) studies the role of call termination fees as a basis for collusion in primary markets in mobile telecommunications. The path-breaking papers of Laffont, Rey and Tirole (*Rand Journal of Economics* 1998) on this subject had asserted that termination fees provide a basis for collusion in primary markets if and only if mobile phone compa-

nies are unable to use two-part tariffs (fixed fee plus service-dependent component) in the primary markets. By contrast, Höffler finds that termination fees can always be used to support collusion. Whereas Laffont et al. did not actually model collusion, Höffler does so, studying the implementability of collusive outcomes as non-cooperative equilibria in a repeated game. The key observation is that termination fees can be used to make a short-run deviation from the collusive outcome less attractive. The acquisition of additional customers through such a deviation is less profitable if this acquisition reduces termination fee revenues that one gets from the other firms.

Höffler and Schmidt (2008) investigate the implications of resale requirements that are imposed by the European directives and national legislation for the telecommunications industry. Under these requirements, competitors must be given the possibility to buy the end products of dominant companies so that they can resell them under their own names. This requirement was introduced with the idea of enhancing competition in the markets for these end products. However, Höffler and Schmidt show that, under the regulated regime with resale, final customers' prices are higher and consumer welfare is lower than they would be without such a regime. The reason is that the dominant company may target its wholesale business as its main source of profits, charging high retail prices downstream as a basis for also charging high wholesale prices upstream, which the reseller then passes through to his own customers. By the same argument, imposition of the so-called *retail-minus* rule for the wholesale price, which is imposed under current regulation, can also raise retail prices and lower consumer welfare.

High electricity prices are at least partly ascribed to the carbon emission permits trading system that was introduced in 2005. Under this system, firms are required to have permits for whatever carbon they emit. Permits are tradable, but the total amount of permits that is available has been fixed by political fiat. Electricity producers that burn coal or gas are treating the market values of these permits as a part of their generation costs. Because at peak times, marginal power plants tend to use coal or gas, these costs have been reflected in wholesale market prices for peak-time electricity. Newbery (2008) has suggested that the induced electricity price increases have been enhanced because the fixity of the quantity of available permits effectively increased the market power of gas producers, e.g. Gazprom.

Starting from this suggestion, Hahmeier (2009) shows that considerations of market power can have an important effect on whether it is preferable to use prices or quantities as instruments to regulate an activity. Ever since this question had been originally raised by Weitzman (1974), it had been formulated in terms of costs and benefits of flexibility in dealing with new information: Whereas a regime that relies on quantity regulation leaves no room for such flexibility, a regime that relies on prices leaves too much room for it. Hahmeier neglects uncertainty altogether. For a model without uncertainty, he studies the influence of the choice of instrument on the market power of upstream suppliers and considers the implications of this influence for optimal instrument values and for the choice between instruments. The analysis is based on the assumption that coal, which is very CO_2-intensive, is supplied competitively, and gas, which is much less CO_2-intensive,

is supplied by a monopolist. This assumption should be understood as a simplified representation of the fact that, in the real world, gas production is highly concentrated, with a few significant suppliers, and coal production is very competitive. Hahmeier's formal analysis confirms Newbery's suggestion that a quantity regime for regulating carbon emissions effectively reduces the elasticity of the demand for gas: If the gas price is increased, electricity generators try to substitute gas by coal but, in the attempt, they raise the price of carbon emission permits; this limits the extent to which the substitution is successful, i.e., as a result of the price increase, the demand for gas goes down less than it would in the absence of carbon emissions regulation. By contrast, a price regime for regulating carbon emissions, e.g., a carbon tax, has no effect on the elasticity of the demand for gas. If the gas producer takes these effects into account, he will charge higher prices under a quantity regime than under a price regime for regulating carbon emissions. Hahmeier (2009) then goes on to show that this effect has consequences for the tradeoff between environmental concerns and the costs of inputs into electricity production, at least if one thinks of gas producers as being foreigner who do not count for national welfare considerations. In this case, environmental policy under a quantity regime has an added cost from increased gas prices. This added cost means that (i) an optimal environmental policy is more ambitious under a regime of price regulation and (ii) under certainty, a regime of price regulation is preferred to a regime of quantity regulation. The policy conclusion would be that the European Union should replace the current regime of tradable permits by a carbon tax.

Magen (2009) analyses the relation of legal and economic logic in the emission permits trading system. He observes, first, that, for from replacing administrative regulation by "the market", the introduction of the emission permits trading system itself is a piece of administrative regulation. This corresponds to the observation underlying Newbery (2008) and Hahmeier(2009) that the emission permits trading system is in fact a quantity regulation regime. Markets merely provide for an efficient allocation of the administratively determined quantities. Magen next studies the incentive effects of alternative allocation regimes for emission permits. He questions positive incentive effects of a costless allocation as well as the argument that a costless allocation of such permits must imply that their opportunity cost should be neglected in the production and pricing of electricity.

Topics in Competition Policy: Cartels and Innovations

Cartels are an important object of antitrust analysis. Their study is not directly related to network industries (but see Höffler 2009). However, it provides an important application of the theory of collective goods. For the cartel members, the lack of competition which results from the cartel agreement has the features of a collective good. Compliance with the agreement is the analogue of a contribution made to the provision of this collective good. It is therefore of some interest to ask what implications can be drawn for the study of cartels from recent developments in our understanding of collective goods, in particular, from the experimental evidence showing that free-rider problems in collective-goods

provision may be less prevalent than neoclassical economic theory would seem to suggest. This question is treated by Engel (2007 a) with a comprehensive and systematic meta-study of oligopoly experiments, asking what factors are most responsible for the sustainability of collusion in such experiments, characteristics of products (e.g., homogeneity versus heterogeneity), markets (e.g., market size), properties of demand and supply functions, specifics of the strategic interaction (e.g., simultaneous versus sequential moves) and the information environment. Engel (2007 b) discusses the implications of this meta-study for antitrust policy, in particular, the cross-industry allocation of resources and the evidence to be considered in cartel investigations. Engel (2009) provides a systematic assessment of theory and experimental evidence and their implications for the practice of competition law and competition policy.

In a case study of cartelization, Burhop and Lübbers (2008 b) and Lübbers (2009) analyse the Rhenish-Westfalian Coal Syndicate in the late 19th and early 20th century. Burhop and Lübbers consider the implications of cartelization for productive efficiency. Contrary to Hicks's well known dictum that the nicest monopoly rent is a quite life, they find no effects of cartelization on production costs. They do however find strong effects of managerial incentives. Lübbers studies the profitability of the cartel as seen by stock market participants and reflected in stock prices. He finds that announcement of the formation of the cartel had a significant positive effect on stock prices; however, this effect was not large enough to outweigh the negative effect of a previous announcement that cartel negotiations had foundered and were broken up. He also finds that stock market reactions did not make a difference between firms even though clauses concerning the right to put down new shafts did discriminate so that some firms were in a better position than others to profit from the cartel.

