PETR BUDINSKÝ, RADIM VALENČÍK et al

Game Theory
(Redistribution and Contextual Games) as a Tool for Human Behaviour Decoding

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1. Extended Introduction

Starting is the most difficult part. Especially if we are dealing with something that is new and the interpretation of which calls for several steps to be made and several different perspectives to be linking together. There is always the danger that right at the very beginning the reader will perceive what we are trying to impart to him or her in a way that differs from the substance of the intended message. This perception then makes it difficult for the reader to understand the text. This is why we have devoted considerable attention in the introduction to the interpretation of what is at stake, the link to existing results, the practical significance of the results attained, both from the individual as well as the societal perspective, work methods employed as well as methods of employing the results, respectively the methodological questions and, last but not least, putting what we are concerned with into historical context (i.e. a reflection of why what we are concerned with is very important at the present time).

1.1 Read this before you go any further

When dealing with something, we legitimately ask the following questions:
- What is it for?
- Will it pay off to us?
- What benefit will we have from it?

Whether the reader realises it or not, these questions will pop up in his or her mind even in the case that he or she is deciding whether to read the following text or how much attention he or she will pay to it. We will therefore try, right at the beginning and as illustratively as possible, to answer these questions or, more precisely, to create a certain idea of the meaning of the text presented. To this end, we will use a quote from the popular book by T. Harford - The Logic of Life (2010):

"... I do not deny that we have the consciously calculating mind of a Mr. Spock. Indeed, we make complex calculations of costs and benefits when we act rationally, but we often do it unconsciously, just as when someone throws us a baseball to catch - we aren't conscious of our brain solving complex differential equations to work out where it's going to land. Most of us couldn't work out the calculations behind catching a baseball if we were given a pen and paper, yet the brain carries them out unconsciously. It's often the same for the calculations behind a rational analysis of costs and benefits." (Harford p. 23)

In his book, T. Harford points to a large number of generally popular errors, whilst he himself is almost never wrong. The passage quoted above is an exception. It contains a significant inaccuracy. Although the baseball that we are to catch is subject to certain physical laws, from which one can derive differential equations describing its flight, we do not calculate these equations. We go about it differently. Like when we need to find the logarithm of any number or the sine or cosine. We do not perform a complex calculation, but simply look through the tables and find the required value. When catching a ball, we proceed in a similar way - figuratively speaking – we look through the tables compiled by our experience and use our imagination. We have stored and well categorized in our memory a situation similar to the one in which we find ourselves in should we need to catch a flying ball. And we also behave depending on how we categorise the respective situation. Therefore it is training, and not knowledge of differential equations, that helps a baseball player to catch a ball. Training, during which he stores a variety of situations into his mind, categorises them and links them with his motor control capabilities, to be able to respond quickly and accurately on the basis of his recognition of the situation. A graphical representation of the ballistic curve, or the
effect of the ball’s rotation on a modification in the ballistic path, as the case may be, will substantially assist the player in having various types of baseball trajectories well organised in his mind.

Artillery fire is another example of not performing a calculation, but simply looking up tables so that we succeed in real-life situations. Here we truly make use of tables that contain the relationship between several variables. They are compiled using a calculation, but also employ experience, respectively the measurements gained from such experience. Because if we shoot from a very big and long artillery gun over a distance greater than ten kilometers, a very important role will be played, among other things, by the heating of the artillery gun’s head after firing. And when engaged in an artillery duel waged between ships at a great distance we cannot wait for the barrel to cool. We have to incorporate the appropriate (and significant) adjustment to the setting of the parameters of that shot by which we want to hit our enemy.

Our goal is to describe or to ”decipher” human behavior (why people behave the way they do) using models based on mathematical game theory. And to do so in such a way that the models we present (the meaning of which the reader can understand and can imagine what they attest to) give support to people when arranging their experience in real-life situations. Each of the models that we present contains only an approximate description of real human behaviour. This is always modified by many other circumstances. Nevertheless, each of the models that we present provides very important support in the identification of the various cases of what can happen, the organisation of the various factors as well as their impacts. In so doing, we will proceed from simple ”reading models” to more complex ones.

The results of the presented research can be understood from this (first) point of view, as being something that is fundamental to a person mastering game theory as an art of war - to be able to respond, in a timely and effective manner, to various game situations that he/she finds him/herself in. Study of this text will only serve the abovementioned purpose if the reader combines his/her understanding of the models with the conscious recognition of specific situations that occur in real life.

Another (the second) view of the text that we offer is that it ”offers up a mirror” (which is a somewhat overused expression in the Czech Republic, but appropriate in the context at hand) of how we behave in the games we participate in, which are played around and with us, which we are drawn into, and during which our weaknesses manifest themselves. Man, believing himself to be the ”Lord of Creation”, often does not realize that his behaviour is frequently governed by very primitive laws, which he is subordinated to without even realizing it. The results of our theoretical research will thus allow him to look at himself from a slightly more unbiased viewpoint than his own illusions about himself would allow.

The following text we can see from the (third) point of view, uncovering what is not seen via what is. This is because of the fact that real life involves the playing of not only those games of which all players are informed, but also of games characterised by varied levels of information provided to the participating players. However, some players often try to conceal what is happening, and this has certain implications for the games, of the course of which the other players are informed. A good model will enable us to reveal what used to remain hidden.

Last but not least (fourth), the text of the monograph is devoted to a critical reflection on the current reforms, particularly those focused on a change in the systems of funding social investment and social insurance (education, health care, pension insurance). It shows how and why their purpose was inverted; instead of resolving the problems, the manner of preparing and implementing these reforms has only escalated them.

We can also express the first, second, third and fourth views such that without game theory, which can describe and decipher the behaviour of people, we cannot at present understand...
what is at stake. Our time will seem to us to be a time that is confused, over-stuffed with various human failures, in which nothing can be changed for the better. We will try to portray a somewhat different picture of reality, which, although perhaps a little harsher, does not condemn us to helplessness, but gives us an answer to the question of what to do.

1.2 Proposed conceptual and methodological procedures

Basic model and its extension
We apply the following procedures which have been improved, resp. completed with new procedures:
1. We use mathematical models from the game theory, both those already described in the theory, and (in cases when a suitable model is not available) also own models. We consider as most important to find for every relevant problem the simplest (elementary) expression with subsequent gradual covering of the social reality in the form of a gradually extended model.
2. We take as the basis in completion of models the concept of limited rationality (see below) which we completed with some elements not included in usual interpretation of the concept. We followed our practical experience from utilization of the concept, the need to cope with specific problems we have faced.
3. We understand the social reality as a complex of mutually related games (not only in the time and space meaning, but also from the perspective of reflection of payoffs from some games into others, addition of strategies, etc.). Every player is in fact aware of only part of the games he/she plays (into which he/she is drawn, which are forced to him/her). Also the theoretical reconstruction of every specific case is always more or less incomplete, findings achieved by using game models must be subject to confrontation with reality and based on that to estimate what remained behind the theoretical model and what to include into the model.
4. The main areas of confrontation of the theory results (in the form of models allowing expression of a part of the social reality):
   - Interpretation of important phenomena of social life of present: a) in the field of conflicts of interest in preparation, negotiation and implementation of reforms in the field of social investing and social insurance both in this country, and abroad; b) in the field of elimination of corruption and related phenomena (For theory of corruption, see Otáhal (2006, 2007).
   - Standard experiments comparing forecasts generated by the model with real behaviour of people involved in the experiments. (The institution of the investigator offers suitable conditions both as to persons involved in experiments, and as to technical facilities).
5. Important tool, theoretical, as well as practical, which is the basis of anticipated experiments includes analyses of redistribution areas on one hand opening the nature of possible negotiation coalitions and agreements of all participants, and on the other obvious course of gradual negotiation steps and final solutions.

Concept of limited rationality
Concept of limited rationality (in our completed design) consists of the following:
1. For rational decision-making (i.e. choice of the best alternative regarding preferences) a man (and to a certain degree also other beings) uses not only the reason but also other components of his consciousness, e.g.:
   - Memory where he keeps his experience;
   - Imagination through which he makes present what is kept by his memory from the past experience, this in the context of present situation;
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- Emotions, resp. experience mechanism by which he performs “on-line“ selection of the best variant in the conditions of real and acute influence of external impacts.
- Conceptual knowledge by which he tries to find the generally valid patterns and therefore more durable, more exact support for his decision-making (this is closest to the term reason as we understand it).
- Dubitation which enables overcoming of borders of what is understood as given and unchangeable for ever (within the meaning of existence of general patterns).
- Intuition through which what is suppressed by the reason and what is certain reflexion of the reason limits at times gets into decision-making.
- Calculation or computation including using of models which enables, with the use of the reason, an unambiguous choice under the conditions exactly defined.
- Moral or ethical assessment which reflects into the choice of variants certain taboos related with compliance with generally acceptable principles.
- Possibly other areas (human psyche is too complicated to be simply put into simple categories what it includes and the functional links of what it includes).

2. The fact that we do not use only purely rational elements in decision-making (they would include, in narrow expression, only logical deduction and use of mathematical tools) but also what is behind (and such elements are used also by thinking using notions) does not mean that we do not make decision rationally (in broader sense of the word), i.e. that we do not search and are not able to chose the best variant, resp. that we at least endeavour to do so. In other words – various elements of our consciousness create mutually linked functional structure which has been cultivated in development (already in animal kingdom) and subsequently in the history so that it allows the optimal choice related to specific preferences. (We will cover below what are “optimal preferences”.)

3. The fact that the whole complicated structure of our consciousness has been calibrated by the whole natural and historical development so that it is functional as much as possible and enables identification of the conditions in which we are (to answer the question what it is) and then to make the choice of the optimal strategy of behaviour does not mean that it is not developing any more and that it is perfect. There might be also partial or systemic failures when the results are much different from preferences to which the choice was linked.

4. Also what is the basis of setting preferences is subject to development, what is related both with values we appreciate, and with searching of the sense of our being and living, and with from where our experience or emotions come from. It means if we say e.g. that we behave to “maximize our benefit” (within the meaning of a subjective experience) this does not mean that our experience structure is unchangeable. It changes permanently under the influence of our environment, it includes a deeply rooted relation between an individual and the tribe inherited already from the period of animal development, it is related with finding and on the other hand losing of the meaning, but also with physiologic processes of maturing and aging in relation with satisfaction of needs an individual has and which play different roles in various stages of his life.

Assumption of limited rationality therefore says, with certain simplification:
1. We can take as the basis of description, analysis and assessment of a person behaviour (regarding prediction how he will behave, and recommendation we can give for his behaviour) the model based on maximizing of his benefit in the form of rational choice of the optimal variant.
2. Rationality (within the meaning of the choice of the optimal variant) is always, more or less, limited by:
- limitation of the information the person has available;
- limitation of the possibility to process the information regarding its use for the choice;
- limitations related with specification of preferences, resp. their reflexion by the person itself. (In short, if we make the choice “on-line“ we must acknowledge that we do not have all information, either we cannot assess it sufficiently, either we do not have what to the assessment related to provided we want to make the choice perfectly. If we, however, are aware of the limitations then the model of rationally behaving individual who maximizes his benefit is a suitable approximation of reality, similarly like a “primary element“ is a good initial, not however sufficient, approximation of a real element.)

Are the social sciences waiting for their Einstein?
From time to time in the field of sciences concerning the society, respectively in the social sciences field, the question as to what extent these are indeed sciences is posed, whether they have not lagged too far behind the natural sciences and what the story is as far as their precision is concerned. This question was, in a very inspiring manner, recently posed at one of the most interesting scientific forums, held in this country, devoted to the social sciences field. The name of this international scientific seminar, Gaps in the Theory and Black Holes in the Public Sector, held for the third time in January 2011, was selected in order to inspire participants to give their greatest possible performances. This seminar was organised by the Department of Public Economics of the Faculty of Economics and Administration at Masaryk University in Brno. The ideas, which we will discuss in the first part of our contribution, were voiced in the contribution of F. Ochrana, one of the leading Czech experts on the public sector and its reforms.
We will answer in the affirmative the questions posed in regard to the status, roles and possibilities offered by the social sciences. We will not reproduce the list of what is disputed in the given contexts, but will demonstrate instead what and how effective methodological means can express, the nature of which corresponds to the need, to describe, analyze and predict human behaviour and to formulate practical recommendations on this basis. As for what effective methodological means we have in mind are the, we are talking in particular about game theory and, specifically, about some of the directions of its elaboration and applications connected with:
- the identification of contextual games and the elaboration of an apparatus for their analysis, i.e. with a view of social reality as an area in which a large number of interrelated games are played.
- the examination of redistributive games as one of the game types we encounter in most areas of social reality.
- the uncovering of a major phenomenon at large in our society, which was named the ”structures based on the mutual covering-up of violations of generally accepted principles“, and its analysis using game theory.
The French structuralism movement devised a programme similar to the one we are trying to implement some 50 years ago. It assumed that elementary organisational and behavioural structures exist among primitive civilisations, which can be detected and which will help us to even understand what is going on in more developed civilisations. It was gradually necessary to scale down the ambitious plans and, instead of supporting the role of rational elements in getting to understand the society, the development of structuralism was one of the sources of the birth of postmodernism relativising the possibility of getting to understand our world. We presume that game theory offers the social sciences the possibility to advance somewhat further in the analysis and prediction of events in the area of social reality, perhaps even further than we can admit to ourselves. The fact that this path offers some promise is evidenced, among other things, by the fact that the Nobel Prize in Economics for 2009 was awarded to E. Ostrom.
The controversial title of this section, “Are the social sciences waiting for their Einstein?”, was chosen deliberately. We borrowed it from the final sentence of F. Ochrana’s contribution (2011, p. 6). This is because of the fact that we wish, right at the onset, to express our conviction that the social sciences field does not rise and fall on the back of one or several significant personalities, but is about the gradual emergence of a certain style of scientific work based on a team and interdisciplinary approach. On the other hand, we should not lower our demands on the level that the social sciences should attain as far as the accuracy and clarity of the evidence they deliver is concerned, if we compare them in this respect to the natural sciences, including physics, for example.

In his paper, F. Ochrana assesses the state of the social sciences relatively critically as follows: ”Natural science managed to find the ...”interpretive key” to new problems back at the start of the last century. And what is the situation like in the social sciences? This discipline also faces a number of problems that we have yet to explain. We are missing the "interpretive key", which we could use to open a corresponding satisfactory interpretation of the existing problems. This is, among other things, also due to the fact that, in my opinion, the social sciences are lagging behind the natural sciences by an entire era. They were not subjected to an anti-Cartesian epistemological revolution of the type we know from the natural sciences. Metaphorically (and with a greater dose of hyperbole) said, essentially a significant (if not the entire?) area of social research represents a ”gap in the theory” If this statement corresponds to reality, then it is a serious warning.“ (Ochrana 2011, p. 4)

In continuation of the above, he raises a number of questions that, on the one hand, are an indirect reflection of the state of the social sciences in comparison to the natural sciences, whilst on the other hand focus on the resolution of certain problems with which the social sciences must come to grips with, whether they like it or not:

- Will we manage to weave a new “interpretative network“ in the social sciences, in which we will rationally capture the social reality so that we explain it in a satisfactory manner?
- Will the social sciences ever go through a similar epistemological revolution, similar in its extent to the revolution that took place in the natural sciences?
- What will be the likely content of the epistemological revolution in the social sciences?
- Should the social sciences aim for and strive towards formalization, quantification and explanation similar to that of the natural sciences, or are these problems of narrative?
- What then is the role of narration and narrative interpretation models in the social sciences?
- What is the ontology of the social world?“ (Ochrana, p. 5)

We will try to give a brief answer to these questions. For certain reasons, we will start with the last question. In our opinion, every area of social reality on which we focus can be themetised as a complex of inter-related games (in game theory terms). Having said this, such a complex is open in the sense that the more in detail we want to describe what is at stake in the given area, the more we must take into account games that are inter-related in various ways. We thus view the "ontology of the social world“ as a mutual conditionality of games in various areas.

The nature of the apparatus offered by game theory enables the social sciences to aim for formalization, quantification and explanation, and to do so in a manner very similar to that exercised by the natural sciences. The "re-armament" of the social sciences for the use of game theory, with the creation of a comprehensive open model containing a series of game models that together interact to cover every real-life problem is one component of what could be called an "epistemological revolution". It is precisely from the methods derived from the need to capture the mutual correlation between individual games that are played in every area of social reality that a new "interpretative network” can be weaved or a new prism, through which we can view social reality, made.
In continuation of the general theoretical and methodological questions, F. Ochrana poses other, more practice-related questions:

- Why do most theoretical proposals for reforms remain in the form of “tin cans”, which are in the end placed on the historical shelf of ”scientific concepts?”
- Why is public sector practice so resistant to reform proposals?
- Is this resistance caused by the allegedly “excessive abstractness of theories”, and hence their low practical applicability?
- Should the social sciences also, in addition to basic and applied research, strive for diagnosis?
- Are the social sciences failing in their ability to fulfil their practical role?” (Ochrana, p. 6)

1.3 Answer to the well-known question (What to do?) using theory, namely the new findings from research in the field of game theory

Developments in our country (these lines are written in the Czech Republic at the end of 2011) are characterised by a number of parameters which the Czech Republic has yet to encounter and which it has yet to get accustomed to. And it clearly does not even want to get accustomed to them. The government coalition, which won mass voter support to implement reforms in June 2011, squandered its political capital, is shuffling in one place and taking delight in the fact that its individual factions are employing the media to disclose one scandal against each other of the heaviest calibre after another. A full 90% of Czech citizens have no trust in the government and are calling for a change. This is a historical record.

It is therefore no wonder at such a time that we are increasingly hearing the following: "If you say that game theory can be applied successfully to explain why people behave the way they do, show us what’s actually happening right now and what to do about it!"

But it is not that simple. If we want to have support in theory when assessing questions related to social reality, we must express ourselves ”clearly and distinctly” (as Descartes would say) as to what is at stake, with precise tools as an effective backup. Social reality is, however, too complex a jumble of various relationships and influences. This is why, on the one hand, we have great theoretical mathematical models, which do not, however, cover the most important, i.e. what is at stake, and on the other hand a somehow themetised concept of reality, in respect to which we are capable of saying all sorts of things, but more on the basis of experience than theory. The greatest temptation that a theorist can easily succumb to is to attempt to apply the theory to “consecrate” something that is not the result of the theory, but merely the result of his observations and experience. This is a case when something that was known even without the theory is presented as its outcome, merely to give it more weight. Something akin to “short links between theory and practice” which discredit the theory and lead to the making of mistaken practical recommendations. A theorist must be very vigilant against such a danger.

With full knowledge of what has been said above, we will nevertheless try to add some "fighting talk" using theoretical findings, which we will present in a popular form so that this concise and popular interpretation allows for easier orientation in the main part of the text. So if we want to understand what is happening today, what worries us, what is the cause of all the injustices that we encounter, we must pay attention to what, in our team, has come to be known as structures based on the mutual covering-up of violations of generally accepted principles. By generally accepted principles we mean what is considered as being right, what must be respected or observed, and what is connected with respecting moral principles or laws.
The establishment of these structures has always gone hand-in-hand with the development of the human society (any community). The only specific aspect of our time is that it is literally overwhelmed by the effect of these structures, and that their interconnection has created a system with no historical precedence. And this system operates, to a large degree, independently of the fundamental political or economic characteristics of that given country - whether we consider it to be a dictatorship or a democracy, capitalism or socialism, multicultural or tribal. All social systems are penetrated by multi-layered structures based on the mutual covering-up of the violation of what is considered worthy of abiding by or respecting, whether it has only moral support, or is protected by law. Mutual covering-up at the local level is linked to the global level. If we were to attempt a brief characterisation of the current reality, then the problem is that the “capitalism rules”, as is claimed by some, but that it is a contaminated form of capitalism, in the way that other systems, which remain in existence in some countries, are contaminated. The obvious question then is how to get out of this situation. If, for example, someone dreamed today of socialism, he can be fairly sure that the womb of the present-day society would give birth to a contaminated socialism, i.e. one contaminated by structures based on the mutual covering-up of violations of generally accepted principles (regardless of what other parameters it would have) and that this would not address the problems of the current time, but would probably result in their amplification. If the theory was to merely prove that it names something precisely, this would not be so little. But it is certainly not enough for us to cast a look at reality from which would emerge an answer to the well-know question: “What to do?”. We will therefore try to take a peek into the kitchen, in which the theory is prepared, from the following interrelated viewpoints: 
- How the structures based on the mutual covering-up of violations of generally accepted principles were exposed.
- How their theoretical analysis proceeds, what results are available and what can be expected.
- How theory can help to change something in practice.

Discussions about the need of reforms, particularly in the field of funding of the pension system, funding of health care, funding of education have been more and more urgent. In some of the countries, some steps have already been implemented, others are prepared, hesitation is over some others. In a number of cases, there has even been reversal when during implementation of reforms and after completion of the first steps, the changes were abandoned. Generally, the situation in this field is not favourable. It is sufficiently clear from the fact that from among countries EU, none can serve as an example for others. Even from the above mentioned areas. To most of the reform steps implemented in any of the countries the statement applies, once famous, of the former Russian prime minister V. Černomyrdin: “We wanted to do it as well as possible but the result was as usual.”

What is the reason? The situation should disappoint not only politicians and the public, but also the professional sphere. This does not involve only an issue with practical importance and practical context but also a question that can be put theoretically. The professional sphere, however, usually lefts it aside claiming that it is able to say “how things should be” but the result is up to politicians. In our opinion, the theory cannot overlook what is important in reality. And when we have seen in all countries EU for a longer time on one side an increasing urgency of reforms, on the other side big problems in their implementation, the theory should cover this theme. The problem is that it does not have sufficient theoretical apparatus. It means apparatus which would be usually and as standard used for analysis of the mentioned issue, with sufficient experience with it, shared by the professional sphere, even internationally.

This monografie is based on results of three linked projects of the Grant Agency CR treated at the Financial and Administration University during the past almost ten years: Effectiveness of
Investments into Human Capital (2003-2005), Investments into Social Capital and Effectiveness (2006-2008) and Theory of Redistribution Systems (2009-2011). (The Grant Agency CR finances from public funds the most important projects of basic research, for more details visit http://www.gacr.cz/.) The first two projects cover preparation of theoretical foundations for reforms in the field of funding of investments into education and subsequently in the field of funding of social investing and social insurance. The third project reflected the real development and focused attention to implementation issues, tried to develop own apparatus subject to the game theory which would enable analysis of conflicts of interest during preparation, discussion and implementation of reforms in the field of social investing and social insurance.

We will use the findings of the above mentioned projects in our article not in the chronological order (how they were gradually achieved) but in the logical order (how they link to each other in gradual focusing attention on the fundamental of the problem):
- First, we will present the basic theme of reforms in social investing and social insurance. The term “systems of social investing and social insurance” was introduced to be able to cover the mutual links between reforms in the field of education funding (part of social investing), funding of health care (part of social investing and simultaneously part of social insurance) and funding of the pension system (part of social insurance).
- We will continue with searching the answer to the question why exactly urgency of reforms in social investing and social insurance increases at present. We will show that this does not cover only problems resulting from the demographic development (as sometimes presented in simplified and purposeful manner). We will present the issue of reforms in the mentioned areas in context with larger changes related with formation of knowledge society.
- Then, we will summarize the basic findings concerning the concept of reforms in social investing and social insurance achieved by the team of the Financial and Administration University. We will provide how they have been used; we will also mention some problems encountered during utilization of the theoretical findings.
- The largest attention will be paid to utilization of the theory for analysis of conflicts of interest inherent to reforms of systems of social investing and social insurance. We will start this section with explanation that even if the game theory is suggested as a tool for investigation of the fundamentals of this area, its utilization is not easy. The decisive role has been played by identification of structures based on mutual backing of breaking generally accepted principles. They originated not only “ex post” (after breaking generally accepted principles) but also “ex ante“ (with the purpose to prepare breaking generally accepted principles), just in relation with the phenomenon mentioned as undermining of reforms (tunnelling). The term “reforms under-tunnelling” is derived from the term “tunnelling”. It has got among globally used words in the Czech environment. The term “tunnelling” means wide drawing of funds from managed assets (Johnson et al. 2000). We understand the term undermining (tunnelling) of reforms as such method for preparation and implementation of reforms which will enable certain entities (operating mostly in the state administration or the financial sector) to extract extensive funds from the area of social life subject to the reforms (originally designed under the law for the public sphere) into the hands of private lobby.

1.4 The characteristics of the content of the monograph from the viewpoint of the structure of science

Although the interpretation is deliberately conducted such that the submitted text, or at least its decisive part is understandable to the widest circle of users even in the absence of special expert training, it is a scientific monograph. It presents original findings from the field of the
microeconomic applications of game theory. In terms of JEL classification, we are namely talking about C70 (Game Theory and Bargaining Theory: General), C71 (Cooperative Games), C72 (Non-Cooperative Games), C78 (Bargaining Theory), D01 (Microeconomic Behaviour: Underlying Principles), D74 (Conflict; Conflict Resolution, Alliances).

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2. What the 14-year Tradition of Scientific Conferences on Human Capital and Investment in Education Showed

The aim of this chapter is to present the fourteen-year history of the conferences on human capital and investment in education organised by the Financial and Administration University (and, prior to its establishment, the Banking Academy, founder of the Financial and Administration University) in such a way as to make it clear:
- How the concept of the comprehensive reform of the funding of the systems of social investment and social insurance was borne (i.e. reforms in the funding of education, health care and pensions).
- How this concept is related to the birth of the knowledge society.
- Why and how it came to be that the preparation and implementation of reforms in the Czech Republic in this area degenerated into promoting the interests of various lobby groups.
- How the theoretical reflection of this issue relates to developing and improving the game theory apparatus so as to enable human behaviour to be described in the real social context (i.e. who is concerned with what).

From this perspective we will mentioned fourteen years long history of conferences and to show how the present concept has developed, with emphasize on the theoretical dimension of the issue. It will not cover only a list of various facts but also an analysis of how the original concept was developing based on interactions between the theory and practice, under the influence of the real social development also using new findings of the theory itself.

The number of participants at the conferences every year was 30 and gradually increased up to 60 active participants. They included also important political figures (prime ministers, ministers), representatives of big firms, leading academicians from domestic, as well as foreign universities. Some of them enriched the conference series with important inspirations (for example the necessity to consider the issue of universities graduates competitiveness through the theory of social networks). Individual conferences were linked together in the meaning that concept of each of them was based on a careful analysis of the last year’s conference results. The conference, in addition to discussion of issues related with this concept, contributed also to a certain opposition to ideas about the concept of the theme of human capital and investments into education, among other things also from the point of view of practical implementation of theoretical solution and wider historical context. What we have gradually achieved within the conferences and the related activities (including in particular the theoretical seminar on economy of productive consumption and social investing held at the Financial and Administration University already since October 2003) is the result of the team work of those who work at the university, as well as those who cooperate with it. The team core consisted of people involved in three consecutive projects of the Grant Agency CR Efficient Investing into Human Capital (2003 – 2005), Investing into Social Capital and Effectiveness (2006 – 2008), Theory of Redistribution Systems (2009 – 2011).

Main findings of the conferences include (formulated with the use of findings of the conferences series and with a certain overview over the results) in particular the following:
- Effectiveness of education services provided by high schools improved also by implementation of the principle of the transferred price, i.e. the principle that everyone pays only from yields of the education, according to the amounts of the yields and directly to the entity which provided him/her the education services.
- This principle can be operated and legislatively and technically provided in such way to enable based on it implementation of the reform of university education funding.
- Implementation of the principle of the transferred price is linked with development of financial markets allowing creation of conditions for equal opportunities, removal of consequences of property differences and barriers in access to education developing as their result.
- Changes in the field of university education funding are necessary and are linked with formation of knowledge society; society in which the decisive role is that of the human needs related with acquisition and implementation of his/her abilities.
- A person’s abilities are implemented within social networks; it means that in addition to the issue of acquisition of human capital, also the issue of acquisition of social capital plays an important role.
- Especially large importance is that of networks of university graduates which can strongly improve the graduates’ assertion.
- An important role in analysis of social networks can belong to the apparatus of the game theory showing the logic of conflicts of interest occurring in assertion of human capital (acquired education).
- The reform of social investing into education must be understood as a part of reforms of funding of the whole system of social investing and social insurance (in particular systems of education, health care, and pension insurance).
- Preparation and implementation of reforms in the field of social investing and social insurance are linked with conflicts of interests reflecting both the historical context, and conflicts of interests within social networks within which human capital assertion is held.
- If the theory dealing with the issue of reforms of social investing and social insurance systems wants to find practical implementation it must be equipped, among other things, with the apparatus of the game theory, allowing it an analysis of involved conflicts of interest.

The text below is based both on the thematic concept of the conferences already held, provided to their participants always in advance, and on an analysis of their results published in symposia from every conference. The authentic formulations are used, translated from Czech to English. We refer both to symposia from the conferences (available since 2003 on the Financial and Administration University website), and to the Internet periodical Marathon in which invitations are published (including the theme) to all conferences and evaluation of individual conferences.

Listing of all people who actively worked on profile of the conferences series results would mean a long line of names and findings or themes.

### 2.1 Way to improved effectiveness of investments into education

Already the 1st conference (29 – 30.9.1998) which was organized, like others, under the title Human Capital and Investments into Education relatively exactly specifies the basic theme, further developed and concretised. The opening account discussed at the conference was based on the following two quotations: “This vision is based on three pillars which could perhaps be summarized under one denominator which is a certain reallocation of investments, of course provided the government can influence them to a limited extent, on investments into physical capital, investments into human capital, therefore into social investments while the government in its Programme Declaration understands under the most important form of social investments the investments into education.” (From the address of the Prime Minister M. Zeman on the Programme Declaration of the CR Government in August 1998.)
“If the capital for investing into humans were so readily available like that for investing into physical assets – whether through the market, or direct investments of involved individuals, their parents or sponsors – the rate of return would have a tendency to become equal in both areas. If it were higher for inanimate capital, parents would be stimulated to acquire that capital for their children and invest a specific amount into their professional education and vice versa. In reality, however, there is very much empiric evidence that the rate of return of investments into education is much higher than the rate of return of investments into human capital. That difference suggests existence of insufficient investing into human capital. That insufficient investing into human capital probably reflects imperfectness of the capital market. Investments into humans cannot be financed under the same conditions or so easily like investments into physical capital." (From the publication by M. Friedman Capitalism and Freedom of 1962.)

The following questions were set on this issue: “In what context the issue of human capital becomes topical at present? Is it true that importance of human capital increases globally, as well as locally (i.e. regarding the needs and possibilities of this country)? ... Does it make sense to “reallocate” sources in favour of investments into human capital? How to perform that reallocation, resp. who should do that? Is it true that investments into human capital are insufficient? If yes, why?

Are investments into education the best investments? Does it mean that they are also the most profitable investments? Why should they be or even are the best or the most profitable investments? And what about the rate of return of those investments? To whom, how and when do the effects of those investments return? Who is the investor – and do the effects return to the investor? Who should be the investor and which investor is the most suitable one? How to tackle the problem of existing and perceived budgetary limitation of the state in investing into human capital? How to achieve return of investments into human capital? Can a private investor be in an equal position with an investor drawing public funds? Can investments into education be funded from future yields? (Underlined by the authors.) If already now those investments are funded from future yields, what is the problem? Can receivables resulting from investments into human capital be in such specific form to be included in an investor’s portfolio like other similar investments? Can such assets (originating on the primary market) be traded on the secondary market? What should be the amount (resp. how to define the amount) and how an acquirer of an investment into human capital should transfer the amount to the investor from yields of the investment? ... What is the relationship between the investor, the acquirer of human capital and that one who provides services in acquisition of human capital (i.e. the educational institution)? Under the present circumstances, has that one who provides private educational services equal conditions like an institution providing the state educational services? Should there be a competitive environment between private and state educational services or should the private service have specifics disabling it to compete the state service? Are the specifics based on the fact that it provides over-standard services or on the fact that it provides services to individuals for whom the state does not have money for funding of their education? Should the school fees be paid also in state educational institutions?"¹

The underlined question and some others linked with it related with the possibility to implement in the CR conditions in analogy to the Australian system of universities funding known as HECS.

Discussion of the above mentioned questions resulted in concept of the 2nd conference (12.- 13.10.1999)². The input documents included the text General Project of Securing Efficiency

and Return of Social Investments which stated: “The general principle based on which efficiency and return of social investments is secured:
1/ Investments into human leads to an increase of human capital and in the market environment it is reflected in an increased income.
2/ Investor (investment fund) creates a financial asset by that investment (which becomes part of his portfolio); at the addressee of the investment into human capital (the fund client) side, on the contrary, arises a financial payable towards the investor.
3/ The client repays the payable in the form of a predefined share of the investment fund in the client’s income until the time of settlement of the discounted payable and the risk premium.
3.1/ From the income of the client, a certain “guaranteed” basis is deducted (which might be, depending on the specific type of investment, for example statistically calculated average income, its multiple, income achieved by the client before the investment, or the amount of a social unemployment benefit, etc.) and a percentage of the income part exceeding the “guaranteed” basis is transferred to the investment fund.
3.2/ The risk premium means a reserve created by the investment fund for coverage of the risk resulting from an anticipated existence of unsuccessful and less successful clients (to achieve with sufficient certainty the same yield from the part of the portfolio consisting of investments into human capital like from the standard part of the portfolio consisting of e.g. investments into state bonds); if it is drawn only partially it is dissolved according to predefined rules in favour of successful clients.
4/ The fund gets the money for investing into human capital exclusively from active persons so that it can pay out premium from the yield on those investments at the time when the persons cease to be economically active.

A brief characteristic of the principle on which efficiency and return of social investments is based: Me (an economically active citizen) transfer part of my income for funding of investments into education, requalification, etc. of other citizens (those who are in pre-productive age, unemployed, etc.) so that from the yield on those investments (through operation of investment funds in this field) in the form of my share in their income, my own income is secured (in the form of payout of insurance benefits of pension insurance, unemployment insurance, etc.) at the time when I am no more economically active. (It is in fact solidarity based on utilization of market mechanisms.)”

Please notice that already the second conference considered connecting of various systems of social investing and social insurance. Simultaneously, it also reflected in a way a wider historic dimension of involved changes: “The broader (and possibly even historical) importance of the proposed approach means that it opens the way to re-orientation of economic growth when ever increasing part of the growth includes satisfying of “ability” needs (i.e. needs the satisfaction of which is linked with development and implementation of human abilities in the form of provision of services in acquiring of the abilities) unlike “product” needs (needs satisfied by using products) which are the basis of the present economic growth. Opening of this growth space is important both regarding the idea about possibilities of further economic growth, and regarding solution of environmental problems (satisfying of “abilities” needs is not demanding as to pollution of the environment, with simultaneous acquiring of the needs leading to increased productivity of natural sources utilization.”

Concept of the 3rd conference (21. - 22.9.2000) presented in the invitation to the conference was the following: “When in the middle of the sixties, the publication by Gary Becker Human Capital was published it attracted extraordinary attention, namely in the Unites States. The

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recent thirty years have confirmed that namely in economies facing the necessity to increase their effectiveness, rational investments into human capital are the most efficient way to achieve that goal. The conference is focused on the issue of importance of investments into human capital as a safe and efficient method for investing playing ever increasing role in international context. A large portion of accounts will deal not only with an analysis of the meaning of investing into human capital, but also the implementation strategies and technical issues linked with their implementation (underlined by the authors). One of goals of the conference is to show economic effectiveness of this way of investing particularly from the side of potential investors and to contribute therefore to extension of the spectrum of entities already operating in this field.\(^5\)

The underlined part demonstrates a new context – the matter of implementation of the theory results in practise. It was based on specific causes. Main actors involved in profiling of content of the conferences worked in teams preparing the governmental draft reforms; at the same time, however, it was obvious that the courage to perform fundamental changes is gradually disappearing.

The emphasise on the link of issues discussed at the conferences with practice was typical for the 4\(^{th}\) conference (17. - 18.9.2001) with the extended title “Human capital and investments into education – on the threshold of knowledge society“. The original date of the conference (19.9.2001) was changed because the Senate of the CR Parliament called public hearing on the matter of tertiary education on that day; large part of the conference participants was involved in it. The opening article mentions the practical context of the conferences with increasing importance at that time: “At the time of the 4\(^{th}\) conference, it will be three years since we met for the first time. Therefore, we had enough clear idea about the meaning of our work – about economy in which lifelong education is the most important factor and its part, about knowledge society whose genesis we experience. We proposed a system for university (tertiary) education funding in which every university would receive sources depending on how its graduates find jobs on professional markets which would secure sufficient funds for universities and lead to a strong increase in efficiency of educational process. The idea of an investing attitude to funding of universities became more specific. Each of the past three conferences was a step forward, was a critical opposition to the present knowledge, brought inspiration and understanding of broader circumstances. We knew how demanding challenge we faced and we did not even hope that during a short time the possibility of investing approach to universities funding would become one of the most discussed issue in our country, that already this year we can present a unified functional model and that we would have a chance to be involved in preparation of an important legislative initiation opening the way to the new economy.”\(^6\)

The closer links between the conferences and the actual social practice are documented by the fact that one of input documents discussed at the conference included “Basic principles of the draft law on school fees and social support of university students“\(^7\) produced by the team of experts under the leadership of P. Matejů. They were the basis of the draft law discussed in early 2002 in the Chamber of Representatives of the CR Parliament and rejected by only a narrow majority. The method for tertiary education funding was directly based on the concept discussed and elaborated at the conferences series. One on main ideas of the document concerning the law objectives is worth mentioning: “To increase interest of universities in the possibility of their graduates to find a job and their remunerations, i.e. to achieve the status


2.2 Identification of barriers preventing increased effectiveness of investments into education

The title of the 5th conference (24. - 25.9.2002) “Human capital and investments into education (with focus on the matter of development of human resources, effectiveness of educational process and needs of professional markets)” reflected orientation on the highest possible connection of education and its competitiveness in practice. This is reflected also in the conference concept: “We set the goal to highlight main ways to increased efficiency of tertiary education process considering competitiveness of graduates in dynamically changing professional markets. As we mentioned last year, each of the past conferences was a step forward, was a critical opposition to the present knowledge, brought inspiration and understanding of broader circumstances. Among other things, it was clear that it is necessary to pay special attention to the matter of efficiency of educational process.”

