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## The economic ethics of social dilemmas

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# **Lehrstuhl für Wirtschaftsethik Martin-Luther-Universität Halle-Wittenberg**

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## **Diskussionspapier Nr. 06-2**

**Sören Buttkereit und Ingo Pies:  
The Economic Ethics of Social Dilemmas**

Herausgegeben vom Lehrstuhl für Wirtschaftsethik an der Martin-Luther-Universität Halle-Wittenberg und  
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# **The Economic Ethics of Social Dilemmas**

by Sören Buttkereit and Ingo Pies

## **Abstract**

Economic ethics is a research program that employs instruments of economic analysis in order to reflect upon problems of morality, e.g. the legitimization of market and state in shaping individual conduct. From the perspective of economic ethics, this paper examines the concept of social dilemmas and its significance for understanding – and improving – the institutional structures of modern society. A social dilemma is a situation, in which all actors behave according to their individual interests but the outcome is Pareto-inferior. The archetype of a social dilemma is the prisoners' dilemma that has become famous as a centerpiece of game theory. However, while game theory looks at optimal strategies for individual players in the interaction with others, economic ethics analyzes the institutional conditions of the interaction from a social perspective. It employs the concept of social dilemmas as a heuristics to identify changes in the rules of the game that improve the overall outcome. In light of this approach, economic ethics is concerned with transforming the outcome of strategy combinations rather than trying to modify individual strategies. This can either imply establishing a social dilemma or overcoming it, depending on the effect of cooperation on a third party. This approach involves changing the payoffs for actors by introducing rewards or penalties through either external authority or through actors' self-commitment. The optimal choice of method depends on the type of situation, the existence of an effective authority and the available incentives. Thus, understanding the economic logic of social dilemmas is vital for assessing the legitimacy of institutional arrangements.

## **1. The concept of social dilemmas and a note on perspectives**

Practically every interaction between individuals is characterized by a simultaneous existence of converging and conflicting interests.<sup>1</sup> This is especially obvious in the case of economic exchange: A vendor seeks to achieve the highest price possible, while a buyer looks for the cheapest offer available. Yet, both have a common interest in their exchange. While it is most apparent in economic relations, the same pattern can be observed in almost all other forms of social interaction. If an interaction between individuals does take place, both partners assume *ex ante* that they will benefit from it. Their converging interests dominate the conflicting interests, and both actors reap the benefits of mutual cooperation. This basic principle of interaction seems to suggest that actors with a common interest will always cooperate and thus achieve gains from cooperation. However, the economic logic of group behavior tells a different story.

There are certain incentive constellations where actors rationally decide not to cooperate, even though it would be in their common interest to do so. The resulting outcome of mutual non-cooperation is Pareto-inferior: A different behavioral pattern could make at least one actor better off without harming the interests of the rest. These situations have been labeled "social dilemmas" because the pursuit of individual interests does not automatically lead to the optimal overall outcome or, in the words of Todd Sandler: "Individual rationality is not

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<sup>1</sup> Cf. Schelling (1960/2003), p. 4 et passim.

sufficient for collective rationality"<sup>2</sup>. It is important to note that actors in a social dilemma do not intentionally choose an inferior result. Rather, this collective result constitutes an unintended consequence of their intentional efforts to maximize individual utility.<sup>3</sup>

The most prominent example of a social dilemma is the prisoners' dilemma.<sup>4</sup> The prisoners' dilemma received its name from the underlying story that serves as an illustration: The police interrogate two suspects of a major crime. They cannot prove their involvement in this crime but can provide enough evidence of misdemeanors for both criminals to detain them, albeit for a shorter period. Both prisoners are offered the same deal: If they testify against the other (defect), all charges against them will be dropped. If they remain silent (cooperate), on the other hand, they will be prosecuted for the minor charges held against them. In the case of defection by both prisoners, both will receive a higher sentence. In this situation, it is preferable for both prisoners to testify, regardless of their partner's choice. At the resulting equilibrium both actors defect and receive the prison sentence for the major crime, even though they would have been better off if they had both kept silent.

Figure 1 illustrates the prisoners' dilemma with two different notations. The left-hand side exhibits the conventional notation in a 2x2-matrix. Each field represents a combination of actions and shows the resulting payoffs for both actors.<sup>5</sup> The arrows indicate the actors' relative preferences of one field over the other and therefore point to the resulting Nash equilibrium. For both actors, the dominant strategy is to defect, as indicated by the arrows pointing towards the fields that represent an actor's defection, regardless of the other actor's choice. At the resulting Nash equilibrium of mutual defection, the payoff for both actors (2,2) is lower than in the case of mutual cooperation (3,3). Thus, they unintentionally harm each other and do not achieve the Pareto-optimal result.

The representation on the right-hand side of figure 1 uses a different notation for the same situation, plotting it in a coordination system with the axes representing the two actors' payoffs. Again, the arrows indicate paths of relative preferences, and again, they point towards the Nash equilibrium. In contrast to the traditional matrix-form, this representation has the advantage of visually illustrating the degree of converging and conflicting interests. It thus allows for a graphical solution to the prisoners' dilemma as a later section of this paper will show.

