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# A GAME-THEORY-BASED ANALYSIS OF CORRUPTION AND ITS EFFECTS IN CEE COUNTRIES

**Summary:** The Czech Republic occupies one of the leading positions as far as the dispersion and deep roots of corruption are concerned, and even though all parties (in the political as well as non-political sense) commit to fight it, the results of this battle are more than dismal. This contribution presents an answer to the question of why this is the case. The real problem is not corruption, which can be uncovered and punished relatively easily, but rather that which we call hyper-corruption. In the first approximation, one can say that this concerns the formation of relationships based on the "corrupting of the corrupt", respectively the forced corruption behaviour of those who have engaged in corruption or similar forms of behaviour.

**Keywords:** corruption, conflicts of interest, game theory, economic growth.

## 1. Introduction

When we talk about corruption, we usually refer to the battle against bribery. From the legal perspective, new bribery regulations are contained in Sections 331 to 334 of the Czech Criminal Code [Šámal 2009]. Experience up until now has shown that even though the Czech Republic occupies one of the leading positions as far as the dispersion and deep roots of this unfortunate phenomenon are concerned, and even though all parties (in the political as well as non-political sense) commit to fight it, the results of this battle are more than dismal. The reduction of corruption has fundamental significance for development in the Czech Republic and other Central and Eastern European counties. This contribution presents an answer to the question of why this is the case. The real problem is not corruption, which can be uncovered and punished relatively easily, but rather that which we call hyper-corruption. In the first approximation, one can say that this concerns the formation of relationships based on the "corrupting of the corrupt", respectively the forced corruption behaviour of those that have engaged in corruption or similar forms of behaviour.

Identification, definition, description, and analysis of hyper-corruption assume a developed theoretical apparatus in the field of microeconomics and using game theory. We have come across this phenomenon while developing several different

theoretical questions, while proceeding in several different directions in our research, which intersected and mutually complemented one another in connection with its discovery and subsequently making it visible.

## 2. The explanation of apparent contradictions between the theory and the experiments performed on the basis of the Prisoner's Dilemma model

Here, we would like to note that both players have two options – either to cooperate or defect in a game of the Prisoner's Dilemma type. The selfish option to defect leads to higher benefit than in the case of cooperation provided that the other player cooperates; however, if he or she also defects, the benefit is lower. The rational behaviour of both accused is to inform against his or her accomplice, even though the optimum solution for both is their mutual silence.

What is called the silent or confess strategy, or cooperation, or defection in the case of prisoners may be interpreted also as a strategy of observing agreements or generally accepted principles or, on the contrary, as a breach of agreements or generally accepted principles in daily life. The best known published results in the given area can be demonstrated in the following table:

**Table 1.** The comparison of experiments in the Prisoner's Dilemma model

| | Defection | Cooperation | Unknown decision |
|---|---|---|---|
| Shafir, Tversky [1992] | 97 | 84 | 63 |
| Li, Taplan [2002] | 83 | 66 | 60 |
| Busemeyer [2006] | 91 | 84 | 66 |

Source: authors' own study.

The name and year specify who and when carried out the respective experiments. Numbers in individual columns express percentage representation of "defections", i.e. cases when a player who had guaranteed information that the other player defected (first column) or did not defect (second column) or was not informed about the decision of the second player (third column), opted for a non-cooperative strategy. Further experiments proved that the willingness to defect or cooperate is, to a great extent, influenced by the size of reward (punishment). Let's have a closer look at the difference between how players (i.e. particular people) should "theoretically" behave and how they behave "in reality". If we do not know how the other one decided, we should defect (and not only in 60-66% of cases). If we know that the other defected, the more so (and not only in 83-97% of cases). If we know that the other one cooperates, why defect (and why even in 66-84% of cases, i.e. even in

a bigger number of cases then if we do not know how the other player behaved)? How can we then explain this "irrational" behaviour (if it really is irrational behaviour)?