Main themes of the conference included: “Human capital, its structure, character, and present globalization tendencies. Lifelong education and development of modern society. Efficiency of educational process and the role of universities. Education, professional preparation, and success on professional markets in the international dimension... Most articles were focused on the question: How to ensure the highest possible efficiency of educational process from the point of view of competitiveness of graduates on professional markets?... The question how to ensure the highest possible efficiency of educational process from the point of view of competitiveness of graduates on professional markets is directly linked with the matter of tertiary education funding and becomes more urgent. If universities are not interested in competitiveness of their graduates and their salaries they will produce “shortcomings” or “structural errors” in the form of unemployed and unemployable graduates.”

The increasing importance of the conferences series was seen also from the fact that the Czech National Bank provided its congress centre for the conference meeting.

The main theme of the 6th conference (23. - 24.9.2003) was: “Effectiveness barriers and competitive advantages in global competition” with the following partial themes: “Increased efficiency of educational processes – the key to implementation of reforms of social investing and social insurance systems. Theoretical instruments of analysis of human and social capital. Psychological, social and economic aspects of creation of social networks in firms, regions and institutions.” It is worth mentioning that discussing of the matter of graduates competitiveness brought an interesting element into the conferences series – the role of social networks. We will see how important was the role that element later.

The following 7th conference (22.9.2004) was focused on the following themes “knowledge society, social capital and social networks, profile of university graduates and graduates networks.” The meeting proceedings confirmed the opinion that “reform of tertiary education funding is necessary. Its objective is to intensify dependence between the funds received by a university and the quality of educational process which can be measured only..."
by long-term competitiveness of their graduates on the labour market. The anticipated model should result in an increased quality and efficiency of educational process. Precondition for improved quality of educational services is direct financial involvement and interest of providers, universities in professional competitiveness of their graduates. That model has been identified during preceding conferences through joint effort of foreign and domestic experts. It is based on the principle of the transferred price when a student pays for his education only subsequently, from his salary he will receive in a job acquired thanks to his qualification. He will start paying only at the moment when his salary achieves a certain amount and during an agreed period he will transfer several percent of his income to the account of his university. “13 The conference conclusions included also a detailed description of the proposed model of universities funding for the CR and description of expected effects: “One of consequences of implementation of this funding system leading to interest of universities in competitiveness of their graduates is – as shown by experience of top universities in the USA, but now also in other countries – genesis of cooperating graduates networks. New graduates find the best employment and achieve the most dynamic income and career rise when they have support from earlier graduates of the school. This, however, means that the educational process must include creation of preconditions for team work. Formation of graduates networks strongly depends on whether the school is able to provide its graduates with lifelong information service in their specialisation resulting in a competitive advantage. Formation of cooperating graduates networks based on provision of lifelong information service based on results of the original research is an innovation of a higher degree. It is one of important aspects of formation of knowledge society. “14

Similarly, also the 8th conference (20. - 21.9.2005) further moved the concept towards the matter of barrier of processes and reforms implementation. Conclusions from the conference were formulated as follows: “With increasing role of education in society, also importance of productive elements of families consumption increases. Development and cultivation of the capital market help to create conditions under which access to education is not limited by the income or property position of families. The main area of this process is funding of tertiary education. Globally, the number of fundamental scientific publications covering this matter increases and its practical implementation (Australian HECS, American MRU, etc.). The role of the capital market in funding of investments into human capital acquisition expands also to other areas and enables solution of effectiveness and equality. This process faces certain barriers in the form of operation of rival social networks operating against the mentioned direction of the capital market development.”15

Two important moments are worth mentioning which are the starting points of the concept of the following conferences:
- Solution of the matter of tertiary education funding according to the principle “everyone should to pay from the yields of his education, depending on how much he earns, and directly to the entity which provided him the education services” is put in direct link with solution of the matter of effectiveness and equality.
- The main barrier is seen in operation of those social networks in which the rivalry element prevails and the structure of which is formed on the basis of investing into social position.

15 Sborník z 8. ročníku konference Lidský kapitál a investice do vzdělání, p. 3. http://www.vsfs.cz/lidskykapital/?id=1402
2.3 Utilization of the game theory in analysis of conflicts of interest in implementation of reforms

Also the 9th conference (19. – 20.9.2006) continued in searching the causes why so intensive opinion conflicts take place in assertion of funding systems for investments into tertiary education which would create equal opportunities and simultaneously increase fundamentally effectiveness of education processes. Also in the media area and at various professional events related with preparation of the tertiary education reform, very strong discussions continued with rather interest context than opinion context. The matter was to clarify what interests act against efforts for the reform of tertiary education funding or generally in the field of social investing. Main themes of the conference were: “1. Increased effectiveness of education processes – the key to implementation of reforms of social investing and social insurance systems. 2. Theoretical instruments of analysis of human and social capital. 3. Psychological, social and economic aspects of formation of social networks in firms, regions and institutions.” The following hypotheses were formulated linked to the previous conferences: “How much we break down barriers of effectiveness in the field of education improvement, so much we will use the competitive advantage in the global competition. Increased effectiveness of education is also the key to implementation of reforms of social investing and social insurance systems, in particular the pension system and the system of health care funding. There is a number of efficient theoretical instruments for analysis of human and social capital – whether statistical, sociological, microeconomic, macroeconomic, the game theory (underlined by the authors), etc. An important role in interdisciplinary attitude to the matter of human capital utilization in firms, regions and institutions belongs to psychological, social and economic aspects of formation of social networks.” Already at this conference, a discussion started about mutual links of reforms in all areas of social insurance and social investing (in particular education system, pension insurance system, health care system). And for the first time, the apparatus of the game theory was used for analysis of conflicts of interests accompanying reforms in the mentioned areas.

The 10th conference held unusually in December (5. - 6.12.2007) was used to summarize results of preceding conferences. Main themes were: “1. From investments into human capital to full implementation of human abilities – presentation of results achieved during the past 10 years and their critical assessment. 2. Increased effectiveness of tertiary education in the CR. 3. Role of human and social capital. 4. Role of human capital in corporate practice. 5. How to use the achieved results and on what problems we should focus in the next period.” The review performed at the conference showed that it is not sufficient to prepare reforms, the most complicated is implementation of the reforms. While preparation of reforms cannot be separated from systematic solution of the matter of conditioning by interests in their implementation.

In this context, the 11th conference (29. - 30.9.2008) was a certain milestone that focused on “Preconditions and implementation of successful forms in acquisition and preservation of human capital,” which was the subtitle of its theme. Evaluation of the conference stated: “Opening of the original theme (within the 2nd block) was an important innovation – analysis of preconditions for implementation of successful reforms in acquisition and preservation of
Before the conference, the team operating at VŠFS produced an extensive study titled “Basics of the Theory of Redistribution Systems and its Application” which contained results of work on elaboration of the game theory apparatus usable for analysis of conflicts of interests in reforms implementation in the field of social investing and social insurance and which was distributed to the conference participants as an input document. The conclusions of the conference state: “The main innovation was opening of the original theme which included analysis of preconditions for implementation of successful reforms in acquisition and preservation of human capital. Speaking about acquisition and preservation of human capital, we mean in particular the area of education and health care linked to individual forms of social insurance. It is possible or even necessary to use the game theory apparatus for identification of preconditions for implementation, resp. a corresponding variant of the game theory can be used, linked with analysis of redistribution systems which is intensively elaborated at VŠFS. As confirmed by a number of recent specialized publications, an extraordinary interest in paid to this matter. The fact is understood that the result of reforms can always be taken as a result of games played in the specific area. If the theory does not cover the area, the reforms do not achieve the desired results. Interest in this matter was checked at several specialized events organized by other universities and other institutions before this conference. VŠFS has a good start in this field or at least very promising results.”

The 12th conference (13.10.2009) focused directly on the possibility to use the game theory in analysis of conflicts of interest linked with reforms. This was reflected in the title: “Human capital and investments into education: Reform of tertiary education in the light of the game theory”. The conference has working spirit and a closer specialization based on the following questions: “1. Who are the players in the process of preparation and implementation of reforms in tertiary education? 2. What are their goals and what strategies do they use? 3. Who is now winning and who is the loser, what has been earned and lost by them, who can win and who can suffer a loss? 4. What and who can still enter the game and influence the result?”. The following procedure was chosen to achieve the most efficient discussion of the key issues:

- The proceedings were divided into three blocks. The first block titled “Education and human capital in social context” included articles dealing with education in general. The second block titled “Problems of reforms in education” consisted of accounts responding the matter of implementation of reforms in the area without explicit utilization of the game theory apparatus. Into the third block titled “Games for the reform and (why) the theory of redistribution systems”, articles were included which were somehow based on the published input document and either responded it critically, or tried to use the apparatus of the theory of redistribution systems for analysis of the matter of reforms in education area. This enabled to focus attention of the third block on review how much it is possible to set the matter of implementation of the game theory within a wider cooperation in analysis of conflict of interests in the field of reforms of systems of social investing and social insurance.

- The working nature of the conference was reflected also into the method of presentation of the articles. Each of the participants was asked to be as brief as possible and to stress the main
ideas so that the core of each block can be focused on discussion of issues invoking interest. At the same time, the conference participants were invited to produce, if interested (in compliance with the information they received during the conference preparation) secondary articles responding what attracted their attention during the conference and studying the primary articles. This “two-level” nature of the conference has proven as efficient.

The last conference by now was the 13th conference (23.-24.9.2010) with a long subtitle “Necessity, urgency and mutual contingency of reforms of systems of social investing and insurance – the way to secure quality education, health care, stability of the pension system”. During preparation of the conference, its participants were invited to “try to show and analyse mutual links between reforms in such areas of social life like education, health care, pension insurance, etc.” This was reflected also in allocation of the conference proceedings into four blocks: “1. Necessity of reforms of systems of social investing and social insurance regarding competitiveness. 2. Funding of investments into education and health, the matter of reforms in that area. 3. Pension system, extension of the life span and possibilities of productive life, mutual conditions of reforms of systems of social investing and social insurance. 4. Games for reforms of systems of social investing and social insurance.” The conference resulted also in the following findings: “1. Mutual links between reforms in individual areas of systems of social investing and social insurance are important, increasing and we can expect even more attention paid to it in practice. 2. More and more important role will be that of education and its influence on economy in links to the process of formation of the knowledge society. 3. Very intensive discussion can be expected around the reform of system of pension insurance where different concepts are distinguished. 4. The period of productive activity of a person in which important role belongs to systems of social investing, in particular health care and quality university education, as well as well designed and focused lifelong education. 5. Conflict of interests in reforms does not have only political dimension, but it reflects also interests of various lobby, in particular in the field of discussions and measures in preparation of the reform of pension insurance. 6. It is possible to use effectively for analysis of conflicts of interests in reforms the game theory and the redistribution systems theory as its part.”

2.4 Contacts and conflicts with practice (a wider social context)

The conferences results have been used gradually in actions organized by the Ministry of Education and Sports CR in working teams with this ministry, committees of the Chamber of Representatives and the Senate of the CR Parliament. The main output was elaboration of the key part concerning funding of tertiary education in the White Book of Tertiary Education. As a basis of the concept for funding of education, which should reflect the balanced relation between the state and the market in the knowledge-based society, the team adopted the ideas formulated back in 1955 and later by M. Friedman in his book Capitalism and Freedom (1963). The same ideas are the basis of the Australian HECS model, the American system MyRichUncle, the current British model of university funding and reforms proposed in some other countries. From among the contemporary authors, the team used particularly the ideas of N. Barr and M. Palacios. One of the most important steps was the rejection of an idea that students should be given loans and that we need to find the most appropriate method for repayment of such loans. The

countries which attempted to increase financial contributions of students in their reforms of university funding encountered many problems. The main issue is that a student with insufficient funds does not have any property which might be used as a pledge for the loan. The interest on the loan would be too high. The loans of that type would mean a too high risk, both for the creditor and for the debtor. The authors came to the following conclusions:

- the risk of the debtor (the person receiving the funds for his/her education etc.) can be reduced if the debtor repays based on his/her income and from the amount exceeding a certain tolerable limit (e.g. the statistically enumerated average wage).
- the risk for the creditor can be reduced by distribution to a large range (large portfolio) of debtors (from some debtors the creditor gets more, from some creditors less; on average the creditor achieves the necessary increase in the value of the lent or invested amount).

Gradually it has turned out that we should not to improve or modify the already known principle (loans) but rather use a new principle that can be called the principle of transferred price. The principle means that:

1. Everybody pays only based on proceeds from the provided funds.
2. Everybody pays depending on how much money the funds yield for him/her.
3. Everybody pays directly to the provider of the funds.

In brief – the repayment is made from the future proceeds. This type of contract transfers the future income into presence (and therefore the name “transferred price”).

The transferred price differs from the "regular" price as follows:
- it has more parameters – the income limit at which the repayment starts, percentage of the repayment, repayment time.
- it does not have a primary nominal value; the nominal value may be established subsequently on capital markets.
- it is derived from the valuation of the effect of the services associated with the acquisition of human capital (educational but also other services) on markets of professions.
- it allocates funds in favor of those providers of services associated with acquisition of human capital (educational but also other services), whose production finds the best use on markets of professions.
- it creates a "bridge" between the specific relation creditor - debtor, which is created by the investment into human capabilities (e.g. the relation between the student or graduate, who "buys" a system of education services and at the same time is the debtor, and who subsequently after the graduation pays for the education, and the university, which acts as a "seller" and creditor), and the capital market.

The primary functions of the price are information, allocation and motivation. The transferred price thus generalizes the term of price as such (while keeping all the functions fulfilled by the price) in a sector where a “normal” price does not exist as a result of the specific character of transactions.

Once the capital market is sufficiently developed in the area of investment into development of human capabilities then the budget limitations of households of the individual students would not play practically any significant role. Thus, everybody will have an access to quality education, regardless of his/her property or income or the property and income of his/her family. This method of “viewing” economic reality is immediately connected with the understanding of the role of productive aspects of consumption by households and individuals in an economic system.

Further, we will consider the sector of university education, which is for many reasons most closely associated with the constitution of a knowledge-based society and which uses
secondary investment opportunities with the highest intensity. The application of the transferred price principle can be described as follows:

1. The primary creditor is the university, i.e. the "seller" providing a system of educational services.
2. The "buyer" (student or university graduate) "pays" for the provided system of services depending on the results of capabilities acquired through the system of educational services – i.e. after graduating and after exceeding a certain income limit (the enumerated average wage or a multiple of that wage) he/she pays a certain amount (e.g. 3–5 % from his/her income), either for a certain period of time (10–15 years) and the liability is thus met (regardless of how much and when the amount was paid) or until repayment of the owing amount (which may or may not accrue interest).

It is important that in the specific conditions of the Czech Republic we assume a gradual introduction of this system, which should function as a “superstructure” over the public funding of universities, i.e. the existing level of funding should remain in place and the universities should get additional funds by the mechanism described above.

To address the problems associated with the imperfect and underdeveloped capital market in the area of funding of investments into education, it is necessary to develop a market mechanism (specifically on the capital market) which would eliminate the obstacles described in the section above. Particularly the following preconditions shall be met:

- The providers of educational services shall be motivated to improve their quality, directly through financial motivation, expressed by their position in the competitive environment, i.e. it is also necessary to create preconditions for competition among the providers of educational services in comparable fields.
- There shall be no barriers preventing access to education, which would be caused by property or income situation of the student or his/her family.

The funding mechanism using the principle of transferred price meets all those requirements. Briefly, everybody pays but the payments are based on the proceeds of what he/she has acquired. The price of the contract concluded now is transferred from the future (which establishes the real market price). It should be noted that the term of transferred price is derived from the concept of a transfer of a future market price into the parameters of the present contract.

It is obvious that the transferred price generalizes the concept of price as such. The original concept of price is associated with the assumption that the acquirer of the property is able, at the time when paying the price and at least approximately, to estimate the benefits of the property or revenues from the use of the property. In the case of educational services such an estimate is very difficult for the reasons explained above. Moreover, there may be unpredictable individual differences, the quality of the provided educational services will be reflected in a whole portfolio of cases, associated with practical use of capabilities acquired from the education services.

The transferred price in the funding of university education fulfills simultaneously several functions:

1. Investment (credit) function: everybody has an access to education, regardless of whether he/she has funds to pay for the school.
2. Solidarity and insurance function: The more successful graduates will pay more than the less successful ones (those who fail will pay nothing). This means a certain solidarity between less and more successful (failed) graduates; this is a method of their protection against risk and dispersion of risks born by the provider of education services.
3. Price function (or transferred price): Educational establishments are motivated to ensure the best quality of the education services in terms of the value of their graduates on markets of
professions and they get funds which reflect the price of the graduates on the market, i.e. the “transferred price” fulfills the function of assuring efficiency of funds allocation (and this function is fulfilled significantly better than by the “real price” in form of a previously prescribed school fees). Apart from the motivation and allocation functions, the price has also the informative function. The repayment of liabilities may be performed through a central registration system which provides information to all players in the system (universities, potential students, companies and financial institutions), anonymously and in a suitable aggregate form, about the income prospectives of graduates from the individual universities and fields of study.

All types of the transferred price (which has a form of certain liability) may be traded on secondary capital markets. There can be also the alternative of direct payment, which shall be understood as a nominal and subsequent (secondary) valuation of the originally “non-nominal” liability. In both the cases the transferred price is nominally appraised on such secondary markets. In summary: the transferred price is something which enables to correct shortcomings of the capital market in the field of investments into human capabilities by the provision of education services.

The principle of the transferred price has been strongly projected directly into the fundamental principles of the White Paper on Tertiary Education. Nevertheless, for a number of reasons which will be analyzed later, the principle has been complemented with a transitional approach (school fees – loans to students for school fees – repayment from the income of the graduate). As this is a problem of critical importance, we provide the full wording of the key sections of the White Paper on Tertiary Education:

“Students will have the opportunity to pay the tuition fee immediately. The willingness or unwillingness of doing so cannot be taken into account by the TEI during the admissions process. One possible consideration is to introduce incentives for paying the tuition immediately by offering a discounted tuition rate. This would lead (i) the better-off students to pay their tuition immediately, which would increase the resources available in the loan fund to help students in need – i.e. for loans to a larger number of applicants or for higher loan amounts. Second, (ii) because the interest on the tuition is exempt while students are enrolled, this interest exemption represents a discount, although indirect. It will always be possible for a student to defer the payment of tuition fees until he or she begins to earn money. In this case, the TEI will obtain part of the tuition fee immediately from the ongoing system of loan financing (a deposit on the deferred tuition, which we can also refer to as a direct tuition fee). The payment of the remainder of the tuition fee will be delayed (delayed payments) and repaid by the graduate depending on his or her income. It is also important to set what proportion of tuition will be represented in the direct tuition fees. Every set of parameters has its pros and cons. The higher the proportion of direct tuition fees, the more resources will be immediately guaranteed and available to TEIs, but the higher the financial requirements for establishing the ongoing system of loan financing. Conversely, the higher the proportion of delayed payments, the less guaranteed income TEIs will have, but this will lead to a proportionately higher level of commitment by TEIs in the success of their graduates on the labour market and in building alumni networks. At the initial stage of the reform process, it would be desirable to place a lot of weight on direct tuition fees, which takes into account both the shorter decision-making horizons of TEI administrators and the uncertainties generated by the transitional period. Then, as the new system of institutional management becomes fully operational and the new competitive self-regulatory mechanisms begin to work, it would be possible to increase the weight of delayed tuition payments.”

(Matějů et al. 2009, p. 53.)

“The obligation to repay the loan should commence when the student ends enrolment. Interest on the loan also begins to accrue at that time. The suspension of repayment should be
possible only under clear and strictly defined conditions. A faster repayment of the loan should also possible." (Matějů at al. 2009, p. 54.)

“The instalment level should be determined as a percent of an amount exceeding the clearly identified minimum income level, which is best expressed as a parameter that is wellunderstood and provided by the Czech Statistical Office. The lower the income level is set, the faster the loans will be repaid; that will make more resources available in the system for further loans, and/or setting a lower rate of repayment. The repayment obligation should be derived from the graduate’s taxable income in the given year; however, it would be advisable for the graduate to make regular, advance instalments, which would be reported in an annual tax statement for the given year.” (Matějů at al. 2009, p. 54.)

“The payment of interest on the student loan should be an important incentive for people to repay the loan in a timely manner. If the real interest rate was low or even zero, the incentive for paying off the loan in a timely way is reduced, which also opens the door for unwanted financial arbitrage. In arbitrage, students would take loans even if they do not need them, and they would deposit the money in investments with high interest rates. We should keep in mind that subsidised interest rates are only partially desirable, and may, on the whole, be very costly and may reduce the available amount of resources to be lent to more applicants in need. Interest payments should be suspended in clearly defined situations, such as long-term illness, disability, maternity leave, parental leave (under certain conditions), etc.” (Matějů at al. 2009, p. 54.)

“The real interest rate on the loans should cover the costs of servicing the debt, administrative costs related to the loan scheme, losses incurred through the incomplete collection of instalments, and the allowances granted. The last item should be understood as a kind of cost sharing in the risk of investments in education. These costs may be shared not only between graduates repaying their loan, but also taxpayers in the form of regular contributions from the state budget. The delayed part of tuition fees can bear a lower interest rate, which TEIs can decide on their own when they set tuition levels (which can be a competitive price instrument).” (Matějů at al. 2009, p. 54.)

“The administration of educational financial aid, including loan repayments and debt collection, should be an integral part of the individual income tax system. This is the only way – while using the existing administrative apparatus – to maintain low costs and ensure a high degree of efficiency in collecting payments. Those lower costs and efficiencies translate into a lower rate of interest. The administrative, technical and legal aspects of administering the system must be co-ordinated with the reforms of the tax system as a whole, particularly in the areas of individual income tax and the collection of social and health insurance.” (Matějů at al. 2009, p. 55.)

“The introduction of additional instruments for the funding of tertiary education and student financial aid will require additional agendas. The key agendas include: the agenda on the maintenance of the student information system (educational institutions); the agenda on the provision of loans and other payments to students (commercial banks); the agenda on the collection of loan instalments (the tax system); the agenda on the ongoing system of loan financing, including the time structure given to the loans (financial institutions); the agenda for setting the parameters of system financing; the analytical agenda; and the agenda on supporting the information system.” (Matějů at al. 2009, p. 55.)

When we compare theoretical assumptions of the proposed reforms of tertiary education with their application in the White Paper, we can conclude that all of them are basically contained in the concerned governmental document. The only difference consists in the fact that the White Paper on one side formulates the proposed reforms in some respects more specifically but on the other hand most of them have been more “blurred”. When developing the White
Paper a number of pressures appeared and the resulting text was thus compromised. The pressures included the following:
- The pressure by the leftist opposition parties, which are against any form of school fees (and even against any other potential payments, which are not school fees in principle), only because it is easy to gain political capital from the initiated aversion.
- The pressure by the current university representatives (academics and students), who like the existing system which does not push for performance improvement (academic representatives are not exposed to mutual competition, the students may extend the carefree period of life etc.).
- The pressure by the administrative sphere as the reform would reduce its share on the power it currently has in the process of reallocation of funds distributed among universities.
- The pressure by the banking sector which would welcome an advantageous product, fully guaranteed by the government, in the form of school fee loans (which the system as originally proposed did not require at all).

The compromised and blurred formulation made space for various interpretations, or rather misinterpretations, of what is being proposed. Instead of a pressure on implementation of changes, we saw games played by the above-mentioned and some other players. Various coalitions appeared in those games and the idea, that reforms of the tertiary education may pave the way for reforms in other areas of social investments and social insurance, has been gradually suppressed.

There have been conflicts with practice; both under some cabinets in which the decisive role was played by the Czech Social Democratic Party. Those were times when that party tried to improve its preferences by its antireform policy and rejected in fact any reforms of funding of social investing and social insurance systems. We must mention that now the present leaders have much more qualified concept based on the historic experience.

Also at present, the situation is very complicated regarding possible social utilization of the concept, with fundamental contribution of the presented and analyses series of conferences on the theme Human Capital and Investments into Education. The parties of the government coalition which declared themselves as pro-reform parties during the election campaign in 2010 and as such achieved a strong mandate from their voters (118 from 200 votes in the Chamber of Representatives) are asserting very fundamental changes which they declare as reforms in a way unusual so far in the CR (without taking into account objections of professionals, trade unions, opposition) and ignoring opinions of the public and against their will (the cabinet has the lowest ever confidence of 18%). An important part of the professional sphere, among them also specialists working at our university, are certain that the changes forced by the government have crucial defects:
- They are unprofessional, not mutually linked.
- Main source of improved effectiveness of social investing and social insurance, sc. emphasise on motivation of providers of education services for quality education regarding competitiveness, is not in fact used and implementation of the changes in that field is permanently postponed.
- There are many justified reasons signalling that what is stressed by the government does not serve the declared objectives but only serves for transfer of huge public funds to the hands of private lobby (i.e. that the reforms forced by the government have the characteristics which allow to mark them as “under-tunnelled” reforms).

These relatively strong statements, we have formulated, are justified based on:
- On one hand, the fact that – as results also from our review and analysis of the conferences series – we have been dealing for a long time with the relationship of the theory and practice
from the perspective of reforms implementation including conflicts of interests and we have been developing the needed theoretical instruments for analysis of this subject matter.
- On the other hand, the fact that we have been dealing with theoretical analysis of the government’s proposals, as well as of specific steps taken by them. (Results of the analysis are included in several other articles presented at the conference.)

2.5 The latest findings, making space for international cooperation, increase qualms about what is happening in practice

The 14th year of the International Scientific Conference was held on 15 and 16 September 2011 in Prague. The conference was attended by 62 experts from the Czech Republic, Canada, Poland, Slovenia and the United Kingdom, and 26 papers were presented there. The discussion took place in English, and one of its objectives was a significant extension of the international cooperation on topics associated with the fairly demanding focus of the conference. This is also why an informal working session was scheduled for the first day. Its objective was to establish or extend a long-term international cooperation, as well as to focus attention on key moments of the conference’s content focus for the maximum of knowledge to be utilised during the discussion on the keynote session day.

Conference was divided into sections Reforms in the Sectors that Generate and Maintain Human Capital, Role of Education in Society, Methods of Analysing Conflicts while Implementing the Reforms of Social Investment and Social Insurance Systems. The discussion in the section about the methods of analysing conflicts while implementing reforms was very lively. It has been proven that plenty of various theoretical approaches exist but there are still significant differences between how theory views the reality of reforms and what actually happens. The discussions in all sections have indicated that the differences in the approaches to the social investment and social insurance reforms are due not only to the different situations in individual countries (with these differences not being huge as concerns major problems) but also (and probably most of all) due to the different traditions associated with the development of theoretical tools, their use in analysing the societal reality and the possibilities of applying the results of this analysis to practice. That said, both the development of theory and the use of international cooperation in respect of theory may be highly relevant. In spite of the significant differences in the approaches to the issues brought onto the agenda in the concept of the conference, the discussion led to the formulation of the following conclusions:

1. As far as theory is concerned, the expression “social investment and social insurance systems”26 is legitimate, reflects the mutual interconnection of the education, healthcare and pension insurance systems, is associated with lifecycle issues, and shows an increasing production role (intermediated by human capital and social capital) of the social system in relation to the economic one.

2. The reform process in respect of social investment and social insurance systems is inherently associated with the existing development stage of the society, has similar features in all countries involved, is not a single change but, instead, is going to take place for a longer period of time, during which various corrections, conflicts and potential reversals will occur.

3. Education and investment in human capital will have the key and increasingly important roles in the process of the reforms of social investment and social insurance systems.

4. While implementing the reforms in the above areas, the individual countries are confronted not only with conflicts of interests between various interest groups but also with attempts at

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26 The term “social” has multiple meanings. In the context of using the expression “social investment and social insurance”, it means the area which is the subject of investment and insurance.
misusing the reforms for the benefit of private lobbies – this is where science should tackle an important task of developing and using appropriate instruments to conduct a theoretical analysis of this issue.

5. The non-profit sector and the civil society have an important role in acquiring and maintaining human capital by providing education and healthcare services; in a way, their mission contrasts with how the role of various lobbies is being promoted through the state administration even in education and healthcare.

6. The problems during the preparation and implementation of reforms of social investment and social insurance systems are very similar, in terms of their main features, in individual countries, and this opens up the possibilities for international cooperation in tackling those problems at the theoretical level, including the reflection of the application of the theoretical outcomes to practice.

7. Various forms of institutional and financial support are highly important for international cooperation, including those which allow for the involvement of students into scientific and research activities.

The real life in various countries is likely to produce enough evidence that the time relevance of the topics traditionally discussed at the Human Capital and Investment in Education conferences and gradually made more specific at those conferences, in line with the development of knowledge as well as societal events, has been growing and becoming a challenge for social science, which has to respond to that challenge.

Comments on item 4 of the conclusions were raised during the conference discussion as to whether such proposition is not too strong or exaggerated. Absolutely independently of the knowledge included in the theoretical analysis of the current developments, using instruments presented at the conference, the same views were also arrived at in the Annual Report of the Security Information Service of the Czech Republic (BIS) for 2010, which, in section 1.2 Protection of Major Economic Interests, Administration of Public Assets, states: “Certain private entities successfully influenced the legislative process. Lobby pressures targeted the legislation that addressed the regulation of gambling and power industry. Strong interest groups were able to enforce their objectives at all levels of the legislation creation process.”

That said, the situation in the Czech Republic is serious, indeed. Maybe this is why favourable conditions exist, just at present and not coincidentally in the Czech Republic, for a positive progress in the area brought into the agenda by the concept of the conference as concerns the scientific reflection of events in society, with such progress also being applicable on the international scale.

Summary and conclusion

The analysis of the 14 conferences on the theme Human Capital and Investments into Education, held during the years 1998 – 2011, points out a number of interesting findings about development of the theory, interdisciplinary approach and possibilities and barrier of its connection with the present social practice:

- On one side it is clear that the theory not only can, but even must if it wants to be full-scope, utilize theoretical instruments also for reflexion of the relationship of its own development and the social practice. Even in so complicated and enmity area like reforms of funding of social investing and social insurance systems.

27 http://www.vsfs.cz/humancapital/
On the other side it comes to light that even such concept does not guarantee durable utilization of the theory findings and that those who have the ruling power for a certain time can act based on motivation different from findings of a qualified analysis of social reality. A good theory must maintain its ground and should try to be such in two meanings:
- Both in good times (when the way for implementation of its findings is open), and in times less fortunate (when it is overlooked or rejected) it must approach its subject matter with the use of theoretical instruments and develop the instruments so that their use enable an efficient theoretical analysis of reality.
- It should not select only issues with already existing proven theoretical instruments for their solution but it should endeavour to develop or to take over in a usable form all theoretical instruments necessary for solution of the issues it faces.

Counter to the selective concept (both as to selection of themes, and as to theoretical instruments), the complex concept must be set. Counter to the narrow specialized approach (moving in context of one discipline), interdisciplinary approach must be used (allowing to use in team work those theoretical disciplines necessary in the specific areas, including connection of the theoretical solution with practice. Counter to the local approach (which is limited to a certain specialized organization or an academic institution), an approach open to cooperation at the national, supranational and global level because the wider cooperation enables availability of the needed expert capacities and the natural authority of science as such.

In the subsequent section we will present the current analysis of the social context of the reforms in the funding of social investment and social insurance. We will demonstrate that if we want to understand what is happening, we must uncover the role of the phenomenon, which we have called structures based on the mutual covering-up of violations of generally accepted principles. As we shall see below, this notion and, in particular, the analysis of the phenomenon which is grasped by this notion, plays a key role in understanding what is the aim in society.
3. Criteria of Correctness of Social Investments and Social Insurance Reforms

Many years of experience with research of the subject matter of reforms of social investing and social insurance systems funding (education system, health care system and pension system) in relation to reforms forced by various governments has inspired us to the question of correctness of the reforms. Under the term correctness (or on the contrary incorrectness), we understand whether a reform has been prepared professionally and serves in particular for solution of real problems or whether it includes serious defects forced by certain interest groups which enable transfer of part of public funds in favour of private lobby. Development in the past years suggests that the issue of correctness or incorrectness of reforms is becoming more and more urgent. Regarding the present cabinet in the CR, its proposals’ analysis led us to setting a question: “Is the whole atmosphere emphasizing the necessity of reforms created with the goal to carry through at least the needed reforms, or does it only arrange backing for further transfer of huge funds which are gathered from citizens allegedly for public purposes into private hands of various lobby or individuals, this at the expense of reduction of their utilization effectiveness?“ We asked that question for the first time at a forum of experts in January 2011 at the conference organized by the Economic and Administration College of Masaryk University in Brno with a well suited title White Places in the Theory and Black Holes in Reforms (it was already the third conference of that type). Following to the results of investigation in the field of conflicts of interests in implementation of reforms with utilization of the game theory apparatus, we specified the question in more detail: “Are structures created, in relation with the now declared, but also objectively needed necessity of complex reforms (in particular in the field of systems of social investing and insurance), based on mutual backing of breaking generally acceptable rules and generally acceptable principles which have controlled this process, or is there still a prevailing effort, in the process of preparation and implementation of reforms, to increase strongly effectiveness of systems of social investing and social insurance?“ We know from discussion in the specialists’ community that there is an opinion according to which the theory should not exceed its competence and should not ask such questions because it could face the risk of lost identity and subsequent subordination to certain political games. This chapter wants to demonstrate that this risk is not impending if we consistently comply with the rules of scientific approach. From this point of view, we will deal, within the specified objective, with the question under what objective and theoretically justified criteria it is possible to assess the alternative expressed by the above mentioned questions. This regardless what government and what country are involved. We are aware that in spite of every effort for objectiveness and general approach, the contemporary context is reflected more or less into formulation of the criteria, as well as the specific features of development of the involved country. The final part of this chapter provides a review and analysis of opinions of the specialists’ community which expresses the reasons why the matter of the reforms correctness is topical in the CR and why theoretical approach must be used for their solution.

29 In more detail e.g. Valenčík 2010a, Valenčík 2010b.
30 Šnajdar-Valenčík 2011.
31 Šnajdar-Valenčík 2011.
3.1 Theoretical instruments we have available for assessment of reforms correctness

What theoretical instruments do we have available when we want to answer the questions formulated above? When someone tries to answer the question before reading the following text, he must discover that it is not so easy to answer it as might seem at first. The difficulties result from the fact that science does not ask such question very often, and from the fact that several types of instruments are involved, very different both in their origin in a specific part of social sciences, and in the method of argumentation or substantiation. We propose the following basic classification of the theoretical instruments:

- **Methodological**, among them namely the method of well structured full list. It enables identification and best presentation of all criteria under which the question can be answered, resp. assess to what extent this or that alternative is valid, included in the questions.
- **Immanent** related with development of science as such. Solution of practical problems in the field of funding of social investing and social insurance systems (and of course also in other areas) is strongly based on development of the science covering the matter. Although science does not have to give definite answers as to the problem which of the possible solutions should be chosen. Looking at a problem from the perspective of the science, however, means that we know what different approaches to the matter are used, how they developed, what arguments they provided and what were the benefits or on the contrary problems faces by the practical implementation. When we look in this way at the final design of the proposal for approval we can relatively exactly distinguish the proposals cultivated by disputes at the professional level and with effort to find the best solution from proposals prepared and forced purposefully with goals that have nothing in common with the declared intentions.
- **Contextual** which enable allocation of the treated problem into a wider historical context, both regarding its content (i.e. when and why a certain problem is treated), and from the procedural point of view (under what social conditions it is treated).
- **Model and conceptual** which are based on comparison of the real development related with preparation, public discussion and adoption of the proposed reforms with a model or at least concept expressing what can be influenced by the process (in particular in the light of various games that are played). There are several types of models or concepts suitable for examination of conflicts of interest, resp. operation of interest groups which can be linked with the process of preparation, discussion and implementation of reforms. For completeness let us state that a model is setup by exact rules and is supported by mathematical apparatus, while a concept is described by notions and mathematical apparatus cannot be used for it. (There are transitional stages between these two when a concept is gradually elaborated and develops into the form when it can be replaced by a mathematically described model.)