Game theory has made extensive use of the prisoners' dilemma as a particular constellation of interests. The primary focus of these considerations is to design optimal strategies for players, e.g. in the case of repeated interaction. Therefore, game theory concentrates on the individual players and the options available to them. Hence the term "prisoner's dilemma" in its singular form: Each prisoner faces the dilemma that his best strategy does not yield the most attractive outcome.<sup>6</sup>

<sup>2</sup> Sandler (1992), p. 3. Even the famous "invisible hand" evoked by Adam Smith is a case in point because the benefits of market exchange depend on the existence of certain institutions such as property rights, law enforcement and basic infrastructure. Cf. Sandler (1992), p. xviii.

<sup>3</sup> Therefore, in contrast to Komorita and Parks (1994), a social dilemma is not about actors who "must choose between maximizing selfish interests and maximizing collective interests" (p. 8). Assuming rational actors, they have no choice but to act according to their own individual interests in a social dilemma, inevitably leading to the inferior outcome.

<sup>4</sup> Economic literature often refers to the constellation as the "prisoner's dilemma" using the singular, but later considerations in this section will explain why economic ethics – following Olson (1965/1971) and his seminal work on the logic of collective action – prefers the use of the plural and thus speaks of the "prisoners' dilemma".

<sup>5</sup> In this case, a lower sentence implies a higher utility, i.e. a higher payoff.

<sup>6</sup> See, for example, the seminal work by Axelrod (1984) that identified "tit-for-tat" as a superior strategy for an individual player. An overview of some of the different streams of research following his work can be found in Axelrod (2000).

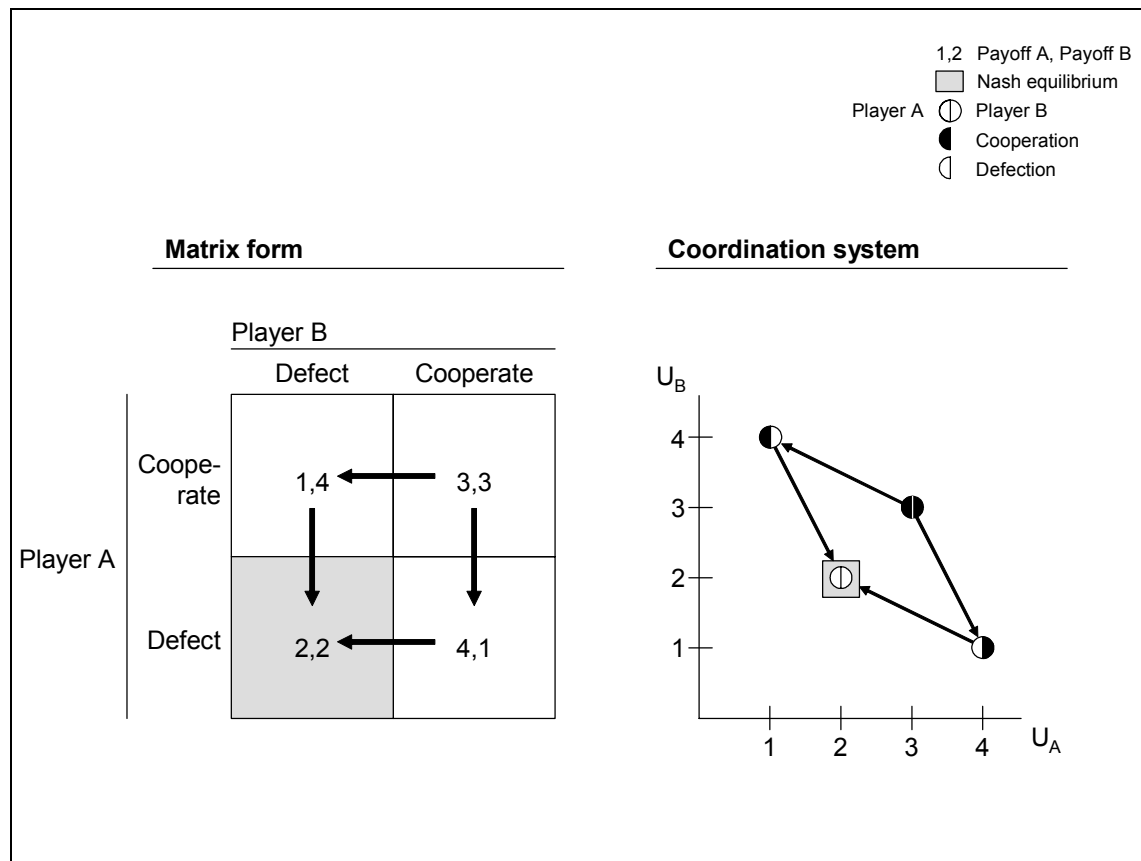


Figure 1: The prisoners' dilemma

Economic ethics, on the other hand, focuses on the conditions that give rise to a social dilemma. It does not consider the actors' decisions or their optimal strategies but rather the rules – or: incentives – that determine them. Hence, the plural form "prisoners' dilemma": The institutional setting constitutes a dilemma for *both* prisoners because it prevents them from jointly achieving the highest possible level of utility.<sup>7</sup> The aim of economic ethics is to identify the underlying conditions of a dilemma and to design possible changes to them in order to attain a superior outcome. The concept of social dilemmas therefore serves a heuristic purpose in the search for social improvements.