Innovations and intellectual property rights are the subject of Engel (2008 a, 2007 c). Engel (2008 a) draws attention to the possibility that excessive intellectual property rights may cause excessive innovative activities. Engel (2007 c) studies the impact of collusion on incentives for process innovation in a duopoly model. Whereas, in the absence of collusion, innovation incentives arise from the prospect of becoming a monopolist, with collusion, they arise from the fact that the innovation affects outside options and, therefore, bargaining strengths, of the cartel participants. The main finding shows that, because quantities are smaller under a cartel than under competition, and the value of the process innovation depends on the quantity to which it is applied, innovation incentives are in fact lower in the regime with collusion than under competition.

The extent of the right to a trade secret is a focus of Bechtold and Höffler (2007). This paper was motivated by a case in the electricity industry where one company sued against outsiders installing devices underneath its transmission lines in order to find out which power plants were working and which were not, with a view to using this information by taking actions in the wholesale market. From this case, Bechtold and Höffler distil the problem of how to deal with the tradeoff between the supplier's investment and production incentives on the one hand and the efficiency implications of information asymmetry between the supplier and the demanders on the other hand. A simple result

asserts that, unless the supplier is actually willing to spend resources in order to safeguard his trade secret, the efficiency implications of information asymmetry dominate concerns about the supplier's investment and production incentives. From this result, the paper infers that the right to a trade secret should not be accepted without question, but should at the very least be subjected to the test how much the supplier himself would be willing to invest to safeguard his secret.

In a series of papers, Jansen (2008, 2009 a, 2009 b, 2009c, 2009 d) analyses under what conditions firms actually have an incentive to maintain secrecy and under what conditions they are willing to disclose information; disclosure is of course a precondition for patenting. The key issue is that disclosure affects competing firms' beliefs about a firm's technology and thereby their behaviours. Disclosure may enable competing firms to acquire the same technology cheaply, but it may also signal the innovating firm's advantages and discourage them from even trying to compete (Jansen 2009 a). Depending on parameter constellations, voluntary disclosure can therefore be part of an equilibrium even if there is no patent protection (Jansen 2009 d). However, with sufficient asymmetry across firms, it is also possible that concealment is preferred because it has a greater discouragement effect on competitors (Jansen 2009 c). The choice between patenting (disclosure) and secrecy also depends on competitive pressures. Interestingly, incentives to patent go up when competitive pressure takes the form of greater substitutability of products and down when competitive pressure takes the form of a greater number of competitors (Jansen 2009 b). As a rule, however, firms would like to be selective on whether they disclose or not, concealing in particular unfavourable information (Jansen 2008).

Private Interests, Public Interests, and the Governance of Large Corporations

Privatization of network industries has meant that governments had to give up control. In many cases, however, governments have tried to have their cake and eat it to, selling their network industries to private investors without really abandoning control. Thus, in the process of privatization, some governments have retained "golden shares", i.e., rights to exert control over certain kinds of decisions that were incommensurate with the shares they retained. Others have tried to reduce the scope for outsiders gaining control by imposing restrictions on shareholder voting rights. Within the European Union, the European Commission has consistently regarded such clauses as restrictions of the freedom of capital movements and, hence, as violations of the Treaty. With one exception, the European Court of Justice (ECJ) has confirmed the Commission's view. While affirming the right of Member States to invoke certain public interests in order to impose restrictions on the autonomy of private firms, it has asked that the public interests in question must be specified very precisely, that restrictions imposed must be suitable and necessary for achieving the public purpose, and that procedures must be such that the shareholders of the companies can have recourse to the courts. On these grounds, all golden-share provisions that provide the government with wholesale rights to interfere with a wide set

of strategic decisions of a private company have been outlawed. Only the rules that Belgium had imposed on the *Société Nationale de Transports par Canalisation* and on *Distrigaz* were upheld. In contrast to other countries, the Belgian law gave the government a right to veto certain decisions of the company within a specified delay, these decisions concerned only certain transactions involving the network infrastructure, not the companies' strategies as a whole, and the companies could appeal the government's veto in a court of law.

Golden-share legislation and jurisdiction raise fundamental questions about the governance implications of privatizations. Golden-share legislation is based on the notion that public interest warrants the government exerting control rights even in a private company. The Court's jurisdiction is based on the notion that, as long as they respect legal rules, private companies are autonomous, and the government has no business interfering with their choices. More precisely, any restriction on the ability of investors to acquire a block of shares in order to exert influence on the company's choice is held to discourage foreigners from pursuing such a strategy.[2] In principle, it is therefore an infringement of the freedom of capital movements that is guaranteed in Art. 56 of the EC Treaty; as such, it is only acceptable if it needed for public safety and order in the sense of Art. 58 EC.

Hellwig (2007,[3] 2008 c) points out the conflict about golden shares in privatized companies is part of a wider conflict about the governance of large private corporations. The Court's view of the role of investors buying shares with a view to exerting control affirms the Anglo-Saxon notion of the shareholder as owner and the stock market as a market for corporate control. On the Continent, this view has never been fully accepted; instead, there has always the notion that firms, in particular large firms, bear some sort of responsibility to society as a whole, and that, therefore, the ownership rights of shareholders must be restricted. This notion has been the reason why the European Takeover Directive was put on ice throughout the nineties and why in the past decade, a first version was blocked in the European Parliament and the final version still leaves Member States with a lot of leeway for national legislation providing firms with string defences against hostile takeovers. It has also been a major factor in Member State attempts to put constraints on foreign investors, in particular, sovereign wealth funds acquiring shares in domestic companies.[4]

With respect to this conflict, Hellwig (2007, 2008 c) points out that a wholesale notion of economic and social responsibility fails to take account of the need to consider tradeoffs between conflicting social goals. Assessments of such tradeoffs require judgement, taking account of the available information. Such judgement can be exercised and imposed if the company in question belongs to the state. For a private company, however, one

2 As discussed in Hellwig (2008 c), this claim is problematic because it neglects the fact that the restrictions tend to lower share prices. This counteracts the direct discouragement effect.

3 Written as an expertise for the German Sachverständigenrat (Council of Economic Experts), Hellwig (2007 has largely been incorporated into Chapter 7 of the Sachverständigenrat's Annual Report 2007/2008 and has therefore not been circulated.