Using these theoretical instruments we can analyse empiric material linked with preparation, discussion and implementation of reforms in the examined area. It includes in particular the following:

- The draft law including the reasoned statement as the most important document we have available.
- Materials preceding the final version of the law – substantial draft law, versions provided for comments, working version, etc.
- Comments on the draft law during the review proceedings from ministries, tripartite and other places of comments.

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32 In our case, we will use namely conceptual instruments – a concept of evaluation of a reform effects, concept of under-tunnelled reform, concept of structures based on mutual backing. The last of the mentioned concepts has available a model; its presentation, however, would exceed the scope of this article.
3.2 Criteria according to which we can assess the reforms correctness

The mentioned material can be assessed, from perspective of the questions asked in the introduction and available theoretical instruments, using the following criteria:

1. Criterion of the method for discussion:
   - was sufficient time given after discussion of the draft law to enable discovery of all possible defects that could reduce functionality of the law, resp. enable drawing money from public funds in favour of private lobby,
   - or was possible discussion of the law limited as much as possible to enable carrying through the defects also into the approved version and opening therefore a way for drawing money from public funds in favour of private lobby?

Re: It is a criterion whose implementation is relatively easy. We have a specific version of the draft law (or a set of laws mutually related), the time needed for their qualified study can be estimated including time for necessary consultations of legislators with experts. If we see efforts to decide on adoption of the law or set of laws in a shorter time without justified urgency resulting from some exogenous factors it is possible to deduct that it is intentional.

2. Criterion of final technical design of the law:
   - was the final design of the law such to enable maximum lucidity,
   - or was the draft law technically elaborated in such manner so that various types of drawing of public funds in favour of private lobby could be camouflaged as much as possible?

Re: This criterion is less definite than the previous one. Still an expert as to what the formal shape of a law should be to allow the most comfortable work with it (unambiguous wording,

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33 Purely hypothetically and for illustration we can anticipate for example the following situation: It is publicly known about a certain part of persons who are decision makers as to the form and adoption of the specific draft law and have decisive role in its implementation (and they do not, and cannot, hide it) that during their political career, they allowed transfer of significant public funds (for example owned by municipalities) in favour of a private financial institution which subsequently was not able to pay them back, and public entities, owners of the funds, lost them beyond redemption; while problems of the financial institution to which the funds were transferred had been known. The mentioned persons justify what happened that nobody could predict that the public funds would be de facto stolen. The draft law they force, however, anticipates also transfer of public funds into the form in which private entities dispose them (purely hypothetical example can be transfer of funds from the continuous pension insurance system into funds managed by private financial institutions). It is also pointed out that the draft law does not sufficiently secure that the money will not be transferred from the system in favour of private lobby. The involved persons claim that such an abstraction of money cannot happen, while they reject removal of the present defects in the system enabling transfer of the money out of the system. It is obvious that if that situation occurs it is impossible not to take into account the specific facts in an independent expert assessment to what extent the reform, anticipated by the draft law, is correct.
easy navigation, etc.) can in some cases assess whether the law was produced to be functional in the mentioned sense or to hide as much as possible defects included in it.

3. **Criterion of involvement of the specialists’ community in preparation of the final version of the law:**
   - was the specialists’ community involved in preparation of the draft law so that to fully utilize findings of specialized disciplines related with content of the law and its legal aspects (including theoretically evaluated experience from implementation of similar reform steps abroad),
   - or the specialists (meaning public and private scientific and academic institutions dealing with the matter) were not invited to preparation of the draft law and their opinions were not taken into account?

**Re:** Generally it applies that the more important the law, the higher attention is paid to its preparation and particularly its discussion with the specialists’ community. Here, it is possible to assess relatively exactly how much the final wording reflects results of specialists’ discussions. It should be a certain warning signal when the final wording of the law differs from what was discussed in the specialists’ community and if it were disabled to subject the final wording to opposed opinions of specialists (by procedure or time limitations, which is related with the first item).

4. **Criterion of defects found in preparatory documents and in the draft law:**
   - were the preparatory documents and the draft law itself produced in such manner that no ways were identified in them enabling or making easy transfer of public funds in favour of private lobby,
   - or did analysis of the preparatory documents and the draft law itself discover various ways to transfer public funds in favour of private lobby?

**Re:** It is important to differentiate between something what could in some circumstances be misused for drawing public money to the hands of private lobby, and something what is intentionally included into the draft law and serves obviously to enable transfer of public money in favour of private lobby (see the following criterion).

5. **Criterion of response of the law presenters to comments linked with discovery of defects:**
   - did the law presenters endeavour to resolve comments concerning possible drawing public money in favour of private lobby found in the preparatory versions of the draft law and namely in its final version,
   - or, on the contrary, did they try to carry through the final version of the draft law together with the defects?

**Re:** It is one of the criteria with the strongest expression value. It involves in particular the response not to general comments, but to specific positive proposals which enable to remove demonstrable defects whose definite goal is drawing public money in favour of private lobby, or at least to limit the risk of such drawing.

6. **Criterion of the defects structure:**
   - do the defects of the draft law related with the possibility to draw public money in favour of private lobby have a shape of something what is difficult to be treated,
   - or do they have a structure of mutually linked ways of drawing public money in favour of private lobby so that it results in consolidation of sufficiently influential interest groups to carry through the law together with its intentionally inbuilt defects?

**Re:** It can happen that some defects of the law are relatively easily readable and it is obvious which interest group can benefit from them and how. It would seem that in that case, it would
be easy to remove the corresponding defect or defects. A situation can, however, develop of unwillingness to resolve even a well readable and easily removable defect by voting. When we want to clarify a virtual nonsense we must use a model of operation of various lobby (related with operation of structures based on the mutual covering-up of violations of generally accepted principles). The matter is that to carry through a law containing defects allowing drawing public money in favour of private lobby it is necessary to have sufficient influence as to achieving the needed parliament majority, influencing of the media sphere, the specialists’ community, etc. As a rule, consensus of various groups must be formed each of which wants to draw public money for itself in a different way. Some methods are better readable, some are more hidden. Because, however, the final shape of the law is a result of consensus of interest groups (lobby), achieved in such difficult way, if any of the groups involved in the consensus and influence enabled by this combination of groups would lose the possibility to draw money from the system it sometimes results in an effort to preserve even obvious and removable defects. When we meet such a phenomenon in discussions of the preparatory documents and the draft law it is one of the most important empiric and demonstrable expressions of the fact that the process of preparation, discussion and subsequent implementation of the law is controlled by a structure of certain lobbies. The involved structure can be then relatively easily mapped, i.e. the possibility to discover how structures based on the mutual covering-up of violations of generally accepted principles operate.

7. **Criterion of consistency of the law and the reasoned statement:**
- are goals defined in the reasoned statement in compliance with the draft law and content of the law,
- or is it possible to identify demonstrable conflicts between goals and consequences of the law resp. operation?
**Re:** The reasoned statement provides importance and utility of the law, formulates its objectives and expected effects. If the draft law were in its considerable part designed to enable drawing part of public funds in favour of private lobby it would be reflected also in certain antagonisms between the reasoned statement and the draft law.

8. **Criterion of reversibility or irreversibility of processes resulting from the law:**
- are possible negative consequences of operation of the law (namely in the sense of possible drawing of public funds in favour of private lobby) easily removable after their discovery,
- or it the draft law designed to make removal of possible defects as difficult as possible or linked with penalties (resulting from e.g. agreements on protection of investments, etc.)?

9. **Criterion of personal purity of the legislative process:**
- are there any doubts as to individual persons participating in preparation of the law and the legislative process,
- or are there cases suggesting that part of the persons participating in preparation of the law and the legislative process is involved in structures based on the mutual covering-up of violations of generally accepted principles?
**Re:** How much it is the case must be assessed based on publicly available and demonstrable information. The information should be assessed using a suitable concept, e.g. in context of the mentioned description of formation, development and operation of structures based on the mutual covering-up of violations of generally accepted principles.
3.3 List of methods by which public funds can be transferred in favour of private lobby

We have mentioned that draft law may include defects allowing transfer of public money in favour of private lobby. When assessing reforms in the examined area, we must differentiate and identify specific forms of such cases:
1. Overpricing of public orders by overcoming or manipulation of public tenders.
2. Achieving advantages in administration of public assets or management of state owned firms and firms with the state share:
   - in the form of high salaries and managers’ contracts disadvantageous for the state.
   - in the form of achieving of various material benefits by managers.
   - in the form of conclusion of disadvantageous contracts.
3. Privatization of public property under the real value.
5. Conversion of funds into financial assets and their subsequent devaluation by operations on financial markets.
6. Payout of unjustified remunerations to employees in the public sector.
7. Conclusion of disadvantageous contracts which can allow initiating of arbitration proceedings under international agreements on protection of investments.

The mentioned forms can be combined in various ways and create various chains of more or less in advance prepared transfer of public money in favour of private lobby (also outside the territory of the involved country). For example:
- Conclusion of disadvantageous contracts leading to indebtedness of a state owned firm and its subsequent forced privatization (profitable for the lobby causing its indebtedness).
- Transfer of public funds into the form of financial assets administered by private entities; after discovery of strong devaluation of those financial assets, in advance prepared arbitration proceedings are initiated based on agreements on protection of investments.

3.4 Basic classification of reforms by their effects

J. W. Goethe says, who fastens the first button wrongly will never dress well. So, before we move to searching answers to complicated questions concerning problems in preparation and implementation of reforms of systems of social investing and social insurance we will try to divide this area into themes. So that not to omit at the general level anything important for solution of partial issues.

When considering benefit of reforms of systems of social investing and social insurance supported from public sources, we can differentiate two types of their effects:
- **Redistribution** type when redistribution is done of what is gained (resp. lost) by individual groups of population as a result of the reform compared to the original situation. This involves, to some extent, zero-sum games (with certain exception covered later).
- **Production** type when performance of the whole system increases while all population groups can, more or less, participate in the increase. This involves non-zero-sum game. Redistribution effects of reforms of the mentioned type of systems are definitely of non-Pareto nature (when some should benefit, others must lose). Also here we can differentiate two types:
  - **Solidarity** redistribution reforms when redistribution of funds is done from property and income stronger groups to property and income weaker groups.
- **Remedial** redistribution reforms when redistribution of funds is done from property and income weaker groups to property and income stronger groups.

Here we must present the objection we mentioned in specification of redistribution effects. These are non-zero-sum games when one of the following effects really results (which in fact result as a rule):

- Solidarity redistribution reforms generally reduce motivation and lead to a decrease in the system performance.
- Remedial redistribution reforms are generally response to a high degree of redistribution and return motivation of individual people into the system and therefore increase performance of the whole system.
- In both cases, however, performance of the system might decrease when reforms are linked either with high transaction costs or give the way for what is called in the CR the system tunnelling.

When speaking about tunnelling, it includes illegal, many a time, however, hardly legally punishable drawing of funds from the public system in favour of private lobby which stressed influence due to poor protection of the system. As a rule, it is not only a “shortcoming” in preparation of the reform but what was included into the reform intentionally to give the way for drawing funds from the public system into private hands and for the process to be hidden as much as possible, as well as the least punishable. We will treat this issue in a separate chapter.

Some details are needed here as to the present context. For example, when the reform consists of transfer of part of money to the system of funds working with capital market products and has private owners it is not necessarily tunnelling in the above mentioned meaning. When there is efficient public regulation and control of the funds they administer public money which remains public. Tunnelling starts only where due to impossibility of full control of trading in capital market products, intentionally inserted errors into the regulation and control system etc. funds are drawn outside the publicly regulated system.

One of the most important questions to which room should be opened now (for certain reasons just in the Central European area, resp. CE countries) is what is the main reason of reforms in the field of systems of funding of social investing and social insurance supported from public sources. One of the two options is possible:

- Either it is response to a high degree of redistribution or egalitarianism in existing systems and motivation of individuals should be improved. In that case, these are remedial reforms.
- Or it is necessity to respond challenges related with the fact that further successful economic growth, as well as social development are possible only if they use the room opened by our position on the threshold of formation of knowledge society. In that case, reforms can have mostly productive content which can and must be fully exploited.

We consider the dispute over the content of present reforms to be fundamentally crucial – this from the point of view of theoretical clarification of the essence – a dispute concerning fundamental questions:

1. When reforms can be mostly productive and use possibilities opened by support of tendencies related with transition to knowledge society, then focusing attention only to the remedial content would necessarily lead to the following:

   - Reforms are outside the historical framework of what they should serve for which will result definitely and not within very long time horizon in originated crisis economic situations.
   - Reforms with remedial content include potential conflict (already because they are non-Pareto type, therefore anticipating creation of a certain discriminating coalition which can very quickly loose majority support, in particular when certain crisis situations occur).
- Reforms with are outside the historical framework of needed changes not only do not improve competition, but even deteriorate it.
- All elements of the system the reforms try to implement and anticipating an increased role of the capital market are very vulnerable in crisis economic situations.

2. When, however, real reforms are implemented with prevailing productive characteristics this will mean:
- Using of a new growth space and space for social development related with transition to knowledge society.
- Possibility to create a wide social basis of reforms facilitating long-term interest and long-term stability needed for their implementation, even in the conditions of various turbulences possibly existing in the surrounding world.
- An increasing competitiveness of the country and countries which will use this method.
- Improvement of elements stabilizing the system based on long-term human interest.

To conclude this chapter, let us ask a question: What is the main reason for reforms in the areas of social life where economic and social aspects are linked? We will not simplify too much saying that:
- On one side, creation of conditions for the best possible utilization of the potential a person has from birth and which increases with development of his/her competences.
- On the other hand, creation of conditions for maintenance of a person’s competences developed in this manner and their implementation in the fullest extent.

### 3.5 Historical context of reforms in the field of social investing and social insurance

In our opinion, which we will try to present in detail and justify in this chapter, the main reason for ever more urgent need of reforms in the field of social investing and social insurance we feel is that we are at the beginning of the process of knowledge society formation. If we want to understand a wider historical context of what is happening at present it is worth trying to compare beginning of knowledge society with the industrial revolution. During the industrial revolution, barriers of craft trades establishment are broken. Crafts are changed into a newly dominating sector as a result of competitiveness forces – industrial sector. The dominant role of this quickly expanding economic sector is based on:

1. Its production leading to fast and long-term increase in productivity of labour employed in agriculture.
2. Its production leading to fast and long-term increase in productivity of utilization of all sources coming from land as a production factor.
3. Gradually, it employs the decisive quantity of labour.
4. It becomes the core of accumulation process – industrial production is mostly consumed in the industrial sector, also the core of innovations is in that sector.
5. It strongly increases the spectrum of human needs which are to an increasing extent satisfied by industrial production, i.e. products and services produced by industry.
6. As a result of all above mentioned, the industrial sector has the decisive share in the total production and economic growth, the shape of which it designs by the characteristics of industrial production.
   (Valenčík 2008)

Further development of society is post-industrial development within the meaning of an increasing role of personal services linked to the industrial sector. An increasing part of the total production (now expressed as GDP indicator) is in the form of the services whose utilization, however, does not strongly operate as a factor of economic growth.
The role of productive nature of personal services starts increasing, in particular those directly related with development and maintenance of human competences, i.e. the process of investing into human capital and linked with education, health care, etc. The process of knowledge society formation is beginning. Similarly like at the stage of industrial revolution, when barriers of craft trades establishment were broken, now similar barriers are broken limiting competitiveness in the most important areas of provision of educational and other services serving for development and maintenance of human competences (similar from this point of view are services related with health care). Education is changed due to the competition forces into a newly dominating economic sector – sector of production and maintenance of human competences through provision of educational and other productive services (educational sector). The dominant role of this fast expanding economic sector is based, similarly like in industrial revolution, on the following:

1. Its production leading to fast and long-term increase in productivity of labour employed in industry and in personal services linked with industry.
2. Its production leading to fast and long-term increase in productivity of utilization of all sources coming from land as a production factor, as well as sources in the form of capital assets in the area of industrial and agricultural production.
3. It gradually employs the decisive quantity of labour, resp. human capital.
4. It becomes the core of accumulation process – production of the educational sector is mostly consumed in the sector, also the core of innovations is in that sector.
5. It fundamentally extends the spectrum of human needs which are more and more satisfied by production of the educational sector; these are needs the satisfaction of which (as well as the benefit from them, including satisfaction related with the benefit) is directly related with development and maintenance of human competences, i.e. these are so called competence needs.
6. As a result of all above mentioned, the educational sector has the decisive share in the total production and economic growth, the shape of which it designs by the characteristics of its production (i.e. production in the form of provision of educational and other services serves for development and maintenance of human competences).

(Valenčík 2008)

In our opinion, the growth factor has been exhausted resulting from the epoch opened by industrial revolution which culminated at the stage of post-industrial society (related with high and prevailing proportion of services in the economic structure). The growth space of that type of development based finally on industrial basis is already limited. Smaller, but also more serious crises our global civilisation undergoes recently and will undergo signal that growth potential within post-industrial economy closes and it is necessary to open a new growth space through system changes. Its basis should include in particular the services not only satisfying needs of a person and for which a person is willing to pay but also services leading to development and maintenance of his/her competences with backward influence of economic growth. In this manner, a new space opens for economic growth which is linked also with positive changes in the social area. In this economic system, not only human needs are satisfied but that needs satisfying should contribute to development and maintenance of competences of a person and their subsequent implementation should become the most important factor of economic growth and social development. As to a person, satisfying of his/her needs will be more and more productive. It means that it will not serve to achieve benefit (as pleasure or experience, i.e. subjective phenomenon) but it will be linked with investing into development of his/her competences and as such will increase the future income.
In our opinion, the first signs of the present economic crisis show that it is the high time to take the direction of changes focused on formation of knowledge society. In the CR, one of the first and necessary steps is reassessment of the prevailing remedial content of reforms in the field of systems of financing of social investing and social insurance so that the reforms have prevailing productive content.

3.6 Main findings concerning the concept of reforms of systems of social investing and social insurance

Findings we have achieved in development of theoretical basis of the concept of reforms of systems of social investing and social insurance can be briefly formulated as follows:

1. For feasibility of the pension insurance system, the decisive factor is not life duration (and its possible extension) but development of the proportion between the period during which a person is productively active (is able to contribute into the system) and the period when a person (for a number of reasons) loses the ability to be productively active (must draw from the system of pension insurance).
   1.1 It is not socially acceptable and economically effective to rely in influencing of duration of productive activity of a person not only on so called parametric changes in the pension insurance system, i.e. administrative definition of the threshold of productive activity of people. It is necessary to include into the complex of reforms motivations both in the pension insurance system itself, and into other systems of social investing and social insurance which would lead all involved entities to creation of conditions for extension of the period of voluntary productive activity of a person.
   1.2 The pension insurance system (in its essence) is not based on intergeneration solidarity (those who are productively active contribute to those who cannot any more be productively active). This is a system of full-scope insurance against the risk of lost ability of a person to be productively active, containing important elements of solidarity between those who are productively active even at higher age and those who lost this ability (for reasons some of which can be influenced).

2. The period of productive activity of a person can be influenced (it means extended) with measures in the following areas:
   - including motivations into the pension insurance system;
   - including motivations into the health insurance system;
   - including motivations into the educational system including life-long education.
   2.1 For example it is possible to achieve that both an insured person, and the insurer in the system of health insurance are interested in the highest possible extension of a person’s productive activity thanks to his/her health condition.
   2.2 For example it is possible to achieve that by inclusion of motivations into the system of education including life-long education both the education acquirer, and the provider of educational services will be interested in qualification, linked with the use of experience of the education acquirer, enabling to extend as much as possible the period of his/her productive activity.
   2.3 It is possible or even necessary (if we want be successful) to design the system of reforms resulting from the fact of extension of life duration so that possibilities in the mentioned areas were respected and utilized, i.e. so that it is a complex reform of systems of social investing and social insurance.
   2.4 Important role in the area can be played for example also by trade unions if it involves rational projection of life-long professional career considering limitation, but also possibilities related with age, according to specific conditions in individual professions.
2.5 It is not true that reforms designed like that are “painful” as claimed some time when speaking generally about reforms of systems of social investing and social insurance. Reforms respond the fact of extension of life duration (if they used possibilities of extension of the period of voluntary productive activity of a person, synergy of motivations included into systems of social investing and social insurance) they would not have to be painful at all, on the contrary. They would result in full-scope life including meeting its sense also at higher and high age.

3. Unfortunately, it is typical for present reforming efforts in the CR that they do not use the synergy of motivations included into systems of social investing and social insurance (i.e. namely the pension insurance system, system of funding health care and education). Besides, they do not use sources related with extension of the period of voluntary productive activity. For certain reasons (we will cover them later) those possibilities are overlooked in present attitude to reforms of systems of social investing and social insurance.

3.1 For example the issue of funding of the education system (including life-long education) is not treated in the CR from the perspective of the role of education as the decisive source of economic growth. Partial reforms in the area of social investing and social insurance are not designed to use in full possibilities of increased interest of the provider of educational services in long-term deployment of those receiving the services, on professional markets.

3.2 The following causes have been identified as possible reasons of a failure to use the mentioned possibilities:
- Insufficient erudition of those who make decisions on the reforms preparation;
- Fears of those who are used to soft environment (to receive rent from the state for their work) of creation of a competitive environment (for example in the case of universities);
- Preferred possibility to exploit local benefit from reforms against their functionality;
- Efforts to carry through for certain reasons so called second pillar of pension insurance as alleged solution for problems in the pension system (through which public funds can be transferred in favour of private lobby in huge extent);
- Efforts to preserve the system limiting vertical mobility, i.e. meeting the principle of equal opportunities.

3.7 Possible utilization of the game theory in analysis of the process of reforms preparation, discussion and implementation

Every reform in the field of systems of social investing and social insurance (education, health care, pensions) is directly linked with interests of people and it is related with certain conflicts of interest. They appear both in preparation of reforms, in the process of their adoption, and – last but not least – in their implementation. Application of the game theory in this field is obvious. Considering the fact that the Financial and Administration University has a strong team dealing with application of the game theory in analysis of social issues, it was natural to try its application also to answer the question in what are interests of people in preparation and implementation of reforms in the mentioned areas. Also other researchers tried something similar.

It is directly possible to name individual players, their strategies and to try completion of the payoff matrix. For example in the case of a reform of funding investments into university education, we can consider universities, students, employers of graduates, the public, etc. to be the players. Regarding a reform of funding of health care, hospitals, doctors, producers and distributors of medicaments, patients, the public, etc. are the players. In the case of a reform of the pension system, those are pension funds, pensioners, the public, etc. The list of players can be extended at discretion. Various ways of reforms implementation can be considered to
be the strategies. The theory can try mapping how coalitions will be formed in reforms with various concepts. One of the first attempts to transfer description of real situations in the field of reforms of social systems related with formation of knowledge society into the language of the game theory was the paper of J. Nemec presented at the conference Public Policies and their Effectiveness – determinants of rational management in the public sector organized in 2008 by the Economic and Administration Department of Masaryk University in Brno. He states there, among other things: “The tool in this part is analysis of interests and strategies of main players. The key players and their strategies are:

A: Hospitals – they are not forced to strong budget cuts. Their managements are able to transfer part of their funds into private hands, their official salaries are low.

B: Doctors - they are not forced to strong budget cuts, they often can do what they want, utilize changes of suppliers, derived demand in all directions (special therapy, special equipment, special medicaments, etc.). They have efficient control over semi-official income as compensation of low official salaries.

C: Politicians – they can profit from providing their voters with “free-of-charge” universal health care.

D: Officers – they have available additional sources to increase their power.

E: Patients – they are not sufficiently informed, and therefore they can be convinced to obtain better (more expensive) medicaments or therapies although they do not need them.

F: Insurance companies – in most Central European countries, they are not in fact independent and do not serve as regulators, but as distribution channels. More sources mean for them a higher level of overhead costs for their own use.” (Nemec 2008)

Please note that the chosen terminology itself exposes the treated matter (reform in health care system) to analytic view. Simultaneously, it brings a number of questions:

1. For whom the existing status suits, why and how it is maintained?
2. How to involve some players in a change of the status?
3. When the coalition for change will be string enough and why – and on the other hand when we can anticipate in advance that the reform will not be successful?
4. What conflicts are inside individual groups of players (in the J. Nemec’s example between representation of hospitals, doctors, politicians, officers, patients and insurance companies), where to search reforms supporters and how to motivate them?

However promising this procedure may be at first glance, it has come to light that it is less fruitful than expected. Either the real process of reforms was not sufficiently described, or it was, however in such manner that from the description only a banal statement was derived. The fundamentals of conflicts accompanying reforms remained, however, outside the theoretical model.

As well, utilization of the game theory apparatus for redistribution systems did not bring the expected effect. The theory of redistribution systems is the original direction of the game theory development included in the field of coalition games with more players and not transferable payoff. The redistribution system is defined as follows: a) players are associated in it for joint performance and what they can allocate to themselves depends on their performance; b) the more proportion of their payoffs allocation is different from proportion of their performance, the lower is performance of the whole system; c) coalitions are negotiated and formed in the system while that one with the decisive influence (for example majority in voting) is able to define the amount of all players payoffs (Budinský, Valenčík 2008; Budinský, Valenčík 2009a; Budinský, Valenčík 2009b; Budinský, Valenčík et. al. 2010; compare also Aumann, Peleg 1960; Aumann, Hart 2002).

The area of funding of education, health care or pensions, resp. all the three systems together can be considered to be a redistribution system. In that system, it is possible to identify
various types of equilibrium. However, also here what happens in reality is very different from what the game theory is able to cover.

An important step forwards in analysis of reforms in the field of systems of social investing and social insurance was performed only in application of another original direction of the game theory developed at Financial and Administration University. Those are games in which can appear and operate structures based on the mutual covering-up of violations of generally accepted principles. First, we will provide how the structures based on the mutual covering-up of violations of generally accepted principles were discovered. Empiric experiments based on the game Prisoner’s Dilemma performed by prestigious scientists in various countries showed results that seem to be in an obvious conflict with what the theory says. According to the theory, people should behave more egoistically (betray the other person, break an agreement) than they really behave (i.e. when we perform an experiment). At first glance, it seems optimistic. It seems that a person behaves more morally than the best strategy would suggest. We succeeded to clarify the apparent conflict between “how a person should behave according to the theory” and “how the person really acts” by the finding that a person always performs his/her choice (whether intentionally, or not) upon considering in context with other games, anticipated or apprehended based on previous experience. Even if it is an experiment and we are asked to assess the situation “independently from the surrounding word” we make the decision in context and we project our experience from life into our decision making. Therefore, we do not cheat, betray the other one. Someone could observe it and we could lose our good reputation. As soon as we included into payoff matrix describing the game Prisoner’s Dilemma the factor of losing or acquiring of credibility capital (good name, reputation) conduct of people changed exactly as anticipated by the theory. In this case, the first correction of the initial model was sufficient. Following this phenomenon, we started covering conduct of people in situations that can be expressed by various game schemes (Fisher 2008) with use of the finding that a person in certain game situation makes decision with utilization of experience from other games in a manner related with this game and with which he/she has some experience during development of own personality (has been primed). The mentioned procedure has proven as suitable, it enables fundamental increase of analytical, explanation and predictive power of the theory (Meliers, Birnabou 1983), therefore to explain why a person acts as he/she does, and to predict conduct in certain situation. We consider discovery of contextual characteristic of games with the mentioned meaning to be one of the original elements of our research. It is an analogy of the standard procedure of theory development in natural sciences. At the first stage, which might last even several years, we can expect clarification of only rather simply situations. The theory must mature. The advantage of the above mentioned procedure (exact simple model and its gradual extension to cover also more complicated situations) is that we must always exactly specify assumptions which are the basis of the specific theoretical construction (in our case the model using certain game schemes). For things to be obvious, we will give a clear example well known from theoretical publications. Farmers have limited store of water (as usual e.g. in Australia where the story goes). They agree upon specific rules for its pumping. When the farmers keep the agreement they will harvest more crop. When only one of them breaks the agreement and will pump more water for himself when others do not know, he will have bigger crop than others while other farmers (provided there are more of them) do not feel it too much. However, when all farmers break the agreement and each of them will try to get as much water as possible, the store of water will be exhausted with very negative impact on the crop. The mentioned situation can be modelled using the game type Tragedy of Collective Ownership (so called).
This is a game type Prisoner’s Dilemma, however one of the farmers (anyone) is one player and other farmers are the second player. It is therefore clear from the payoff matrix that each of the farmers benefits from breaking the agreement on water pumping, which however results in a situation the least favourable for all.

The life has shown that players in many cases face the dilemma expressed in the game relatively with dignity. They find a way how to administer and protect joint sources, how to exclude those who are cheating (joy riders). This is the case of the Australian farmers. Here, for example fishermen clubs can do this relatively efficiently when manage a certain area. This was documented based on long-term research by the Nobel Prize holder for economy in 2009 E. Ostrom (Ostrom 1986; Ostrom 1990; Ostrom et al. 2005; Ostrom 2008; Ostrom – Andersson 2008).

The issue of efficient administration of joint sources can be modelled through matrix variously modified. Besides the already mentioned maintenance of credibility capital, also other factors can matter. A player who discovered breaking of rules by another player (caught him when excessively pumping water) can, for example, inform other players and punishment will result (limitation of further access to water or exclusion from the community). That case has already been well treated (Fehr, Gächter 2000). The model also explained why a player after catching another player might do nothing not to complicate his life (not to look as whisperer, not to have to fear revenge of the farmer who can be able of anything in despair, etc.).

The possibility not yet treated by the theory, however frequent in reality, is that the player discovering breaking of rules by another player (caught him when excessively pumping water) blackmails the player and forces him to a joint procedure in which they both jointly harm interests of the community without knowledge of the others (in our case farmers). This creates a germ of the structure based on mutual backing of breaking generally accepted principles. We can describe the mentioned process relatively exactly.

Now, let us assume for example ten farmers. Three of them (as they have caught gradually each other) have formed the structure based on mutual backing. The water disappears compared to the adopted plan of pumping and nobody (from those who do not form the structure based on mutual backing) knows who breaks the joint agreement. Therefore they decide to choose from themselves someone who will guard pumping of water (someone will represent them in this function). Voting is done on candidates. To become a candidate, each must have support of at least two farmers. You can be sure that such support is achieved by one of the farmers who have created the structure based on mutual backing of breaking rules for pumping the water, and it is very probable that he will be the winner of the voting.

Operation of structures based on the mutual covering-up of violations of generally accepted principles is very devastating. It leads to the system controlled by those who have lost any moral principles, who consider normal what is not normal, who consider the loss of barriers in obtaining unjust benefit as something which makes them “better” than others. When the community creates any institutionalized structure or representation then exactly the structures of the mentioned type will cause violation of its operation.

The first step of analysis of structures based on mutual backing includes schemes of players decision making in basic situations:

- To break generally accepted principles (e.g. to steal, cheat, etc.) or not?
- What response when catching a player breaking generally accepted principles (inform against, do nothing, blackmail him)?
- What response when we have broken generally accepted principles and a player who caught us blackmails us (do not allow/allow to be blackmailed, inform others about the attempt blackmail even with what we have committed)?

In modelling of the dilemmas it is suitable:
- To envisage in horizon of several circles and express possible development as a game in an explicit shape (e.g. considering what might come next when I allow to be blackmailed).
- To estimate probability how other players can act in individual circles and use the apparatus of Bayesian games for identification of the optimal variants.

The second step or direction of the analysis is differentiation of individual types of formation of structures based on the mutual covering-up of violations of generally accepted principles. By now, we have considered only one type – the basic type of formation of structures based on the mutual covering-up of violations of generally accepted principles i.e. after our committed breaking of generally accepted principles when someone blackmails us. Also other option can occur – subsequent formation of the structures, i.e. after we have been caught and are in danger of blackmailing we search how that one who has caught us himself breaks generally accepted rules to force him not to inform against us. A certain case might be garble something to blackmail the other, i.e. there might not be real reason for blackmailing but the blackmailed player might fear that we will use against him fabricated or garbled accusation for breaking generally accepted principles. Similarly, breaking generally accepted principles can be provoked by preparing a trap for the other to discredit him. In the case of more developed structures based on the mutual covering-up of violations of generally accepted principles, we can see preventive search of what can be used for blackmailing (collection of data or production of compromising material). In larger communities, resp. social systems where institutionalized structures are formed (e.g. in relation with representation element) we can see formation of structures based on the mutual covering-up of violations of generally accepted principles in the form of appointment. This is a case when someone who can be blackmailed is selected (appointed) by those who can blackmail him and who form the structure based on mutual backing. We have mentioned that case in relation with election of that one who will guard maintaining of the rules for water pumping in the community of farmers. An example of the type of structures based on the mutual covering-up of violations of generally accepted principles, last but not least worth attention, are subordinated structures based on the mutual covering-up of violations of generally accepted principles. It is a case when a certain economic, intelligence or power centre searches persons who can be effectively blackmailed using a case of breaking generally accepted principles (so important that it is possible to discredit the person immediately and fatally), then the persons are supported in their position career, appointed to key positions of the institutionalized structure and used for advance specific power, intelligence or economic objectives.

Another important step is analysis of structures based on the mutual covering-up of violations of generally accepted principles included utilization of redistribution systems. As we have already mentioned, the theory of redistribution systems treats cases where players are united for joint performance, they are remunerated according to the performance of the system, the decision of individual payoffs is made by the coalition which has achieved the largest influence in the system. While the more payoffs of individual players differ from their efficiency and given performance, the lower performance of the whole system, i.e. the less the players can allocate among them. The most important findings in that area are a) proving of the possibility to express some important patterns concerning games with more players analysed by a model of the game type Tragedy of Collective Ownership; b) discovery of certain types of equilibrium in those systems (discriminating and jointly adopted) from which it is possible to deduce how the players would act if fully informed about what is happening in the system and no other forced influenced the system; c) the fact that there might be parallel redistribution games in the system about which only part of the players are informed (resp. the limited information of players is the necessary condition for the games to be played). Direct relation was proven between the model of parallel redistribution games and structures based
GAME THEORY
(REDISTRIBUTION AND CONTEXTUAL GAMES) AS A TOOL FOR HUMAN BEHAVIOUR DECODING

on the mutual covering-up of violations of generally accepted principles. This enables to express some important characteristics of structures based on the mutual covering-up of violations of generally accepted principles and based on that to identify those hidden structures in specific situations. An important practical result was that the “mirror” set by the model of redistribution system enables to “make visible” operating of structures based on the mutual covering-up of violations of generally accepted principles among other things because the structures pre-determinate formation of coalitions and cause anomalies against how the redistribution systems would work without the external forces.

The question is how discovery of structures based on the mutual covering-up of violations of generally accepted principles is related with problems and conflicts accompanying reforms in the field of systems of social investing and social insurance. Analysis of structures based on the mutual covering-up of violations of generally accepted principles enables to show what will happen if generally accepted principles are broken and discovery of that fact is misused for blackmailing (instead of is publishing and punishing).

However, there are also structures formed with the purpose to prepare conditions for breaking generally accepted principles “in advance”. It means to create conditions under which funds can be drawn from the system in favour of some people to the detriment of others, so that:
- others cannot prevent that;
- other (if possible) do not discover that;
- the breaking of generally accepted principles in the form of unjust advantage of some people to the detriment of others cannot be punished.

Operation of structures formed with the purpose of above mentioned objectives is very similar to operation of structures formed “ex post” for mutual backing of breaking generally accepted principles. “Ex post“ in the meaning that they are formed only after breaking generally accepted principles. Above, we have considered only structures based on the mutual covering-up of violations of generally accepted principles which have already been formed. Now, we will treat also structures formed “ex ante“for mutual backing of breaking generally accepted principles. „Ex ante“in the meaning that the structures only prepare breaking of generally accepted principles and mutual backing of breaking of generally accepted principles. This is a phenomenon well described by the term tunnelling of reforms or generally any change in legislation, resp. also of the whole system of prepared and declared reforms anticipated by countries to face their problems. It happens that each step declared as for reform or its part includes a number of elements enabling drawing of funds in favour of private lobby related with structures based on the mutual covering-up of violations of generally accepted principles. The elements can be inbuilt into legislation changes intentionally, they draw larger and larger funds which do not transform into factors of growth, on the other hand, serve to block the changes which would open the space for growth.

In this context we must point out a certain difference between formation of structures “ex post“ for mutual backing, i.e. after breaking of generally accepted principles (we have covered them above), and “ex ante” serving for tunnelling of reforms (with future breaking of generally accepted principles, during implementation of the reforms). In the later case (purely theoretically) there breaking might not happen of generally accepted principles with subsequent blackmailing before formation of the lobby able to carry through during preparation, discussion and implementation of the reform what then enables it to draw public funds for itself. The structure could be formed only based on allocation of advantages agreed in advance allowing drawing of public funds into private hands. For example in the case of the prepared Czech reform of the pension system it is a promise to those who promote the government concept in the professional sphere of lucrative positions in private pension funds anticipated within the reform.
A detailed analysis shows that the logic with the help of which structures based on the mutual covering-up of violations of generally accepted principles largely merges with the logic of real process. It means that description of structures based on the mutual covering-up of violations of generally accepted principles formed “ex post” are both easier, and formation of structures “ex post” precedes in reality formation of lobby with the purpose to draw funds from reforms in own favour, i.e. formation of structures formed “ex ante” for mutual backing of breaking generally accepted principles. Or differently and more simply – we can see that structures formed “ex ante” with the purpose to enable and mutually back breaking of generally accepted principles in the future stand on solid grounds of structures formed “ex post” for mutual backing of breaking generally accepted principles. The system based on links between structures based on the mutual covering-up of violations of generally accepted principles causes the biggest losses by blocking of changes which would open the space for perspective development of society and enable formation of knowledge society.