For the discipline of economic ethics this approach offers a powerful instrument in the quest for a positive analysis of normative issues. First, it improves our understanding of the working properties of institutions and thus helps to identify a consensual basis for the rules that govern modern society. Second, it shows how social problems can be solved and thus is a guideline for institutional reform. Third, it helps to improve moral discourse by transcending public (mis-)perceptions of seeming zero-sum conflicts. In particular, it is an antidote against conspiracy theories. To explain unintended results it is an important contribution to avoiding the pitfalls of moralizing because it shifts the focus of attention away from individual actors and their (presumably bad) intentions towards the incentive properties of institutional settings within which individual actors take their decisions.<sup>8</sup> Against this background, it is informative

<sup>7</sup> See, for example, Kreps et al. (1982).

<sup>8</sup> This is in line with a long philosophical tradition: In its Greek origin, the word "ethos" had three meanings. First, it denoted the place where a group of people lives. Second, it denoted rules (customs) that were typical of this place. And third, it denoted the acquired habits (character) of those people who lived under these rules. From this perspective, economic ethics can help to determine the correct level for moral discourse by arguing that – with regard to social dilemmas – the real source of a problem causing moral concern might not be the (bad)

to consider alternative constellations to the prisoners' dilemma and the resulting patterns of interaction.

## 2. The archetype of social dilemmas and its variations

The prisoners' dilemma constitutes the archetype of social dilemmas because of its unparalleled combination of simplicity and explanatory power. Tullock (1985) even asserts that "almost all interactions between human beings can be drawn as prisoners' dilemmas" (p. 1079).<sup>9</sup> The following considerations will show that this claim at least holds for those constellations that are characterized by a dominance of conflicting over converging interests.

There are three situations that feature the same simplicity as the prisoners' dilemma but denote alternative constellations of interests between two actors.<sup>10</sup> These are summarized in figure 2, following the notation in a coordination system. They can be derived from the prisoners' dilemma by changes to the payoffs (and thus, the ordinal preferences) and produce decidedly different outcomes. In fact, none of them represents a social dilemma in the strict sense because at least one of the resulting Nash equilibria is Pareto-optimal. The lower half of figure 2 exhibits them in order of decreasing conflict of interest from left to right.

In the chicken game, the outcome of mutual defection is the least attractive for both actors. However, unilateral defection is still preferred to mutual cooperation by the defecting party. Consequently, two Nash equilibria result that represent the exploitation of one actor by the other. The actual outcome depends on the actors' ability to credibly signal their defection: Whoever does so more effectively, forces the partner into a cooperative move in order to avoid the least preferred outcome. Therefore, the chicken game still displays a strong conflict of interest between the two actors. However, its outcome is not Pareto-inferior because the two Nash-equilibria constitute Pareto-optimal solutions.<sup>11</sup>

The assurance game bears a strong graphical resemblance to the chicken game. In fact, it is a reversed image of it: Both actors prefer cooperation, if their partner cooperates, but choose defection if the partner defects. As a result, the assurance game also displays two Nash-equilibria, one of them at the Pareto-inferior constellation of mutual defection, one at Pareto-superior mutual cooperation. It is apparent that the assurance game is marked by less conflict of interest than the two types discussed earlier because mutual cooperation is attainable.

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character of the actors involved but instead the (bad) rules which shape individual behaviour. In general, such arguments raise the awareness that the category of personal guilt might be ill-suited for assessing systemic results. Cf. Homann (2000/2002) as well as Pies and Sardison (2005).

<sup>9</sup> In contrast, Mancur Olson sees the prisoners' dilemma as a very particular case: "There is obviously nothing wrong with the arithmetic of the standard presentation of the one-shot Prisoner's Dilemma game. Rather, the problem is finding any significant number of real-world situations that correspond to this arithmetic" (Foreword in Sandler (1992), p. xii).

<sup>10</sup> Many more would be possible if variations of other parameters were allowed, e.g. regarding the symmetry of players' incentives, the number of players involved, the frequency of interaction, the degree of information asymmetry, the level of certainty and the sequence of decisions made by players. See Fudenberg and Tirole (2002/1991) for an extensive treatment of these cases as well as references to additional literature. Nonetheless, the following four archetypes represent the most important varieties of interactive behavior.