4 Political discussion about such restrictions was the primary subject of Hellwig (2007) and Chapter 7 in Sachverständigenrat (2007).

needs regulatory rules to impose a consideration of the public interest even when it conflicts with the company owners' own goals. Such rules need to be administered by proper procedures. This leaves little room for exercising judgement about the proper assessment of tradeoffs. From a theoretical perspective, the distinction between the government's role in a public company and in a private company subject to regulation corresponds to the distinction between incomplete contracts that assign the authority to take decisions when the situation arises (to the owner) and complete contracts that try to predetermine future decisions by explicit rules. The ECJ's jurisdiction conforms to this logic, in particular, when it requires the rights of interference that the government reserves to itself to satisfy standards of specificity, appropriateness and procedure that would also be applied in other areas of administrative law.

At the same time, Hellwig (2007, 2008 c) criticizes the Court for apparently accepting the Anglo-Saxon view of the shareholder as owner, without paying attention to the fact that the joint-stock corporation was in fact created in order to restrict the rights of shareholders to interfere with the company's assets and activities. As an institutional innovation, relative to a private partnership, the joint-stock corporation enjoyed a certain protection from the whims of its shareholders; this protection provided the new institution with a certain degree of permanence and therefore off credibility for creditors, suppliers, and, not least, the other partners (Blair 2004). Given this permanence of the institution, rules for the co-existence of the different stakeholders are part of the *ordre public*, to be shaped by the polity, without prejudgment by any simple understanding of the assertion that the shareholders "own" the company.

From a historical perspective, Bayer and Burhop (2008, 2009) have looked at corporate governance mechanisms for private joint-stock corporations and studied the effects of the 1884 German law that introduced the two-tier structure with an executive board and a supervisory board that still exists today. Their major finding shows that, prior to this law, remuneration of top managers involved significant incentive components; after the enactment of this law, these incentive components were much reduced, presumably because monitoring by supervisory boards provided a substitute. Bayer and Burhop (2010) consider tenure and turnover of top management in banking before and after the 1884 law. Here the major finding is that turnover rates did not change much, but, after 1884, turnover was much more closely related to business results.

C.III.1.3 Research Questions

To make progress in thinking about the general issues discussed above, we intend to work on the following specific questions:

- To what extent is there a conflict between the requirements for regulation set forward in European law and in German Constitutional Law? Tension arises not only from concerns about the democratic legitimacy of regulatory decisions and about

the scope of legal protection for the addressees, but also from concerns about the role of foreign institutions, in this case the regulatory authorities of other member states, in national regulatory decisions.

- Are there modes of procedure that satisfy the economist's concern for efficiency as well as the lawyer's concern for due process in regulation? In 2002, the Monopolies Commission proposed a two-stage procedure whereby, at one stage, the authority determines, e.g., a system for allocating fixed and common costs, and at the second stage, the authority determines the individual price, the idea being that, at stage 1, the addressee can question the appropriateness of the chosen system, and, at stage 2, he can question the way the system is being applied, without, however, questioning the appropriateness of the individual price on substantive grounds.

- In some network industries access regulation is complicated by the fact that access can be provided at several stages of the value creation chain. This raises a question of the consistency of different access prices. If one believes that it is unrealistic to suppose that regulation can get the system of access prices right, one must ask which types of error are more important: errors that hurt entrants further upstream, who partly build their own infrastructures; or errors that hurt entrants further downstream, who don't build much of an infrastructure at all.

- What is an appropriate procedure for calculating capital costs? The 2003 report of the Monopolies Commission shows that currently applied rules involve inappropriate measures for risk premia and an inappropriate treatment of corporate and personal income taxes. The implications of this critique need to be developed formally. To the extent that an appropriate treatment of risk premia imposes unrealistic information requirements on the regulator, suitable proxies must be proposed.

- Is it really appropriate to saddle the incumbent with the risks that, under a regime of regulation according to the costs of efficient service provision, technical change may alter the access prices that the regulator imposes? What about the risks of changes in interest rates and similar market parameters that affect the costs of efficient service provision?

- Why are electricity producers willing to shed their transmission grids? One explanation that is sometimes given is that grids are too boring. More precisely, under sector-specific regulation, they do not earn high rates of return. For managers of giant corporations, eager to conquer the world or merely to earn the high bonuses that go along with high rates of return on equity, tying up company resources in these assets is undesirable. If such grapevine explanations are correct, they raise serious questions about governance and remuneration schemes. Could it be that certain incentive structures create biases against assets like network infrastructures that are boring?

C.III.1.4 References

Bechtold, S., and F. Höffler (2007), An Economic Analysis of Trade-Secret Protection in Buyer-Seller Relationships, Preprint 2007/18, Max Planck Institute for Research on Collective Goods, Bonn, forthcoming, *Journal of Law, Economics, and Organization*.

Bechtold, S., and J. Lüdemann (2007), Europäisches Telekommunikationsrecht zwischen Dezentralisierung und Kohärenzsicherung (European Telecommunications Law Between Decentralization and the Need for Consistency), in: M. Stolleis and W. Streeck, *Aktuelle Fragen zu politischer und rechtlicher Steuerung im Kontext der Globalisierung*, Nomos Verlag, Baden-Baden, 167 – 184.

Bayer, C., and C. Burhop (2008), A Corporate Governance Reform as a Natural Experiment for Incentive Contracts, *Schmalenbach Business Review* 60, 378 – 399.

Bayer, C., and C. Burhop (2009), Corporate Governance and Incentive Contracts: Empirical Evidence from a Legal Reform, *Explorations in Economic History* 46, 464 – 481.

Bayer, C., and C. Burhop (2010), If Only I could Sack You! Managerial Turnover and Performance in Large German Banks between 1874 and 1913, *Applied Economics Letters*, forthcoming.

Blair, M. (2004), Reforming Corporate Governance: What History Can Teach Us, Berkeley Business Law Review 1, 1ff.

Burhop, C. (2009), Pharmaceutical Research in Wilhelmine Germany: The Case of E. Merck, *Business History Review* 83, 475 – 503.

Burhop, C., and T. Lübbers (2008 a), Incentives and innovation? R&D management in Germany's high-tech industries during the second Industrial Revolution, Preprint 2008-38, Max Planck Institute for Research on Collective Goods, Bonn, forthcoming in *Explorations in Economic History*.

Burhop, C., and T. Lübbers (2008 b), Cartels, Managerial Incentives, and Productive Efficiency in German Coal Mining 1881 – 1913, Preprint 2008/13, Max Planck Institute for Research on Collective Goods, Bonn, forthcoming in *Journal of Economic History*.

Burhop, C., and T. Lübbers (2009), The Historical Market for Technology Licenses: Chemicals, Pharmaceuticals, and Electrical Engineering in Imperial Germany, Preprint 2009-25, Max Planck Institute for Research on Collective Goods, Bonn.