3.8 Is the reform of the CR pension system under-tunnelled?

A good theory should be able to prove, as well as to predict. This applies also to a good theory in the field of social sciences. We should be able to say not only what has happened and why, but also what will happen, when and why. As for deployment of some new findings of the game theory for analysis of reforms of systems social investing and social insurance in the CR, contribution of the theory can be illustrated by the following quotation: “There is a certain analogy with the theory of elementary particles, resp. quantum mechanics. The more particles integrated to each other, the more various particles are excited from virtual to “visible” (more precisely, identifiable by available procedure) status. In the social reality, every contact of two entities (players) includes the possibility of various (all possible) games and transitions between them. Which games will be “excited” as important and identifiable depends on how much is at stake (what is the value of the game). “Nothing”, it means physical vacuum, includes all particles. They can be excited from it, depending only on the energy of the particles exciting them by collision. This is also the case of mutual relations between contextual games. That game which at present already generates “spread” of various games and will influence for a certain time interestingly development around us, it is the game for the 2nd pillar of the pension system. No other game enables yearly drawing of amounts of 10^{11} CZK (i.e. hundreds billion crowns). This already is a proper “energetic” potential able to excite very wide spread of contextual games. Let us carefully monitor what will happen in this field. Here, the theory has a unique opportunity to observe it closely and to check hypotheses, as well as to calibrate theoretical tools. Similarly like after renewed operation of the particle accelerator in CERN (by the way, it cost us much less).” (Šnajdar-Valenčík 2011, s. 12).

The quotation from the paper presented at the traditional international scientific seminar well titled “Uncovered Areas of Theory and Black Holes of Reforms“ (in Czech uncovered areas are called “white places”). The third seminar was organized on January 20 – 21, 2011, the organizer is the Economic and Administration Department of Masaryk University in Brno. The seminars are one of most important expert platforms dealing with the issue of present reforms. New attitudes to topical social problems are presented there; wide attention is paid also to methodology, e.g. how to understand ontology of social reality. Authors of the quoted paper work in the team at the Financial and Administration University by which this thesis was completed. They propose to perceive the social reality as a complex of overlapping games in which every player is aware of only some of them or is in the secret of only some of
them. He/she perceives every of the games he/she plays in the context of other games. The higher payoffs in the games, the more the games are reflected by various entities and the more of them start to “emerge”, i.e. can be identified. The authors of the quoted idea used analogy borrowed from the present physics of elementary particles. In the paper, they expressed an assumption that the decisive game in the CR will soon start around implementation of the pension system reform, this for the following reasons:
- It is linked with the possibility to draw the most from public funds in favour of private lobby.
- The way how it is prepared at present is directly against the logic of reforms which would be able to solve the real problems and it is in conflict also with experience from other countries.
- The effort to carry through at any cost the government concept of the reform initiated a number of conflicts which will initiate other conflicts.

While the above mentioned was stated in late January, at the time of completion of this part (middle of April) we can only state that what was forecast takes place now almost entirely. This itself might not be a sufficient proof and document that the pension reform in the CR is prepared as “pre-tunneled”. Therefore, we will at least briefly mention the basic elements of the reform proposed by the present CR cabinet and the main critical comments on it.

In the CR, a continuous system of pension insurance is used at present with characteristic relatively high degree of solidarity in the meaning of redistribution of funds from those who contribute more into the system in favour of those who contribute less into it (together 28% of salary is paid for pension insurance in the system). This so called first pillar is completed with a voluntary system of additional pension insurance supported by the state, the so called third pillar.

The proposed reform aspires to implement the so called 2nd pillar with the following parameters:
- Every citizen can choose whether to stay in the existing system or to send part of the money (3% of his/her salary together with additional 2%) to so called second pillar where the money will be capitalized in private pension fund.
- When the citizen gives part of money to private funds, payment of the pension benefits (in method not yet specified) for him/her from the continuous system will be reduced.
- Private pension funds will be allowed to have more risky financial assets in their portfolio than the existing funds of the additional pension insurance.
- It will be possible to divide the amount of the balance in the second pillar at the saving stage in favour of the closest relatives.
- A decision on leaving the continuous system will be irreversible, i.e. the person will have to contribute with the amount of 3 + 2% to the specific private pension fund until termination of his/her productive life.

The government provides in particular the following in favour of that system:
- Within the next 30 years, there is the danger of demographic crisis which would result in deficiency of the pension account.
- It is necessary to reduce the risk of diversification to continuous and fund insurance.
- Permission of risky financial assets will increase efficiency of private funds up to 8% (compared to insufficient efficiency of the existing additional pension insurance).
- We have not available any better proposal for solution of problems resulting from the demographic crisis.

The main objections of opponents against the system proposed by the government are the following:
- It is a heterogenous hybrid of the continuous system and two not linked systems of voluntary additional pension insurance.
- The long-term efficiency of 8% (but also lower) after deduction of the costs for the portfolio administration is overestimated and it is in conflict with recent situation from all world countries, namely considering consequences of possible financial crises.
- Demographic risks are overestimated; it can be proven that the government uses purposefully distorted data.
- The anticipated alternatives of reduction of contribution from the continuous system in the case of transfer of a person to the fund system 3% contributions are in fact partial withdrawal from participation in the solidarity function of contributions and are therefore in obvious conflict with constitutional principles.
- A real method for the CR for solution of the pension system problems is transfer to NDC system with sufficient experience in developed European countries, as well as some Eastern and Central European countries (including Poland) which is fully well proven.
- The method of preparation and unwillingness to have expert discussion over the risks of the system proposed by the government invokes the impression that it is an attempt to enable using private pension funds exclusion of large amounts from the public system in favour of private lobby.

The monograph issue of the periodical Newsletter issued by the foundation Centre for Economics and Politics was devoted to comprehensive critical comments on the system proposed by the government. It includes wide specialized articles of one of the leading experts in the matter of pension system J. Vostatek (Vostatek 2011) and of the CR President V. Klaus (Klaus 2011).

One of the most important phenomena of our presence is, as we mentioned already in the introduction, the phenomenon which can be called under-tunnelling of reforms. Let us try, considering how structures based on the mutual covering-up of violations of generally accepted principles “ex ante”, formulate the general characteristics of an under-tunnelled reform so that we can assess (both now, and regarding how the CR situation will develop) whether it is a case of an under-tunnelled reform or not. The basic characteristics of an under-tunnelled reform are the following:
- On one hand, they declare an effort to solve a certain problem (as a rule artificially exaggerated).
- On the other hand, they open the way for massive drawing of funds from the public system in favour of private lobby, forming organized combination for that purpose.

Besides:
1. In the case of an under-tunnelled reform, instead of real solution of a real problem, the objective is intentionally shifted so that utilization of funds (reform measures) can be declared for that shifted objective which enables extraction of sources from the public system.
2. Shifting of the objective from real to fictive is one of the attributes that the reform is under-tunnelled.
3. Frequently, it does not involve only extraction of existing public funds (i.e. those which are in the system or entered it according to certain rules) but their significant increase (to which the public is forced by legislation).
4. Combination occurs based on bribery in the following forms:
   - Using of allowed forms of contribution for work of political parties, however with subsequent requests to their leaders to enforce certain legislative changes enabling purposefully prepared and under-tunnelled reform.
   - Promising of lucrative positions to part of the “professional public” in the proposed system (and corrupting them in this way).

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5. The under-tunnelled reforms include an arrangement for transfer of funds in certain forms (excessive prices of tenders, within liquidation processes, bankruptcy and settlement, in administration of public assets, in transactions with public funds on capital markets, in compensation for losses caused by wrong decisions of the state authorities, etc.) that cannot be punished legally.

6. The failure to punish will be achieved through measures disabling:
- Timely identification of a transfer of public funds;
- Identification of individual liability for a transfer of funds;
- Possibility to punish activities leading to the transfer of funds. (The above mentioned is, as a rule, inbuilt into the draft under-tunnelled reform and is one of important and unmistakable attributes that the reform is under-tunnelled.)

7. Significant part of funds achieved in this way is then used for funding (bribed in the form of contributions for political activities and for similar purposes) of another under-tunnelled reform.

Further development in the CR will, no doubt, bring about a number of findings enabling to answer in more detail and more definitely the following question: Is that what accompanies advancing of the governmental proposal of the pension insurance system an organized combination with the purpose to carry through an under-tunnelled reform based on misuse of constitutional power, as well as partial power in the system of public decision making and utilization of bribery (as a rule in legally not punishable forms), or not?

3.9 Dilemmas of specialists over the governmental draft pension reform and their cause

In this part, we will present some specific opinions concerning the governmental proposal of the pension reform. On one side, we will show justification of the question about correctness of reforms, on the other side it will enable us to set a question in conclusion of this part which should be asked by the specialists’ community, directly related with correctness of reforms.

The most representative discussion about the reform of pension system proposed by the government provided by three laws was held in the newspaper Hospodářské noviny in the column Macháčkovy výměny (Macháček’s exchanges). J. Macháček asked two questions to open his article: “1. For what and for whom is the second pillar of the pension reform good? 2. The fundamentals of pensions, more than for anything else, should be and must be confidence. What is the risk that the whole system will soon be changed again or even cancelled?”

He added his comment, suitably titled About defects of the pension reform. He states in it: “Not only the opposition but also a number of economists close to the government or the right wing do not understand much for what should the so called second (or fund) pillar of the pension reform serve if it is not obligatory for anyone. – If the fund pillar is optional it is estimated that the upper ten percent of people will enter it which, of course, is no systemic solution for our economy because the upper ten fifteen percent in any society include people who, so to speak, care about securing themselves and somehow arrange their dignified old age anyway. In other words, the upper ten fifteen percent need not be educated to economic rational behaviour.”

We present several most important texts by all seven economists who commented on this issue in Hospodářské noviny:

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35 Macháček 2011.
36 Macháček 2011.
37 Macháček 2011.
P. Kohout in his article well titled *Pension reform as a “Cimrman” joke* says: “It does not matter at all whether the second pension pillar is to be obligatory or optional. The essence of the matter is that the whole pension reform is designed incorrectly ... The Bezdeć committee and NERV further proposed arrangement of the second pillar for the highest cost effectiveness and maximum security. And the result? The Chamber approved the draft law inwardly prepared at the Finance Ministry without opposition by specialists and fully throwing away all recommendations.”

J. Procházka called his comment *We will stay half-way*. He also claims “NERV in one of its variants proposed a state bond fund with minimizing of fees and non-attractive investment profile, but with a stable yield. We found a deaf ear. Therefore, the last bright idea comes to light – such a small deception of citizens – automatic enrolment, it is an obligation to log out from the insurance system, otherwise a person falls to it automatically. ... So to the 1st question, in brief: For nothing, if it is very similar to the third pillar and is optional.”

D. Marek in his article *Pension harassment* also joins critics of the government’s proposal: “We will then have two pillars of that type competing with each other. The pseudo-second pillar, however, will be disadvantaged because people will first use the subsidised additional pension insurance (the existing 3rd pillar) and only then they will consider another savings in a fund. Opt-out will be probably used by so small part of the population that it will not help the main purpose of the reform: diversification of funding of pensions and long-term stabilization of the pension system. I understand the result of the reform efforts of the government as an attempted compromise, however with the result a bit unfavourable.”

O. Schneider in his article *Reform at the very least contradictory* states also in the critical spirit: “…the present shape of the reform is at the very least contradictory. The government waived a deeper reform of the existing continuous system, at least a reform with effects earlier than in fifteen years and which would improve operation of the labour market for example by reduction of obligatory transfers to the pension system. ...the originated system will be too expensive, overregulated, and therefore non effective in a long horizon.”

E. Outrata in his article *Reform in the country with interrupted continuity* tries to clarify in the historic context why it is so difficult in the CR to perform a reform of the pension system. He also criticizes the governmental project of the reform: “I do not know for whom the second pillar will be good. It much depends on what alternatives will be with the third pillar. I doubt that many people will invest into it voluntarily.”

I. Pilip sets his opinion in the title of his article “Changes that are not worth the effort”. He wonders over the following: “Motivation of the reform battle is even more unclear to me when it comes to its impacts on the budget. It is perhaps the worst moment for drawing money from the system and for increasing taxes (there are reasons for increase in taxes in the budgetary crisis, but no reasons are for its use for such a pension reform). The pressure of the budget and savings will be huge and very complicated for the government. And the budget crisis in half Europe ...”

Z. Kudrna with his article *Second pillar will not solve anything but perhaps will not spoil anything* joins expression of constraints over the government’s proposal: “Setup of the second pillar will be changed for sure because the present “cat-dog” does not make sense. The second pillar will either be developed to become a reasonable part of future pension reforms or will mere vegetate a few years and then will be degraded to additional pension insurance,

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38 Kohout 2011.
39 Prochážka 2011.
40 Marek 2011.
41 Schneider 2011.
42 Outrata 2011.
43 Pillip 2011.
the difference are minimal even now. The certainty of uncertain changes of course undermines willingness of pension funds to invest to start-up of the system, as well as willingness of clients to become testing mans in reform games of future governments.

It should be added that the opinions are rather of right-wing economists (some of them occupied important positions in right-wing cabinets), resp. financial experts. Opinions of trade unions or left-wing political opposition, not presented, are even more critical. A number of questions appear:
- Why did the government decide to create de facto a “second third“ pillar not resolving anything?
- Why the government does not reform the first pillar and instead of a reform, it subjects it to a strong pressure?
- Why does it “solve” rather problems of those who do not have any problems with securing for post-productive age (their income is so high that they acquire, independently on the state support, sufficiently secure and profitable portfolio), and intentionally ignores problems of the young generation?
- Why did the government prepare the proposal inwardly (in a “hidden” procedure, as states P. Kohout) with a number of amateur elements when it could use many well elaborated input documents produced by teams of specialists working for the government or legislative bodies (NERV, Bezděk committee, etc.)?
- Why does the government enforces a reform of the pension system with such vehemence and does not take into account wide aversion against it both from the specialists‘ community, and from the general public?
- And why does the government do that in conditions when instability on the global financial markets can be expected which is the least suitable time for implementation of a reform of this type?

In the light of these questions, many of the government’s acts seem not to make sense. However, if we do not ask questions of another type: Who and how is trying to benefit from the reform proposed by the government? If we start studying of a complicated complex of three laws, already carried through by the government in the first reading in the Chamber of Representatives of the CR Parliament we would start realizing that from the perspective of those who endeavour to draw public funds through the reform of the pension system for themselves in several (different and differently dangerous) ways, the draft reform has been prepared definitely perfectly. Only, we must be able to read it through the eyes of the lobby benefiting from it in various ways, not through the eyes of a fair expert who even does not want to realize that so important change might not be performed only to resolve real social problems.

Instead of a brief conclusion, we would formulate a suggestion: Would not it be worth it to organize over the question “Who and how is trying to benefit from the reform proposed by the government?“ a similar discussion like on the issue of the second pillar? This with stress on the technical dimension of the matter and with utilization of appropriate theoretical instruments.

**Summary and conclusion**

This chapter was based on the hypothesis that the theory should not avoid controversial issues and controversial themes if it wants to be reflexion of social processes with practical use. When, however, it starts dealing with controversial themes it must, the more, comply

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44 Kudrna 2011.
with the principles of scientific approach. It is not anything easy because suitable theoretical instruments might not be available. In the context of reforms in the field of social investing and social insurance prepared and forced in the CR at present, namely in relation with the reform of the pension system, we have tried to present some procedures and concepts which will enable assessment of their correctness.

We have provided evidence of the many question marks hovering over the correctness of reforms in the Czech Republic, which can be explained by the fact that this area is subject to a phenomenon that we call structures based on the mutual covering-up of violations of generally accepted principles. In subsequent chapters we will try to develop tools for analysing (and, in some sense, ”making visible”) this phenomenon. The necessary theoretical tools were developed in the course of solving two problem:

- Analysis and description of contextual games.
- Analysis and description of games in redistributive systems.

We will address this issue in the following chapters.
4. Contextual Games and Identification of Structures Based on Mutual Covering-up

4.1 The discovery of the contextual character of games

The issue that led to the discovery of the contextual character of some games was faced by our team already when dealing with the apparent discrepancy between theory and experiments, which is described in the Valenčík-Budinský (2010) article. The decisive step – based on T. Kosička’s (2010) initiative – was then taken in connection with the problem of the interpretation of experiments based on the prisoner’s dilemma motives. What is the issue? In experiments examining the behavior of people in situations of the prisoner’s dilemma game type, we came across a considerable discrepancy between what theory says and how people actually behave. In the prisoner’s dilemma, both players have two options – cooperate or betray. The selfish choice to betray leads to greater benefits than cooperation if the second player cooperates, but to lesser benefits if the second player also betrays. The rational behavior of both accused persons is to testify against the other person, even though the optimal solution for both of them together is for both to remain silent. The result where betrayal is the right decision has lead to many discussions and explanation attempts. Several widely published experiments were also performed. Let us show the results of the most well-known and most important experiments, as per the following table.

Table 4.1: Results of experiments on the prisoner’s dilemma motives

<table>
<thead>
<tr>
<th>Name</th>
<th>non-cooperation</th>
<th>cooperation</th>
<th>unknown decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shafir, Tversky (1992)</td>
<td>97</td>
<td>84</td>
<td>63</td>
</tr>
<tr>
<td>Li, Taplan (2002)</td>
<td>83</td>
<td>66</td>
<td>60</td>
</tr>
<tr>
<td>Busemeyer (2006)</td>
<td>91</td>
<td>84</td>
<td>66</td>
</tr>
</tbody>
</table>

Source: Kosička 2010

The names and year show who performed the corresponding experiments and when. The numbers in the columns express the percentage representation of “betrayals”, i.e., cases when the corresponding player who had guaranteed information that the other player betrayed him (first column) or did not betray him (second column), or was not informed about the second player’s decision (third column), opted for the strategy of non-cooperation. Other experiments showed that the willingness to betray or cooperate is influenced to a large degree by the size of the reward (punishment).

Let us now take a closer look at where is the difference between how players (i.e., specific people) should behave in theory versus how they actually behave:

1. If we do not know how the other player decided, we should always betray (and not only in 60-66 % of cases of non-cooperative behavior).
2. If we do know that the other player betrayed us, we should betray all the more so (and not only in 83-97 % of cases of non-cooperative behavior).
3. If we know that the other player is cooperating, why betray him (and why in 66-84 % of cases of non-cooperative behavior, i.e., in even in a greater number of cases than when we don’t know how the other player behaved)? (For the sake of precision, let us add that this concerns not only a discrepancy between theory and experiment, but – at least at first glance – a glaring discrepancy between two cases tested experimentally.)
How can the “irrational” behavior be explained (if, however, it really is irrational behavior)?

We have to proceed from the contextual character of games, because in reality a situation where a prisoner’s dilemma type game is played without repetition and is completely isolated from other games occurs very rarely. In most cases during the course of a game, other people (who we can consider to be players in other games) are observing how individual players decide, and based on this they also create a relationship to the participants of the given game. In reality, it is not a clean game without repetitions played by certain two players that is taking place, but rather a number of games in which other players also participate and these games also include game situations that could be called contextual games with quasi-repetitions.

Therefore we can view each game that we are playing in reality as a contextual game, i.e., a game that we are playing in the context of other games. We are introducing the term “contextual games” as an original term. In theoretical literature we will find only the designation of some starting points with which we are working, such as Meliers – Birnabou (1981). But this is only a partial view without an apparatus that would make it possible to analyze the contextual games phenomenon.

The reflection itself of contextual games depends considerably on our experience and the transformation of this experience into the “on-line” mechanisms of our (human) decision-making in which important roles are played by imagination, emotions and other attributes of the psyche. Let us demonstrate how a game of the prisoner’s dilemma type changes if we begin considering it as a game played in context with some other games.

Table 4.2: Payoff matrix of a game of the prisoner’s dilemma type on the example of the keeping or breaching of an agreement

<table>
<thead>
<tr>
<th></th>
<th>X2 cooperation</th>
<th>X2 non-cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1 cooperation</td>
<td>6; 6</td>
<td>0; 8</td>
</tr>
<tr>
<td>X1 non-cooperation</td>
<td>8; 0</td>
<td>3; 3</td>
</tr>
</tbody>
</table>

Source: Own creation routinely used when teaching

X₁, X₂ are players that have two strategies – comply with an agreement or breach an agreement (breach agreed upon or acknowledged rules). Their payoffs are presented in the matrix. Now let us assume that from the perspective of one of the players (e.g., X₁) the game has a certain context, respectively is played as a contextual game in the sense that the community in which this player lives may be (but also does not have to be) informed about the game’s outcome. If he complies with the agreement and the other players in the given community see this, it will contribute to the increasing of his credibility capital (reputation). If, conversely, he does not comply with the agreement and the other players in the community find out about this, his credibility capital (reputation) will decrease. Let us also assume that the credibility capital (reputation) can (at least approximately) be valued in units in which the payoffs from the prisoner’s dilemma type games are made, and the corresponding player also values it. For example, the player values the loss in the event of non-compliance with an agreement with -6 points, and the increase in the event of compliance with the agreement with
+2 points (trust is lost faster than it is gained). The following table shows how the situation changes.

*Table 4.3: Payoff matrix of a game of the prisoner’s dilemma type with the taking into account of credibility capital (reputation)*

<table>
<thead>
<tr>
<th></th>
<th>Cooperation</th>
<th>Non-cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1: Cooperation</td>
<td>6+2; 6+2</td>
<td>0+2; 8-6</td>
</tr>
<tr>
<td></td>
<td>8-6; 0+2</td>
<td>3-6; 3-6</td>
</tr>
</tbody>
</table>

*Source: Own creation, first presented by Šnajdar-Valenčík (2011)*

We can see that the situation changes dramatically. It is worthwhile for both players to cooperate. But only if the original payouts and payoffs connected with the gain or loss of credibility capital (reputation) have certain values. The situation can be different if the values are different. As tends to be the case, the functioning of credibility capital (reputation) is dependent on certain assumptions. These include particularly the following:
- The possibility that one of the players (e.g., X₂) discovers that another player (e.g., X₁) is breaching agreements or rules.
- The possibility of the spreading of information by a player (e.g., X₂) about the breaching of agreements by another player (e.g., X₁).
- The possibility of sanctions issued by other players (community in which contextual games are taking place) against the player breaching agreements (e.g., X₁).

But the player who discovers the breaching of rules (let us call him player X₂) also has a possibility other than spreading information about the breaching of rules. Instead of spreading information about the breaching of rules, he can persuade the player that breached the rules (let us call him player X₁) to take action that is advantageous for player X₂. In the next illustration Figure 4.1 we will demonstrate the dilemma of a player who is deciding whether to allow himself to be blackmailed or not.

*Figure 4.1: Schema describing the blackmailed player’s dilemma*

*Source: Own creation*
Here:

- \( a_{11} \) is the valuation of the sanction that the blackmailed player will face if he accepts the blackmailing player’s offer (in the given case one can assume that it will be zero)
- \( a_{12} \) is the valuation of the sanction that the blackmailed player will face if he does not accept the blackmailing player’s offer (in the given case one can assume that it will be quite severe)
- \( a_{21} \) is the valuation of the advantage that the blackmailed player will have if he accepts the blackmailing player’s offer (in the given case one can assume that it will have a certain value)
- \( a_{22} \) is the valuation of the advantage that the blackmailed player will have if he does not accept the blackmailing player’s offer (in the given case one can assume that it will be zero)
- \( a_{31} \) is the valuation of the risks and negative consequences that the blackmailed player assigns to the fact that he allows himself to be blackmailed and starts to cooperate (in the given case this concerns a negative value and usually a big one)
- \( a_{32} \) is the valuation of the risks and negative consequences that the blackmailed player assigns to the fact that he does not allow himself to be blackmailed and does not start to cooperate (in the given case this value is zero)

- \( a_{11} + a_{21} + a_{31} \) is the sum of all of the blackmailed player’s payoffs if he accepts the cooperation offer
- \( a_{12} + a_{22} + a_{32} \) is the sum of all of the blackmailed player’s payoffs if he does not accept the cooperation offer

Some notes to this:

1. The payoff of the blackmailed player, no matter how he decides, consists of several components. As we have seen, this also holds in similar cases, i.e., not only when he faces the dilemma whether to allow himself to be blackmailed or not. When illustrating this in a corresponding schema, it is good to list the individual components under each other, so that also in the schema a brief characteristic can be assigned to them at least in one word. This makes the schema clearer. Anyone studying it will have a better idea of what is going on. The total sum of the payoffs is then stated under the line.

2. In the model, the following applies in the logic of the matter:
   - if \( a_{11} + a_{21} + a_{31} > a_{12} + a_{22} + a_{32} \), the player accepts the offer and allows himself to be blackmailed;
   - if \( a_{11} + a_{21} + a_{31} < a_{12} + a_{22} + a_{32} \), the player does not accept the offer and does not allow himself to be blackmailed.

3. For the sake of completeness, we also include in the schema the values of those variables that are equal to zero in the given case, as they can have non-zero values in the schematic expression of similar situations.

4. A player can be mistaken when handling the said dilemma. The origin of the error can be in one or more of the following mistakes:
   - The player is not aware of and does not consider (“does not include”) an influence or consequence that plays a significant role in reality (in our case we stated three, there can be more in real situations).
   - The valuation of an influence is inadequate (in the given case, consequences that will be faced by the blackmailed player if he accepts the cooperation offer and allows himself to be blackmailed usually tend to be significantly undervalued). This is usually the case because the player is unable to imagine how the game will continue to develop (we will deal with this later on).

5. 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 necessary to also take the other player’s (the one who is doing the
blackmailing) reaction into account, the cause of errors can also be an incorrect estimate of parameters according to which the other player is making his decisions. This is a considerably more complex case, which we will also discuss later on.

Let us demonstrate specific decision-making cases:

First example:
Let us assume the player gives the following valuation:

\[
\begin{align*}
    a_{11} &= 0, & a_{12} &= -7, \\
    a_{21} &= +2, & a_{22} &= 0, \\
    a_{31} &= -5, & a_{23} &= 0, \\
    \Sigma &= -3 > \Sigma &= -7
\end{align*}
\]

The player accepts the cooperation offer because -3 > -7. But in this case the player could have overvalued the sanction that he would face for committing an act that makes it possible for him to be blackmailed, or conversely undervalued the negative consequences of allowing himself to be blackmailed.

Second example:
Let us assume the player gives the following valuation:

\[
\begin{align*}
    a_{11} &= 0, & a_{12} &= -5, \\
    a_{21} &= +2, & a_{22} &= 0, \\
    a_{31} &= -8, & a_{23} &= 0, \\
    \Sigma &= -6 > \Sigma &= -5
\end{align*}
\]

Let us assume the player gives the following valuation:

The player does not accept the cooperation offer because -6 < -5. The player becomes aware of the negative consequences of what would occur if he allows himself to be blackmailed.

Third example:
Let us assume the player gives the following valuation:

\[
\begin{align*}
    a_{11} &= 0, & a_{12} &= -5, \\
    a_{21} &= +4, & a_{22} &= 0, \\
    a_{31} &= -8, & a_{23} &= 0, \\
    \Sigma &= -4 > \Sigma &= -5
\end{align*}
\]

Let us assume the player gives the following valuation:

The player once again accepts the cooperation offer because -4 > -5. He is enticed by the relatively high reward for cooperating if he allows himself to be blackmailed. The high reward that he gets for cooperating could have ensued from the consideration (and precise valuations) of the second player. He set it exactly so that his offer would be accepted by the blackmailed player.

The examples listed above implicitly contain another important moment, which is the fact that the player must be able to adequately guess the future development. But in order to be able to do this, he must be capable of imagining what this future development will look like. In other words – if the corresponding valuations are to be adequate, he must be able to think several moves ahead. And for this we need to expand our original model considerably. There are a number of possibilities. What we will need for this, we have already in a certain sense inserted into our first schema, which described the basic dilemma of a player who is deciding whether or not to allow himself to be “drawn” into a structure based on mutual covering-up.
4.2 Methodological and inspirational insert

If we want to develop tools that will enable us to model and analyze structures that are based on mutual covering-up using mathematical procedures, we are facing a relatively difficult task. On one hand, at first glance it is not apparent where we should start tackling the issue, and on the other hand one can assume that we will have to use a wide palette of various instruments.

From this perspective we consider it suitable to perform a certain analogy with what contemporary physics is facing today and which instruments it is developing. The analogy ensues from the questions of how many contextual games need to be taken into account when analyzing specific situations and how many contextual games are reflected into each specific situation. Probably a large quantity and number of games, the influence of which becomes evident, will depend on the amount that is concerned in the given case. Like in elementary particle physics, where that which is activated in the collision of particles depends on their energy.

One can thus assume that with each specific contextual game that “rises to the surface” is connected a number of other games that are in the shadows or concealed. The greater the amount that is at stake, as far as a specific game is concerned, the greater the number of linked, i.e., contextual, games are “activated” so that they shift from a sphere where their role was concealed into a sphere where they are visible and have considerable effects, like in elementary particle physics. Here the greater the energy of the particles entering into interaction, the greater the number of various particles that are activated from the virtual into the “visible” state (to put it more precisely, into a state that is identifiable with procedures that we have available to us). In social reality, each contact of two entities (players) contains in it the possibility of various (all possible) games and transfers among them. Which games – as significant and identifiable – will be “activated” depends only on how much is at stake (what the value of the game is). For the purposes of clarity, we will present a symbolic depiction of the production of particles “out of nothing” (from a physical vacuum), with which contemporary physics works today. The greater the energy, the greater the number of particles that are formed in the interaction.

Figure 4.2: How physics see the formation of particles out of “nothing” (physical vacuum)

![Diagram of particle formation](http://astronukl/fyzika.cz/JadRadFyzika5.htm [cited on March 30, 2010])
Only a big optimist can expect that we will be able to use more modest and simple instruments in analyzing social situations and thus also various types of social conflicts. Experience from how work has proceeded in the given area also suggests this. The analogy presented above was prepared in March 2010 and was presented for the first time at the EPS Theoretical Seminar on May 5, 2010 (see the source material at www.vsfh.cz/?id=1046). At that time, our team did not have at its disposal any tools for the analysis of contextual games. But today we do have a number of these instruments available to us. It is proving to be the case that the external form in some aspects is close to what quantum mechanics uses for a simplified presentation of what happens in the micro-world. This, however, could just be chance. But the relations between some interactions in the micro-world and relations between some contextual games in our social world do show a much greater relationship—even if some formal characteristics are concerned—than could be expected. At any rate, it is worth taking a lesson from a science that is rightly considered a true science and to even let ourselves be inspired by it.

4.3 Tools of the analysis of games based on mutual covering-up

As follows also from the previous methodological insert, the modeling of structures that are based on mutual covering-up is relatively difficult. We only have the first tools available to use and we are generalizing the first experiences from their use. We have to take into account the following, among other things:

1. That which one player (X₂) forces another player (X₁) to do depends on the contextual game type. If, for example, discriminating coalitions are being created, this can involve the support of the formation of such a coalition. Both players then face the following risk: a third person discovers that they are establishing a structure that is based on mutual covering-up, and this third person then faces a dilemma whether to spread news of his discovery or use the new information for the benefit of his game based on mutual covering-up. Etc.

2. In contextual games players accept various roles. (This can also be stated the other way around—contextual games select players into various roles and imprint certain typical game characteristics onto them.) If we want to put a payoff matrix together, we have to take into account not only various types of contextual games that are based on mutual covering-up, but also the various roles that the players accept.

Structures based on mutual covering-up can be very complex and developed as their development is subject to laws that are very similar to natural selection (only the most viable ones survive).

3. If the process of identifying the breaching of rules is institutionalized, the structures based on mutual covering-up must have the ability to install their players (who are subordinated to behavior based on mutual covering-up) into all institutional structures of this type.

In most games based on mutual covering-up, one player (the one generating the game that is based on mutual covering-up) controls (establishes power over, influences, blackmails) a larger number of players (those that were caught while breaching rules), the roles of which usually supplement each other. In real situations, we also have to take into account the fact that systems have a more complex structure in the following two directions:

1. They are hierarchical systems; one of the systems consists of sub-systems at a lower hierarchical level.

2. They are systems in which institutions specializing in restricting rule breaching actions are formed.
Re: 1. If hierarchical systems are involved, it is significant who discovered the breaching of rules and where, i.e., what the relationship is between player \(X_2\) (the one who discovered the breaching of the rules and is abusing this fact) and \(X_1\) (the one who committed the breaching of rules and was caught). The following possibilities can occur here:

1.1 Both are in the same sub-system.
1.2 Each of them is in a different sub-system at the same level.
1.3 \(X_1\) is in a sub-system, \(X_2\) is in a hierarchically higher system.
1.4 \(X_2\) is in a sub-system, \(X_1\) is in a hierarchically higher system.
1.5 Both are in a hierarchically higher system.

(What can take place depends on the type of relations between the sub-systems and the system as well as among the sub-systems themselves.)

Re: 2. This concerns systems in which institutions specializing in restricting rule breaching actions are being formed. These are institutions in the following areas:

2.1 Identification of rule breaking.
2.2 Spreading of information about rule breaking.
2.3 Judging the degree of rule breaking and imposing sanctions.
2.4 Generating the creation and powers of institutions oriented on restricting actions that breach rules and generally accepted principles.

As has already been mentioned in the previous methodological insert, it is not completely obvious how to approach the problem and what should be the basis for grasping it. After the discovery of the phenomenon that was referred to as structures based on the mutual covering-up of the breaching of rules and generally accepted principles, our team did not know for several months how to describe and analyze it. Eventually, the path based on a certain symmetry between how a structure based on mutual covering-up is formed (which we presented – although only in the first approximation – in the part called Contextual games and identification of structures that are based on mutual covering-up), and how it could be disturbed proved to be promising. In other words, the symmetry between incorporating a player into a structure (binding him) where this player deals with a corresponding dilemma, and his eventual departure from the structure that is based on the mutual covering up (his release) where he also deals with a certain dilemma. Looking back, the discovery of the fact that the problem must be approached this way may appear trivial. But this is a frequent case when a theory is being formed.

But contextual games are more complex in the case of the analysis of situations formed during the decision-making of a player about exiting a structure that is based on mutual covering-up. More precisely – if in a case where the player is considering the dilemma whether to commit to a structure that is based on mutual covering-up he leaves the situation’s further development unaccounted for (generally he is not aware of everything that he could come across and on what the further development will depend on), then in a case where he is deciding about the possibility of exiting a structure he is able and forced to see more into the future. If he also saw into the future in a similar way in a situation where he is dealing with the dilemma of committing to a structure, his assessment of the consequences would presumably be more accurate.

Let us therefore assume that one of the players faces the dilemma whether or not to exit a structure that is based on mutual covering-up, i.e., whether to allow himself to continue to be blackmailed and take actions that are against his beliefs as well as that bring him considerable risks, or to resist and possibly even fight against the corresponding structure and publish what he knows about it with the intention of eliminating it or weakening its influence. At the same time we will assume that the structure’s core (i.e., the players who decide how the structure will behave), which up until now we have considered to be one of the players, itself consists
of several players, which we will take into account (not immediately, but at a certain moment).

We will only consider the case where player X₁ in the first phase (that we will model) considers only the possibility of departing “quietly”, i.e., not making public what he knows and not taking a stance against the structure. The structure based on mutual covering-up (which in our model will represent player X₂) then by contrast has the chance to penalize the player (punish for the fact that he has stopped subordinating) or allow the departure to take place without notice. At the same time it of course knows (and player X₁ – from whose position we are putting the model together – also knows this) that if it allows him to depart without notice (without a penalty), player X₁ will not make what he knows public. If it punishes him, the player can make this public. This will cause damage to the structure. But if it allows him to leave and does not punish him, other players forming the structure may find out about this and follow the first player. We can depict the situation as a game in an explicit form, as shown in the following illustration.
Figure 4.3: Schema describing a game between a certain subject and structure

Source: Own creation, first presented by Šnajdar-Valenčík (2010)

Here:
\[a_{z1} + a_{z2} + \ldots + a_{zM}\]
is the sum of all (i.e., a total of M) impacts on player \(X_1\) (valued in units that are homogenous with the valuation of all other cases), if player \(X_1\) stays.

See the following table for more details (if we were to interpret the individual impacts like in Figure 4.1).

Table 4.4: Schema describing a game between a certain subject and structure

| \(a_{z1}\) | risk of disclosure |
| \(a_{z2}\) | possibility of a career in the structure |
| \(a_{z3}\) | rewards ensuing from the possibility to function in the structure |
| ... | ... |
| \(a_{zM}\) | increase in structure tied-ness |

Source: Own creation

In a similar way, we can also interpret and characterize other cases in more detail, e.g.:
\[b_{u1} + b_{u2} + \ldots + b_{uR}\]
is the sum of all (i.e., a total of \( R \)) impacts on the structure represented in the model by player \( X_2 \) (valued in units that are homogenous with the valuation of all other cases), if player \( X_1 \) departs (as this player sees it, respectively values it), the structure decides to punish him and player \( X_1 \) starts to inform against the structure.