<sup>11</sup> In the example presented in figure 2 the sum of cardinal utility is equal for the Nash-equilibria and the situation of mutual cooperation. This implies that there are no forgone gains from cooperation associated with the Nash-equilibria. Some authors model the situation of mutual cooperation in the chicken game with either a slightly higher (cf. Sandler (1992), p. 38) or a slightly lower sum of payoffs than in the equilibria (cf. Fudenberg and Tirole (2002/1991), p. 19 or Bornstein et al. (1997), p. 386). If the payoffs from mutual cooperation equal those from mutual defection, the game is sometimes also referred to as "battle of the sexes".

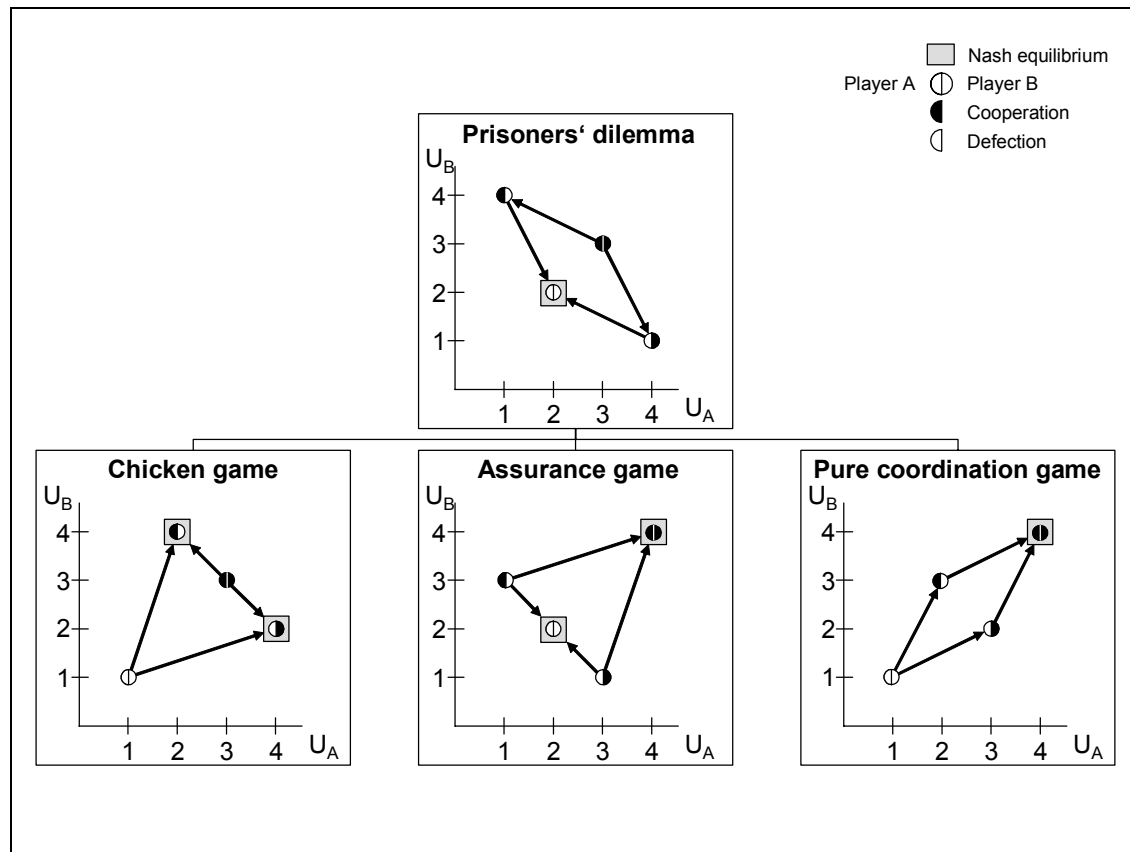


Figure 2: Variations of the archetypical prisoners' dilemma

However, there is still a possibility of a Pareto-inferior outcome. As in the case of the chicken game, signaling plays an important role: If both actors credibly indicate their willingness to cooperate, e.g. by way of a pledge, the Pareto-optimal outcome will ensue.

Finally, in the pure coordination game, the actor's interests are strongly aligned: Even in the case of defection by their partner, they would choose cooperation, so that the Nash-equilibrium establishes itself at mutual cooperation – the Pareto-optimal result. In this case actions following the individual interests automatically produce the ideal social result.

The pure coordination game represents the prisoners' dilemma rotated by ninety degrees. This observation points to one of the advantages of the notation in a coordination system: It illustrates the degree of converging and conflicting interests. Figure 3 demonstrates this interpretation for the two examples.

The descending diagonal within the coordination system stands for conflicting interests. In fact, it marks a zero-sum – or, more precisely, a constant-sum – dimension: Actors can only increase their utility at the expense of the other actor. In the case of the prisoners' dilemma, this dimension of conflicting interests is particularly strong. The ascending diagonal, on the other hand, indicates the converging interests of both actors. The line itself represents perfect complementarity between them, a win-win-situation: An increase in utility by one actor coincides with an increase for the other actor. This dimension is dominant in the pure coordination game.