Engel, C. (2007 a), How Much Collusion? A Meta-Analysis on Oligopoly Experiments, *Journal of Competition Law and Economics* 3 (2007) 491-549.

Engel, C. (2007 b), Tacit Collusion – The Neglected Experimental Evidence, Preprint 2007-14, Max Planck Institute for Research on Collective Goods, Bonn.

Engel, C. (2007 c), Innovationsanreize aus Wettbewerb und Kollusion, in: Ansgar Ohly / Diethelm Klippel (eds.): *Geistiges Eigentum und Gemeinfreiheit*, Verlag Mohr Siebeck, Tübingen, 19-43. (English version: Preprint 2007/06, Max Planck Institute for Research on Collective Goods, Bonn).

Engel, C. (2008 a), Geistiges Eigentum als Anreiz zur Innovation – Die Grenzen des Arguments, in: Martin Eifert / Wolfgang Hoffmann-Riem (eds..): *Geistiges Eigentum und Innovation,* Duncker, Berlin, 43-72. (English version: Preprint 2007/04, Max Planck Institute for Research on Collective Goods, Bonn).

Engel, C. (2008 b), Die Bedeutung der Verhaltensökonomie für das Kartellrecht, Preprint 2008-40, Max Planck Institute for Research on Collective Goods, Bonn.

Engel, C. (2008 c), *Die verfassungsrechtliche Zulässigkeit eines Entflechtungstatbestands im Gesetz gegen Wettbewerbsbeschränkungen* (On the Constitutionality of Providing for the Possibility of Divestment in the Law against Restraint of Competition), *Common Goods: Law, Politics and Economics* 19, Nomos-Verlag, Baden-Baden.

Engel, C. (2009), Competition as a Socially Desirable Dilemma: Theory vs. Experimental Evidence, Preprint 2009/24, Max Planck Institute for Research on Collective Goods, Bonn.

Hahmeier, M. (2009), Prices versus Quantities in Electricity Generation, Preprint 2009/27, Max Planck Institute for Research on Collective Goods, Bonn.

Hellwig, M. (2007), Zur Problematik einer staatlichen Kontrolle ausländischer Beteiligungen an deutschen Unternehmen als Beitrag zu einer strategischen Industriepolitik, Report to the Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung, Max Planck Institute for Research on Collective Goods, Bonn.

Hellwig, M. (2008 a), Private Purposes, Public Purposes, and the Role of Regulation, in: Le Cercle des Èconomistes (eds.), *Les nouvelles frontiers de l'Entreprise/Firms : The New Frontiers, Actes des Rencontres Économiques d'Aix-en-Provence*, Paris, 397 – 401.

Hellwig, M. (2008 b), Zur Problematik staatlicher Beschränkungen der Beteiligung und der Einflussnahme von Investoren bei großen Unternehmen, *Zeitschrift für das gesamte Handelsrecht und das Wirtschaftsrecht* 172, 768 – 787.

Hellwig, M.F. (2009 a), Competition Policy and Sector-Specific Regulation for Network Industries, in: X. Vives (ed.), *Competition Policy in the EU: Fifty Years On from the Treaty of Rome*, Oxford University Press, Oxford, 203 - 235.

Hellwig, M (2009 b), Private Interessen, öffentliche Interessen und die Rolle der staatlichen Regulierung", in: U. Jens und H. Romahn (eds.), *Wirtschaftliche Macht – politische Ohnmacht? Zur Liberalisierung und Re-Regulierung von Netzindustrien*, Metropolis-Verlag, Marburg, 23 – 29.

Höffler, F. (2008), Ökonomische Gründe für die Regulierung von Netzindustrien (Economic Arguments for Regulating Network Industries), in: J. Lüdemann (ed.), *Telekommunikation, Energie, Eisenbahn – Welche Regulierung brauchen die Netzindustrien?,* Verlag Mohr Siebeck, Tübingen.

Höffler, F. (2009), Mobile termination and collusion revisited, *Journal of Regulatory Economics* 35, 246 – 274.

Höffler, F., and S. Kranz (2007), Legal Unbundling Can be a Golden Mean between vertical Integration and Separation, *http://ssrn.com/abstract=1068802*.

Höffler, F., and K.M. Schmidt (2008), Two Tales on Resale, *International Journal of Industrial Organization* 26, 1148 – 1160.

Höffler, F., and T. Wittmann (2007), Netting of Capacity in Interconnector Auctions, *Energy Journal* 28, 113 – 144.

Jansen, J., D.S. Jeon, and D. Menicucci (2008), The Organization of Regulated Production – Complementarities, Correlation, and Collusion, *International Journal of Industrial Organization* 26, 327 – 353.

Jansen, J. (2008), Information Acquisition and Disclosure in Oligopoly, *Journal of Economics and Management Strategy* 17, 113 – 148.

Jansen, J. (2009 a), Strategic Information Disclosure and Competition for an Imperfectly Protected Innovation, Preprint 2009/06, Max Planck Institute for Research on Collective Goods, Bonn, forthcoming in *Journal of Industrial Economics*.

Jansen, J. (2009 b), Competition and the Strategic Management of Intellectual Property in Oligopoly, Preprint 2009/13, Max Planck Institute for Research on Collective Goods, Bonn.

Jansen, J. (2009 c), Beyond the Need to Boast: Cost Concealment and Exit in Cournot Duopoly, Preprint 2009/32, Max Planck Institute for Research on Collective Goods, Bonn.

Jansen, J. (2009 d), Share to Scare: Technology Sharing in the Absence of Intellectual Property Rights, Preprint 2009/36, Max Planck Institute for Research on Collective Goods, Bonn.

Lübbers, T. (2009), Is Cartelization Profitable? A Case Study of the Rhenish Westfalian Coal Syndicate, 1893 – 1913, Preprint 2009/09, Max Planck Institute for Research on Collective Goods, Bonn.

Lüdemann, J., (2008), Wettbewerb und Regulierung in der Telekommunikation, in: J. Lüdemann (ed.), *Telekommunikation, Energie, Eisenbahn – Welche Regulierung brauchen die Netzindustrien?* (Telecommunications, Energy, Railways – Which Regulation is Needed for the Network Industries?), Verlag Mohr Siebeck, Tübingen.

Magen, S. (2009), Rechtliche und ökonomische Rationalität im Emissionshandelsrecht, in: E. Towfigh (ed.), Recht und Markt, Wechselbeziehungen zweier Ordnungen, Nomos Verlag, Baden-Baden, 9 – 28.