It is necessary to emphasize that in the given case the entire model is built based on the valuation of one player, in the given case of the player who is deciding whether to remain or not, i.e., player \( X_1 \). The second player (entire structure based on mutual covering-up) can see and assess the situation differently. But if the first player is deciding, he has no choice but to guess how the structure will react, respectively which parameters of the situation the structure will assess and how it will assess them. Of course player \( X_1 \) can be wrong as the structure may assess the situation differently.

There can be many impacts on individual players. For example, in the case of the player who is deciding, it can be the risk that the activity of the entire structure will be revealed and penalized, that the player will be forced to perform activities that go against his beliefs and represent growing risk for him, that by joining the structure he sacrifices his own other promising possibilities, etc. Similarly, there are also many possible impacts on the second player (i.e., the entire structure).

The game can continue on (as is suggested in Figure 4.3). For example, player \( X_2 \), i.e., the corresponding structure that is based on mutual covering-up, can decide whether it will escalate the situation and punish the player that is informing against it more severely, even at the price of the risks that emerge as a result of this. At the same time, it is necessary to also take into account the fact that games between the player who wants to leave the structure and the structure itself induce other games inside the structure, e.g., between those who favor a more conciliatory solution and those who favor a more severe solution.

The case of a contextual game (of the induced type in the given case) that starts to be played inside a structure that is based on mutual covering-up among players favoring a more severe approach and the players favoring a more conciliatory approach must be modeled using means that we have not used yet.

Let us take the simplest case of a core of a structure that is based on mutual covering-up, which – if the creation of coalitions among the players that form the core is to play a role – will include three players in this case. With fewer players coalitions could not form. Let us assume that each player considers the following components via which he values each of the possible situations:

- \( a_{T+} \): positive consequence of a harsher stance, which can be read, for example, as that the functioning of the structure is able to provide higher payoffs to the core players
- \( a_{T-} \): negative consequence of a harsher stance, which can be read, for example, as that the functioning of the structure does not enable the given core player to leave the structure without being penalized if he himself felt this need
- \( a_{M+} \): positive consequence of a softer stance, which can be read, for example, as that a certain precedent is being created for the given core player to be able to leave the structure without being penalized if he himself felt this need
- \( a_{M-} \): negative consequence of a softer stance, which can be read, for example, as that the weakening of the structure threatens payoffs that the given player from the structure’s core will receive
- \( a_{V+2} \): positive consequence for the corresponding core player if he is in a coalition that won the vote on the harsher or softer stance and this coalition is formed by two players (one is now in the opposition)
a_{V+3} positive consequence for the corresponding core player if he is in a coalition that won the vote on the harsher or softer stance and this coalition is formed by three players (no players are in the opposition)
a_{V-2} negative consequence for the corresponding core player if he is not in a coalition that won the vote on the harsher or softer stance and he now finds himself in the opposition

Let us also assume the following:
1. These are all relevant components that must be taken into account in the given situation.
2. The values of the listed components are the same in the case of all three players.
   (Regarding this let us note that this is a considerable simplification from the practical point of view.)
3. The payoff of each player is equal to the sum of all compatible components.

In this case, situations can occur, the complete list of which can be presented by the following table, which contains $2^3 = 8$ different possibilities:

**Table 4.5: The payoff matrix of players that form the core of a structure based on mutual covering-up**

<table>
<thead>
<tr>
<th></th>
<th>$X_{21}$</th>
<th>$X_{22}$</th>
<th>$X_{23}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+3}$</td>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+3}$</td>
</tr>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
<td>$M$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
</tr>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
<td>$M$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
</tr>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
<td>$M$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
</tr>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
<td>$M$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
</tr>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
<td>$M$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
</tr>
<tr>
<td>$T$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
<td>$M$</td>
<td>$a_{T^+} + a_{M^+} + a_{V+2}$</td>
</tr>
</tbody>
</table>

**Source:** Own creation

Here:

$X_{21}, X_{22}, X_{23}$ are players that form the core of the structure that is based on mutual covering-up

$M, T$ soft or harsh version of the stance that the corresponding player will take

$T, M$ the corresponding alternative of the stance that did not receive support (the carrier of which finds himself outside of the winning coalition) has been crossed out

$(a_{T^+} + a_{M^+} + a_{V+3})$ one of the cases of the presentation of components from which the total payoff of the corresponding player in the situation that occurred consists

The schema presented in table 4.3 is not nearly as complicated as could appear at the first glance. We will demonstrate this on an example. Let:

**Valuation Comment**

**components:** to this:

$a_{T^+} = 8$ is greater than 5, i.e., in the given case the structure is on the rise, players value the proceeds from the structure more than the possibility of leaving

$a_{T^-} = -3$ is less than -4, i.e., the players relatively highly value the risk that the possibility of departing the structure will decrease

$a_{M^+} = 5$

$a_{M^-} = -4$
The players assign a relatively high payoff to the state where they find themselves in the winning coalition and one player ends up outside of it.

If all three vote the same way, the payoff valuing the change of position has a zero value.

The players assign a relatively high negative payoff to being left outside the winning structure.

If we establish these valuations of the individual components, we get the following values:

**Table 4.6: Payoff matrix of the core players of a structure that is based on mutual covering-up, with specific values**

<table>
<thead>
<tr>
<th>$X_{21}$</th>
<th>$X_{22}$</th>
<th>$X_{23}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (8 + -4 + 0 = 4)</td>
<td>T (8 + -4 + 0 = 4)</td>
<td>T (8 + -4 + 0 = 4)</td>
</tr>
<tr>
<td>T (8 + -4 + 7 = 11)</td>
<td>T (8 + -4 + 7 = 11)</td>
<td>T (8 + -4 + 7 = 11)</td>
</tr>
<tr>
<td>T (8 + -4 + 7 = 11)</td>
<td>M (8 + -4 + -10 = -6)</td>
<td>T (8 + -4 + 7 = 11)</td>
</tr>
<tr>
<td>T (-3 + 5 + -10 = -8)</td>
<td>M (-3 + 5 + 7 = 9)</td>
<td>M (-3 + 5 + 7 = 9)</td>
</tr>
<tr>
<td>M (-3 + 5 + 7 = 9)</td>
<td>T (8 + -4 + 7 = 11)</td>
<td>T (8 + -4 + 7 = 11)</td>
</tr>
<tr>
<td>M (-3 + 5 + 0= 2)</td>
<td>M (-3 + 5 + 0= 2)</td>
<td>M (-3 + 5 + 0= 2)</td>
</tr>
</tbody>
</table>

**Source:** Own creation

The resulting values are marked here in bold. For the sake of clarity, the next table indicates only the total size of the payoffs.

**Table 4.7: Payoff matrix of the core players of a structure that is based on mutual covering-up, with specific values (just the outcome)**

<table>
<thead>
<tr>
<th>$X_{21}$</th>
<th>$X_{22}$</th>
<th>$X_{23}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (4)</td>
<td>T (4)</td>
<td>T (4)</td>
</tr>
<tr>
<td>T (11)</td>
<td>T (11)</td>
<td>M (-6)</td>
</tr>
<tr>
<td>T (11)</td>
<td>M (-6)</td>
<td>T (11)</td>
</tr>
<tr>
<td>T (-8)</td>
<td>M (9)</td>
<td>M (9)</td>
</tr>
<tr>
<td>M (9)</td>
<td>T (11)</td>
<td>T (11)</td>
</tr>
<tr>
<td>M (9)</td>
<td>M (9)</td>
<td>T (-8)</td>
</tr>
<tr>
<td>M (2)</td>
<td>M (2)</td>
<td>M (2)</td>
</tr>
</tbody>
</table>

**Source:** Own creation

The table shows that with the given input data, each player:
1. Has an average payoffs of 4 when supporting the harsh approach, 3.5 when supporting the soft approach.
2. Has a higher payoff three times and a lower payoff just one time when supporting the harsh approach.
3. Can have the lowest payoff (-8) when supporting the harsh approach, whereas when supporting the soft approach the least he can get is -6.
Overall, it is possible to say that each player can count on the fact that the other players in the given case will support the harsh approach and thus for him it is also most advantageous to support the harsh approach. A more detailed analysis of decision-making under different parameters is beyond the scope of the presented contribution. We will only note some aspects:

- If more than three players are involved, we have to take into account their powers of influence if they find themselves in the minority during the decision-making. In our case, we used a negative payoff component instead of decreasing the power of influence.
- Under different parameters the tendency towards orthodoxy usually wins, which can also be understood as group proving loyalty and becoming convinced of it.
- The analysis of decision-making of the type stated above shows certain similar attributes to what is being examined within the redistribution systems theory. This suggests that presumably there exists a more general model, of which the cases handled by the redistribution systems theory, the case that we have just dealt with, and probably other cases as well are specific cases.
Figure 4.4: Schema describing a game between a certain subject and a structure

Etc. The game continues. The structure can take a harsher stance. Once again within the structure there will be a conflict between the supporters of the harsh and soft approaches. The conflict can also spread beyond the structure.

Source: Own creation, original presentation

Worth mentioning is also the possibility of expanding the conflict beyond the given structure that is based on mutual covering-up, as this structure is weakened by the conflict, of which other structures that compete with it in the given social space could take advantage and weaken its position or even eliminate it. On the other hand, by doing this they could also create a precedent for their own players who are pondering the idea of leaving the structure. That is why the decision-making of the structure’s core does not have to be unanimous, and also in this case one can assume a certain tendency towards orthodoxy. Moreover, individual structures that are based on mutual covering-up can be mutually penetrated by cross-coalitions, i.e., coalitions that form among various structures that are based on mutual covering-up.

Similar diagrams of decision are used in the empirical testing of hypotheses relating to corrupt conduct, see, eg:
“The Figure 1 summarizes the experimental structure. The amounts shown at individual steps correspond with the setting of experiment in experimental crowns. The structure implies that while the firm and official benefit from their corrupt behavior (if they are not punished), its punishment (or intolerance) is costly for the citizen. Such setting reflects real costs that an individual reporting corruption incurs (usually referred as a whistleblower).

Game settings make it obvious that if people considered only the bribe amounts and deemed the game as an investment game, the subjects acting in the role of citizens should rather tolerate corruption. Such tolerance is further included in corrupt behavior.

**Figure 1: Structure of performed experiment**

Source: authors according to Cameron et al. (2009) 
(Špalek 2011)

### 4.4 Application of the apparatus of Bayesian games for analysing decision-making in connected dilemmas

We can apply the apparatus of Bayesian games theory to the issue of decision-making in connected dilemmas. This apparatus allows us to analyse the situation when a player does not have all the information, but is able to create an idea (with some probability) of how the other players will behave. The apparatus of Bayesian games enables one to transform a game with incomplete information into a game with complete, but imperfect information. We will demonstrate this using a specific example.
If the other players decide to cooperate, they can considerably punish a player who does not cooperate. In our case let us consider a punishment of 9 points, i.e. a player would have a total payoff of just one point in the event that others cooperate and he doesn’t. In such a case it would pay for all players to cooperate. The problem is that, as a rule, a player is not entirely sure of the following: - Will the community detect that he is violating the agreement, i.e. the generally recognised rules, and punish him? - Will the other players not succumb to the temptation to violate the agreement in the hope that their behaviour will not be revealed? We can again express the above dilemma as a Bayesian game in the form of an associated matrix, with the player placing a certain value on the probability that he can be punished. Let’s suppose that in our case this probability is 50%.

Table 4.8: Associated pay-off matrix for a Bayesian game of the Tragedy of Common Ownership type and its modification taking into account the possibility of punishing a player who does not cooperate

<table>
<thead>
<tr>
<th></th>
<th>NN</th>
<th>NC</th>
<th>CN</th>
<th>CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual farmer N</td>
<td>2; 2</td>
<td>1,5; 3</td>
<td>6; 2</td>
<td>5,5; 4</td>
</tr>
<tr>
<td>C</td>
<td>1; 2</td>
<td>3; 3,5</td>
<td>3; 3,5</td>
<td>5; 5</td>
</tr>
</tbody>
</table>

C – He cooperates; They cooperate
N – Does not cooperate; Don’t cooperate

Source: Own creation

We can express the same situation as a game in an explicit form.
The analysis makes it clear that even a seemingly serious punishment need not result in the elimination of those who violate the generally accepted principles. Having said this, it depends on both the size of the sanction as well as the probability of punishment. To uncover the role of these variables, we will show examples of the game its explicit and strategic form with the general values of $p$ (probability that this is a game which is not penalized) and $t$ (the parameter expressing the size of the punishment or sanction).
Figure 4.6: Bayesian game, in an explicit form, of the Tragedy of Common Ownership type and its modification taking into account the possibility of punishing a player who does not cooperate, with universal values of probability \( p \) and punishment \( t \)

<table>
<thead>
<tr>
<th>Decision of individuum</th>
<th>Decision of community</th>
<th>Decision of individuum</th>
<th>Decision of community</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>N</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td>5 ; 5</td>
<td>1 ; 2</td>
<td>10 ; 4</td>
<td>2 ; 2</td>
</tr>
</tbody>
</table>

C – He cooperates; They cooperate
N – Does not cooperate; Don’t cooperate

Source: Own creation

From here we easily obtain the corresponding associated matrix.

Table 4.9: Associated pay-off matrix for a Bayesian game of the Tragedy of Common Ownership type and its modification taking into account the possibility of punishing a player who does not cooperate, with universal values of probability and punishment

<table>
<thead>
<tr>
<th>Other farmers</th>
<th>NN</th>
<th>NC</th>
<th>CN</th>
<th>CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual farmer</td>
<td>C</td>
<td>2 ; 2</td>
<td>2p+(1-p)(10-t); 2</td>
<td>8p+2; 2p+2</td>
</tr>
<tr>
<td>N</td>
<td>1 ; 2</td>
<td>3 ; 3,5</td>
<td>3 ; 3,5</td>
<td>5 ; 5</td>
</tr>
</tbody>
</table>

C – He cooperates; They cooperate
N – Does not cooperate; Don’t cooperate

Source: Own creation
A superficial interpretation reveals that the larger is the coefficient $t$, expressing the size of the punishment (compared to the advantage that a player can gain at the expense of the community if the community cooperates), the better will the community be protected from violations of the generally accepted principles. But this is not the case. In the case of the analysis of games derived from a game such as the Prisoner’s Dilemma, which we modified so as to express the role of reputation, i.e. the credibility of capital, we already saw that every player who discovers that another player is violating generally accepted principles has the following options:

- Distribute the information about the violation of generally accepted principles, i.e. report the relevant player.
- Leave the relevant player’s conduct unnoticed, i.e. do not react.
- Misuse the information, i.e. blackmail the relevant player.

The greater the punishment for violating generally accepted principles, the greater will be the effect of blackmailing a player who violates the generally accepted principles.

If an attempt is made to blackmail a player who violated the generally accepted principles, this player has several options:
- Refuse the attempted blackmail even at the expense of the being punished by the community.
- Notify the community of the attempted blackmail, which is also a certain violation of the generally accepted principles and may be punished by the community.
- To comply with the wishes of the player who is blackmailing him, and let himself be blackmailed.

In this case the player compares:
- The sanction that the blackmailed player will receive if he does not accept the offer of the blackmailing player (in this case it can be expected to be quite noticeable).
- The advantage that the blackmailed player will derive if he accepts the offer made by the blackmailing player (in this case it can be expected to have some value).
- The risks and negative consequences that the blackmailed player must bear by being blackmailed and beginning to cooperate (in this case it is a variable which is, in most cases, large).

The player can make an error when deciding which option to choose. The origin of the error can be in any of the following mistakes:
- Does not realize and does not consider (“take into account”) one of the influences or consequences that in reality plays a significant role (in our case we only stated a few of the options).
- Evaluation of one of the influences is inadequate (in this case the consequences for the blackmailed player, if he accepts the offer to cooperate and lets himself be blackmailed, tend to be significantly underestimated). This tends to be the case, as a rule, because the player cannot imagine that the game will take another course.

The greater the punishment for violation of generally accepted principles (in our case in the form of non-cooperative behaviour), the greater will be not only the protection of the community from this conduct, but the more effective can be the blackmailing of a player by another player. As soon as structures based on the mutual covering-up of violations of generally accepted principles start to be established on the basis of this, there may be a significant decrease in cooperative behaviour and the subsequent loss of effectiveness. In the case of a larger system which creates its own institutional structure, serious dysfunctions of this entire institutional structure may result. A more detailed analysis of these issues relies on the use and interpretation of other models which are gradually developed and improved upon within the framework of the above-mentioned themetised research programme.
Summary and conclusion

Games that are played in real life are connected. We play every game, insofar as we realize it, in a certain context. This enables the apparent differences between theory and the experiment to be explained, without abandoning the concept of man as a subject making rational decisions.

In this chapter we focused on two types of the contextual linking of games:
- By means of the sum of pay-offs;
- In the form of connected dilemmas.

This allowed us to reveal some of the characteristics of structures based on the mutual covering-up of violations of generally accepted principles.

The interconnecting of different games can have many forms. In terms of "making visible" the structures based on the mutual covering-up of violations of generally accepted principles, of significance are particularly such interconnections in which the original game (from the viewpoint of coalitions and the distribution of pay-offs) is influenced by a hidden dominant game. In the next chapter we will discuss the development of theoretical tools that enable the relationships between the original game and hidden dominant game to be analysed.
5. Modelling and Analysis of a Game of the Tragedy of Common Ownership Type as a Redistribution System as a Key to Unveiling the Structures Based on the Mutual Covering-up of Violations of Generally Accepted Principles

As we have repeatedly stated, one of the most important steps in the analysis of the structures based on the mutual covering-up of violations of generally accepted principles is making them “visible”. The manner in which this can be achieved is considerably demanding on the imagination. We shall therefore base this part of our monograph on a representative example. This is the case of farmers who distribute a limited supply of water in an area in which water is lacking (this issue will, for the sake of brevity, be called the Farmers Assignment). We have already mentioned this example in connection with the possibility of exercising the apparatus of Bayesian games to analyse dilemmas concerning the behaviour of players in the event of a violation of generally accepted principles. This example has showed itself to be very appropriate for many reasons:

1. It is a very appropriate example for illustrating a game of the Tragedy of Common Ownership type.
2. Very important mathematical models can be applied to the case of three players:
   - Which enable going from a game such as The Tragedy of Common Ownership to a game with three players as part of a redistribution system (Valenčík et al. 2011).
   - Allows to show how the players behave, if the system were no external influences, and on this basis, to enable identification of external influences.
   - These models have a background in the apparatus of game theory.
   - Certain traditions have already been established when solving the relevant missions, i.e. other missions are formulated in follow-up to the missions already being resolved and on this basis there is an improvement in the relevant theoretical apparatus (Budinský et al. 2010; Mihola et al. 2011; Mihola, Vlach 2011).
3. The work of E. Ostrom, a Nobel laureate in economics (precisely in the said area), and other authors (Ostrom 1990; Fisher 2008; Špalek 2011) have been devoted to the empirical description and analysis of situations arising precisely in the said case.
4. This is an illustrative example, which we can imagine. The possibility of using a specific idea proves to be very important.
5. Enables a very accurate description to be made of standard situations (and decision-making dilemmas) that arise when one of the players violates the rules for drawing water, and if he is caught doing so by any one of the other players (Budinský, Valenčík 2011a; Špalek 2011b).
6. Allows the creation of an illustrative idea.

In this chapter we will proceed as follows:
1. We shall demonstrate how it is possible to go from a game such as The Tragedy of Common Ownership to the analysis of games as part of redistribution systems.
2. We will give a brief characterisation of games as part of redistribution systems with three players.
3. We shall describe parallel redistribution games and show their connection to the creation of structures based on the mutual covering-up of violations of generally accepted principles.
5.1 Analysis of a game of the type of Tragedy of Social Ownership

A model of a game of the type of Tragedy of Social Ownership is similar to the game of the type Prisoner’s Dilemma, but it is intended for several players. As an example, we can take limited use of water by farmers in a country with frequent draughts. In the matrix, one of the farmers is on the one side and the others are on the other side:
- If all of them (i.e. both the individual farmer and the other farmers) fulfill the agreement and cooperate (which in the case at hand means compliance with the agreed restrictions when using water), the yield from hectare of soil will be five tons for both groups.
- In the event that both groups (i.e. both the individual farmer and the other farmers) fail to fulfill the agreement (do not restrict the use of water), then the yield will be only two tons (water will be exhausted early and a part of the yield will be damaged).
- If only the individual farmer fails to fulfill the agreement, he/she will obtain 10 tons and the other farmers will obtain four tons (one farmer will partially restrict the other farmers). When determining the figures of the payment matrix, we made a small deviation from what is stated by Fisher. According to Fisher, the yield for the other players even if one of the players failed to fulfill the agreement on drawing water is five units. Starting from the fact that the player from “other players” is represented profusely and in the event that one of the players infringes the agreement, the other players do not recognize it in respect of their production. At the same time, this can be considered as refusal to take personal responsibility by the person who infringes generally recognized rules that nothing happened since the others have the same yield, which can be true in certain events, but in other events not.
- In the event that the individual farmer acts honestly but the other farmers do not, the individual farmer obtains only one ton and the others two tons. (These as well as the following figures are for illustration only; in the following payment matrix, we will also use general parameters.)

Table 5.1: Payment matrix of a game of the type of Tragedy of Social Ownership

<table>
<thead>
<tr>
<th></th>
<th>Other farmers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>They cooperate</td>
<td>Don’t cooperate</td>
</tr>
<tr>
<td>Individual farmer</td>
<td>He cooperates</td>
<td>5; 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1; 2</td>
</tr>
<tr>
<td></td>
<td>Does not cooperate</td>
<td>10; 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2; 2</td>
</tr>
</tbody>
</table>

Source: Fisher 2008

The farmer’s dominant strategy is to fail to fulfill the agreement on water drawing, since he/she can obtain as much as 10 tons and at least two tons. If the farmer decided that he/she will cooperate, he/she could obtain maximum five tons, but also only one ton. In case of the other farmers, it depends on how they will behave – whether they will consider themselves as a cooperating group or not cooperating individuals. Or – in other words – whether they assess the situation that fairness or unfairness overwhelms. If the other farmers also betray (do not cooperate), the result will be division of payments (2:2), which means big losses for the relevant community.
The problem is that if we consider the other players as sensible persons maximizing their yields, each of them will see the situation in respect of him/herself as an individual farmer and therefore their dominant strategy will be to fail to fulfill the rules concerning water drawing. Thus the result will be the worst. We should note in this respect that in the context of such tasks aversions may arise against models established on the assumption that players are sensible and their yield is maximum. The conviction may then arise that people’s real conduct can only be explained where models are supplemented by good morals, which are understood as an exogenous element.

Nobel prize winner for economy for 2009, E. Ostrom (awarded for an analysis of social ownership), offered another view of resolution of this dilemma. On the basis of rich empirical results, she presented a resolution in the form of autonomy. Joint ownership may be managed on a self-help basis without any central management. A voluntarily established community is capable of creating effective management of social ownership. In other words, a voluntarily established community is capable of defending joint ownership, allocate the fruits of such ownership among its members and eliminate fare dodgers. E. Ostrom did not create mathematical models but examined social institutions by analyzing extensive empirical materials from various parts of the world and applied a view based on development. According to her, human beings make mistakes but simultaneously learn or are capable of learning from mistakes.

Now let us imagine that we have three players. Let us have a look at the game during which they will use a rare source and may allocate it in the manner corresponding with a game of the type Tragedy of Social Ownership. Let us assume at first that each of the players can achieve the same yield under the same conditions. In the upper line of the table, we stated illustrative figures and general parameters (a, b, c, d, e and f) in the bottom line, the sense of which we have clarified below.

Table 5.2: Payment matrix of a game of the type Tragedy of Social Ownership (3 farmers)

<table>
<thead>
<tr>
<th>Individual farmer</th>
<th>Other (2) farmers</th>
<th>0 does not draw in accordance with the agreement (2 cooperate)</th>
<th>1 does not draw in accordance with the agreement (1 cooperate)</th>
<th>2 don’t draw in accordance with the agreement (0 cooperate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>He cooperates</td>
<td>10; 20</td>
<td>4; 20</td>
<td>2; 16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a; 2a</td>
<td>c; b+c</td>
<td>d; 2e</td>
<td></td>
</tr>
<tr>
<td>Does not cooperate</td>
<td>16; 8</td>
<td>8; 10</td>
<td>1; 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b; 2c</td>
<td>e; d+e</td>
<td>f; 2f</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Own creation*

We can set the parameters in a certain range, but the following applies:
\[ b > a > e > c > d > f, \text{ i.e.;} \]
- the player has the biggest yield if he/she did not fulfill the agreement on water drawing while the other players fulfilled such agreement;
- the player has the second biggest yield if all players fulfilled the agreement (here the scenario $e > a$ could also be considered, i.e. that the player, in the event that the player failed to fulfill the agreement with another player, has a yield bigger than in the event that all players fulfilled the agreement);
- the player has the third biggest yield if he/she failed to fulfill the agreement with another player;
- the player has the fourth smallest yield if he/she fulfilled the agreement, but the other two players failed to fulfill such agreement (other scenarios could also come into consideration); or
- the player has the smallest yield if none of the players fulfilled the agreement.

Since we consider the position of two players as equal in value, the following must apply:
1. The yield of each of the players in the event that a certain number of the other players (2, 1 or 0) cooperates, must be the same in the event where such player him/herself cooperates as well as in the event that he/she does not cooperate.
2. The sum of the yields of the players in all events where a certain number of players (3, 2, 1 or 0) cooperates must be the same (there is always only one case where there are 3 or 0 cooperating players).
3. The less players cooperate, the lower is the sum of their yields.

For the sake of completeness, we should add that this – rather complicated – model has been significantly simplified. We assume that each of the players, if he/she does not cooperate, i.e. fails to fulfill agreements arising from the regulation of the quantity of water that such player has available, will draw the maximum possible quantity of water, i.e. the quantity of water that each of the players will appropriate in contrast with the rules agreed, is the same in every case given by the number of non-cooperating players. Therefore, we do not take into consideration the fact that the player may “steal” greater or smaller quantity of water (i.e. use the water for its land to increase the yield beyond the framework of the agreed quantity of water). We neither take into consideration any potential sanctions that might be applied if such player were caught by another player.

### 5.2 Application of game theory in redistribution systems using the case of three farmers

Now, we take into consideration an even more complicated case where individual players (farmers) do business under different conditions. Each further unit of water that the player uses for its land would bring a different yield for each of the players. From a microeconomic viewpoint, it applies that the maximum joint yield can be achieved in the event where the limited yield from the last unit of water used by any of the player equals the limited yield from the last unit of water of any other player.

Now we can assume that the above-mentioned situation occurs in the event where the players share the water in the 6:4:2 ratio. If they deviated from such ratio, their joint yield would be lower. The yield would be the lower the more the water allotment deviates from the above ratio.

There is another assumption, which is intuitively evident and which would not lead to narrowing of the general character of the issue we deal with. The assumption is that in the event that the players share the water in the 6:4:2 ratio, their payments (coming from the yields) would be allotted in the same ratio. The yields of the farmers are proportionate to the allotments of water (and such proportion need not be linear). Reduction of this three-dimensional case to two-dimensional case would be very difficult in this case, but also
incomplete. The general rule of the relation between payments and allotment of water is as follows: What farmers may allot among themselves equals the maximum quantity that they could allot (i.e. 12) minus the amount by which joint yields will drop as a result of the fact that the players allot the yields otherwise than in accordance with the optimum proportion given by the fact that limited yields are equal (that is 6:4:2 proportion). From the formal viewpoint, there is an equation:

\[ \text{This is a basic equation in the theory of redistribution systems (Valenčík and Budinský-Valenčík 2008a, 2008b, 2009a, 2009b). It describes the situation of “inputs”. It does not depend on how the players share the yields, how they jointly contribute to a certain fund, etc. In the “farmers” system it is possible to imagine negotiations and creation of discriminating coalitions of two players against the third one. The theory of redistribution systems is a separate field of development of the theory of games. From the mathematical viewpoint, the theory of redistribution systems belongs to coalition games of more than one player (a case of games with non-transferable prize has so far only been analyzed).} \]

The use of the concept of a redistribution system has exposed a number of significant phenomena and relations, which make it possible to examine what is happening in companies, including conflicts of interest that may arise. At the same time, it turned out that it was necessary to investigate how the individual games (in the context of the game theory) were mutually interrelated, i.e. we opened the issue of the so-called contextual games, i.e. games in which the player realizes its relation to another game, and decides also based the parameters of the latter. A research program was formulated which, among other things, seeks to reveal why people behave in a particular manner, why people accept various roles and what are the impacts on their personal characteristics, what remains hidden in their mutual relations and even what is kept hidden intentionally.

5.3 Theory of redistribution systems and social or psychological aspects of management

Czech theoretical literature dealing with social or psychological aspects of management mostly ignores the issue of formation of coalitions asserting redistribution in their favor and a decrease of the performance of such a system as a result of such redistribution. Typical examples of representative monographs published in the Czech Republic and intended for the general public include e.g. (Bedrnová and Nový 2002; Bělohlávek 2005; Dědina and Čejthamr 2005; Koubek 2001; Mayerová and Růžička 2000; Nakonečný 2004; Nový and Surynek 2002; Stýblo 2003; Tureckiová 2004; etc.), however, they fail to contain a single mention of relations inside the managed systems that operate against the performance–based rewarding and reduce effectiveness of organizations. Some positive exceptions include monographs by Čakrt (2000, e.g. pp. 31, 49-54 etc.), Barták (2006, pp. 133-135) or Štědroň (2007, pp. 29-30).

M. Čakrt mentions the game theory as a tool to analyze conflicts in managed organizations; however, when presenting the issue, he prefers its description and generalization. In a way, it is a pity because an application of the game theory would have made it possible for him to look "under the hat" of what was happening in this field. He could have analyzed relations between the formation of coalitions inside companies, changes in coalition structures, role of negotiation, forms of redistribution and types of conflicts. Let us look at an example provided and analyzed by the author himself (and we could quote many more from his monograph):

"Let us imagine a dispute that has arisen in a certain company between the production and sales departments. The issue was, what else, a shortage of financial means from the budget.
A new product is to be launched on the market and, as it usually happens, the sources are not bottomless. Either party is able to find “bullet-proof” reasons why it should get more than the other party.” (Čakrt 2000, pp. 31.)

We can see that the conflict arises from the effort to assert a certain type of redistribution, while it is necessary to form coalitions for the purpose. This is the way it usually works everywhere and every time in value chains. The theory of redistribution systems enables to classify the arising situation, to provide an overview of all alternatives of the development, to identify a suitable kind of arguments which may support the formation of a coalition capable of solving the conflict based on improvement of the effectiveness.

Instead, M. Čakrt points out at the end: "It is a classical situation with a zero sum – any extras I can get consist of what I can grab from the other party’s cake." (Čakrt 2000, pp. 31.) He is slightly mistaken here. This is actually not a game with a zero sum. If the resources, i.e. financial means, are not distributed between the production department and the sales department in an optimum manner (an economist would say that limit proceeds from the funds provided to both the departments must be equal) then the performance of the company will decrease, which will harm both the people in both the departments - production and sales alike.

One of the most interesting and most contributive parts of the monograph by M. Čakrt is called The development of an inter-group conflict. (Čakrt 2000, pp. 49-54). The very subtitles in the chapter are worth the attention: "What is happening inside then groups? And what is happening between the groups? What is happening in the winners group? Even the losers group goes through a certain development." Each of those subsections has 5-8 items and some of them represent relatively accurate descriptions of standard situations arising in redistribution systems.

M. Štědroň deals, among other things, with the so-called paranoid management, whose principles he formulates as follows:

"- get rid of the best workers and, if this is not possible, do not provide them with the needed information,
- assign extrovert activities to introverts and vice versa,
- never define clear priorities of a particular activity,
- do not formulate anything clearly and concisely,
- do not clearly define the content and sphere of competence of managers,
- do not surround yourselves with people who think out of the box and who have critical thinking, as they may destabilize the workplace,
- when the situation requires that, maneuver at the edge of events." (Štědroň 2007, pp. 29)

Moreover, the paranoid management needs to ensure the following:

"- intentionally create tension between work team members,
- atmosphere of worries and fear,
- elimination of all independently and critically thinking workers outside the limits of the organization,
- regular decimation of the work teams." (Štědroň 2007, pp. 29-30)

A “successful” manager of this (paranoid) type needs to:

"- get rid of his/her responsibility,
- systematically belittle the work of experts." (Štědroň 2007, pp. 30)

Considering the possibility of formation of coalitions, their effects on redistribution inside systems and the effect of redistribution against the output or performance lead to a model which may seem very complicated at the first sight. However, once you formulate the redistribution equation (see below) it turns out that the model can be very well analyzed with the use of the original mathematical apparatus and that the results of the analysis provide interesting findings that reflect reality and may be utilized in practice.
The following text summarizes results obtained so far and formulates tasks that can and should be performed in the nearest future, at the current degree of completion of the issue. The tasks have been described with three mutually connected forms:
- Basic information about the issue.
- Commentary which in detail clarifies the meaning of terms and content of tasks, integrates the tasks into a broader context and shows their relation to practical problems.
- Description of outputs which we are gradually obtaining, which may be expected and which contribute both to the development of the theory and to its practical utilization in the value chain analysis.

We have set the sequence of tasks so that it proceeds from the general to the specific. One of the key tasks, on which a team operating at the University of Finance and Administration has concentrated for a long period of time, is to express the process of negotiation in an elementary redistribution system as a game in an explicit form and subsequently:
- to achieve a full theoretical interconnection of an intuitive concept of negotiation in the system with the mentioned method of expression.
- to demonstrate a connection between the course of negotiations with various forms of the redistribution equation.

We will explain the purpose of the task formulated above and its connection with the issue of value chain analysis. The game theory may be used in the dispute about how much the individual sections of the value chain should receive (see Čakrt 2000, as mentioned in the Introduction section). One of the approaches usually used in this connection is the determination of the Shapley value (Osbourne 2004), (Selten 1999). However, when using it, we fail to take into account the conflict side of the process of determination of benefits and the complicated negotiations that are usually conducted between the parties, and also the fact that the developing coalitions may lead to discrimination of certain players and, last but not least, also the fact that everything is connected with the overall performance of the system (the company etc.). Therefore we have introduced the concept of the redistribution system so that we can analyze events in organizations, institutions and companies, their organizational units and in some institutions with the following features:
- People are associated in order to jointly perform a particular function, to jointly implement activities in a certain area and with a certain objective.
- Each of the players (people) in the system needs to face the dilemma between the quantity of his payoff (utility) and the gain of the whole system as a result of the performance.
- Negotiations and formation of coalitions occur in those systems (the coalitions that win decisive influence may discriminate against the other players when it comes to the amount of the payoff).
- The more payoffs of the players deviate from their performance the poorer is the performance of the system.

(It is obvious from the above-mentioned that the term “redistribution system” is defined to express essential characteristics of a very broad circle of social phenomena.)

The effect of a deviation of the payoff amount of a particular player from his/her performance is expressed by the redistribution equation. The equation may have different forms defined by the shape of the respective function and the coefficient of sensitivity. Special features and characteristics of the redistribution function, redistribution area (maximum – in the sense of the Paret rule – admissible distributions) and redistributions of the space defined by it, have been relatively well analyzed for the case of three players. If we anticipate additional simplification – i.e. not only that we have just three players but all of them have the same power of influence, there are no limitations for the formation of coalitions etc., then we can speak of an elementary redistribution system.
The following conclusions follow from the performed analysis of the negotiation process: If the players create fully discriminating coalitions and if the negotiations among the players are governed by rules that are acceptable from the intuitive point of view, then the sequence of payoffs of the players, based on coalitions agreed between any of the two players, converges to three points inside the redistribution area, while the set of such points is identical with a single final internally and externally stable set (in the sense of the original definition by Neumann, Morgenstern 1944).

5.4 Complementarity of models based on the theory of redistribution systems and models based on the delimiting of structures based on mutual covering-up

The term “redistribution system” was introduced already in 2006 in order to make it possible to analyze what is happening in organizations, companies, their organizational units and some institutions that are characterized by the following:
- People associate here in order to jointly perform a certain function, jointly execute performances in a certain area and with a certain goal.
- Each player (person) in this system faces the dilemma between the size of his own payoff (utility) and how much the entire system gets based on its performance.
- Negotiations and the formation of coalitions occur in these systems (coalitions that win a deciding influencing position can discriminate other players as far as the size of their payoff is concerned).
- The greater the deviation of the players’ payoffs from their performance, the greater the performance decline of the entire system.

The term “redistribution system” was thus defined so that it expresses the essential characteristics of a very wide circle of social phenomena.

The impact of the deviation of the size of a certain player’s payoff from his performance is expressed by the redistribution equation, which can have various shapes given by the form of the corresponding function and sensitivity coefficient. The specificities and properties of the redistribution function, redistribution area (maximum – in the Pareto sense – acceptable distributions) and redistribution space that it defines are currently relatively well analyzed for the three player case. If we assume further simplification, i.e., not only are there the three players involved, but all three have the same influential power, there are no restrictions for the creation of coalitions, etc., we are speaking of an elementary redistribution system. The distance function can be defined as Euclidean metrics, i.e., positive value of the root of the sum of the squares of the payoff differences according to the real payoffs.