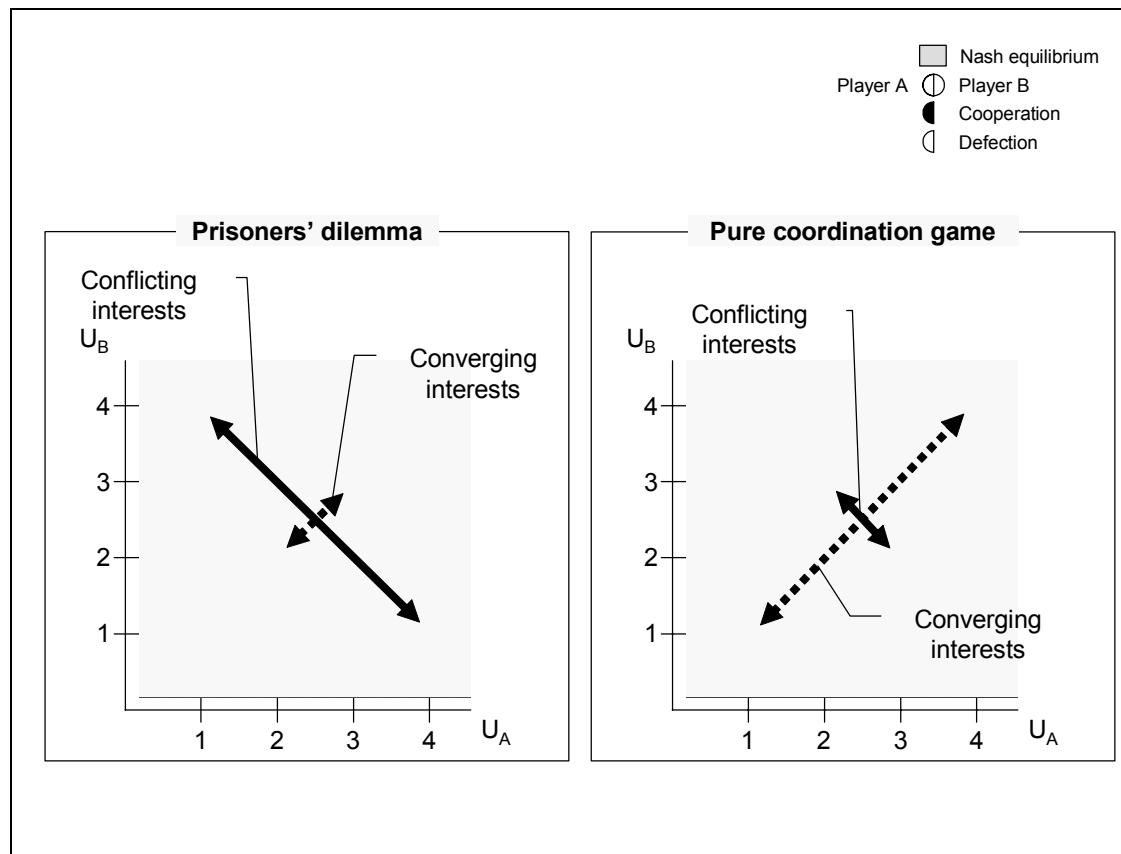


Figure 3: Dimensions of converging and conflicting interests

Economic ethics can make use of these dimensions in its aspiration to facilitate socially superior outcomes. If mutual cooperation is to be achieved, changes in the rules of the game must extend the dimension of converging interests to the point that they dominate conflicting interests. If, on the other hand, cooperation produces undesirable social costs, instruments can be designed that bolster the dimension of conflicting interests.

### 3. On productive and counterproductive social dilemmas

Even though the term "social dilemma" carries a slightly negative notion and is often used accordingly<sup>12</sup>, social dilemmas are not necessarily harmful from an overall social perspective. Hence, it is important to distinguish between productive (or: desirable) social dilemmas and counterproductive (or: unwanted) social dilemmas.<sup>13</sup> A productive social dilemma prevents cooperation between actors at the expense of a third party, while a counterproductive social dilemma prevents actors from reaping the benefits from mutual cooperation that do not negatively affect a third party. Therefore, the level of analysis plays an important role for the interpretation of a situation.<sup>14</sup> Two examples shall serve to illustrate the difference.

The mechanism of market competition constitutes a productive social dilemma. Producers strive to maximize their individual profits, but in their efforts to do so they drive down overall earnings for the industry by competing on the price of their product. As a group, they could increase their collective profits by cooperating and forming a cartel that is able to extract

<sup>12</sup> See, for example, Dawes (1980).

<sup>13</sup> Cf. Pies and Sardison (2005), pp. 283-286.