Newbery, D. (2008), Climate Change Policy and its Effect on Market Power in the Gas Market, *Journal of the European Economic Association* 6, 727 – 751.

Sachverständigenrat zur Begutachtung der geesamtwirtschaftlichen Entwicklung (2007), *Das Erreichte nicht verspielen, Jahresgutachten 2007/2008*, Wiesbaden.

Spengel, C., D. Endres, D. Harhoff, F. Heinemann, M. Hellwig, M. Hüther, C. Regierer, W. Schön, K. Stein (2009), *Steuerliche Förderung von Forschung und Entwicklung (FuE) in Deutschland*, MPI Studies on Intellectual Property, Competition and Tax Law, Volume 8, Springer Verlag, Berlin, Heidelberg.

Weitzman, M. (1974), Prices versus Quantities, *Review of Economic Studies* 41, 477 – 491.

C.III.2 Financial Stability and the Regulation of Financial Institutions and Financial Markets

The current financial crisis has induced us to devote yet more effort to the area of financial stability as a collective. The general overview that follows is unchanged from the previous report. The relation of these ideas to our analysis of the crisis will subsequently be discussed in the section on completed research.

C.III.2.1 General Overview

Discussions of collective goods do not usually refer to the financial sector. However, collective-goods aspects play an important role in arguments about statutory regulation in this sector. In most countries, financial-sector regulation is more stringent than the regulation of other sectors. A first line of argument justifies this regulation by referring to problems of asymmetric information and moral hazard in financial relations, but that raises the question why the regulator should be able to handle these problems better than the parties themselves. A second, more solid line of argument then refers to the systemic, collective-goods aspects that arise because the handling of asymmetric-information and moral-hazard problems by the contracting parties has repercussions for the rest of the system.

Such collective-goods aspects can be due to *domino effects* or to *confidence effects,* acting alone or in combination.[1] *Domino effects* arise when outcomes in one set of financial relations or financial transactions have implications for the participants' relations with third parties. In a simple case, the insolvency of a firm or a set of firms brings the firms' banks into difficulties, and this has repercussions for the banks' depositors and other financiers. A recent example was provided by the 1997 crisis in Thailand, when the devaluation of the Baht induced defaults by many Thai firms that had borrowed in dollars. These defaults in turn compromised the solvency of the Thai banks that had lent to these firms and caused problems for the international banks that had lent to the Thai banks.

Domino effects can also arise through markets. A financial institution that gets into difficulties may be forced to sell its assets. By putting the assets on the market, it may depress asset prices. The decrease in asset prices in turn may put pressure on other financial institutions that have also invested in them. A domino effect arises even though there may be no contractual relation at all between the first institution and the others. Thus, as this report is written, financial actors worldwide are apprehensive about the possibility that difficulties of financial institutions engaged in mortgages and in mortgage-backed securities may force fire sales of such securities, with serious consequences for asset prices and for all other institutions that hold such assets. Similarly, in 1998, the Federal Reserve Bank's organization of an operation to rescue Long Term Capital Man-

[1] For a systematic discussion, see Staub (1998), Hellwig (1998 b).

agement (LTCM), at least for the time being, was motivated by fear that an immediate closure and liquidation of LTCM's assets would have a drastic effect on the prices of long-term bonds to the detriment of all financial institutions that were holding these bonds. A historical example of such domino effects resulting from the interdependence of insolvencies, asset liquidations and asset prices is provided by the 1763 financial crisis studied in Schnabel and Shin (2004).

A final domino effect concerns the macroeconomy. A financial institution that gets into difficulties is usually unable to continue its financing operations on the same level as before. Its clients may find it expensive or difficult to get funds elsewhere because nobody else knows them as well as their previous partner. If many financial institutions get into difficulties at the same time, there may then be a "credit crunch", leading to an overall decline in external investment finance and in aggregate investment activity, with further repercussions on aggregate demand and employment in the economy. These kinds of "multiplier effects" of financial crises on macroeconomic investment played a major role in the Great Depression, as well as the banking crises and macroeconomic recessions of the early nineties in the Scandinavian countries. Remarkably, such effects have been much weaker for stock market downturns (1987, 2001) than for real-estate and banking crises.

Confidence effects are important because the willingness to participate in financial relations depends on confidence, which in turn depends on what one sees happening in the financial system. If one bank goes under, another bank's depositors may become apprehensive and start to withdraw their funds, putting pressure on that bank's liquidity. With deposit insurance, nowadays, depositors may be less fidgety. However, events of the past summer show that the effect is still very relevant for other short-term financiers, in this case, the lenders in commercial-paper markets who had provided leverage to hedge funds investing in asset-backed securities. After a few hedge funds had begun to write down the values of their asset-backed securities, short-term lenders to these funds became apprehensive, and financing through the commercial-paper market dried up. If the different banks' or hedge funds' asset positions are correlated, such a reaction is fully rational, taking account of the information provided by the first institution's difficulties.

By exactly the same kind of argument, somebody's wanting to sell an asset may contain information about the asset. If people are thereby induced to be apprehensive, market liquidity is greatly reduced. In the LTCM crisis, the price effects of immediate closure and liquidation were deemed to be incalculable because market participants were apprehensive about the prospect of a crisis, and the closure itself might have provided a bad signal, making people unwilling to buy the assets that LTCM would have had to liquidate, except at greatly depressed prices. In the current crisis situation, similar fears are attached to the possibility of fire sales by some institution(s) having significant effects on asset prices.

In these considerations, the collective-goods aspects cannot be identified with any one good that is bought or sold. Both domino effects and confidence effects concern the

functioning of the overall system of institutions, contracts, and markets. The actions that individuals take and the contracts that groups of individuals write have repercussions for the functioning of the system, but people rarely consider these repercussions. Actions are taken from the perspective of the individual in question, contracts are written from the perspective of the participants – how they affect the system is of little interest to them.

This is where statutory regulation and supervision of financial institutions and financial markets come in. In principle, this regulation is intended to induce participants to adjust their behaviours so that collective-good aspects are duly taken into account. Thus, traditional asset allocation rules and capital adequacy requirements are meant to protect the solvency of financial institutions and to eliminate the possibility of domino effects even before they have a chance to get started. Publicity rules for listed securities, as well as rules against insider trading regulations of market microstructure, are meant to protect the orderly functioning and the liquidity of markets by eliminating the worst instances of asymmetric information leading to market breakdown.