The following then holds for all acceptable distributions:

\[ x_1 + x_2 + x_3 \leq E - \eta \cdot R(x_1 - e_1; x_2 - e_2; x_3 - e_3) \]

where

\[ R(x_1 - e_1; x_2 - e_2; x_3 - e_3) = \sqrt{(x_1 - 6)^2 + (x_2 - 4)^2 + (x_3 - 2)^2} \]

We can also consider other types of metrics, such as:
- Manhattan metric as the sum of the absolute values of the differences of performances and payoffs of individual players:
  \[ R[ (x-6); (y-4); (z-2)] = |x-6|+|y-4|+|z-2| \]
- Chebyshev metric, which selects from the differences in performances and payoffs of individual players always the difference that pertains to the player with the greatest deviation:
  \[ R[ (x-6); (y-4); (z-2)] = \max [(x-6); (y-4); (z-2)] \]

For the three player case under several additional restrictions (full informedness of players, their equal voting – respectively influence – powers, non-existence of time delays and
transactional costs, etc.), several types of functional models were created and some important assertions were proven. The most important attained results can be briefly characterized as follows:

1. If the players are creating fully discriminating coalitions and if the negotiations of the players are governed by rules that are acceptable from an intuitive perspective, the sequence of the payoffs of players based on the coalitions negotiated between any two players converges to three points on the redistribution area, and the set of these points is equal to the unique and final internally and externally stable set. These three points were called discriminating equilibrium. The following applies:
   - A fully discriminating coalition of two players in a system with three players is one where the player outside of the coalition gets the smallest possible payoff.
   - When speaking of intuitively acceptable rules, we mean the following: Each player a) proposes such a distribution of payoffs where he and one of the other players becomes better off; b) presents the proposal to the player with which he can be the better off player; c) the proposal of his payoff ranges between the biggest one that he could get under these conditions and the biggest one that he could get if he negotiated with the third player (with the player with which he could get the smaller largest possible payoff).
   - The set is internally stable if it is not possible to say about any of its elements that it is better than any other element of this set. The set is externally stable if it holds for every element of the original set (in our case the redistribution area) that among the elements of the externally stable set there is at least one that is better. An element of a set is better than another element of a set if at least two players have a bigger payoff in it.

2. The players can also negotiate a jointly acceptable equilibrium (our term), in which they will be better off in comparison with the average payoff if they attempt to proceed as was stated in the previous point. The jointly acceptable equilibrium point is determined uniquely.

Several comments to this:
   - The average payoff is given by the sum of his (two) payoffs in the case where he is a member of the winning coalition, and the payoff where he himself is fully discriminated against.
   - There is a precisely defined and intuitively acceptable strategy via which the players arrive at the jointly acceptable equilibrium, and this strategy is clearly determined by these negotiations (Valenčík-Budinský 2010). Interesting and important is the fact that it is also possible to arrive at this equilibrium using several other approaches.
   - This equilibrium has certain specificities in comparison with the Nash solution, the Kalai-Smorodinsky solution, the Shapley value.

3. The process of negotiating fully discriminating coalitions as well as the jointly acceptable equilibrium is very sensitive to outside influences. One of the most important objectives of the theory is to reveal and describe which influences are involved and what the mechanism of their functioning is, particularly the mechanism of the functioning of those influences that cannot be compensated by concessions during the negotiations. The question of differentiating the influences that can be compensated by concessions during negotiations and those that cannot be compensated is absolutely fundamental. And the answer to this question has an interesting interpretation, to which we will get shortly.

4. The functioning of external influences can be – at least in the first approximation – described using parallel games, i.e., games during which some of the players get payoffs from the system without the other players being aware of this. We will discuss parallel games in the next section.
The ambition of the redistribution systems theory from the beginning of its elaboration was to capture with a consistent model everything that is essential in real systems of this type. For example, at a certain phase of research it appeared that an expression of the element of representation, respectively leadership, is missing. From the perspective of transaction costs of decision-making, in systems with a larger number of players a relationship must be created where one set of players represents another. This is a significant aspect of the institutional system. The problem can also be called the problem of the selection of the council of elders and the chief. How to proceed with its resolution? It turned out that if no external influences act on a system, chiefty or representation is entrusted into the hands of the person who represents the jointly acceptable equilibrium. Thus the representation problem is nothing other than an augmented problem of equilibrium types in a redistribution system. It was thus correct to begin by analyzing a model without representation, because on the basis of this simplified model it is possible to more organically and on a unified basis describe what the meaning is of that which takes place if the system contains an element of representation. It could thus appear that the redistribution system model can be expanded so that it covers almost everything. We can add to this: Yes – redistribution systems theory is able to consistently cover everything, but only everything from “what is visible”, i.e., what all players in a corresponding system are informed about. (By stating this – in order to provide a better understanding of the purpose of what is concerned here – we have gotten somewhat ahead of the explanation that is coming up.)

Revealing the structures that are based on mutual covering-up and the first steps of their analysis pointed to complementarity between what models of redistribution systems show and what models based on the analysis of structures that are based on mutual covering-up show:
- The first ones (models of redistribution systems) map that “which can be seen”, i.e., everything that all players are informed about, including and especially those from whose viewpoint we are viewing reality.
- The second ones (models of structures that are based on mutual covering-up) identify and reveal that “which cannot be seen”, i.e., everything the condition of which is different informedness of players and especially the lack of informedness of those players from whose viewpoint we are viewing reality.

Methodologically we can imagine this the following way: we confront the complete description of “how the system should behave” if all of its elements were “visible” to all players with reality, i.e., with how the system actually behaves. Because we know the model of that on which the formation and behavior of the “invisible” is based (these are the structures based on mutual covering-up and transitional phenomena from redistribution systems to structures based on mutual covering-up, such as parallel games or – as will be mentioned later on – cross-coalitions and the social networks that evolve from them), we can relatively precisely reveal that “which is not visible” and that which is hiding. The term “can see — cannot see”, respectively “visible – invisible”, is represented here by the term “differing informedness of players” or “the lack of informedness” of those players from whose positions we are viewing the corresponding problem, in the relevant context. I.E., one set of players is informed and the second set that “does not see” is not. This is a less precise statement, but on the other hand it is more fitting and not misleading.

**5.5 Combining the model of parallel redistribution games with a model of structures based on mutual covering-up**

The model of parallel redistribution games is based on the following idea: some players are able to acquire some of the means from the redistribution system in a certain way without the
other players knowing about this. Stated more precisely, a necessary condition for some of the players in a given system to be able to acquire some of the means (payoffs) in addition to in comparison with those means (payoffs) that they are receiving within the basic redistribution game is for the other players to not know about this, i.e., to not be informed. This “extraction” of some of the means without the knowledge of other players was called a parallel redistribution game. The basic model of the system of parallel redistribution games was described by the following set of equations:

\[ \sum_{j} x_{0j} - \eta_0 R_0(X_0 - E_0) - \sum_{j} \pi_i \sum_{j} x_{ij} \]

where:

- \( i = 1, 2, \ldots M \) are individual parallel redistribution games, \( M \) is the total number of parallel redistribution games,
- \( j = 1, 2, \ldots N \) is the index related to the players (denotes that which applies to the first, second, etc.) and \( N \) is the total number of players,
- \( x_{ij} \) is the payoff of player \( j \) in parallel game \( i \),
- \( \sum_{j} x_{ij} \) is the sum of the payoffs of all players from redistribution game \( i \) (basic game in the case of \( i = 0 \), in other cases then the parallel redistribution game),
- \( e_j \) is the payoff of player \( j \) in parallel game \( i \) based on his performance in this parallel game,
- \( \eta_0 \) coefficient of performance decrease in the basic redistribution game,
- \( X_i - E_i \) vector \((x_{i1} - e_{i1}; x_{i2} - e_{i2}; \ldots; x_{iN} - e_{iN})\), i.e., vector of the differences between the payoff according to the performance of player \( i \) and his actual payoff,
- \( R_i(X_i - E_i) \) function of the decreasing of earnings as a result of the deviation of payoffs from player performance,
- \( \pi_i \) coefficient of the influence of the size of the payoffs of players in parallel redistribution game \( i \) on the decreasing of the payoffs in the basic redistribution game.

The listed set of redistribution equations for the case of parallel redistribution games can be read as follows: in the basic redistribution game the sum of the payoffs of players \((\sum x_{0j})\) summed after \( j \) equals how much they could get if they received payoffs according to their performance \((\sum e_{0j})\) totaled after \( j \), but decreased as a result of the deviation of the payoff of players from the performance of players \((\eta_0 R_0(X_0 - E_0))\) and also by the negative influence of parallel redistribution games on the total performance of the basic redistribution system \((\sum \pi_i \sum_{j} x_{ij})\) connected with the loss of allocation effectiveness. If another game was inserted into a certain parallel redistribution game, then it would be easy to expand, respectively hierarchize, the corresponding set in the corresponding manner.

The presented model of parallel redistribution games is also based on other simplifying assumptions. But mainly it covers only the external aspect – it does not say anything about how some of the players are able to get additional means (payoffs) for themselves without the knowledge of other players and at their expense.

The following hypothesis based on two mutually supplementing statements presents itself here:

1. If this concerns a method how some of the players acquire means from the redistribution system in their favor without the knowledge of other players, then this is always a structure based on mutual covering-up.
2. Each structure based on mutual covering-up enters the redistribution system as a certain parallel redistribution game and it manifests itself as such in the system.

If this hypothesis is valid, it offers the way to further elaboration of the model of structures based on mutual covering-up and their better visibility. In support of the said hypothesis, one can say that each structure based on mutual covering-up requires the use of certain means for
the securing of its functioning (e.g., blackmailing is always supplemented with the bribing of players), which means that it is linked with a certain parallel game. Also worth mentioning is the fact that each player that does not participate in parallel redistribution games and that stands outside of the structures based on mutual covering-up is hurt in several ways by the effects of one as well as the other:
- Some of the means in which he would otherwise participate within the scope of redistribution are extracted from the system.
- The decreasing of the performance of the entire system as a result of the influence of parallel redistribution games on the loss of allocation effectiveness occurs, which also leads to a decrease of the means in which he would otherwise participate within the scope of redistribution.
- Coalitions and possibly also the formation of representations that give preferential treatment to their members even within the scope of the original redistribution game are predetermined, whereas he is discriminated against within the scope of the basic redistribution game by coalitions that formed this way as well as by how they create their representation.

**Summary and conclusion**

That which was revealed as the result of the development of the theory in several directions, which met in a certain area, at the same time opens the path of the further development of the theory in various directions. This concerns especially the following areas:
- Adding more elements to the payoff matrix that describe the consequences of the consideration of various alternatives by both the subjects that are being blackmailed as well as by those that are doing the blackmailing in the formation of structures based on mutual covering-up. The goal is to make the list of all consequences of this or that decision as complete as possible and also well-structured.
- It is also possible to identify more alternatives that are possible for players in various situations, from the perspective of the expression of their behavior within the structures that are based on mutual covering-up as games in an explicit form.
- A more difficult task is reflecting the course of the game (moves that are made later) into the establishing of the value of the specific consequences of this or that decision in the early moves.
- Find suitable symbolism that has considerable importance during the subsequent formalization and mathematization; it is still possible to improve much on the symbols and symbolism that we use.
- The most difficult tasks are then in the area of mathematization and possibly also the axiomatization of sub-models and their interconnection; among other things, also the interconnection of the model of structures that are based on mutual covering-up and the model of parallel redistribution games is concerned here.
6. Foundation of the Theory of Redistribution Systems

6.1 Three-person negotiation in the classic book Theory of Games and Economic Behavior

Theory of Games and Economic Behavior (Neumann and Morgenstern 1953), now a classic work by J. Neumann and O. Morgenstern, published for the first time as long ago as in 1944, provides major theoretical background for certain types of multi-player games. We will demonstrate that this can be applied to analyse the games played in redistribution systems with three persons. This will enable us to identify and describe the discrimination equilibrium and then, on the basis of it, the mutually acceptable equilibrium. Both of them are highly relevant for understanding the real behaviour of people, including the ethical aspects.

Although the work by J. Neumann and O. Morgenstern has been superseded in many respects, and even includes numerous simplifications and deficiencies, it contains certain important points, which have not been considered enough in further research.

That said, let us look at how the aforementioned book analyses the issue of three persons and their negotiations. The simplest case is analysed in § 21: The Simple Majority Game of Three Persons. We will cite the most important passages, including the specification of the paragraph from which they were taken: „Each player, by a personal move, chooses the number of one of the two other players. Each one makes his choice uninformed about the choices of the two other players. … If two players have chosen each other’s numbers we say that they form a couple. Clearly there will be precisely one couple, or none at all. If there is precisely one couple, then the two players who belong to it get one-half unit each, while the third (excluded) player correspondingly loses one unit. If there is no couple, then no one gets anything… Since each player makes his personal move in ignorance of those of the others, no collaboration of the players can be established during the course of the play.“ (Neumann and Morgenstern 1953)

The game is described exactly. It may end up either in two players getting \( \frac{1}{2} \) each and the third player getting -1, or in each player obtaining no payoff. This is one of the simplest three-person games that may be devised. The extension of the game leads to more complex games. In § 21.3. the authors stress that “the game is wholly symmetric with respect to the three players” (Neumann and Morgenstern 1953). As we will see, this is very important. They specify quite in detail that, if any agreement among the players is reached, it will be reached outside that basic game (it would be an outcome of another game). As a follow-up to this, the authors of the classic work take the first step, extending the basic (elementary) model of the simple majority game of three persons (§ 22.1.2.): „…let us now consider a game in which each coalition offers the same total return, but where the rules of the game provide for a different distribution. For the sake of simplicity let this be the case only in the coalition of players 1 and 2, where player 1, say, is favored by an amount \( \varepsilon \)... If the couple 1,2 forms, then player 1 gets the amount \( \frac{1}{2} + \varepsilon \), player 2 gets the amount \( \frac{1}{2} - \varepsilon \), and player 3 loses one unit. If any other couple forms (i.e. 1,3 or 2,3) then the two players which belong to it get one-half unit each while the third (excluded) player loses one unit. – What will happen in this game? – …Prima facie it may seem that player 1 has an advantage, since at least in his couple with player 2 he gets more \( \varepsilon \) than in the original, simple majority game. – However, this advantage is quite illusory. If player 1 would really insist on getting the \( \varepsilon \) in the couple with player 2, then this would have the following consequence: The couple 1,3 would never form, because the couple 1,2 is more desirable from 1’s point of view; the couple 1,2 would never form, because the couple 2,3 is more desirable from 2’s point if view; but the couple 2,3 is entirely unobstructed, since it can be brought about by a coalition of 2,3 who then need pay no attention to 1 and his special desires. Thus the couple 2,3 and no other will
form; and player 1 will not get $\frac{1}{2}+\epsilon$ nor even one-half unit, but he will certainly be the excluded player and lose one unit. – So any attempt of player 1 to keep his privileged position in the couple 1,2 is bound to lead to disaster for him. The best he can do is to take steps which make the couple 1,2 just as attractive for 2 as the competing couple 2,3. That is to say, he acts wisely if, in case of the formation of a couple with 2, he returns the extra $\epsilon$ to his partner." (Neumann and Morgenstern 1953). This is a very important point. A detailed explanation is provided as to why the player in the winning coalition have to share the payoff equally. That said, if one of them wanted more, he would find himself outside the coalition and end up with loss rather than profit (in a zero-sum game).

Another important step to which we will pay attention in the classic work is the extension of the model to the case of differing amounts that two players may obtain from the third player if the two combine. The problem is described in paragraph 22.2., entitled *Coalition of Different Strength*. The consideration included there may be briefly summarised as follows: Consider there are amounts $a$, $b$, $c$ ($a$ = what players 2 and 3 may get from player 1, etc.). If player 1 wanted payoff $x$, then what would be left for players 2 and 3, after subtracting payoff $x$, must be greater than or equal to what players 2 and 3 would obtain from player $a$ if the two combined, i.e. $(c-x)+(b-x)\geq a$. This means $x\leq(-a+b+c)/2$. Thus player 1 may count upon obtaining the maximum payoff of $a=-(a+b+c)/2$, and likewise players B and C may count on obtaining payoffs $\beta=(a-b+c)/2$ or $\gamma=(a+b-c)/2$. (Neumann and Morgenstern 1953)

Let us add the following to this brief summary: In every winning coalition, each player allied with either of the other players gets the same payoff. This (expressed in the language of economic theory) could also be formulated in such a way that the opportunity costs sacrificed in forming any of the coalitions, based on the player’s potential payoff in another coalition, are equal. In the next section, we will demonstrate how the basic, very simple theoretical model of three-person games and the analysis of them, in the form of procedures described, are followed up by the analysis of more complex cases, which include further major elements we come across in real-life situations.

### 6.2 Basic terms of the theory of redistribution systems and examples of the theory application

Now we will deal with the analysis of the games played in redistribution systems. The main difference is that these are inconstant-sum games. The aim of the theory of redistribution systems is to identify and describe what is generally present in the group behaviour of people in various firms, workplaces, teams, institutions, organisations, etc., where people are grouped for the sake of joint performance and then they can share the outcome of their joint performance. In redistribution system games, players face (in various ways) the dilemma between their own (i.e. coalition) benefit and the performance of the entire system. Most generally, we can define the redistribution system in such a way that what the players can share depends on how they will share it, with this dependence being well-known and expressible (for example, by equation). A monograph by P. Budinský, R. Valenčík et al. (2010), available online, is concerned with the theory of redistribution systems. One of the possible interpretations of what can be defined as a redistribution system is as follows: 1st Assume there are three players, named A, B, C. 2nd These players perform differently; their respective performances can be expressed as $e_1$ (performance of player A), $e_2$ (performance of player B), $e_3$ (performance of player C). 3rd If these players share the outcome according to their respective performances, they will together achieve the highest performance $E = e_1 + e_2 + e_3$. 4th If they share the outcome differently, then the performance of the system where the players’ payoffs are redistributed will decline as compared to their performance; the greater
the deviation of payoffs from players’ performances, the greater the decline. This can be expressed by term \( \eta R(x - e_1; y - e_2; z - e_3) \), where \( \eta \) is a coefficient; \( R \) is the function describing the relevant dependence; \( x, y, z \) are the payoffs for individual players. In that event, all Pareto-optimal payoffs for players lie in the redistribution area based on the redistribution equation.

\[
x + y + z = E - \eta R(x - e_1; y - e_2; z - e_3)
\]

For \( N \) players, the following equation applies:

\[
x_1 + x_2 + ... x_N = E - \eta R(x_1 - e_1; x_2 - e_2; ... x_N - e_N)
\]

(describes an interesting interpretation pertaining to the type of game entitled Tragedy of Commons (Fisher 2010), which is analogous to the Prisoner’s Dilemma, but designed for multiple players. An example may be the limitation on the use of water by farmers in a country suffering from frequent droughts. The matrix includes one of the farmers on the one side and the others on the other side. If all of them (both the individual farmer and the other farmers) keep the agreement and cooperate (which, in this case, means keeping the agreed water use restrictions), the yield from each hectare will be the highest for both groups. If both (the individual farmer and the other farmers) fail to keep the agreement (fail to limit the use of water), their yield from each hectare will be much lower. If just a single farmer breaches the rules, his yield from each of his hectare will be much higher, with almost no impact on the others. If, by contrast, all the others breach the agreement while the farmer concerned keeps the water use agreement, his yield will be even lower than in the event of joining the others in breaching the agreement. If we consider the other players to be rational entities who maximise their benefits, each of them will view the situation on his part, as an individual farmer, and their dominant strategy will be failure to keep the water use rules. Thus the outcome will be the worst. Let us note that it is the context of these tasks in which aversions to models based on the assumption of players’ rationality and the maximisation of their benefit arise, as consequently does the conviction that the real behaviour of people can only be explained if the models are complemented with an ethical dimension, which is viewed as an exogenous element. E. Ostrom (who was awarded the 2009 Nobel Prize for her analysis of the commons) offers a different view of addressing this dilemma (Ostrom 1990). On the basis of extensive empirical results, she presents a solution in the form of self-government. Common-pool resources can be managed by the community itself, without central management. A voluntarily established community can, by itself, spontaneously create an efficient management of common-pool resources. In other words, a voluntarily established community can protect common ownership, allocate the yields of that ownership among its members, and eliminate unentitled parties. Rather than creating mathematical models, E. Ostrom explores social institutions by analysing extensive empirical material from various parts of the world and applies an evolutionary view. We will demonstrate that the disclosure of two types of equilibria in redistribution systems pertains to the aforementioned issue. Let us look at a three-person game where the players will use a precious resource and can distribute it in a manner consistent with the Tragedy of Commons type of game. We will consider a more complex case, when the individual players (farmers) are farming under different conditions. Each additional unit of water a farmer uses for his land will result in different income for each of the players. From the microeconomic point of view, the maximum common income can be achieved when the marginal income from the last unit of water to be used by any of the players equals the marginal income from the last unit of water of any other player. Now suppose that the above situation will occur when the players share the water at the ratio of 6:4:2. If they diverge from that ratio, their common income will be lower—the more they diverge from that water distribution ratio the lower their income. We may also accept another assumption, which is intuitively obvious and does not narrow the
universality of the problem we are dealing with; i.e. that if they share the water at the ratio of 6:4:2, their payoffs (coming from income) will be distributed accordingly; as well as the fact that the farmers’ income is proportionate to the allocations of water (without this proportion necessarily having to be linear). Then the general rule of the relationship between the payoffs and the distribution of water will be as follows: what the farmers can distribute among themselves equals the maximum of what they could distribute (i.e. 12) minus the decline in common income as a result of the fact that the players will share the income otherwise than according to their optimal proportion based on the equality of marginal income (i.e. the proportion of 6:4:2). This dependence is described by the redistribution equation (1).

Function R can be, for example, the generally used Euclidean distance (for the ratio of 6:4:2):

\[ R[ (x-6); (y-4); (z-2)] = \sqrt{(x-6)^2 + (y-4)^2 + (z-2)^2}; \]

Manhattan distance as the sum of the absolute values of the differences in performance and payoffs of the individual players:

\[ R[ (x-6); (y-4); (z-2)] = |x-6|+|y-4|+|z-2|; \]

Chebyshev distance, which always selects that difference from among the differences in the performance and payoffs of the individual players that appertains to the player with the greatest divergence:

\[ R[ (x-6); (y-4); (z-2)] = \max\{(x-6); (y-4); (z-2)\}. \]

The characteristics of various redistribution areas and major points on them have been described by J. Mihola (Budinský et al. 2010, pp. 51-73). Further, we will only deal with the areas all points of which lying on them represent Pareto-optimal situations (this applies to all of those mentioned above), and the solutions on that areas.

### 6.3 Discrimination equilibrium and commonly acceptable equilibrium

Let us try to define a very simple game (similar to those we mentioned for zero-sum games from the book by J. Neumann and O. Morgenstern). For example, if two players form a coalition, they can distribute among themselves everything the third player would get. The third player will obtain the lowest possible payoff (say 0 in our case; however, we could also consider that the lowest amount the player must obtain would be greater than 0 or even smaller than 0). The players who have created a two-person coalition will subsequently distribute payoffs in certain proportion among themselves. The difference from the case addressed by J. Neumann and O. Morgenstern is primarily in the fact that the amount distributed among players is inconstant and variable depending on how it is distributed. Let us label those lines in which the payoff of one of the players equals 0 to be the lines of full discrimination of one player by the other two players (here in after the ‘discrimination lines’). They represent common points of the redistribution area and sides determined by two coordinates of x, y, z (Figure 6.1). Their course is determined by equations:

\[ y + z = E - \eta^* R(0; y - e_2; z - e_3) \] (3.1)
\[ x + z = E - \eta^* R(x - e_1; 0; z - e_3) \] (3.2)
\[ x + y = E - \eta^* R(x - e_1; y - e_2; 0) \] (3.3)

The question is what payoff to allocate each of the players if they form a two-person coalition (hereinafter referred to as the ‘coalition’) and if they fully discriminate the third player. Let us recall what happens in a zero-sum game: First, we allocated the value corresponding to the ½:½ distribution. Then we admitted the possibility that one of the players might claim more, and proved that, unless the player wished to become discriminated, he could not claim more. Subsequently, we were dealing with the situation of the differing value of what the players could distribute in the event of different coalitions, and laid down the distribution rule; the rule is that, in creating a coalition with a player, every player must claim exactly what he would have claimed in creating a coalition with another player. The third requirement can be also met in our more general case. Just consider the equations that describe the course of the
discrimination lines to be a system of three equations with three unknowns. The solution to it (in non-negative values) is three points, to which the following applies: The payoff of player A (i.e. $x$) is the same in the coalition with player B as well as in the coalition with player C. The payoff of player B (i.e. $y$) is the same in the coalition with player A as well as in the coalition with player C. The payoff of player C (i.e. $z$) is the same in the coalition with player A as well as in the coalition with player B. Let the points which lie on the discrimination lines and which comply with the above system of equations be called the points of discrimination equilibrium (Figure 6.1).

**Figure 6.1: Redistribution area with an indication of discrimination equilibria**

Let the payoff values of players A, B, C, if they are in a coalition that discriminates the third player and if they find themselves in the points of discrimination equilibrium, be called $x_d$, $y_d$, $z_d$. Suppose that the player who is outside the coalition will obtain a payoff equal to 0. The points of discrimination equilibrium constitute an internally and externally stable set (for a proof see Budinský et al. (2010, pp. 49-50). Let us look at one more interesting feature of the points of discrimination equilibrium. If player A, in a coalition with player B, required a payoff by some $\varepsilon > 0$ greater than would be adequate to the discrimination equilibrium, the coalition of players A and B would never be formed – with the reasons being the same as stated in the above-cited passage [9]. That said, each of the players may require a payoff for himself only increased by $\varepsilon = 0$. A coincidence will determine which players will form a coalition and whether a coalition will be formed in the respective game. In addition – if we considered a more complex game, with multiple rounds of negotiations, and wished to express it explicitly (which exceeds the possibilities of our paper), player C would be aware that it would pay him to form a coalition with player B, and not with player A. The reason is that his maximum payoff with player A would be $z_{\text{Amx}}$ while his possible payoff with player B would be $z_{\text{Bmx}}$, which is necessarily higher because player A claims a greater payoff for himself than adequate to the discrimination equilibrium (Figure 6.1). Let us reiterate that the positions of all the three players (in our basic model) are fully symmetric. They feel no liking for or
aversion to each other, i.e. the fact who will form a coalition with whom is not determined from ‘outside’; it is the outcome of what will happen within the relevant redistribution system, where the outcome only depends on coincidence. We ought to make a brief note on what was said above in terms of the practical importance of the models we deal with. If we know what happens in the basic model, which is subject to no external effects, and compare this to what happens in real-life systems, which we model by means of redistribution systems, we can find various deviations. The analysis of those deviations may subsequently help us find out which external factors (including hidden ones) impact upon the system. In short, we will see what we would not see without the model. This is one of the aspects of the practical importance of our activities. Now, however, we are studying the basic model, which does not reckon with any external effects. What expected payoff may each player expect? Either a payoff he gets if he forms a coalition with any of the other two players, or the lowest payoff which the other players will allocate him in the discrimination position, i.e. 0. In this context, it is absolutely relevant to state that the player may count upon the expected average payoff, which equals $2x_d/3$ for player A, $2y_d/3$ for player B, $2z_d/3$ for player C (Figure 6.2). The area delimited by the lines of the expected average payoffs has an important feature. Each point inside stands for a Pareto improvement for each player vis-à-vis his average payoff, i.e. in lieu of an uncertain payoff, though it may be greater than the average expected payoff in two out of three cases, but only minimal (equal to 0) in one case, a rationally behaving player may prefer reaching an agreement on the distribution of payoffs so that the distribution is consistent with a point inside the considered area. (For the sake of simplicity, we do not consider a decline in the marginal utility of the payoff achieved; if we did, the area of Pareto improvements would be even greater.) The outcome we have achieved is important and may be interpreted in various ways; for example, by saying that the reality itself, due to its mathematical foundations, offers players a better chance than striving for discrimination of some by the others; i.e. the very mathematical foundations of our reality contain a sort of fairness, the assumption of what we consider to be moral, etc. Let us admit, however, that these interpretations use a great deal of fiction. We should also note that the Pareto improvements of the expected average payoffs only exist in inconstant-sum games and games with more than two persons. For constant-sum or zero-sum games, they do not exist. In papers which we have used as the basis and which are concerned with similar issues of player behaviour in terms of coalition formation and negotiations in games with transferable as well as non-transferable utility (Aumann and Hart 2002; Bimore 1985; Davis 1997; Kalai and Smorodinsky 1975; Moulin 1982; Osborne 2004; Kluwer 2003; Selten 1999; Thomson 1983), we have failed to find the outcome we have achieved. However, we can continue to elaborate this and ask the following questions: Which of the points in the area of Pareto improvements is ‘the right one’, i.e. the one on which the players will agree? Is there any? And if it is, can players agree on the distribution of payoffs in compliance with it? Figure 6.2 will help us answer those questions.
Figure 6.2: Redistribution area with an indication of the lines of expected average payoffs

LEALP_{AB1}, LEALP_{BC1}, LEALP_{BC1} – the line of expected average level 1 payoffs

LEALP_{AB2}, LEALP_{BC2}, LEALP_{BC2} – the line of expected average level 2 payoffs

Area of Pareto improvements vis-à-vis the expected average payoffs of individual players

CAE – commonly accepted equilibrium

Source: Own creation

Now let us imagine that the players, on the basis of features of the basic game we have considered thus far, will realise that they are better off reaching a mutual agreement. Nevertheless, as concerns the basic game, this realisation as well as the effort for an agreement, if any, is another game, the relationship of which to the basic game is only based on the fact that the exploration of certain features of the basic game has enabled us to unveil the area of Pareto improvements in the expected average payoffs, the possibility of a joint agreement, and the issue of defining the game to describe how the players will choose one of the points of those improvements. Each of the players might attempt to form a coalition with any of the other two players in order to achieve the maximum improvement even if all players are already choosing points inside the area of the Pareto improvements of expected average payoffs. The situation would reoccur. It would be possible to define and calculate the points of level 2 discrimination equilibrium, to derive the lines of expected average level 2 payoffs from them, and consequently the area of the level 2 Pareto improvements. Then we could proceed to discrimination equilibria, the lines of expected average payoffs, and the area of level 3 Pareto improvements, etc. The situation resembles a matryoshka doll, with another game nested in each game which allows defining the area of Pareto improvements of certain level. These areas gradually diminish and become the surroundings of certain point which is clearly defined by this process. This point will be referred to as the point of commonly acceptable equilibrium. Its coordinates correspond to payoffs when players succeed in achieving the commonly acceptable equilibrium.

6.4 Pending issues and conclusion

It is very probable (and this can be viewed as a hypothesis) that a point of commonly acceptable equilibrium may also be achieved by other procedures, e.g. as an intersection point
of the lines derived from discrimination equilibria. In finding the point of commonly acceptable equilibrium in this case, we proceed in such a way that, for each player, we change parameter \( d_x, d_y, d_z \), which expresses the smallest payoff the player has to obtain, (so far, we have considered that the value of a discriminated player’s payoff is 0) from the initial value (i.e. equal to 0) to the maximum possible value (i.e. the absolutely greatest payoff the player can achieve), without changing the values of this parameter for the other two players. Three lines derived from the points of discrimination equilibria will be achieved on the redistribution area. On the basis of this, we can lay down the following two hypotheses: 1\textsuperscript{st} The lines derived from discrimination equilibria, by changing parameter \( d_i \), intersect in a single point. 2\textsuperscript{nd} This point is identical to the point of commonly acceptable equilibrium we have achieved by the above-described negotiations. Further evidence will be required to prove whether this is the same point as that used in the ‘matryoshka doll’ procedure. Likewise, no mathematical analysis has been made thus far as to the relationship of the Nash and Kalai-Smorodinsky solutions to the commonly acceptable equilibrium defined by us. Existing analyses seem to indicate that the commonly acceptable equilibrium coincides with none of the aforementioned types of equilibrium. One of the most important tasks is the explicit expression of various types of games played in redistribution systems, and consequently the answer to the question how to define the rules of various types of games for the players to achieve a commonly acceptable equilibrium through negotiations, i.e. to define the types of games in which they will fail to achieve a commonly acceptable equilibrium. Certain partial results have already been achieved in this area, and are available online http://www.vsfs.cz/?id=1046.

6.5 Mapping the redistribution surface of an elementary redistribution system

What is the mapping of the redistribution surface?
Redistribution missions and games deal with the issue of allocating or reallocating some common value or amount, such as winnings (initial deposit) or a joint yield generated by persons doing business or cooperating together or players or those with a looser bond, for example if everyone is dependent on some common resource. Despite the fact that a more extensive structured set of redistribution missions is not part of this chapter, to facilitate understanding of the following mapping I consider it appropriate to at least give some illustrative simplified situations leading to the use of the apparatus of redistribution missions:
Three agricultural entrepreneurs have a limited amount of water available in the summer months for their crop production. If they share this resource according to a ratio known in advance, they will all attain maximum yield. Failure to do so will result in a smaller yield for one or two of them, thus also reducing the amount of their combined harvest.
If these entrepreneurs comply with the optimum water pumping ratio and all attain the optimum yield, they can negotiate how to split the amount obtained by selling the entire yield (i.e. the harvests of all three entrepreneurs). Different ways of distributing a certain amount are thus being searched for. This amount is not reduced in any way however this amount is distributed.
If three people enter into a joint business venture and produce, thanks to their respective specialisations, a joint profit of a certain value, they can consider distributing this amount according to another ratio (e.g. in a more egalitarian manner) than that corresponding to their respective efforts to generate that profit. The more they differ from the ratios given by their original merits, the lower will be the distribution amounts.
The essence of the reduction in the total amount distributed can also be reduced motivation of
participants of the joint venture. This reduced motivation may be the result of a redistribution plan, announced in advance, which may be de-motivational for some of the participants. If we consider several subsequent periods, the dissimilar motivation levels may be reflected in the partial as well as combined output of the participants.

For the sake of simplicity, we will for the time being consider only missions involving three participants (players) and in order to define the space (sets) of all the possible, and in the mission envisaged, ways of distributing that amount we will use the redistribution surfaces corresponding to the elementary redistribution model. For the time being, the redistributed shared sum will be considered as being arbitrarily divisible non-zero and positive value, such as a financial value.\(^{45}\)

The elementary redistribution model assumes that every form of distribution other than that corresponding to the so-called baseline ratio (e.g. distribution according to performance) may cause a certain decline or loss in the amount distributed, and that the more we depart from the baseline the greater will be this loss. This loss may be in the form of taxes, administrative costs, court charges or may be caused by a time delay. If the baseline output represents the sum of the output of three separate participants creating, for example, product for his own use, we are in quite a different situation than when we are dealing with the outcome of a joint cooperative enterprise as part of some trading company. If the envisaged loss is zero, this is a mission of redistributing constant, unchanging amounts among the three players. An elementary redistribution system is defined in such a way as to allow modelling of all situations from a zero to a maximum loss. But a reduction in the total sum distributed need not manifest itself in a reduction in the pay-offs to every participant (player) compared to their baseline pay-offs. If come of them receive a better pay-off at the expense of others, this will not be a Pareto improvement.

The individual participants (players) initial ratio of the benchmark amount will have a significant influence on addressing the role of redistribution. Qualitatively different situations shall arise if the participation in the creation of the joint share is the same or different in the case of all or two of the participants. An asymmetrical relationship or merit on the distributed amount may, but need not, lead to uniform and egalitarian distribution. Nor even the same merit may lead to egalitarian distribution. Special cases may arise when a certain participant (player) or some of the participants (players) has/have a zero share in the creation of the joint value (amount) and still participate in the distribution. For example, the owner of the company need not directly be involved in producing the distributed profit, but may have the right to participate in the distribution.

Another variable that features in the elementary redistribution model is the amount of the planned minimum pay-off or share in the distribution. The minimum pay-off may also be zero (this corresponds to the exclusion of the participant (player) from the distribution, but can also be non-zero. This minimum pay-off can also be interpreted as an opportunity cost. The upper limit of the minimum pay-off is the entire amount distributed if it is assigned to one participant (player) and there is a zero distribution loss. These minimum pay-offs can be the same for all players, but they may even be different for individual participants (players). The reason why one or even two participants (players) receive zero payments and are thus excluded from the distribution may be that the significant standing of one or two participants (players) discriminates against one or two participants (players). In this case we talk of the creation of a discriminating coalition. But a coalition may not always be discriminatory. To the sake of generalisation, we will introduce coalitions in general according to the number of

\(^{45}\) At this stage of the research we are not concerned with specifying the measurement of the variables employed or their units of measure. For the purpose of displaying the redistribution surfaces we assume that outputs and pay-offs are expressed in non-negative rational numbers, where \(x \geq 0; y \geq 0;\) and \(z \geq 0.\) We are aware that money, for example, can only be divided into units of currency, e.g. CZK or hallers, or 50 hallers, ie. CZK 0.5.
participants (players) in the coalition, i.e. according to the cardinalities of the sets of player coalitions.

\{0\} the coalition does not contain any players. This is a situation where the redistribution process does not occur as part of the elementary system.