<sup>14</sup> For a general discussion of the levels of analysis see Williamson (2000), in particular p. 597.

monopoly rents. A monopoly, however, is socially undesirable because it involves dead-weight losses to society. Therefore, the social dilemma of competition on the level of producers leads to the socially desirable outcome of efficient allocation on the level of society as a whole. Consequently, economic ethics would seek to find rules that establish and maintain the social dilemma of competition, harnessing it for overall welfare.

Corruption, on the other hand, is an example of an unproductive social dilemma because it produces social costs on the overall level. Companies can attain a competitive advantage over their rivals by bribing officials, e.g. in public tenders or the interpretation of official regulations. Their competitors react by doing the same, increasing the level of corruption (defection) in society. This not only proves costly for the companies involved, but also generates costs on the social level in the form of overregulation, regulatory uncertainty and lack of accountability. Economic ethics therefore poses the question of how to design mechanisms that induce companies to refrain from bribery. Here, the goal is to foster defection instead of cooperation.<sup>15</sup>

#### 4. How to overcome a social dilemma and how to establish it

Depending on the effect of cooperation between actors on third parties, it can be socially desirable to either overcome a social dilemma or to establish it. As argued earlier, mere appeals to behave morally (i.e. in the common interest) aimed at those involved will not produce any result as long as they do not fundamentally alter the existing pattern of payoffs. Rather, a solution to these dilemmas lies in an institutional correction, i.e. the introduction of incentives that transform the logic of interaction in the desired direction. The goal of the modification is to reach a Nash-equilibrium at the Pareto-optimal point.

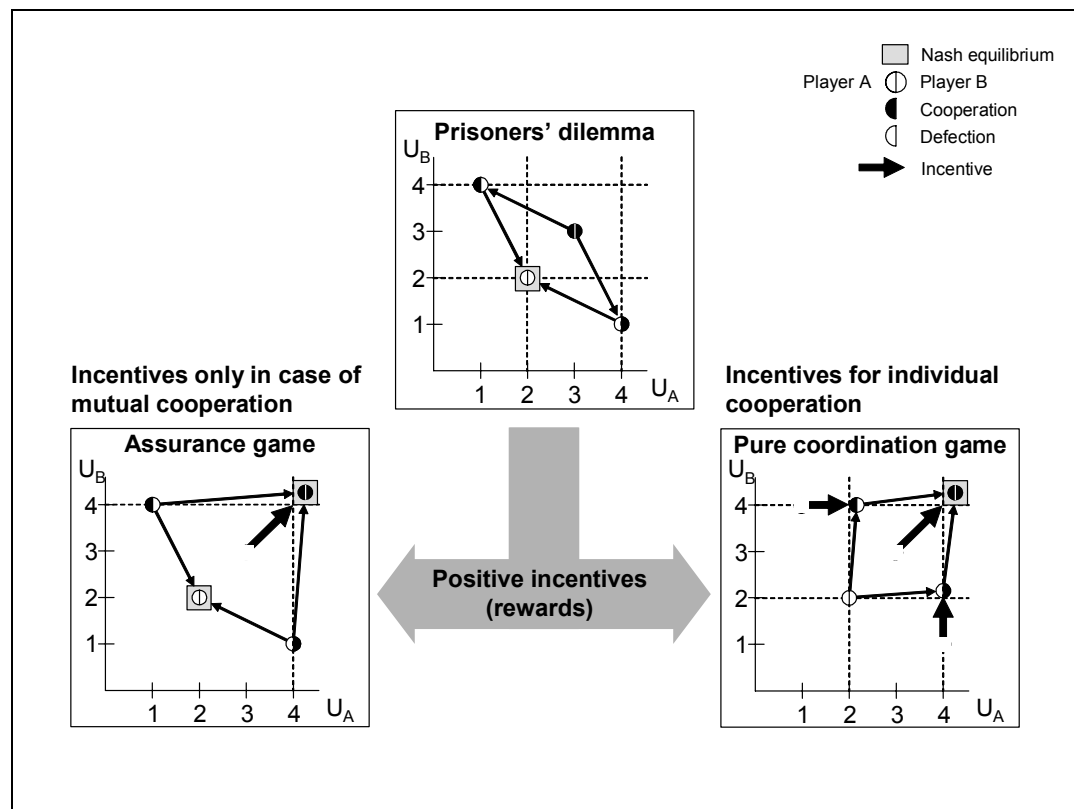


Figure 4: Overcoming the prisoners' dilemma – rewards

<sup>15</sup> Cf. Pies (2003).

Figure 4 illustrates how positive incentives (rewards) can achieve that goal for the case of an undesirable dilemma. The payoff from mutual cooperation has to shift outward in order to dominate the choice of unilateral defection for both players. In other words, there is a minimum threshold value for the payoff from mutual cooperation for both actors. The outer dashed lines mark this threshold. These lines are defined by the maximum values of both actors' utility in the case of defection.