However, the incidence of statutory regulation is not always clear. Poorly designed rules may well be counterproductive. Thus, statutory deposit insurance seems to have played a role in exacerbating the crisis of the savings and loans industry in the United States in the nineteen-eighties. The enhancement of depositor confidence by deposit insurance may avert destabilizing bank runs. However, it also worsens the incentives of depositors to monitor the institutions in which they deposit their money and, by implication, the incentives of these institutions' managers to avoid exposing their institutions to excessive risk. In the eighties, this latter effect prevailed when institutions close to insolvency were "gambling for resurrection", using advertisements of high interest rates on "federally insured deposits" to expand their deposit base and thereby the funds they had available for such gambling.

Capital adequacy requirements, which, over the past two decades, have become a mainstay of banking regulation, have also been questioned. Initially, in the early nineties, discussion focussed on incentive distortions due to inappropriately chosen "risk weights" in capital requirements. In the late nineties, discussion has turned to the procyclical macroeconomic implications of more finely tuned capital requirements, as well as the actual implications of such requirements on the actual risk exposure of the financial system. Recent events suggest that one must also question the systemic implications of a regulatory approach that focuses entirely on banks, providing banks with strong incentives to shift risks out of their balance sheets, into special-purpose vehicles selling asset-backed securities to institutions such as hedge funds that are not subject to any regulation.

For the lawyer, financial regulation raises even more questions than the regulation of network industries. The concerns about democratic legitimacy and the rule of law that were discussed above for the regulation of network industries must also be raised here. Democratic legitimacy is in doubt because the "Basel process" for developing rules for capital regulation has not really been controlled by any institutions whose legitimacy was

based on democratic elections. While the individual members of the Basel Committee on Banking have been appointed by their respective national governments, the Basel Committee as such has worked as a committee of experts with little outside interference and has presented its accords for individual countries to adopt on a take-it-or-leave-it basis. Until small entrepreneurs came to fear that "Basel II" would make it more difficult or more expensive for them to get bank loans, there was hardly any discussion of this regulation in the political arena. However, there was a lot of discussion with certain interested parties, mostly from the large, internationally active banking institutions and their lobbies. This discussion was to some extent driven by the notion that the more sophisticated large, internationally active banking institutions are more competent in advanced risk management than the bank regulators themselves; less attention was paid to the notion that the risk management of a private institution on its own account might be driven by different concerns than the risk management that a regulator wants to impose in order to avoid systemic risk.

At the level of the implementation of rules, i.e. of banking supervision, concerns about the rule of law arise with respect to the handling of the models-based approach to determining required capital and with respect to the valuation of a bank's assets and the assessment that the bank is in difficulties. Within the models-based approach, the assessment of the model used by a bank involves an important element of arbitrariness. Backtesting of such models could be helpful if the underlying data exhibited sufficient stationarity. In practice, however, they do not; this is a problem for the banks themselves and even more so for the bank supervisors. Important elements of arbitrariness are also involved in the valuation of loans that the bank has made and in the supervisory assessment that a bank is in such trouble that it ought to be closed. If loans are not traded in open markets, there is no extraneous measure of borrower solvency and, hence, no "objective" valuation standard.

All of these assessments require judgment and can hardly be codified so as to lend themselves to sensible court proceedings. Even if a court review of such administrative decisions was feasible, it would hardly be effective. By the time the courts rescind an unjustified regulatory intervention, the damage may be beyond repair. The major damage is likely to involve reputation and depositor confidence. These are difficult and sometimes even impossible to restore once they have been impaired. Given the role of discretionary judgement and given the substantive importance of supervisory intervention for a bank, the question how such decisions can fit into the framework of German constitutional and administrative law is even more puzzling than for the regulation of network industries.

C.III.2.2 Completed Research

Securitization and the Crisis

Hellwig (2009) provides a thorough analysis of the different elements that have driven the financial crisis. Initially presented as the 6th Jelle Zijlstra Lecture in Amsterdam in May 2008, the actual text was written – and greatly expanded – over the subsequent months and was by and large finished when the Lehman insolvency caused an all out panic. The paper comes in two parts. The first part explains what went wrong in subprime mortgage securitization. The argument starts from the observation that risks associated with real-estate investment and finance are always a problem simply because the amounts involved are large, some shocks (interest rates, macroeconomy) affect all real estate at the same time, and there are hardly any investors willing to commit their funds for the entire economic lifetime of a building. Previous crises have shown that neither the originating intermediary nor the real-estate owner (the borrower) are in a position to really bear the interest rate risk associated with the investment. Using some kind of securitization to transfer this risk to a third party is socially desirable, but should be done in such a way that there are no adverse incentive effects on the originating bank. Having the originating bank issue debt of congruent maturity while retaining liability for the property-specific risks would be appropriate, the German Pfandbrief provides an example.[2]

Mortgage securitization in the United States deviated from this ideal by shifting *all* the risks away from the originating bank. Adverse incentive effects initially were limited because Fannie Mae and Freddie Mac, the government sponsored enterprises that were responsible for the growth of these markets, gave guarantees for the debt service on the underlying securities and imposed minimum quality standards for the mortgages that they would securitize, hence the term "prime" mortgages. These safeguards were, however, abolished when, in the early 2000s, private investment banks moved into these markets, using special purpose vehicles to perform the securitization, without providing any guarantees and with a focus on "subprime" mortgages where there was no competition from the government-sponsored enterprises.

When minimum quality standards and debt services guarantees were abolished, the discipline that they had imposed was *not* replaced by external discipline, be it from rating agencies or from the buyers of securities. Rating agencies as well as buyers seem to have believed that credit risk on the underlying mortgages was irrelevant because real estate prices were always going; there seems to have been no understanding of the fact that some of the causes of the observed real estate price increases were one-time events, not to be repeated, e.g. the interest rate decrease from 2000 to 2003. There also seems to have been no understanding of the role of correlations, or the dependence on interest rate and real-estate price movements as a common factor. Buyers of securities were eager to obtain high yields and seem to have paid little attention to risks; thus investment banks and hedge funds hungry for yields bought equity tranches of mortgage packages,

[2] Diamond (1984), Hellwig (1994, 1998 a).

European banks concerned about their market shares bought mezzanine tranches in order to securitize them in turn through MBS CDO's.

In all these institutions, there seems to have been a breakdown of internal as well as external mechanisms of risk control. The paper places this breakdown of internal and external mechanisms of risk control into the context of internal and external discourse driven by the objective of "shareholder value" and focussed on yield at the expense of risk. The focus of internal and external discourse on yield is explained by the influence of bonus systems that tie remuneration to short-term profits and stock-price movements, by the much greater ease which corporate executives, analysts, journalists, and institutional investors have in communicating about yield than about risk, and by the fact that some risks concerned creditors and taxpayers rather than shareholders.[3] On the side of at least some investors, e.g. the German Landesbanken, yield hunger probably was also due to the difficulty of finding viable business alternatives in a world with low interest rate and low intermediation margins.