\{A\};\{B\};\{C\} are one-man (degenerate) coalitions, comprising of either player A; B or C

\{AB\};\{BC\};\{AC\} is the most natural dyadic coalition, as part of which two players join forces against the remaining player. The coalition may be formed by players A and B; B and C or A and C

\{ABC\} is a so-called grand coalition, which stems from a common agreement concluded by all three players.

Despite the fact that the definition of a grand coalition makes mention of the word “agreement”, it does not mean that some actual negotiation, depicted by a series of points on the redistribution surface and exhibiting certain signs of rationality necessarily led to a certain decision on the distribution, represented by a certain point on the redistribution surface. Participants can select such a distribution point based on knowledge of the properties of points on the redistribution surface, and can also combine the chosen selection criteria in an appropriate manner.

The possibilities and range of the elementary redistribution model correspond to the requirements of the missions that have accumulated on this topic. For simplicity, however, we shall not concern ourselves in this chapter with a detailed concrete interpretation of the specific missions nor with the variables acting within these missions. Nor shall we concern ourselves with considerations as to whether the given distribution of pay-offs is frequent or how likely is it to occur in practice. The role of mapping is mainly to underline the mathematical properties of certain significant points or areas of the redistribution surface in response to changes in some default mission parameters. We will assume that it is useful for the purpose of the proposals or decisions of individual players, coalitions of players or all players, whether the cooperate or not, to know what significance as well as what context the different significant points or areas of the redistribution surface have. For this comparison it has also proven important what kinds and types of aggregates we use to aggregate the partial pay-offs made to the players. This is because the applicable aggregations may be not only the sums but also products, simple or weighted arithmetic, geometric, harmonic, and many other averages.

Among the conditions considered are therefore included:

- The size of the loss in the distributed (or created) amount due to the effect of redistribution processes, including the manner of its expression as well as its course in relation to other variables.
- The effect’s influence to the creation of the distributed or redistributed amount or the effect’s influence on the limited resources. This will manifest itself in the location of the starting point of elementary redistribution mission and will significantly affect the final shape of the redistribution surface.
- The minimum pay-off to individual participants (players) and their possible asymmetry and the influence of creating different kinds of coalitions.
- Using various well-interpretable aggregates of winnings (pay-offs) to participants (players).

In the following text we will, for the sake of simplify, focus only on the interpretation of participants as players.

### Mathematic formulation of a mapping task

To work with the elementary redistribution system, which reduces the number of players to only three, we can clearly visualise redistribution surfaces in a three-dimensional space. This
makes it possible to represent and derive numerous links, properties and particularly illustrations of the elementary redistribution system.

Redistribution surfaces represent all possible alternatives of choosing both the individual players and all specified coalitions. Also, by means of various characteristics, it is possible to use redistribution surfaces to show the preferences of individual players as well as the preferences of all types of coalitions, including the grand coalition. The navigation in the redistribution surfaces is possible with the isoquants of constant payoffs for individual players and of the constant sums, products of multiplication or of other aggregates of the other multi-member coalitions. The redistribution surface also allows drawing certain equilibrium points and payoff points of specific properties such as the egalitarian payoff, the payoff with payoff ratios consistent with the initial point, the maximal common payoffs of two selected players in a coalition, the solution point of Nash assignments, etc. Redistribution surface may also be used to record the moves in a multi-stage game or a bargaining process.

The elementary redistribution system (model) is defined for three players, and thus \( N = 3 \). For each player, we will assume the same ability to influence the outcome, i.e. the influence power equals 1; at the moment, we will not express this by any dedicated variable. We will refer to players as A, B, and C.

Payoffs or achievements:
- of player A will be plotted on axis x,
- of player B will be plotted on axis y,
- of player C will be plotted on axis z,

The elementary redistribution system is generally based on the following expression:

\[
x + y + z = E_0 - \eta \cdot R\{ (x-x_0); (y-y_0); (z-z_0) \}
\]

(1)

where:

- \( E_0 \) is the sum of players’ achievements\(^{47} \):
  \( E_0 = x_0 + y_0 + z_0 \). The player’s achievement means, for example, his/her contribution to the creation of the initial investment in a game, achievement of the common gain to be distributed, his/her capacity, the need to use a limited common resource (such as water), etc. In certain tasks, this contribution to the creation of the sum distributed need not be known. In any event, quantities \( x_0; y_0; z_0 \) represent coordinates of what is known as the initial point \([x_0; y_0; z_0] \).

- \( x, y, z \ldots \) are the payoffs for individual players. It is a result of the distribution or redistribution process.\(^{48} \)

If the game or bargaining consists of multiple stages, the payoffs in the individual stages will be referred to as index 1; 2; 3 \ldots; \( n \), for example, \( x_1; x_2; x_3; \ldots; x_n \) for player A (and likewise for players B and C). The redistribution result may also become a new initial point. The following applies to the payoffs for individual players:

\[
x \geq 0; \ y \geq 0; \ z \geq 0
\]

(2)

---

\(^{46}\) Likewise, it is possible here to draw constant ratios or differences of certain payoffs or other functions associated with the development of the game concerned.

\(^{47}\) At this stage of our research, we are dealing neither with the specification of measuring the quantities used nor with their units. To show the redistribution surfaces, we assume the representation of performances and payoffs by non-negative rational numbers \( x \geq 0; \ y \geq 0; \ z \geq 0 \).

\(^{48}\) If a minimal payoff for each player were introduced, such as 1, then the following applies to players’ payoffs:\( x \geq 1; \ y \geq 1; \ z \geq 1 \).
\( \eta \) is the parameter of reducing the sum of payoffs from the initial amount distributed, e.g. the sum of players’ achievements. The redistribution equation may also be understood in such a way that what the players can distribute among themselves equals the maximum of what they could distribute among themselves, reduced by what they would give up or would have to give up in redistribution. If the parameter \( \eta = 0 \), the sum of payoffs will not be reduced during redistribution. If the payoffs are reduced, then \( \eta > 0 \). As players’ payoffs are always considered to be positive, and may also be of a minimal non-zero size, there is also a minimum threshold for the sum of payoffs. As we will demonstrate later, it will be appropriate to choose \( \eta = 1 \) as the upper threshold in all instances under consideration. Our further explanation will indicate that parameter \( \eta \) also represents the degree of opening (or curving) of the redistribution surface. For the highest value of \( \eta = 1 \), it will be the maximum interpreted curving (deformation) of the redistribution surface.

Quantity \( E_0 \) is the initial amount to be distributed if \( \eta = 0 \), or also the maximum possible amount to be distributed if \( \eta > 0 \);

The minimal players’ payoffs will be referred to as \( x_{\text{min}}; y_{\text{min}}; z_{\text{min}} \). If the payoff is 0, the player concerned is excluded from distribution. The minimal payoffs may or may not be the same for all players. The minimal payoffs consist of the coordinates of the point of minimal payoffs \( [x_{\text{min}}; y_{\text{min}}; z_{\text{min}}] \). If we move the start of the coordinates to that point, the coordinate planes thus moved will define that portion of the redistribution body which corresponds to the redistribution surface. For \( \eta = 0 \), the upper threshold of the minimal payoff, e.g., for player A is \( x_{\text{min}} \leq E_0 \).

Function \( R \) of the distance from the initial point whose coordinates are \( [x_0; y_0; z_0] \), where the sum of the coordinates consists of the distributed amount \( E_0 \), may be defined in multiple ways. From among numerous options in the existing experiments, the following four ways of expressing (measuring) the distance from the initial point have proved to be practically usable:

- **Euclidean metric:**
  \[
  R[(x-x_0); (y-y_0); (z-z_0)] = \sqrt{(x-x_0)^2+(y-y_0)^2+(z-z_0)^2}
  \] (3)

- **Square of Euclidean metric:**
  \[
  R[(x-x_0); (y-y_0); (z-z_0)] = (x-x_0)^2+(y-y_0)^2+(z-z_0)^2
  \] (4)

- **Manhaten’s metric:**
  \[
  R[(x-x_0); (y-y_0); (z-z_0)] = |x-x_0|+|y-y_0|+|z-z_0|
  \] (5)

- **Chebyshev’s metric:**
  \[
  R[(x-x_0); (y-y_0); (z-z_0)] = \max [(x-x_0); (y-y_0); (z-z_0)]
  \] (6)

---

49 For \( \eta < 0 \), the sum distributed would be increased from the sum of players’ achievements. In effect, this is out of the question if we deal with the task of redistributing a previously created sum of players’ achievements, with which we will be primarily concerned. However, there are real interpretations of tasks in which the total sum redistributed will be higher, for example, because of a synergic effect. The achievement by a cooperating group of compatible people with appropriately channelled inclinations is greater than the sum of individually working people, particularly if various forms of expertise are required.

50 For \( \eta > 0 \), the amount to be distributed is less than 12, and for \( \eta < 0 \) the amount would be greater than 12. This paper will be primarily concerned with the variant of \( \eta > 0 \).
The square of the Euclidean metric (with the increasing distance from the initial point, the diminution increases in a non-linear way).

Further reflections in this chapter will be illustrated using the frequently applied Euclidean metric$^{51}$.

For the purposes of the following representations, a particular redistribution surface needs to be chosen.

In the first step, the parameters of this redistribution surface will be as follows:
- $E_0 = 12$
- Players’ achievements$^{52}$ are $x_0 = 6; y_0 = 4; z_0 = 2$.
- Then the initial point’s coordinates are [6; 4; 2]
- The players’ minimal payoffs in the first step are 0, and thus $x_{\text{min}} = y_{\text{min}} = z_{\text{min}} = 0$
- Therefore the point of minimal payoffs lies at the start of the coordinates [0; 0; 0]

**Representation of the redistribution surface**

**Linear redistribution surface:**
The simplest instance of visualising the redistribution surface is the redistribution system with a constant sum of payoffs, corresponding to the amount of $E_0$. This instance corresponds to $\eta = 0$. The redistribution equation will be simplified to:

$$x + y + z = E_0$$  \hspace{1cm} (7)

As the sum of all the three payoffs remains constant in this plane, we will hereinafter refer to it as the **summation plane**.

The redistribution surface is an isosceles triangle, lying symmetrically in the summation plane. For $E_0 = 12$, this linear redistribution surface is represented in figure 6.3. The vertices of the redistribution triangle have, due to the minimal payoffs based on the point of minimal payoffs [0;0;0]; the coordinates [0;0;12]; [0;12;0] and [12;0;0], and can be represented as follows:

---

$^{51}$ It is a positive of the root of the sum of the squares of the difference between payoffs and achievements of the individual players – see expression (3).

$^{52}$ At this stage of our research, we are dealing neither with the specification of measuring the quantities used nor with their units. To show the redistribution surfaces, we assume the representation of performances and payoffs by non-negative rational numbers $x \geq 0; y \geq 0; z \geq 0$. 
Figure 6.3: The summation plane I

![Diagram of the summation plane]

The perpendicular\(^{53}\) to this summation surface at the initial point with coordinates [6;4;2] can be expressed by equation:
\[x - 6 = y - 4 = z - 2\] \hspace{1cm} (8)

This straight line is parallel to the axis of the first quadrant, and its direction is based on the same directional cosines.
\[\alpha = \beta = \gamma = 54,74^\circ\] \hspace{1cm} (9)
\[\cos \alpha = \cos \beta = \cos \gamma = \frac{1}{\sqrt{3}}\] \hspace{1cm} (10)

Hence it is useful, for further reflections, to use the representation of a linear redistribution surface in the direction of its surface normal\(^{54}\), as shown in figure 6.4. The cube of edge 12, with one of its corners lying at the start of the coordinates, appears to be a regular hexagon, within which a plane with the shape of an isosceles triangle with vertices at [0;0;12]; [0;12;0] and [12;0;0] is located. Linear isoquants of the individual players’ constant payoffs of 1 to 12, always by 1, are drawn on this surface.

Player A has payoffs on axis x.
Player B has payoffs on axis y.
Player C has payoffs on axis z.

\(^{53}\) The coordinate plane x y is intersected by this line at [4;2;0].
\(^{54}\) Figure 1 evidently indicates that the redistribution surface is shown in the direction of the space diagonal of a cube with its vertex at the start of coordinates of edge 12.
For player C, the isoquants of the constant payoffs are represented by a colour scale. Chart 2 also shows the initial point with coordinates \([6;4;2]\).

**Figure 6.4: The summation plane II**

![Diagram showing a conic redistribution surface with an initial point at \([6;4;2]\).](image)

**Source: Own creation**

**Conic redistribution surface**

The redistribution surface will no longer be fully linear if we consider \(\eta \neq 0\). We will primarily focus on \(\eta > 0\). If we use the Euclidean metric (3) and the initial point’s coordinates are \([6;4;2]\), the form of the redistribution equation will be:

\[
x + y + z = 12 - \eta \sqrt{(x-6)^2 + (y-4)^2 + (z-2)^2}
\]

(11)

This equation represents quadric (a quadratic surface of the second degree). Using orthogonal invariants of the second degree, we can verify that it is a real conic surface\(^{55}\).

Parameter \(\eta\), which models the redistribution reduction of the distributed amount compared to the initial distributed amount \(E_0\), represents, in its geometrical interpretation, the degree of

\(^{55}\) If we consider the growth of \(\eta\) in excess of 1, the vertex angle of a cone will continue to decrease, and consequently we will not obtain practically usable redistribution surfaces. If \(\eta \geq \sqrt{3}\), the real cone would turn into an imaginary one.
opening of the redistribution cone. The zero curve is modelled at \( \eta = 0 \). For the greatest real deformation, we will choose \( \eta = 1 \). That said, parameter \( \eta \) is within the range of \( 0 \leq \eta \leq 1 \).

The vertex of this cone lies in the initial point\(^{56}\), i.e. \([6;4;2]\) in our particular case. The axis of this cone is the straight line:

\[
x - 6 = y - 4 = z - 2
\]

we have already seen as a relation (8). It is a surface normal vis-à-vis the summation plane, which intersects the initial point \([6;4;2]\).

To draw the redistribution surface, the equation (1) needs to be modified to: \( z = f(x; y) \).

For the redistribution cone, we can derive the relation for its vertex angle \( \alpha \), which only depends, as has become evident, on parameter \( \eta \).

\[
\alpha = 2 \cdot \arccos \left( \frac{\eta}{\sqrt{3}} \right)
\]

or

\[
\eta = \sqrt{3} \cos \left( \frac{\alpha}{2} \right)
\]

Thus the opening of the cone remains unchanged in relation to the shifting of its vertex along the summation plane, i.e. in relation to choosing the initial point for which the sum of players’ achievements will be identical, but the individual players’ achievements may change.

Relation (13) or (14) allows for deriving the relations between limit values \( \eta \) and \( \alpha \). The extent for parameter \( \eta \), which is \( 0 \leq \eta \leq 1 \), determines the extent of vertex angle \( \alpha \), which is \( 109^\circ \leq \alpha \leq 180^\circ \). At \( \alpha=180^\circ \), the cone turns into a redistribution summation plane. The minimum angle of \( 109^\circ \) is double the angle between the space diagonal of the cube and its edge, i.e. double the directional cosine – see expression (10). In other words, the smallest angle \( \alpha \) is in such a redistribution cone one of the surface lines of which, leading from the cone vertex, is concurrently a perpendicular from this vertex to one of the coordinate planes; in our instance of initial point \([6;4;2]\), it is the plane \( xy \).

Such a cone ceases to be a function, and therefore this limit cone will be represented for \( \eta = 0.999 \) rather than for \( \eta = 1 \). Figure 6.5 illustrates the sizes of the minimal vertex cone of \( \alpha=109^\circ \), redistribution cone of \( \alpha=146^\circ \), which are consistent with \( \eta = 0.5 \), and of the largest completely open redistribution cone for \( \alpha=180^\circ \), i.e. a cone which turns into a summation surface.

\(^{56}\) Generally, it will be point \([x_0; y_0; z_0]\) and the cone axis equation will be: \( x - x_0 = y - y_0 = z - z_0 \).
Figure 6.5: The redistribution cone

Source: Own creation

The conic redistribution surface itself arises, as shown in figure 6.6 (plotted for \( \eta = 0.5; E_0 = 12 \), and the minimal payoffs of all players are identical, amounting to 0), by cropping the conic surface by the coordinate system’s planes, i.e. by plane \( xy \); plane \( xz \) and plane \( yz \). The curves arising out of this at the intersection of coordinate planes and of the redistribution conic body are hyperboles. If the minimal payoffs are non-zero, the cropping of the cone will determine the point of minimal payoffs.

Figure 6.6: The conic redistribution surface I

Source: Own creation

The shifting of the initial point, i.e. of the vertex of the redistribution cone along the summation plane, does not change the form of that cone (i.e. its vertex angle \( \alpha \) and the
direction of its axis), but it is cropped otherwise, by coordinate planes. Figures 6.7 and 6.8 show the redistribution cones for initial points [5;3;4] and [2;2;8], which are partly symmetric.

*Figure 6.7: The conic redistribution surface II  Figure 6.8: The conic redistribution surface III*

Source: Own creation

Figures 6.9 and 6.10 show the redistribution cones with initial points [10;1;1] and [4;4;4], which are completely symmetric (egalitarian). In figure 6.9, the cone axis intersects axis y, while in figure 6.10, it intersects the start of the coordinates.

*Figure 6.9: The conic redistribution surface IV  Figure 6.10: The conic redistribution surface V*

Source: Own Creation
The mapping of redistribution surfaces depending on coalition size

One-member coalition:
A one-member coalition is formed if exactly two players get the minimal payoffs only. If these minimal payoffs are zero, just a single player gets the payoff. If $\eta = 0$, this only payoff is $E_0$. If $\eta > 0$, this payoff to a single player is less than $E_0$. The fact whether this only payoff would be the same for each of the players or for two of them depends on how symmetrically the initial point lies. If the initial point is egalitarian (all of its coordinates are of the same size), e.g. [4;4;4] on summation plane 12, these only payoffs will be identical irrespective of the player the payoff is paid to.

The amount of the payoff in a one-member coalition for the given redistribution surface is no longer influenced by the amounts of players’ minimal payoffs. This payoff is also the upper threshold of the minimal payoff of the player paid.

If none of the coordinates of the initial point is zero, the player’s payoff in a one-member coalition will always be higher than the player’s payoff at the initial point would be. The greatest difference will be seen by a player with the lowest share in the sum distributed, i.e. $\min(x_0/E_0; y_0/E_0; z_0/E_0)$.

The points on the redistribution surface, expressing the payoffs in one-member coalitions, always lie on the appropriate axis of the coordinates, and are represented for players A, B and C for $\eta = 0.5$ on figure 6.11 below.

*Figure 6.11: The points on the redistribution surface, expressing the payoffs in one-member coalitions*

Two-member coalitions:
A two-member coalition is formed if one of the players only gets (obtains) the minimal payoff. If such minimal payoff is zero, a non-zero payoff is only paid to players in a two-member coalition. If $\eta = 0$, the sum of two coalition payoffs at the minimal payoff of zero equals $E_0$. If $\eta > 0$, this sum of payoffs to players in the coalition is less than $E_0$.

If the payoff of each one-member coalition were represented by a single point on the redistribution surface, then the members of each two-member coalition may choose from
among the points constituting a portion of the limit curve (line segment, polygonal chain or conic section), most frequently hyperbolae. As shown in figure 6.12, this hyperbola is based on a section of a coordinate plane with a zero (or, where appropriate, non-zero minimal) payoff to a discriminated player and a redistribution cone while we also need to meet condition (2), expressing that we only consider positive payoffs to players, i.e. the payoffs greater than the set minimal payoffs. That said, the limit points of those hyperbolae are the payoffs of one-member coalitions. The hyperbolae portions which delimit the redistribution surface and on which all possible payoffs of pair coalitions lie will be hereinafter referred to as the limit hyperbolae. Three limit hyperbolae form a limit triangle (depending on the opening of the redistribution cone and the location of the initial point, it may turn into other closed curves, such as an ellipse, a triangle composed of other conic sections, etc.).

That said, players in a two-member coalition may choose which of the points in this most frequent hyperbola to choose, and thus determine how they will distribute the relevant payoff among themselves. The following points with major properties are highlighted in these hyperbolae on figure 6.12:

- red points II\(_{Ap}\); I\(_{Bp}\); II\(_{Cp}\), where the same payoff ratio among coalition players as in the initial point is maintained;
- dark blue points II\(_{AN}\); II\(_{BN}\); II\(_{CN}\) correspond to a Nash assignment solution, i.e. the point where the product of multiplication (or geometric average) of players’ payoffs of the relevant coalition is maximal;
- green points II\(_{Ar}\); II\(_{Br}\); II\(_{Cr}\) correspond to the egalitarian distribution of payoffs among the coalition players;
- light blue points II\(_{Ad}\); II\(_{Bd}\); II\(_{Cd}\) are the points of the discrimination equilibrium;
- violet points II\(_{Am}\); II\(_{Bm}\); II\(_{Cm}\) are based on the maximum sum of coalition players’ payoffs.
- grey points I\(_{A}\); I\(_{B}\); I\(_{C}\) are the limit points of a hyperbola portion corresponding to the payoffs in the relevant one-member coalitions.

For \(E_0 = 12\); \(x_{\min} = y_{\min} = z_{\min} = 0\); \(\eta = 0.5\) and the Euclidean metric, all of these points are represented in figure 6.12, where, for \(Z=0\), certain points coincide (two additional points of the grand coalition are also plotted on the redistribution surface: the initial point in red \([6;4;2]\); the egalitarian point in green \([3.5077; 3.5077 ; 3.5077]\).
Figure 6.12: The points on the redistribution surface

A total of three points of the discrimination equilibrium, one at each limit hyperbola: II_{Ad}; II_{Bd}; II_{Cd}, lie on the redistribution surface. The index denoting a player always denotes the discriminated player, i.e. the other two players are coalition members. The coordinates of the points of discrimination equilibrium can be obtained through a solution to three simultaneous linear equations, obtained from expression (1), by gradually putting in the coordinates of the minimal payoff.

\[ x_{\min} + y + z = E_o - \eta \cdot R[ (x_{\min} - x_0); (y - y_0); (z - z_0)] \]  \( (15) \)

\[ x + y_{\min} + z = E_o - \eta \cdot R[ (x - x_0); (y_{\min} - y_0); (z - z_0)] \]

\[ x + y + z_{\min} = E_o - \eta \cdot R[ (x - x_0); (y - y_0); (z_{\min} - z_0)] \]

If we use a particular choice of all corresponding parameters, we will obtain the coordinates of the three particular points lying on the limit hyperbolae of the redistribution surface. For example, for \( E_o = 12 \), \( x_{\min} = y_{\min} = z_{\min} = 0 \); \( \eta = 0.5 \) and the Euclidean metric, it is:

\( II_{Ad} [ 0; 4.9596; 3.8626] \)

\( II_{Bd} [ 5.9307; 0; 3.8626] \)

\( II_{Cd} [ 5.9307; 4.9596; 0] \)
The coordinates of these points can also be obtained through gradual bargaining, where the individual players strive to maximise their payoffs within various pair coalitions. From this point of view, the points of discrimination equilibrium appear to be the most appropriate; each player would get the same payoff in both coalitions where the player is not discriminated.

For $\eta = 0$, the points of discrimination equilibrium coincide with the egalitarian points as well as with the points of the maximal product of multiplication: $\Pi_{Ad} = \Pi_{Ar} = \Pi_{AN}$; $\Pi_{Bd} = \Pi_{Br} = \Pi_{BN}$; $\Pi_{Cd} = \Pi_{Cr} = \Pi_{CN}$ (it is unnecessary to consider the points of maximal sum or arithmetic averages here because their sizes across the entire discrimination line is $E_o$). The relevant bargaining usually turns into an infinite loop, but the coordinates of the redistribution equilibrium points can be obtained as the average values of individual players’ non-zero payoffs. For player A and 90 bargaining stages, $E_o = 12$; $x_{\min} = y_{\min} = z_{\min} = 1$, this illustrates figure 6.13.

**Figure 6.13: The points of discrimination equilibrium I**

For $E_o = 12$; $x_{\min} = y_{\min} = z_{\min} = 0$; $\eta = 0$ and the Euclidean metric, the coordinates of the discrimination equilibrium points are as follows:

\[
\begin{align*}
\Pi_{Ad} & \quad [0; 6; 6] \\
\Pi_{Bd} & \quad [6; 0; 6] \\
\Pi_{Cd} & \quad [6; 6; 0]
\end{align*}
\]

(17)

For $\eta = 0.5$; Euclidean metric; $E_o = 12$; $x_{\min} = y_{\min} = z_{\min} = 1$; and for 120 bargaining stages, figure 6.14 illustrates how the player A’s non-zero payoffs gradually approach the x-coordinate value of point $\Pi_{Bd}$ or $\Pi_{Cd}$. 

Source: Own creation
All of the payoff points in pair coalitions considered so far lie on the limit hyperbolae (curves), which always represent an isoquant of the minimal payoff to one of the players. All the three limit isoquants represent a limit triangle, which delimits the redistribution surface. For $\eta = 0$, this triangle is composed of three straight lines, and thus lies in a plane. If $\eta \neq 0$, at least one side of this limit triangle is composed of a portion of a conic section, such as a circle, ellipse, parabola, and most often hyperbola. Such a limit triangle can no longer lie in a plane because it is a three-dimensional shape. Figure 6.15 shows the limit triangles for the minimal payoffs identical for all players in the amounts of $x_{\text{min}} = y_{\text{min}} = z_{\text{min}} = 0; 1; 2$ and $3$ (the circles represent the isoquants of the constant sums of the payoffs to all the three players in the amounts of $11; 10$ and $9$). The figure is drawn for $\eta = 0.5$; Euclidean metric; $E_o = 12$. The limit triangle for $x_{\text{min}} = y_{\text{min}} = z_{\text{min}} = 2$ is composed of a single polygonal chain and two sections of hyperbolae.
The explanations provided so far make it clear that players in pair coalitions can choose from among numerous points on the relevant limit hyperbola (curve, line segment or polygonal chain), and numerous points with special properties are available to them. The choice of one of them depends on the optimisation criteria selected by the individual players, on the cooperation ability of the players in a coalition, as well as on their ability to form a new coalition.

Grand coalition:
The grand coalition is consistent with all those distributions of payoffs (solutions) where none of the players will get the minimal payoff. This includes all those points on the redistribution surface that do not belong to the limit triangle or to any other limit curve. The conic surface delimited in this way may exhibit, as part of mapping the redistribution surface, certain major portions (areas) of that surface as well as certain major points.

Major areas:
- The areas where the payoff to two selected players is greater than in the initial point. They include three non-linear triangular surfaces with their common vertex in the initial point. For $\eta = 0.5$; Euclidean metric; $E_o = 12$ and $x_{\text{min}} = y_{\text{min}} = z_{\text{min}} = 0$, these areas are shown in figure 6.16.
- Areas of the constant sum of all players’ payoffs. To illustrate this, figure 6.16 shows the redistribution cone with an axis identical to axis $z$. The representation corresponds to $\eta = 0.5$;
Euclidean metric; and $E_0 = 12$. The maximal sum of all players’ payoffs of 12 is only reached in the initial point, i.e. at the cone vertex. Figure 6.17 includes the colour representation of the areas with the sum of payoffs gradually falling by 0.25 to as low as 9.5.

- Areas of the constant product of multiplication of all players’ payoffs. Figure 6.18 show the point of the maximal product of multiplication of all payoffs (or of the geometric average of those payoffs) and the isoquants of constant products of multiplication. It is a view of the redistribution surface in the direction of axis $z$ ($\eta = 0.5$; Euclidean metric; $E_0 = 12$; $x_{\text{min}} = y_{\text{min}} = z_{\text{min}} = 0$). The same situation, albeit for $\eta = 0$, is represented in figure 6.19 which, instead of the isoquants of constant products of multiplication, shows the isoquants of constant geometric averages (which are identical). The point of maximal geometric average coincides with the egalitarian point, the coordinates of which are [4; 4; 4]. The geometric average value in this point is 4. The isoquants’ value gradually falls by 0.25. Along the perimeter of the limit triangle, which is linear in this instance, the product of multiplication of payoffs, and their geometric average alike, is 0.

Figure 6.16: The areas where the payoff to two selected players is greater than in the initial point

Figure 6.17: The areas with the sum of payoffs

Source: Own creation
**Figure 6.18**: The point of the maximal product of multiplication of all payoffs

**Figure 6.19**: the isoquants of constant geometric averages

**Source**: Own creation

Major points:
- initial point $\text{III}_0$;
- point $\text{III}_{KS}$ with the payoff proportions in one-member coalitions, what is known as Kalai-Smorodinsky point;
- point $\text{III}_N$ of the maximal product of multiplication of all players’ payoffs, what is known as the solution point in a Nash assignment (likewise, we can also seek the points corresponding to the maximal product of multiplication of expression $(x-x_{\min})(y-y_{\min})(z-z_{\min})$, i.e. using the minimal payoff point);
- point $\text{III}_V$, with the payoff proportions of the discrimination equilibrium in pair coalitions; egalitarian point $\text{III}_r$.

All of these major points are represented on the redistribution surface for $\eta = 0.5$; Euclidean metric; $E_\eta = 12$ and $x_{\min} = y_{\min} = z_{\min} = 0$ in figure 6.20.
Figure 6.20: The major points on the redistribution surface

Source: Own creation

The initial point III₀, which is highlighted in red, also lies in summation plane $E₀ = 12$.

In Kalai-Smorodinsky point IIIₖₛ (the beige point, second from the top), the mutual ratios of players’ payoffs correspond to the ratios between the payoffs the players would get in their respective one-member coalitions. This feature can be used in designing or finding this point on the redistribution surface. As shown in figure 6.20, we can initially plot the point (the little yellow square in space) the coordinates of which correspond to the payoffs in one-member coalitions of all players $[9.2390; 8.2031; 7.4734]$ and subsequently connect the point to the start of the coordinates. Point IIIₖₛ lies where this line segment (a blue dashed line) intersects the redistribution surface. For $\eta = 0.5$; $E₀ = 12$ and $x_{min} = y_{min} = z_{min} = 0$, its coordinates are $[4.0067; 3.5575; 3.2411]$

The solution to the Nash assignment is point IIIₙ (a smaller blue point, closely under IIIᵥ), the hallmark of which is that the product of multiplication (or the geometric average) of all players’ payoffs is maximal here. Thus the cuboid determined by this point and by the coordinate system would have the maximum volume. For $\eta = 0.5$; $E₀ = 12$ and $x_{min} = y_{min} = z_{min} = 0$, its coordinates are $[4.5820; 3.7086; 2.86582]$

As concerns the green-highlighted egalitarian point IIIₑ, its equally sized coordinates represent the amounts of identical payoffs of all players. In $\eta = 0.5$; $E₀ = 12$ and $x_{min} = y_{min} = z_{min} = 0$, its coordinates are $[3.5077; 3.5077; 3.5077]$

For $\eta = 0$; $E₀ = 12$; $x_{min} = y_{min} = z_{min} = 1$, major points of the grand coalition are shown in figure 6.21.
The figure makes it clear that, in this instance, points $\text{III}_{KS}$; $\text{III}_N$; $\text{III}_V$ coincide with egalitarian point $\text{III}_r$. If the position of the initial point were also identical to that of the egalitarian point, all of the considered major points of the grand coalition would be identical. Also, in the discrimination lines where one of the minimal payoffs $x_{\text{min}}$; $y_{\text{min}}$ or $z_{\text{min}}$ is always zero, it is evident that, with the exception of the red point, which maintains the same ratio of coalition players’ payoffs as in the initial point, all the other points for all players again coincide with egalitarian point $\text{II}_d = \text{II}_r = \text{II}_N$. It is unnecessary to consider the point of maximal sum or, where applicable, the point of the maximal arithmetic average here because the sum of coalition players’ payoffs, and consequently their arithmetic average, is constantly straight on the discrimination lines $E_0$.

The positions of major points of the grand coalition approximately at the junction of the egalitarian point and the initial point, as shown in figure 6.20, are conditional on the fact that $\eta \neq 0$ (later on, we will also examine the coincidence of points at $\eta = 1$). It has become evident that if $\eta$ does not reach its limit values, the order of major points does not change either. Hence these points may be viewed as various stages of compromise between the initial point and the egalitarian point.

Point $\text{III}_V$, with the payoff proportions of discrimination equilibrium in pair coalitions may be interpreted in another way. That said, it can be achieved as a point of intersection of the curves of the lines of discrimination points of gradually increasing minimal payoffs. These curves are presented in light blue in figure 6.22.
Figure 6.22: The curves of the lines of discrimination points of gradually increasing minimal payoffs I

Figure 6.22 again shows point IIIν (in violet) and, using the same colour, also point M. These points lie at the junction where the coordinates begin. Point D also lies on this straight line, and its coordinates are formed as the averages of the coordinates of discrimination equilibrium points – see relation (16). Point D’s coordinates are [3.9538; 3.3064; 2.5751]. Also represented here are the lines of discrimination points of gradually increasing minimal payoffs. These are created if we gradually raise the minimal payoff of a selected player and always recalculate all the three points of the discrimination equilibrium. The points which lie on the newly created isoquant of the selected player’s minimal payoff will gradually, as the minimal payoff will increase, form a line, leading up to the payoff point of a one-member coalition. These three lines will intersect at the point (the inaccuracies in the figure, making these lines fail to intersect precisely at point IIIν, are due to the fact that the results have been achieved using approximate numerical methods).

Figure 6.23 shows the same situation as figure 6.22, albeit from the view in the direction of the link of points M, IIIν, D and the start of the coordinates (the violet dashed line segment in
The fact that the points of lines of discrimination points of gradually increasing minimal payoffs are reflected in the coordinate axes means that these lines may be achieved as sections of the redistribution surface by means of three planes determined by the link of points M, III, D and by the individual coordinate axes.

*Figure 6.23: The curves of the lines of discrimination points of gradually increasing minimal payoffs II*

Source: Own creation

The mapping of the redistribution surface will continue. Its purpose is to prepare qualified underlying data for the decisions to be made by particular participants involved in distribution or redistribution tasks.

A well-described and mapped redistribution surface makes it quite easy to combine multiple criteria to choose the payoff distribution represented by a point on the redistribution surface. For example, players may require that (the examples have been selected for \( \eta = 0.5 \); \( E_0 = 12 \) and \( x_{\min} = y_{\min} = z_{\min} = 0 \): the amount distributed do not fall to less than 11 or 10, and two selected players will hold better shares than those they hold in the initial point, or
the middle player (if each of the players holds a different share in payoffs in the initial point, then the middle player will be the one who holds no extreme share, i.e. neither the highest nor the lowest share) will keep the payoff corresponding to the initial point, or players will choose one of the compromise points of the grand coalition, lying between the initial point and the egalitarian point.

The following table shows how the sum and the geometric average of players’ payoffs change in major points of the grand coalition:

<table>
<thead>
<tr>
<th>Point definition</th>
<th>Summa of payoffs</th>
<th>Geometric average payoffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial point III(_V)</td>
<td>12,0000</td>
<td>3,6342</td>
</tr>
<tr>
<td>Nash solution point III(_N)</td>
<td>11,1566</td>
<td>3,6518</td>
</tr>
<tr>
<td>Discrimination equilibrium point III(_V)</td>
<td>11,0971</td>
<td>3,6432</td>
</tr>
<tr>
<td>Kalai-Smorodinski point III(_KS)</td>
<td>10,8053</td>
<td>3,5882</td>
</tr>
<tr>
<td>Egalitarian point III(_E)</td>
<td>10,5229</td>
<td>3,5076</td>
</tr>
</tbody>
</table>

*Source: Own creation*

**Summary and conclusion**

In the preceding chapter we have spoken about precise definition or more accurate concept of rational behaviour of players. We are making a sense of rational behavior could be perceive as a maximization of utility, or expected-utility maximization just us in work by J. Neumann and O. Morgernstern. In the case of moral decision we have suggested the utilitarian criterion as the appropriate rationality criterion, involving maximization of the average utility of all individuals in the society using theory of redistribution systems and so it has been in this paper written. Finally, in the case of game situations we have argued that we need a concept of rational behavior yielding a determinate solution *commonly acceptable equilibrium* for our redistribution system. But this will require significant further efforts in our analytical tools. Our preceding discussion shows that, in a redistribution system, it is almost always possible for rational players to reach an efficient (Pareto-optimal, *redistribution surface*) outcome. In a discrimination game in general this is not possible, because of discrimination solution; but, even so, a surprising amount of cooperation is possible in most cases. There is a conflict of interest between three players, this is a sufficient explanation for a behavioural conflict between them - as if no explanation were needed for the players' inability to reach a peaceful compromise *commonly acceptable equilibrium* that would benefit all of them. In our view any major deviation from Pareto-optimality always requires a detailed explanation, such as unenforceability of agreements, barriers to communication, ignorance, and etc.