We have to proceed from the contextual nature of games. That is to say, in reality a situation when a game of the Prisoner's Dilemma type is played without repetition and quite in isolation occurs very rarely. Mostly other people (whom we can consider as players in other games) watch the course of the game and the way that individual players decide and, depending on it, they establish their relationship to those participating in the game. Therefore, we can perceive each game that we play for real as a contextual game, i.e. a game that we play in the context of other games. Our decision-making in real games is significantly conditional on how we reflect contextual games. The reflection of contextual games alone is in a significant way conditional on our experience and "re-melting" this experience into "on-line" mechanisms of our (human) decision-making, in which an important role is played by imagination, emotions, and other attributes of the mind, i.e. mechanisms that we usually classify as being outside the sphere of human rationality. However, a model based on the assumption of partial rationality, to which also other mechanisms of the human mind contribute, has sufficient information capability from the point of view of the targets that we are following. We can speak rather about limited knowledge and limited possibility to process information in real time than about irrationality. That is to say, this limitation is given already by the variety of the reality in which we live. The knowledge of contextual games helps us to assess situations, but this knowledge is always only incomplete. Let us demonstrate how a game of the Prisoner's Dilemma type changes if we consider it to be a game played in the context of some other games.

**Table 2.** The comparison of experiments in the Prisoner's Dilemma model

| | | B | |
|---|---|---|---|
| | | cooperation | non-cooperation |
| B | cooperation | 6; 6 | 0; 8 |
| | non-cooperation | 8; 0 | 3; 3 |

Source: authors' own study.

A and B are players that have two strategies: comply with an agreement or breach an agreement (breach agreed upon or acknowledged rules). Their payouts are in the matrix. Let us now assume that from the perspective of one of the players (e.g. A) the game has a certain context, respectively it is played as a contextual game in the sense that the community in which the player is active may be (but also

does not have to be) informed about the outcome. If he or she complies with the agreement and the other players in the given community see this, this will contribute to the increasing of his or her credibility capital (reputation). If, however, he or she does not comply with the agreement, and the other players in the community find out about this, his or her credibility capital (reputation) decreases. Let us also assume that the credibility capital (reputation) can (at least approximately) be valued in units in which the payouts from Prisoner's Dilemma type games are made, and the corresponding player values the loss or acquisition of the credibility capital in this way. For example, the player values the loss in the event of non-compliance with an agreement at –6 points, and the increase in the event of compliance with the agreement at +2 points (trust is lost faster than it is gained). It is necessary to emphasize that this valuation is based on the assumption that there is only a certain probability of the community being informed about how the players decided. Each player guesses the level of this probability and its value is directly linked to the bonuses and penalties given by the acquisition or loss of credibility capital. The following table shows how the situation changes.

**Table 3.** Payout matrix of the game of the Prisoner's Dilemma type, taking into account credibility capital (reputation)

| | | B | |
|---|---|---|---|
| | | cooperation | non-cooperation |
| A | cooperation | 6+2; 6+2 | 0+2; 8-6 |
| | non-cooperation | 8-6; 0+2 | 3-6; 3-6 |

Source: authors' own study, first presented by [Šnajdar,Valenčík 2011].

We see that the situation changes dramatically. It is worthwhile for both players to cooperate, but only if the original payouts and payouts connected with the acquisition or loss of credibility capital (reputation) have certain values. The situation can be different if the values are different.

## 3. Preconditions for the creation and operation of credibility capital, a structure based on mutual cover-up

A model based on the assumption of the contextual nature of a game of the Prisoner's Dilemma type and its expansion by the element of acquisition or loss of credibility capital offers a way to solve the question of why and when it pays off to comply with rules or generally accepted principles. This model may also contribute to clarification

of the issue of institutions' creation. However, it is important to define exactly the preconditions under which credibility capital may be created and operated. They include, among others:

– The possibility that some of the players who are part of the system in which we consider the contextual game (e.g. such as player C) find out that another player (e.g. B out of a couple of as yet not considered players) breached or, on the contrary, did not breach any generally accepted principle. At the same time, we can perceive the breach of one of the generally accepted principles in a certain system (a community, etc.) as a breach of an agreement.
– The fact that it pays off for player C, who found out about a breach or non-breach of generally accepted principles, to inform other players about the breach or non-breach of generally accepted principles by player B. A part of this assumption is also the fact that he or she has the possibility to inform the other players (otherwise it would not pay off for him or her).
– The fact that the knowledgeability of a community means a malus or bonus for the player breaching or not breaching agreements (as a consequence of sanctions or, on the contrary, growth in authority etc.).