In summary, the subprime problem is ascribed to a breakdown of incentives in creditworthiness assessments that in turn is due to the fragmentation of liability in the chain of transactions induced by the securitization and to the yield mania of the different participants, including the final buyers.

The second part of the paper begins with the observation that the estimate of 500 bn. $ of losses on subprime-mortgage-backed securities that is given in the International Monetary Fund's Global Financial Stability Report of October 2008 is too large to be explained by declines in expected present values of debt service on the underlying mortgages and, when taken by itself, too small to unsettle a global financial system with more than 80000 bn. $ of bank assets prior to the crisis. To solve the riddle, the paper points to the role of systemic repercussions. Two are particularly important. First, there had been a significant amount of maturity transformation. Long-term mortgage-backed securities had been held by special investment vehicles that were themselves financed by commercial paper, short-term, with no equity of their own, but promises of liquidity assistance from sponsoring banks. When, in August 2007, the subprime problem broke out into the open, refinancing of the special investment vehicles broke down, the sponsoring banks had to step in – and found that thereby they were themselves insolvent or at least in violation of their capital requirements. From one day to the next, market participants learned that there were some 1000 bn. $ worth of mortgage-backed securities and derivatives looking for new financing. Even in the absence of concerns about quality, this would have induced a significant increase of maturity and liquidity premia or, equivalent, a significant downward adjustment of market prices. Coming on top of quality concerns – many mortgage-backed securities had just been downgraded by three grades at once by the rating agencies – the breakdown of maturity transformation affected markets all the more strongly.

[3] This analysis expands the analysis of "market discipline" as a matter of discourse rather than intervention rights that was given in Hellwig (2005).

Second, the shocks of August 2007 set in motion a downward spiral that went unchecked until the Lehman insolvency induced a panic that caused governments of major countries to step in, making the taxpayer foot the final bill. The downward spiral arose from the interaction of price declines in malfunctioning markets, the rules of fair value accounting requiring banks with assets whose prices declined to immediately acknowledge the losses in their books, thus eroding their equity positions, a lack of "free" equity, i.e. equity above regulatory requirements, forcing banks to take corrective actions, usually in the form of "deleveraging", i.e., sales of assets, which in turn put pressure on market prices, with negative repercussions on other banks. Under the model-based approach to determining capital requirements for market risks, banks had run down their equity to around 1 – 3 percent of their balance sheets.[4] This meant that deleveraging involved multipliers of 30 – 100, i.e., for every dollar, euro, or Swiss franc of losses, they had to sell 30 – 100 dollars, euros, or Swiss francs worth of assets in order to get in line with capital requirements again.[5] It also meant that very soon, there was a question of solvency. Suspicions of insolvency hampered banks' positions in interbank markets. The generalization of such suspicions in September 2008 made these markets break down altogether.

With a view to discussions about reforms, Hellwig (2008) makes a distinction between individual misbehaviour and flaws in the system. Reform discussion should focus on the latter. Moreover, it should address not only those flaws in the system that arise from flawed assignments of liability and control, but also those flaws that arise from systemic interdependence created by general-equilibrium repercussions.

Financial Regulation and Supervision

Hellwig (2009) concludes with an extensive analysis and critique of the regulatory framework which set the stage for this systemic implosion.[6] Major points of critique are: (a) The objectives of capital regulation are unclear; to the extent that different objectives are involved, conflicts and tradeoffs have not been articulated. (b) The effects of capital regulation, in particular, the precise channels by which it is supposed to reach the given objectives, have never been laid out theoretically, let alone confirmed empirically. (c) No account has ever been given of the dynamics of regulatory intervention in a multi-period setting where the bank has inherited assets and liabilities with different maturities and different degrees of marketability from the past. (d) No account has ever been given of the systemic implications of regulation-induced deleveraging. (e) The model-based approach is based on the illusion that all risks can be measured when in fact correlations of counterparty credit risks and underlying risks in hedge contracts are changing all the time and, hence, unmeasurable, and there is hardly any information available to assess

4 The usual press release that the bank has 10 percent „core capital" relates equity to "risk weighted" assets only and is meaningless if the risk weights are inappropriate, e.g., because the bank's risk model failed to take account of some risks or some correlations.

5 On the procyclical effects of regulation-induced deleveraging, see Blum and Hellwig (1995, 1996).

6 See also Hellwig (1995, 1996).

an institution's exposure to risk from the overall system's responses to other institution's problems, e.g., the breakdown of refinancing of special investment vehicles in August 2007. (f) Because of systemic interdependence, the regulatory community's view that the safety and soundness of banks can be assessed by looking at each institution individually is invalid. Exposure to systemic risk is typically hidden in correlations, which are effectively unmeasurable. The view that banking regulation and supervision need to go beyond looking at individual institutions and to think about systemic interdependence has also been the subject of one of the main recommendations of the report that Hüther et al. (2009) prepared for the Federal Ministry of Finance on the practice of financial supervision in Germany.

Moral Hazard in Financial Institutions

The problem of moral hazard in financial institutions has been the subject of several papers. Most recently, Hakenes and Schnabel (2009) have taken up the impact of credit risk transfers on moral hazard in loan origination. Starting from the observation that there is, in principle, an economic rationale for credit risk transfers as a means of sharing risks, they study the tradeoff between risk sharing motives and moral hazard. The paper first develops the welfare gains from risk sharing through credit risk transfers in a world in which loan quality is observable. It then goes on to show that, if loan quality is not observable, the existence of credit risk transfer markets will induce excessive lending and a deterioration in the quality of loans. However, the net welfare effect of having such markets is still positive, provided the counterparties appreciate that there is moral hazard and adjust their return expectations accordingly so that prices will reflect the actual average loan quality in the market.

Boyd and Hakenes (2009) discuss the interaction between moral hazard in risk taking and looting. If there is scope for bank managers to appropriate resources from the bank on their own account and if such looting is particularly attractive in the wake of a crisis, this can in itself enhance risk taking incentives. In this case, the most effective regulation is not one that tries to rein in risk taking, but one that addresses the problem of looting outright. The paper shows that measures that try to rein in risk taking may actually backfire, inducing managers to compensate a reduction in the volume of risky projects by an increase in the riskiness of the ventures in which they invest. The analysis was motivated by certain features of the Savings and Loans crisis of the nineteen eighties in the United States. However, it seems that, if "looting" is replaced by certain kinds of bonus payments, the analysis is also relevant to some features of the current crisis.