All possible sets of the players in redistribution systems will form coalitions to save their common interests against all another players, so that the game will become a complicated network of huge volume of mutually overlapping coalitions in an *elementary redistribution system* in a pluralistic model of society. Game theory always improves itself by answering questions from real-life. Today we divide game theory research on the basis of the players’ information knowledge as symmetric information, but we often ignore the information losing information problem. The rational behavior of a player in a game requires his calculation of
the other players’ behavior. If the opponents are rational, the study of their actions requires build up the rational strategy of the first player. The information must not be confused with the difference between games with perfect and with imperfect information. Under our definition of elementary redistribution system must involve complete information, but it may involve either perfect or imperfect information.
7. Some Current applications in society

In this section, we will present some current societal applications of game theory, with respect being given to their contextual character and employing theoretical analysis of games as part of redistribution systems. These applications are expressed at the level of concepts, i.e. they do not reach the level of a mathematical model. In this section, we will suggest three conceptual applications on the problem of corruption.

7.1 Definition of corruption

Corruption is a term which is named after a specific contract at least two people - the corrupt and the corrupting. While the corrupt promises that he will provide a service (and performance within this service can be a tangible and intangible) for corrupting and corrupting is committed for this service somehow reward (reward again can have tangible and intangible nature).

Within such context corruption is the result of human action (Ackerman 1999, Otáhal 2006a, Lambsdorff 2007). People are guilty of corruption, because corruption brings them satisfaction (utility). Therefore, corruption from the perspective of human action does not constitute an economic problem. If the corrupt and corrupting interact reach a higher level of utility, it is from the perspective of economics of mutually beneficial exchange (Kohn 2004). The key problem of corruption is behind the implicit assumption that there is the third party which does not wish the agent, with whom it is in a contractual relationship, to be corrupt. Corruption is not in the third party’s interest. Thus, the policy recommendation comes out from the third party’s effort to set an arrangement of contractual terms or rules developing a system of incentives forcing the agent not to take rewards for providing services that the third party does not wish to sell. This is the key point of all economic policy recommendations resolving problem of corruption. Hence, a contractual relationship between a corrupt agent and a corruptor is not an economic problem connected with corruption. An economic problem connected with corruption is the third party’s effort to make some kinds of contracts among agents and others prohibited (Otáhal 2007b, pp. 167).

Yet believe that our definition is consistent with the definition of corruption is often mentioned (Nye 1967, 418): „behavior which deviates from the normal duties of a public role because of private-regarding (family, close private clique), pecuniary or status gains; or violates rules against the exercise of certain types of private-regarding influence. This includes such behavior as bribery (use of reward to pervert the judgment of a person in a position of trust); nepotism (bestowal of patronage by reason of ascriptive relationship rather than merit); and misappropriation (illegal appropriation of public resources for private regarding uses)“. In contrast to this definition, however, we believe that corruption does not occur only in the public sector, but wherever a party of corrupt contract can violate legal or moral rules, which is committed by the third party (see below).

7.2 Corruption as a problem of paralel redistribution system

Economic theory deals with corruption either in the principal-agent theory (i.e. Becker a Stigler 1974, Benson a Baden 1985, Klitgaard 1991, Shleifer and Vishny 1993, Otáhal 2007b) or in the theory of rent-seeking (i.e. Tullock 1996, Labsdorff 2002, Wallis 2004). Nevertheless, these two major economic theories that deal with the problem of corruption face
some difficulties (Otáhal 2010). The principal-agent theory has difficulties accounting for the environment in which the agents offering and accepting corruption operate as well as explaining the importance of the agents for the survival of their environment. The rent-seeking theory, on the other hand, finds it difficult to establish socially effective legislation and ways to determine the barriers to entry that motivate agents to behave corruptly. Both problems, however, are central to solving the problem of corruption. Lacking the knowledge of the agents’ environment (system) and their significance for the survival of the system, the theory cannot define incentives that would discourage the agents from corrupt behavior. If the rent-seeking theory does not determine the barriers to entry that motivate agents to behave corruptly, it cannot determine the proper legislation that would deter corrupt behavior and lead to general prosperity. Both problems can be explained and solved by theory of redistribution systems and its part theory of parallel redistribution games. This section will briefly describe the basics of the theory.

Theory of redistribution systems is based on the fact that most social systems, i.e. an environment in which people exist, have the character environment in the environment where is redistributed income and wealth or a direct source of goods that the environment is available in. For purposes of this text will be redistribution defined as a situation where a person is rewarded differently from their performance (Valencík 2008). The redistribution has some objective reasons. This is particularly the facts that in any system necessarily live people, whose economic performance or the ability to produce goods and collect the goods necessary for his living is low, or zero. Typical examples are children, elderly, sick, disabled, etc. If a society wants to ensure the life of these persons (groups of persons) must redistribute necessarily - some people take resources and goods and other giving. History shows that a given redistribution occurred since the beginning of human existence. After all, otherwise humanity would survive at all. From a philosophical point of view we can say that a given redistribution is a manifestation of humanity, thanks to this redistribution people meet in the I-You mode, while in this mode develops a person (personality) of individual people - people are learning collaboration, cooperation, solidarity, help. Generally redistribution helps to socialize the individual people. Man encounters the redistribution from his birth, takes it for granted, as something given to him. Redistribution of this environment is man's own perspective (immanent), philosophically, we can write that a person is born in (is casted to) the redistribution environment. Potůček (2005) therefore rightly notes that all the economic and social systems are currently redistribution systems. The redistribution in favor of people who needs it can be called as necessary redistribution (Wawrosz 2011). Although the criterion of needed redistribution as arbitrary we believe to be important. Apart from necessary redistribution it is possible to meet with cases of redistribution in which a person who is redistributed in favor does not need the redistribution - such redistribution can be called as unnecessary redistribution. Redistribution hence provides environments for corruption, because in them there is a reallocation of funds other than those corresponding to performance of its members, which also encourage members to redistribute through bribes and to rent-seeking.

Economic theory in analyzing the issue of redistribution necessarily has to note redistribution reduces the efficiency of the system. It is quite logical - it is also a redistribution of certain associated costs. Sources used to redistribute it cannot be used to produce new goods, thus not contributing to the growth of system performance. In particular, redistribution, however, also discourages from productive behavior. He/her is at the expense of redistribution going on and who is losing the fruits of his/her effort is not motivated to economic activity hence tend to rent-seeking. The disincentives, however, leads to a decline in the performance of the system and therefore to decrease the amount of resources that can be redistributed within the system. Likewise, the person in whose favor the redistribution is done, is not if it is income (or assets
and resources) available through redistribution, too motivated to be economically active and to contribute to improve the performance of the system. Given the fact - the more redistribution within the system, the smaller the system performance is usually interpreted as a dilemma (the trade-off) between equality and efficiency.\textsuperscript{57}

Necessary and unnecessary redistribution must be governed by certain rules, which define, for whose benefit and at whose expense is to be redistributed to resources or goods and to what extent, to be redistributed, etc. These rules may be formal (legal) and informal character. It is important that the necessary and unnecessary redistribution is carried out in accordance with the standards applicable in the society (organization), i.e. no violation of the rules governing the society (organization). Regardless of the nature of redistribution can then be given redistribution (redistribution system) to mark the legal system of redistribution - redistribution occurs in accordance with the standards of the company. It should be stressed that these rules do not only have in general binding rules (laws, regulations, decrees, etc.), but can be a type of informal rules of customs, traditions, etc. So the word “legal” in our meaning cannot be here related only to the recognized state law.\textsuperscript{58}

Besides the legal systems of redistribution, however, there are other forms of redistribution - the parallel redistribution systems. The basic characteristics for a parallel system of redistribution are:
- In a parallel redistribution are violated the rules that exist within the legal system through redistribution act, which in the legal system of redistribution is not allowed.
- Redistribution that occurs in parallel redistribution system is hidden and secret.
- Redistribution in favor of members of a parallel system of redistribution is happening at the expense of the original redistribution system within the parallel system of redistribution exists. Shortly, redistribution in favor of members of a parallel system of redistribution represents rent-seeking game.
- Members of parallel redistribution system strive through the system to increase the remuneration paid to them. This remuneration may take the form of cash or in kind, may be to gain an advantage (position) - for example, easier access to resources, goods (including information, etc.), so this position thanks to members of a parallel redistribution of higher revenues or lower costs than if they did not participate in parallel play.

For characteristic parallel redistribution system can thus indicate that each system of parallel redistribution game corresponds to a specific type of disruption of the institutional framework - a parallel redistribution system (play) violates the legal institutional arrangements of redistribution system, and this disruption is happening covertly, i.e. violating aspire to him by other persons (players) and could not learn to failure to intervene. In terms of new institutional economics (Furubotn and Richter 2005, Otáhal 2009b) parallel redistribution can be described as a manifestation of the game opportunistic behavior - individual entities behave differently than the respective institutions. Corruption can then be considered as an example of parallel redistribution game - the aim of corruption against the rules to reallocate resources, which could have a third party (those not participating in the redistribution of the contract) for the benefit of participant’s corrupt contract.

\textsuperscript{57} In theory, the dilemma is described by Okun (1975). The dilemma, including the text as shown in this figure which expresses the dependence is presented for instance in Musgrave (2004), Stiglitz (2000). Empirical studies can then mention such a study by Kuhn and Riddell (2006), which for example different unemployment insurance systems in Canada shows that systems with higher unemployment benefits lead to more unemployment and prolonged unemployment.

\textsuperscript{58} For the case of explanation of corruption problem within informal institutional environment, see Otáhal (2009a).
7.3 Theory of “hyper-corruption”

In the first approximation one can say that hyper-corruption is the formation of relations based on the “corrupting of the corrupt”, respectively forced corrupt behavior of those that have committed corruption or similar forms of behavior. For other theories of corruption see Becker and Stigler (1974), Shleifer and Vishny (1993), Lambsdorff (2002), Wallis (2004), or Otáhal (2007b). It starts where the person who caught someone in the act of corruption does not face this form of the breaching of generally accepted principles by expanding the informedness of others about what occurred, but on the contrary forces the person that was caught into behavior that also, and usually even more severely, breaches generally accepted principles. But this is only the first step in the formation of hyper-corruption. Relations based on mutual covering-up have the tendency to expand quickly and grow through the corresponding system, penetrate the formation of its representation and institutional components, including and especially those institutional components that are supposed to prevent corruption and other forms of the breaching of generally accepted principles. For pioneering contributions to the theory of regulation or the theory of regulatory capture, see Stigler (1971), Peltzman (1974) or Schwarz (2001).

The legal regulations governing bribery contained in § 331 to § 334 of the Criminal Code are based only on the fact that only persons who accept a bribe or the promise of a bribe or, conversely, only persons who give or promise a bribe, are committing the corresponding criminal act. The legal regulations governing blackmail contained in § 235 speak of the fact that the corresponding criminal act is committed by the person who forces another person with violence, the threat of violence or the threat of other severe damage to do something. It is clear from the above stated that in the area of legal regulations there are considerable reserves, as far as disciplinary action against structures based on mutual covering-up and the forms of blackmail that exist in the given case are concerned. It is also clear that hyper-corruption is only affected minimally by the existing methods of the battle against corruption. The existing forms of the battle against corruption practically cannot weaken the structures based on mutual covering-up that are linked to corruption and blackmail. It is no wonder that education in the given area is also ineffective, because it is quite remote from that which is actually taking place in reality.

The original schema based on expanding the prisoner’s dilemma type model with the effects of credibility capital assumes that the blackmailing of a player that has committed an act of behavior breaching generally accepted principles is effective only if sufficient influence of this type of capital exists in the corresponding community. In other words, if the influence of credibility capital faded, the decreasing of the effectiveness of blackmailing on the basis of its loss would occur, along with weakening of the structures based on mutual covering up. These situations can occur in various periods and their existence is provable. Usually, however, the development is different, especially in places where the institutional system is significantly penetrated with structures based on mutual covering-up. Here the structures based on mutual covering-up usually preserve their influence by increasing the penalties for minor breaches of generally accepted principles, and blackmailing itself is then based on utilization of a double standard in the judging of the behavior of someone who in accordance with the process of the structure’s genesis needs to be pulled into the structure, or – conversely – of someone who could come across one of the cases of the breaching of generally accepted principles by the structure or one of its players and would want to inform the other players in the system. From the above stated ensues, among other things, that the model that we have provided makes it possible to formulate and operationalize a number of indirect indicators of the degree of the influence of structures that are based on mutual covering-up.
Structures based on mutual covering-up usually function in complex communities that have the form of hierarchical social systems. In these systems, in which some redistribution systems have a specific function, payouts can be acquired not only from the redistribution system itself, but also from its environment, respectively other redistribution systems. (Because the “it’s easy to spend other people’s money” principle applies here, the conditions for the formation of structures based on mutual covering-up are very favorable in this area and it is here that they frequently start to flourish.) Structures based on mutual covering-up can also be formed “cross-wise” among various redistribution systems, resulting in cross-coalitions or even entire social networks growing through the entire hierarchical system. The existence of cross-coalitions and the from them evolving social networks growing through hierarchical systems manifests itself by the fact that the predetermining of the formation of coalitions occurs the same way in more cases. According to how and where the predetermined coalitions form, it is then possible to map the contours of structures that are based on mutual covering-up. Analysis of the negotiations process in a “clean” redistribution system makes it possible to reveal and describe various strategies that people (as players) would use if no external influences acted on the system. The better we are able to describe this process of the use of strategies and the learning of strategies by individual players, the more clearly it will be possible to identify when and how a player is pulled into the formation of structures that are based on mutual covering-up. A player usually tends to be pulled into the formation of structures that are based on mutual covering-up by being told “in public interest” during negotiations that “some information is only for some people” and that certain breaching of rules is “completely normal” because “everyone does it”, including persons whom he trusts. A player drawn this way into the formation of structures that are based on mutual covering-up gradually comes to terms with that about which he would have said earlier that he would never come to terms with; he begins playing the game “for the better persons” and those that have the right “to a different truth” than the one that is “for the majority” because “the majority does not deserve the real truth”. This also concerns demonstrations of how that which is “invisible” allows itself to be seen in various ways. One just has to learn how to read it all. And a good theory is necessary for this.

7.4 Theory of structures based on mutual coverage of the Mafia type, and their empirical content

We usually understand the term “Mafia” as something with a strongly negative effect. In our case, as we have mentioned before, we use the term “structure based on the mutual coverage of the Mafia type” as a technical term, and therefore we consider it necessary (at least at this stage) to avoid the negative connotations because they may be misleading. The term “Mafia” is so significant that it is covered by extensive popular and scientific literature. One of the most famous cases of the use of the word “Mafia” to describe the social reality in the context of the current situation was the statement rendered by M. Benešová regarding the “Judicial Mafia”, which led to quite interesting and complicated legal implications. The case is even covered by a comprehensive (but unfortunately not quite updated) entry at Wikipedii. Also in standard communication describing the current situation in the Czech Republic, people tend to use the word “Mafia” quite frequently. Unlike at the place of the origin of this term, we often use it to describe some institutional structures of a society. Such an overuse of the term or word “Mafia” may however be quite misleading. For further cases, see Otáhal (2006b, 2007a).

59 http://cs.wikipedia.org/wiki/Kauza_Justi%C4%8Dn%C3%AD_mafie
It is our intention to describe - based on the brief presentation of the theoretical background - the concept of the structures built on the mutual coverage of the Mafia type, and will compare it with some of the phenomena associated with the preparation and implementation of reforms in the public sector (Šnajdar a Valenčík 2011). The Mafia type structures are characterized as follows:

1. There are more such structures within a certain public space, they compete with each other but are able to come to a mutually acceptable agreement and keep it (better than other entities). Each of the Mafia type structures existing within the social space is the outcome of the process of natural selection, and is therefore resilient and adaptable. The ability to keep the agreement is based on:
   - The significant difference in payments resulting from the existence vs. non-existence of a jointly acceptable agreement. (Any war between individual Mafia groups is devastating for all of them.)
   - The experience based on the conditions and consequences of the existence of structures built on the mutual coverage of commonly accepted principles, and therefore the elimination of such structures from the area of its operation. Tendency to a commonly acceptable agreement therefore faces no overlapping as regards the negotiations of individual Mafia type structures.

2. They violate a precisely defined type of the generally accepted principles applicable within the social space, while they themselves (as collective bodies of a structure type) and their individual players forming the inner structure comply with the commonly accepted principles (there is a very strong tendency to enforce these principles within and between individual structures). From the violation of the generally accepted principles within the social space in which they operate, they acquire resources that enable their reproduction.

3. They have a high degree of resistance to sanctions in the event that the rules of the wider community are violated. This is based on the fact that those who violate the principles may be blackmailed and pulled into the structure of the Mafia type. The higher the penalties are from the outside (e.g. imposed by the state), the more coherent is the structure of the Mafia type and the entire system of Mafia type structures, and the easier it is to find those who can participate in these structures. This is no longer possible inside a Mafia structure. Here are the penalties for the violations of internal principles of harsh and effective.

4. The system of the Mafia type structures tends to be very durable and enclosed. Individual structures of the Mafia type that create it will not allow anyone among themselves. One of the manifestations of Mafia type structures is that from the outside, those who enter these structures behave immorally, while from an internal point of view there is a high degree of the compliance with moral principles (which many communities of another type could envy). These structures can only operate on a long-term basis if the social space from which they obtain funds for their operation is sufficiently large and has sufficient production capacity. The production capacity of a social space must not be significantly undermined by the functioning structures of the Mafia type. From this perspective, a system of structures of the Mafia type may be interested in the good functioning of the state or states within the social space in which it operates.

A completely different situation arises if the system of structures based on mutual coverage penetrates the state structures. This leads to the following consequences:
   - Permanent crossing the boundaries of what can be violated under the generally accepted principles, based among other aspects on the competition of individual structures of this type within a social system.
   - Increasing decrease in the production capacity of the social space.
Both aspects lead to the situation of an intensified clash between individual Mafia type structures, which operate within the given social space and are intertwined with state institutions. In such a case, the situation inevitably leads to a war between Mafia type structures, which can take two extreme forms:

- The war ends with the victory of one of them, which then becomes the constructive force. It will guarantee the enforceability of the generally accepted principles that are essential for the society’s production capability, and at the same time reveal and punish the representations of other Mafia type structures. A necessary condition is to gain public confidence (i.e. the confidence of those not incorporated in the Mafia type structure). As a general rule, the period of positive reforms follows.

- The wars among Mafia type structures, which repeat again and again owing to the inability to achieve an increase in the system’s production capability through the necessary reforms, leads to a situation when the public is drawn into the process of finding solutions. In such a case the development is difficult to predict and it is historically conditioned by what the public is willing to accept as an ideological and institutional concept or project, and by who is actually able to present such a concept or project. Even the creation of the relevant concept or project is affected by the surviving Mafia type structures which attempt to influence it.

The existence of Mafia type structures therefore requires a strict separation of the following three types of laws:

1. Social (legislatively anchored) laws which members of the Mafia type structures may or even must violate, for the following two reasons:
   - So that they are able to draw resources for their own benefit from the respective social system (as a general rule, these are various forms of criminal activities).
   - So that the Mafia type structure is able to defend its identity against persecution by state authorities or in any mutual conflicts.
2. Own (morally anchored, but very strictly enforced) laws that must be strictly followed, similarly as the related types of agreements entered into within or among Mafia type structures based on mutual covering.
3. Social (anchored in legislation, or only morally) laws conditioning the effective functioning of the social system and its sufficient production level, without which the Mafia type structure would be unable to draw sufficient resources from this system for its benefit. These are laws that the Mafia type structure does not violate and even usually provides significant assistance in their protection.

If a clearly defined and respected boundary is created between these three types of laws, the whole social system rests in a relative balance. Because the Mafia type structure based on mutual covering is built on the basis of identified (or in some cases enforced) violation of the generally accepted principles, because its own structure is based on the mutual coverage of the violation of a certain type of generally accepted principles (formulated above in clause 1), it is able to very effectively guarantee the functionality of the principles and laws formulated in clause 2 and 3. Not all types of structures based on the mutual coverage of the violation of generally accepted principles have “advanced” to such a high level.

If, for example, we look at the recent developments in the Czech Republic, we will see that the structure based on mutual coverage do not meet the requirements for the type that we have defined as Mafia type structures. This especially concerns clause 3. As pointed out in the Annual Report of the Czech Security Intelligence Service (as well as the indirect identification using the concepts making use of the game theory), the laws necessary for the effective functioning of the social system are not only violated, but the individual structures based on the mutual coverage of the violation of generally accepted principles have increasingly been violating these laws under the influence of mutual competition. Thus, the problems of the social system functionality have been dramatically escalating.
Note that from the methodological point of view the concept of Mafia type structures based on the mutual coverage (as compared with the reality in the Czech Republic) made it possible to show significant differences between this type and the type of structures based on mutual coverage, currently existing in the Czech Republic. These can ideally be described as structures based on the mutual coverage of the violation of generally accepted principles, that face no constraints. There are no constraints (rules, regulations or similar), which would restricted the escalated violation of the generally accepted principles by the structures of this type. Meanwhile we do not have a suitable terminology to describe them. Such a situation is unstable. In this respect, the theory may:

1. Anticipate a variety of possible future developments.
2. Identify and present the typical indications associated with the genesis and effects of the structures based on the mutual coverage of the violation of generally accepted principles, that face no constraints.

Summary and conclusion

Economic theory deals with corruption either in the principal-agent theory or in the theory of rent-seeking. The principal-agent theory has difficulties accounting for the environment in which the agents offering and accepting corruption operate as well as explaining the importance of the agents for the survival of their environment. The rent-seeking theory, on the other hand, finds it difficult to establish socially effective legislation and ways to determine the barriers to entry that motivate agents to behave corruptly. Both problems, however, are central to solving the problem of corruption. Lacking the knowledge of the agents’ environment (system) and their significance for the survival of the system, the theory cannot define incentives that would discourage the agents from corrupt behavior. If the rent-seeking theory does not determine the barriers to entry that motivate agents to behave corruptly, it cannot determine the proper legislation that would deter corrupt behavior and lead to general prosperity. Both problems can be explained and solved by theory of redistribution systems and its part theory of parallel redistribution games. The theory of redistribution systems and parallel redistribution games solves these problems by:

a) defines the environment in which corruption occurs as a legal system of redistribution
b) defines a parallel redistribution system (the game) as a system in which violations of legal rules redistribution system and defines corruption as an example of a parallel redistribution games c) based on the definitions explained concludes that reducing the legal redistribution eliminates stimulation agents to behave in a corrupt
d) is able to describe the features that should have rules to discourage agents from corruption.

Following the previous the theory of “hyper-corruption” as an application of theory of parallel redistribution games was revealed as the result of the development of the theory of redistribution systems in several directions, which met in a certain area, at the same time opens the path of the further development of the theory in various directions. This concerns especially the following areas:

- Adding more elements to the payout matrices that describe the consequences of the consideration of various alternatives by both the subjects that are being blackmailed as well as by those that are doing the blackmailing in the formation of structures based on mutual covering-up. The goal is to make the list of all consequences of this or that decision as complete as possible and also well-structured.
- It is also possible to identify more alternatives that are possible for players in various situations, from the perspective of the expression of their behavior within the structures that are based on mutual covering-up as games in an explicit form.
- A more difficult task is reflecting the course of the game (moves that are made later) into the establishing of the value of the specific consequences of this or that decision in the early moves.
- Find suitable symbolism that has considerable importance during the subsequent formalization and mathematization; it is still possible to improve much on the symbols and symbolism that we use.
- The most difficult tasks are then in the area of mathematization and possibly also the axiomatization of sub-models and their interconnection; among other things, also the interconnection of the model of structures that are based on mutual covering-up and the model of parallel redistribution games is concerned here.

The greater the progress made in the resolution of these questions, the greater the applicability of the theory for dealing with the given issues in practice. Practical application can be expected in the following areas:
- Education of the public (where combining theory and practice usually begins), so that everyone is able to properly evaluate that which he or she comes across so that he or she does not become a victim and instrument of hyper-corruption and is able to react to its manifestations in a qualified manner.
- Legal regulations, so that the Criminal Code punishes actions that have the greatest social danger, instead of contributing to the creation of an environment in which anyone can become blackmailable.
- Politological reflection, which would comment in a qualified manner that which is taking place in connection with the declared battle against corruption.

We also consider elaboration of the theory of structures that are based on mutual covering-up within the scope of institutional economics and theory of institutions as an independent dimension from both a theoretical as well as practical perspective.

Theoretical analyses of structures based on the mutual covering-up of violations of generally accepted principles of the Mafia type - hidden parallel redistribution games - show that the situation in the Czech Republic is evolving dynamically and growing into instability:
- Penetration into institutions of structures based on the mutual covering-up of violations of generally accepted principles continues.
- These structures are using ever stronger (more invasive) means.
- Competition between these structures is escalating.
- The amount of funds that they gain and try to gain from the public sector in favour of private lobby groups is on the increase.
- The impact of their influence on the inefficiency of the public sector grows.

The theory is not powerful enough to be able to clearly predict everything that is happening. It can, however, describe various alternatives of future development, which can be regarded as one of the current missions. Above all, however, it has the unique opportunity to "be at the frontline" and apply its theoretical tools to real-life developments so that it can further improve and calibrate these tools.
8. Final Note

Over the past few years, we have gradually refined, in a series of related contributions, the analysis of conflicts, problems and social contexts that accompany the public sector reforms. In parallel, we have developed and honed the tools of theoretical analysis which, on the one hand, can make ever greater use of the predicative power of the mathematical approach, whilst, on the other hand, ”reveal” what is trying to remain hidden and what, in the absence of adequate theoretical tools, we only suspect. If we see education as one of the ways that theory can be used in practice, then in this regard alone the approach presented herein has found some application.

It is probably true to state that the further the theory evolves as far as the analysis of the given issue is concerned, the greater will be the role it shall play and the less dramatic will be the process of the society coming to grips with this issue. The theory’s growing readiness to deal with questions that we have tried to thematise is evidenced, among other things, by the number of contributions made by younger authors presented at the 14th International Scientific Conference titled Human Capital and Investment in Education (Heidu 2011; Heissler, Wawrosz 2011; Grochová, Otahal 2011b; Jindřichovská 2011; Spalek 2011b).
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10. Summary

The main goal of the book is to show how redistribution systems (meaning systems where remuneration of the members of the system differ from their real productivity) influence people behavior. All human systems (family, firm, organization, society, state) are redistribution systems – at least some necessary redistribution must be done in favor of child, old people, ills and so on. That is why redistribution must be seen as one of the key factors influencing human behavior. From the point of view of game theory human action can be described as continual row of games (conflict situations) where the opinions and interests of the people clash. In some moment person can participate in many different games and his/her behavior (strategy) in one game can be influenced by his/her reward and losses from the other games. Because human behavior takes place in time it is also influenced by the reward from the future games. Present and future games influencing behavior of the person in some game can be of different type – for instance behavior of person in the situation of prison dilemma can be influenced by his/her reward from present and future game that have characters of stag hunt or battle of sex. What we want to say is that human behavior takes place in some present and future context (and is, of course influence also by past context – e.g. behavior of the people in previous games). So it is insufficient to analyze human behavior only from the point of view of some game. The behavior must be analyzed in such way including context of studied game. The theory of contextual games is analytical tool helping to better understanding of human behavior. The book describes main characteristic of the theory of contextual games and its practical using (for instance in the case of corruption, wars against “mafia”).

The book consists of 7 chapters and final note. First is extended introduction describing in details goals of the books. The results of the presented research can be understood, as being something that is fundamental to a person mastering game theory as an art of war – to be able to respond, in a timely and effective manner, to various game situations that he/she finds him/herself in. Study of this text will only serve the abovementioned purpose if the reader combines his/her understanding of the models with the conscious recognition of specific situations that occur in real life. Second view of the text that is offered is that it “offers up a mirror” (which is a somewhat overused expression in the Czech Republic, but appropriate in the context at hand) of how we behave in the games we participate in, which are played around and with us, which we are drawn into, and during which our weaknesses manifest themselves. Man, believing himself to be the ”Lord of Creation”, often does not realize that his behavior is frequency governed by very primitive laws, which he is subordinated to without even realizing it. The results of our theoretical research will thus allow him to look at himself from a slightly more unbiased viewpoint than his own illusions about himself would allow.

The following text can be also seen from the (third) point of view, uncovering what is not seen via what is. This is because of the fact that real life involves the playing of not only those games of which all players are informed, but also of games characterized by varied levels of information provided to the participating players. However, some players often try to conceal what is happening, and this has certain implications for the games, of the course of which the other players are informed. A good model will enable us to reveal what used to remain hidden.

Last but not least (fourth), the text of the monograph is devoted to a critical reflection on the current reforms, particularly those focused on a change in the systems of funding social investment and social insurance (education, health care, pension insurance). It shows how and
why their purpose was inverted; instead of resolving the problems, the manner of preparing and implementing these reforms has only escalated them.

Second chapter brings the analysis of the 14 conferences on the theme Human Capital and Investments into Education, held during the years 1998 – 2011. The conferences point out a number of interesting findings about development of the theory, interdisciplinary approach and possibilities and barrier of its connection with the present social practice:

- On one side it is clear that the theory not only can, but even must if it wants to be full-scope, utilize theoretical instruments also for reflexing of the relationship of its own development and the social practice. Even in so complicated and enmity area like reforms of funding of social investing and social insurance systems.
- On the other side it comes to light that even such concept does not guarantee durable utilization of the theory findings and that those who have the ruling power for a certain time can act based on motivation different from findings of a qualified analysis of social reality. A good theory must maintain its ground and should try to be such in two meanings:
  - Both in good times (when the way for implementation of its findings is open), and in times less fortunate (when it is overlooked or rejected) it must approach its subject matter with the use of theoretical instruments and develop the instruments so that their using enable an efficient theoretical analysis of reality.
  - It should not select only issues with already existing proven theoretical instruments for their solution but it should endeavor to develop or to take over in a usable form all theoretical instruments necessary for solution of the issues it faces.

Counter to the selective concept (both as to selection of themes, and as to theoretical instruments), the complex concept must be set. Counter to the narrow specialized approach (moving in context of one discipline), interdisciplinary approach must be used (allowing to use in team work those theoretical disciplines necessary in the specific areas, including connection of the theoretical solution with practice. Counter to the local approach (which is limited to a certain specialized organization or an academic institution), an approach open to cooperation at the national, supranational and global level because the wider cooperation enables availability of the needed expert capacities and the natural authority of science as such.

In the subsequent section we will present the current analysis of the social context of the reforms in the funding of social investment and social insurance. We will demonstrate that if we want to understand what is happening, we must uncover the role of the phenomenon, which we have called structures based on the mutual covering-up of violations of generally accepted principles. As we shall see below, this notion and, in particular, the analysis of the phenomenon which is grasped by this notion, plays a key role in understanding what is the aim in society.

This chapter titled Criteria of Correctness of Social Investments and Social Insurance Reforms was based on the hypothesis that the theory should not avoid controversial issues and controversial themes if it wants to be reflexing of social processes with practical use. When, however, it starts dealing with controversial themes it must, the more, comply with the principles of scientific approach. It is not anything easy because suitable theoretical instruments might not be available. In the context of reforms in the field of social investing and social insurance prepared and forced in the CR at present, namely in relation with the reform of the pension system, we have tried to present some procedures and concepts which will enable assessment of their correctness.

We have provided evidence of the many question marks hovering over the correctness of reforms in the Czech Republic, which can be explained by the fact that this area is subject to a
phenomenon that we call structures based on the mutual covering-up of violations of generally accepted principles. In subsequent chapters we will try to develop tools for analyzing (and, in some sense, “making visible”) this phenomenon. The necessary theoretical tools were developed in the course of solving two problems:
- Analysis and description of contextual games.
- Analysis and description of games in redistributive systems.
We will address this issue in the following chapters.

The fourth chapter with title Contextual games and identification of structures based on mutual covering-up can be seen as one of the key parts. It is based on the fact that games that are played in real life are connected. We play every game, insofar as we realize it, in a certain context. This enables the apparent differences between theory and the experiment to be explained, without abandoning the concept of man as a subject making rational decisions. In this chapter we focused on two types of the contextual linking of games:
- By means of the sum of pay-offs;
- In the form of connected dilemmas.
This allowed us to reveal some of the characteristics of structures based on the mutual covering-up of violations of generally accepted principles.
The interconnecting of different games can have many forms. In terms of ”making visible” the structures based on the mutual covering-up of violations of generally accepted principles, of significance are particularly such interconnections in which the original game (from the viewpoint of coalitions and the distribution of pay-offs) is influenced by a hidden dominant game. In the next chapter we will discuss the development of theoretical tools that enable the relationships between the original game and hidden dominant game to be analyzed.

In the fifth chapter we deals with games of the Tragedy of Common Ownership type which we see as the key to unveiling the structures based on the mutual covering-up of violations of generally accepted principles. The chapter emphasizes that which was revealed as the result of the development of the theory in several directions, which met in a certain area, at the same time, opens the path of the further development of the theory in various directions. This concerns especially the following areas:
- Adding more elements to the payoff matrix that describe the consequences of the consideration of various alternatives by both the subjects that are being blackmailed as well as by those that are doing the blackmailing in the formation of structures based on mutual covering-up. The goal is to make the list of all consequences of this or that decision as complete as possible and also well-structured.
- It is also possible to identify more alternatives that are possible for players in various situations, from the perspective of the expression of their behavior within the structures that are based on mutual covering-up as games in an explicit form.
- A more difficult task is reflecting the course of the game (moves that are made later) into the establishing of the value of the specific consequences of this or that decision in the early moves.
- Find suitable symbolism that has considerable importance during the subsequent formalization and mathematization; it is still possible to improve much on the symbols and symbolism that we use.
- The most difficult tasks are then in the area of mathematization and possibly also the axiomatization of sub-models and their interconnection; among other things, also the interconnection of the model of structures that are based on mutual covering-up and the model of parallel redistribution games is concerned here.
The sixth chapter is devoted to the foundation of the Theory of Redistribution systems. In the preceding chapter we have spoken about precise definition or more accurate concept of rational behavior of players. We are making a sense of rational behavior could be perceive as a maximization of utility, or expected-utility maximization just us in work by J. Neumann and O. Morgernstern. In the case of moral decision we have suggested the utilitarian criterion as the appropriate rationality criterion, involving maximization of the average utility of all individuals in the society using theory of redistribution systems and so it has been in this paper written. Finally, in the case of game situations we have argued that we need a concept of rational behavior yielding a determinate solution commonly acceptable equilibrium for our redistribution system. But this will require significant further efforts in our analytical tools. Our preceding discussion shows that, in a redistribution system, it is almost always possible for rational players to reach an efficient (Pareto-optimal, redistribution surface) outcome. In a discrimination game in general this is not possible, because of discrimination solution; but, even so, a surprising amount of cooperation is possible in most cases.

There is a conflict of interest between three players, this is a sufficient explanation for a behavioral conflict between them – as if no explanation were needed for the players’ inability to reach a peaceful compromise commonly acceptable equilibrium that would benefit all of them. In our view any major deviation from Pareto-optimality always requires a detailed explanation, such as unenforceability of agreements, barriers to communication, ignorance, and etc.

All possible sets of the players in redistribution systems will form coalitions to save their common interests against all another players, so that the game will become a complicated network of huge volume of mutually overlapping coalitions in an elementary redistribution system in a pluralistic model of society. Game theory always improves itself by answering questions from real-life. Today we divide game theory research on the basis of the players’ information knowledge as symmetric information, but we often ignore the information losing information problem. The rational behavior of a player in a game requires his calculation of the other players’ behavior. If the opponents are rational, the study of their actions requires build up the rational strategy of the first player. The information must not be confused with the difference between games with perfect and with imperfect information. Under our definition of elementary redistribution system must involve complete information, but it may involve either perfect or imperfect information.

Seventh chapter describes topical application our theoretical approach especially it concerns corruption. Economic theory deals with corruption either in the principal-agent theory or in the theory of rent-seeking. The principal-agent theory has difficulties accounting for the environment in which the agents offering and accepting corruption operate as well as explaining the importance of the agents for the survival of their environment. The rent-seeking theory, on the other hand, finds it difficult to establish socially effective legislation and ways to determine the barriers to entry that motivate agents to behave corruptly. Both problems, however, are central to solving the problem of corruption. Lacking the knowledge of the agents’ environment (system) and their significance for the survival of the system, the theory cannot define incentives that would discourage the agents from corrupt behavior. If the rent-seeking theory does not determine the barriers to entry that motivate agents to behave corruptly, it cannot determine the proper legislation that would deter corrupt behavior and lead to general prosperity. Both problems can be explained and solved by theory of redistribution systems and its part theory of parallel redistribution games.

The theory of redistribution systems and parallel redistribution games solves these problems by: a) defines the environment in which corruption occurs as a legal system of redistribution
b) defines a parallel redistribution system (the game) as a system in which violations of legal rules redistribution system and defines corruption as an example of a parallel redistribution games c) based on the definitions explained concludes that reducing the legal redistribution eliminates stimulation agents to behave in a corrupt d) is able to describe the features that should have rules to discourage agents from corruption.

The final note brings main conclusion. Here, in the summary, we want only to write that over the past few years, we have gradually refined, in a series of related contributions, the analysis of conflicts, problems and social contexts that accompany the public sector reforms. In parallel, we have developed and honed the tools of theoretical analysis which, on the one hand, can make ever greater use of the predicative power of the mathematical approach, whilst, on the other hand, ”reveal” what is trying to remain hidden and what, in the absence of adequate theoretical tools, we only suspect. If we see education as one of the ways that theory can be used in practice, then in this regard alone the approach presented herein has found some application.