Let's pay closer attention to the second assumption, i.e. that it pays off for the second player to spread the relevant information (e.g. in the form of denouncing the player breaching generally accepted principles). Generally, it applies that it may pay off for him or her on one occasion and not pay off due to different reasons under other conditions. Player C can then decide between different options:

– spread the information, i.e. denounce player B;
– leave player B's behaviour unnoticed, i.e. take no action;
– abuse the information, i.e. blackmail player B.

Player C's decision-making can be explained by the following figure:

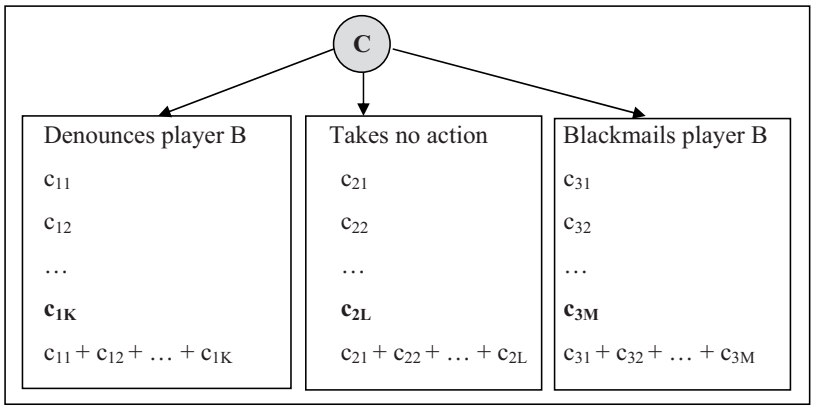


**Fig. 1.** Diagram describing the decision-making of a player who discovered a breach of generally accepted principles

Source: authors' own study.

Where $c_{1i}$ (and similarly in other cases $c_{2i}$ or $c_{3i}$) means evaluation of different consequences in case player C decides for one of the options. Values of these parameters may be positive or negative. As an example, we can give the following:

– protection of the community and share in its results,
– threat of revenge by the denounced player,
– reward by the community for protecting it.

It is proved that a suitable key to description of material aspects of behaviour of structures based on mutual cover-up is the discovery (or more exactly understanding the meaning) of symmetry between a player's inclusion in the structure and a player's release from a given structure. The symmetry is not complete due to the following reasons:

– a player who solves the dilemma of whether to join a structure or not is usually less informed and does not have a sufficient idea of all possible consequences;
– sanctions resulting from leaving the structure may be much graver that the sanctions for refusing to join the structure based on mutual cover-up;
– a player leaving the structure, or trying to release himself or herself from the structure, is offered several possibilities of how to proceed.

We can consider several options of a player who joined the structure as a result of blackmailing or bribery (we will identify him or her as player B based on the aforementioned):

– player B remains in the structure after having considered all options;
– player B leaves the structure, but keeps to himself or herself all that he or she knows;

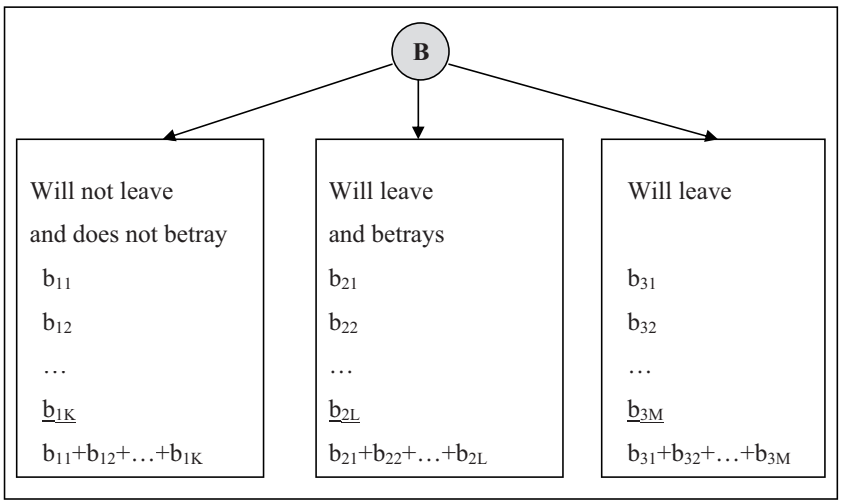


**Fig. 2.** Diagram describing the decision-making of a player who contemplates leaving the structure

Source: authors' own study.