Hakenes and Schnabel (forthcoming)[7] study the role of government bailout promises on competition among banks, showing that, if such promises apply to some banks but not to others, the latter face more intense competition and may be induced to incur greater risks, with a possibility that system stability as a whole is less than it would be without the

[7] Originally Preprint 2004/12.

government bailout promises. The importance of this effect is confirmed in the empirical analysis of Gropp, Hakenes, and Schnabel (2007). Schnabel (2009)[8] discusses the effects that the Reichsbank's implicit liquidity assistance promises to the so-called "Great Banks" in Germany had on these banks' liquidity management practices in the twenties and on the role of these policies and practices in the banking crisis of 1931.

C.III.2.3 Research Questions

Like the organization and regulation of network industries, the financial sector provides research questions for both lawyers and economists:

- How does the governance of financial regulation fit into the German legal system? A similar question has already been raised for network industries. Here, some key issues would be: What is to be made of the fact that the financial supervisory authority has extensive discretion and extensive legal powers, to the point that he can threaten the very existence of institutions in his domain? Why did they not use their powers prior to the crisis or in the crisis?

- How are we to assess the relation between different institutions, nationally and internationally, as a matter of law and as a matter of economics and politics? Internationally, banking regulation is harmonized under the auspices of the Basel Accords and the corresponding regulations of the European Union. What can be said about institutional reform in the wake of the crisis, the role of the new European institutions vis à vis the national authorities, relations between finance ministries, bank supervisors and central banks at the national level and in the interplay with the European Central Bank?

- Financial regulation is motivated by a desire to protect the financial system. However, the addressees of financial regulation are the individual institutions. How do these things go together? Banking regulation and supervision is intended to eliminate systemic risks. For the economist, this raises the question by what mechanisms the regulation of individuals safeguards the functioning of the system. For the lawyer, this raises the question as to what precisely is being protected and how the desire for protection supports the rules that are imposed on individual institutions. Current discussion about the role of macroprudential concerns highlights some of the issues. Whereas some see such concerns as a matter of analysis and information provision rather than regulations, others, in particular, at the Bank for International Settlements, are proposing to make such concerns an integral part of capital regulation of the individual institutions.

- What tradeoffs have to be considered in financial regulation? Relevant tradeoffs concern risk sharing and moral hazard through securitization, effectiveness of

[8] Originally Preprint 2005/05.

"market discipline" and vulnerability of institutions to market vagaries, efficiency gains and contagion risks from having more extensive markets.

- What are appropriate governance mechanisms for financial institutions? What scope is there for counteracting the yield bias of prevailing incentive systems, in particular those that are based on "market discipline"? Is the kind of formula-driven system of capital regulation that we have the best way to counteract excessive risk-taking incentives? Are there mechanisms by which one can give effective "voice" to the concerns of creditors and tax payers in banking governance?

C.III.2.4 References

Blum, J., and M. Hellwig (1995), The Macroeconomic Implications of Capital Adequacy Requirements for Banks, *European Economic Review* 39, 739 – 749.

Blum, J., and M. Hellwig (1996), Die makroökonomischen Wirkungen von Eigenkapitalanforderungen für Banken, in: D. Duwendag (ed.), *Finanzmärkte, Finanzinnovationen und Geldpolitik*, Schriften des Vereins für Socialpolitik, NF 242, Duncker und Humblot, Berlin 1996, 41 – 71.

Boyd, J., and H. Hakenes (2009), Looting and Gambling in Banking Crises, forthcoming preprint, Max Planck Institute for Research on Collective Goods, Bonn.

Diamond, D. (1984), Financial Intermediation and Delegated Monitoring, *Review of Economics Studies* 51, 193 – 414.

Gropp, R., H. Hakenes und I. Schnabel (2007), Competition, Risk-Shifting, and Public Bail-out Policies, European Central Bank, Frankfurt, and Max Planck Institute for Research on Collective Goods, Bonn, *http://ssrn.com/abstract=965495*

Hakenes, H., und I. Schnabel (forthcoming), Banks without Parachutes – Competitive Effects of Government Bail – Out Policies, *Journal of Financial Stability*.

Hakenes, H., and I. Schnabel (2009), Credit Risk Transfers and Bank Competition, Preprint 2009-33, Max Planck Institute for Research on Collective Goods, Bonn.

Hellwig, M. (1994), Liquidity Provision, Banking, and the Allocation of Interest Rate Risk, *European Economic Review* 38, 1363 – 1389.

Hellwig, M. (1995), Systemic Aspects of Risk Management in Banking and Finance, *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* 131 (1995), 723 – 737.

Hellwig, M. (1996), Capital Requirements for Market Risks Based on Inhouse Models – Aspects of Quality Assessment – Contribution to Panel Discussion, Special Volume on "Capital Adequacy Regulation as Instruments for the Regulation of Banks: Further Results", *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* 132 (1996), 755 – 759.

Hellwig, M. (1998 a), Banks, Markets, and the Allocation of Risks", *Journal of Institutional and Theoretical Economics* 154, 328 – 351.

Hellwig, M. (1998 b), Systemische Risiken im Finanzsektor, *Schriften des Vereins für Socialpolitik* NF 261 (*Zeitschrift für Wirtschafts- und Sozialwissenschaften* Beiheft 7), Verlag Duncker & Humblot, Berlin 1998, 123 – 151.

Hellwig, M. (2005), Market Discipline, Information Processing and Corporate Governance, in: K. J. Hopt, E. Wymeersch, H. Kanda, H. Baum (eds.), *Governance in Context: Corporations, State, and Markets in Europe, Japan, and the US,* Oxford University Press, Oxford, UK, 379 – 402.

Hellwig, M. (2008), The Causes of the Financial Crisis, *CESifo Forum* 9, Nr. 4, 12 – 21.

Hellwig, M. (2009), *Systemic Risk in the Financial Sector: An Analysis of the Subprime-Mortgage Financial Crisis*, Jelle Zijlstra Lecture 6, Netherlands Institute for Advanced Studies, Wassenaar 2008, reprinted in: *De Economist* 157 (2009), 129 – 208.

Hüther, M., M. Jäger, M. Hellwig, T. Hartmann-Wendels (2009), *Die Arbeitsweise der Bankenaufsicht vor dem Hintergrund der Finanzmarktkrise*, Bundesfinanzministerium, Forschungsvorhaben fe 22/08,
http://www.coll.mpg.de/sites/www.coll.mpg.de/files/text/Gutachten%20Bankenaufsicht%20BMF.pdf

Schnabel, I. (2009), The Role of Liquidity and Implicit Guarantees in the German Twin Crisis of 1931, *Journal of International Money and Finance* 28, 1 – 25.

Schnabel, I., and Shin (2004), Liquidity and Contagion: The Crisis of 1763, *Journal of the European Economic Association* 2 (2004), 929 – 968.