The graphical illustration also shows that there are two possible constellations that result from the introduction of positive incentives. If a reward only applies in the case of mutual cooperation, the prisoners' dilemma becomes an assurance game. In that case, signaling by both actors remains important to reach the Pareto-superior outcome. If, on the other hand, rewards are also allotted in the case of unilateral cooperation, the prisoners' dilemma turns into a pure coordination game and the optimal outcome will result unambiguously.<sup>16</sup>

Rewards offer a powerful instrument to overcome a social dilemma, but they entail one major obstacle that limits their use: Additional resources have to be available to be inserted into the system. In both cases of positive incentives represented in figure 4, the total sum of payoffs in the case of mutual cooperation increases. Raising these resources implies withdrawing them from other uses, at least in the case of monetary incentives.<sup>17</sup> This will often cause distributional squabble around the question of where to draw these resources from.

Negative incentives (penalties) offer a less contentious solution.<sup>18</sup> Figure 5 illustrates that they can achieve the same outcome without requiring additional resources. The total sum of payoffs in the case of mutual cooperation remains constant for both situations of negative incentives. Again, there are two possible outcomes depending on the method of imposing the penalties. If only individual defection is punished, an assurance game develops that still has a Pareto-inferior Nash-equilibrium but a second Nash-equilibrium that is Pareto-superior. If mutual defection also carries a penalty, a pure coordination game develops.<sup>19</sup>

Following the discussion above, negative incentives seem to offer the more feasible reaction to an unproductive social dilemma, at least with respect to monetary incentives. There are two additional distinctions, however, that are necessary to determine the realistic solution space and that might lead to a different conclusion: the existence of an external authority and the type of incentives conceivable.

The introduction of negative incentives requires that there is a recognized authority that determines the applicability and the severity of penalties. In the context of a nation state, this might be the government that enacts upon generally approved legislation. Assuming a functional judicial system, this should ensure that penalties apply as intended and produce the desired cooperative behavior. If, on the other hand, there is no higher-level authority or no reliable system supporting it, penalties will prove less effective. In that case, actors at risk of

<sup>16</sup> The third variation of the prisoners' dilemma – the chicken game – would result if the rewards were only assigned in the case of individual but not in the case of mutual cooperation. While it is theoretically possible to construct this constellation, it does not seem very useful in practice and is therefore omitted in figure 4.

<sup>17</sup> See a later section on the different types of incentives, including non-monetary motivation that can potentially be generated from within the system.

<sup>18</sup> Note the early observation by Schelling (1960/2003), p. 177: “[A] promise is different from a threat. The difference is that a promise is costly when it succeeds, and a threat is costly when it fails. A successful threat is one that is not carried out.”

<sup>19</sup> Again, it is also feasible to construct the chicken dilemma by only imposing penalties on individual defection without punishing mutual defection. As before, this case does not offer much practical value.