– player B leaves the structure and starts informing players from the relevant system (e.g. community), whom he or she can inform about all that he or she knows.

Where $b_{1i}$, $b_{2i}$, $b_{3i}$ represent different types of consequences contemplated by the player and possible to occur in his or her opinion. One of the interesting and important directions of the theory development is drawing up a typology of consequences, which correspond to individual options of behaviour, for which a person may decide.

The structure (represented usually by a core of players who decide on how he or she will behave) reacts on the person's decision to leave or release himself or herself from the structure. Thereby a whole chain of contextual games is triggered, which we can model by means of expressing the basic scheme of contextual games as a game with an explicit shape with other inserted games added, which will start to be played.

One of the benefits of the presented schema is, among other things, that it makes it possible to identify, differentiate, and describe individual cases of errors. In more complicated situations, where it is also necessary to take the other player's (the one who is doing the blackmailing) reaction into account, the cause of errors can be also the incorrect estimate of parameters according to which the other player is making his or her decisions. This is a considerably more complex case, which we will also discuss later on.

A situation where one player can blackmail another player based on the aforementioned statement occurs in two ways. Either as we have already discussed, i.e. the first player (in our case player B) does something and the second player begins to blackmail him or her and force him or her to take a certain type of action. But it can also occur in a different way. The player that we have designated as "C" can be engaged in an activity that is contrary to the generally acknowledged principles in a given community. He or she usually also performs this activity with other players. Player B discovers this, while at the same time player C knows that player B has discovered this fact. If player C also has the chance to discover some sort of breach of generally accepted principles committed by player B, he or she can begin blackmailing him or her, in this case only *ex post*. From this perspective, the first case is then *ex ante* blackmailing.

In real situations, the relations between the player doing the blackmailing and the one that is being blackmailed tend to be asymmetrical. A player with other players who together are performing activities breaching generally acknowledged principles – we can label them, for example, players $C_1$, $C_2$,… $C_M$ – search for information about other players in the system so that they can blackmail them, respectively to force them to perform an activity that makes it possible for that which players $C_1$, $C_2$,… $C_M$ are doing to be covered up, to be disguised.

Whether the abuse of the fact that one player or multiple players knows or know that another player has breached principles generally acknowledged in a certain community or system, either *ex pos*t or *ex ante*, is formed based on what we have

stated, structures that we have called "structures based on the mutual covering-up of the breaching of rules or generally accepted principles". Especially, these structures are based on hyper-corruption.

## 4. Conclusion

It is not difficult to imagine a number of directions in which we can continue during further investigation of the phenomenon called hyper-corruption. What was revealed as the result of the theory's progress in several directions, which intersected at a certain point, concurrently opens up a way to further develop the theory in different directions. It applies namely to the following work:

- Adding other elements to the payoff matrixes that describe the consequences of different option considerations both by blackmailed persons and those who blackmail during the formation of structures based on mutual cover-up. The aim is that the list of all the consequences of one or another decision is as complete as possible and, at the same time, well-structured.
- The identification of further alternatives offered to said players in different situations from the point of expressing their behaviour within the framework of structures based on mutual cover-up as games have an explicit form.
- The projection of a game course (moves that are made subsequently) into the determination of the value of the individual consequences of one or another decision in the initial moves.
- Finding suitable symbolism that is of great importance during subsequent formalization and mathematization.
- The most difficult tasks that we then face in the area of the mathematization and possibly also the axiomatization of partial models and their interconnection.

The bigger the progress made in the solution of these issues, the bigger will be the applicability of the theory in practice solving the issue. Practical applications may be in the areas of public education, legal regulation, and politological reflection.

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## KONSEKWENCJE KORUPCJI W KRAJACH EUROPY ŚRODKOWO-WSCHODNIEJ Z PUNKTU WIDZENIA TEORII GIER

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