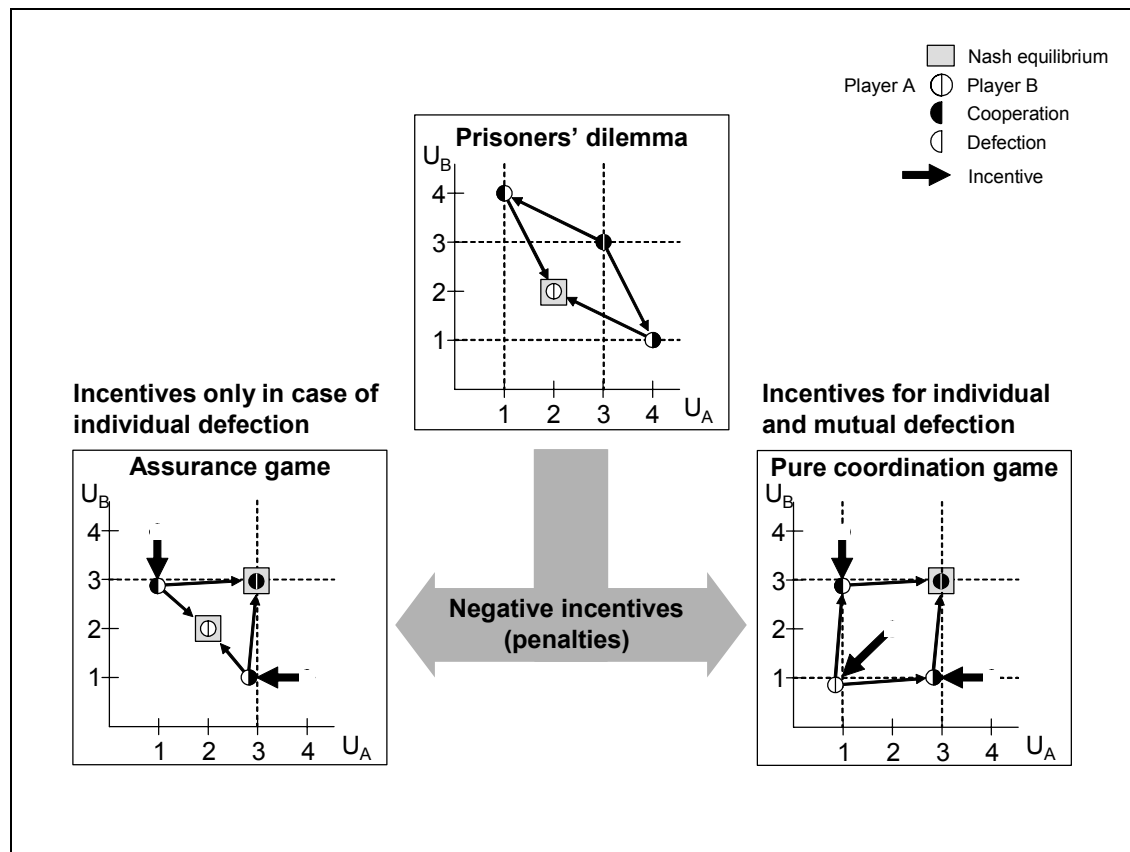


Figure 5: Overcoming the prisoners' dilemma – penalties

entering a social dilemma have to design internal mechanisms that create the desired institutional incentives themselves and bind themselves through mutual self-commitment.<sup>20</sup>

Obviously, this is much more difficult to achieve, even more so in the case of actors that usually compete with one another. In this situation, it might be more helpful to think beyond mere monetary incentives and consider other types of penalties and rewards.

Clearly, incentives will only make a difference in the actors' consideration if they ultimately also affect the actors' utility and therefore have a monetary equivalent. In contrast to monetary incentives, however, it is possible to create non-monetary incentives without withdrawing them from other areas. The issue of reputation offers a good example in this respect, particularly for actors with a high exposure to public opinion.<sup>21</sup> For them, pinning their own reputational fate on the adherence to mutually agreed standards can create the incentives necessary to overcome a social dilemma. Figure 6 lists a number of examples of the various types of incentives discussed in order to give a systematic overview.

While the considerations above and the examples in figure 6 focus on overcoming a counterproductive social dilemma, they similarly apply to the institutionalization of a productive social dilemma. Recurring to the mechanism of rewards and penalties encapsulated in figures 4 and 5, their logic simply has to be reversed in order to establish a

<sup>20</sup> Cf. Beckmann et al. (2006). Here, the authors differentiate between individual self-commitment that is required for situations of a one-sided danger of exploitation and mutual self-commitment for situations with a symmetrical danger of exploitation like the prisoners' dilemma. Transferring this logic to the archetypes, individual self-commitment will preclude mutual defection in the assurance game, while mutual self-commitment is necessary in the prisoners' dilemma.

<sup>21</sup> Cf., for example, Kreps and Wilson (1982).

dilemma. If, for example, a constellation presents a pure coordination game with negative side-effects for a third party (as in the case of collusive behavior in an oligopoly), incentives have to be designed that either reduce the payoff of mutual cooperation through sanctions or increase the attractiveness of defection through rewards. As a consequence, the actors face the prisoners' dilemma and will abandon their cooperation.

	Positive Incentives (rewards)	Negative incentives (penalties)
<b>Outside the game (authority)</b>	<b>Monetary</b> <ul style="list-style-type: none"> <li>State subsidies to micro-finance initiatives</li> </ul> <b>Non-monetary</b> <ul style="list-style-type: none"> <li>Award of certificates for adherence to social standards by governmental agencies</li> </ul>	<b>Monetary</b> <ul style="list-style-type: none"> <li>Government fines for alleged cartelization by industry players</li> </ul> <b>Non-monetary</b> <ul style="list-style-type: none"> <li>Publication of names of companies involved in corruption by NGOs</li> </ul>
<b>Within the game (self-commitment)</b>	<b>Monetary</b> <ul style="list-style-type: none"> <li>Common industry resources for developing code of conduct</li> </ul> <b>Non-monetary</b> <ul style="list-style-type: none"> <li>Industry awards for development of environmentally sound production systems</li> </ul>	<b>Monetary</b> <ul style="list-style-type: none"> <li>Provision of retaliatory import taxes against trade offenders</li> </ul> <b>Non-monetary</b> <ul style="list-style-type: none"> <li>Publication of names of companies not complying with standards by industry association</li> </ul>

Figure 6: Examples of rewards and penalties from inside and outside the game

## Summary

The concept of social dilemmas has a decisive importance for economic ethics. It helps to objectify moral discourse. It improves public understanding of (and agreement to) the incentive properties of market and state as enforcement mechanisms. And it offers a powerful heuristics to institutional reforms aiming at superior social outcomes. In this context, two points can be stressed: First, in cases of cooperation at the expense of a third party, institutional reform means to establish a social dilemma that prevents cooperation. Faced with a counterproductive social dilemma, on the other hand, institutional reform should strengthen the dimension of converging interests. Second, if an external authority can impose the incentives on the system, negative monetary incentives are preferable because they are less likely to produce distributional conflict. If, on the other hand, the rules of the game can only be changed through mutual self-commitment by the actors involved, non-monetary incentives, positive or negative, might prove to be more effective.

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