

**СЪТРУДНИЧЕСТВО МЕЖДУ БАНКОВИТЕ НАДЗОРНИ ОРГАНИ В
ЕС: МОДЕЛ НА ИГРИТЕ**
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**COOPERATION AMONG EU BANKING SUPERVISORY
AUTHORITIES: A GAME MODEL***
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Received: 18.06.2018, Accepted: 23.07.2018

Abstract

The aim of the paper is carrying out of survey for cooperation among banking supervisors based on the model of cooperative games. The initial measures of supervisors are aimed at rescuing the banking assets in their territory and to reduce losses to local taxpayers. The new reality demands these measures also to take into account the effects on other countries, and the need for cooperation among banking supervisors through ex-ante engagements for sharing ex-post costs.

The results of paper show that the original measures to reduce the effects of global crisis have triggered short-term stabilization of the banking system at predominance of national interests. Using game theory for cooperation among banking supervisors leads to optimization of outcome for all countries participating in the ex-ante engagements. From the concrete case for a Bulgarian bank, part of an EU banking group, we have concluded that cooperation among more than two supervisors is recommended depending on the structure of the banking group.

Keywords: *banking supervision, game theory, cooperative games*

JEL Codes: *C71, E58, L51*

1. Introduction

The effects of the global crisis provide a basis for traditional instruments on banking supervision to revise, as the results of the measures under coordination across countries are limited - they are reflected mainly in ensuring the primacy of national interests before the interests of community and to transfer the costs of rescuing distress banks to other EU members.

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The development of banking requires application of scientific methods in practice, including the game theory (Nedelchev, 2013). Before the global crisis (2008) is used game models which are non-cooperative and do not include the need for an external monitor for complying with the agreed engagements. There was a need to take steps to optimize these models when the crisis starts, but they do not give the expected results because of their stated preference for national measures without cooperation with foreign authorities to share responsibility and costs.

Taking into account the results of the banking rescue measures in the EU over the last ten years, we have formulated two research hypotheses:

H1: The game model is applicable for the supervisory authorities of a cross-border banking group.

H2: Restructuring a cross-border bank to a holding group, including a bridge bank, will reduce the cost of rescuing the group.

The content of the paper includes three parts. The first part introduces the game theory into the practice of banking supervision. The second part contains a new look at the game theory. The third part deals with the cooperation between supervisors of a cross-border banking group on the example of the banking system in Bulgaria.

2. Stages of cooperation development among supervisors and game theory

The first attempts to implement the cooperation among banking supervisors are related to expanding of bank activities cross-border. To increase the efficiency of supervision over overseas banks in 1975 Basel Committee has introduced guidelines for cooperation. They require a regularly consultations for division of responsibility between home and host supervisors and the ultimate responsibility for supervision is borne by the host competent authority. In relations among supervisors increasingly takes place the principle of competition, which requires the use of non-cooperative games and in most cases - the prisoner's dilemma.

As a result of bank failures during the 1980s the game theory focuses on the collapse of the banking system in only one country (Diamond & Dybvig, 1983). In the literature began focusing on non-cooperative games (e.g. strategy of two depositors who can either withdraw deposits or wait maturity of the deposit) and for improvement of results is used the Nash equilibrium as a tool. First steps are being taken towards cooperation by providing information and prevention of bank failures. The occurrence of cases for cross-border rescue of banks is reason to recognize the need for international monitor for better implementation of national engagements. Given limited resources to control the implementation and observance of cooperation among supervisors began to use game models in a parallel with a control (Smojver, 2012).

With the beginning of globalization in 1990s the game theory has been reflected in the analysis of systemic risks for large cross-border financial groups (Holthausen &

Rønde, 2004). Due to more complex banking structures and the burdensome procedures of host supervisor is accelerated the role of cross-border cooperation in the fields of insolvency. The home supervisor has the ultimate responsibility for choosing a strategy to reduce systemic risk - through financial support or by closing of overseas subsidiary bank, while the decision to close an overseas branch is at the responsibility of the banking group itself. In this connection between home and host supervisors shall be concluded an agreement for coordinating supervisor - the game model is shifting from winner-loser to winner-winner.

The lack of cooperation among banking supervisors enhances the effects of the global economic crisis. The theoretical models start to analyze the behavior of depositors in more than one country. In the practice was apply the Chicken game in which rational players compete for limited sources of funds and achieve their goals through better knowledge of resources. The number of participants in cooperation increased and includes the national ministries of finance and funds for deposit insurance due to the use of public funds to stabilize banks (Nieto & Schinasi, 2007). The incentives for cooperation shall be determined by the fiscal costs for rescue of a bank and its systemic importance in both the home and host country. The achieved positive results however are limited to cases in which the parent bank and overseas subsidiary bank are systemically important in both the home and the host country, and depend on the role of overseas subsidiary bank for the survival of the entire banking group. A new form of cooperation is introduced - establishment of colleges of supervisors to control international banking groups in different jurisdictions. Responsibilities between home and host supervisors are clearly separated and identified based on bilateral agreements (memorandums of understanding) for organized exchange of information.

The lack of reaction on pan-European level to resolve the crisis causes a number of spillover effects. In this connection, efforts in the last stage of cooperation development of banking supervisors are aimed at the adoption of ex-ante engagements for sharing of ex-post costs. The Nash equilibrium is replaced by Coase equilibrium for benefits of cooperation through zero transaction costs (Gaspar & Schinasi, 2010). In 2008, with the adoption of the Declaration on the joint action plan by the euro area members, the cooperation is reoriented to introduction of a single supervision for troubled banks, incl. the practice of international lender of last resort for state intervention.

Regardless of the stages of development and used games, the cooperation among supervisors in banking industry is defined in decision making (Schoenmaker, 2010) and is socially optimal, i.e. the benefits outweigh costs. The home supervisor has leading opinion, and the host supervisor has lowest costs for bank rescues. In cross-border business the cooperation is different due to the insufficient means of exercising control, which is why supervisors are stimulated by determining their share of potential recapitalization for failed banks.

3. Cooperative games - a fresh look

We shall present the cooperative games in a fresh look - on the basis of the maritime shipping and the assumption that the cooperation among the captains is aimed to ensure safety.

At the beginning of shipping history every captain of a vessel prepares and observes its own safety rules. His limited knowledge allows daytime sailing and close to the coast. Given the small number of vessels and relatively low probability for confrontation among them, the captains have concluded in advance memorandums on safety rules applied within a given territory.

With the increase in number of members in maritime shipping is increasing the need for monitor over the preliminary rules in the common goal - safe navigation for all. To ensure the fulfilment of this objective the state began to provide public goods - construction of lighthouses, control over engagements among captains and to make substantial investments. A good example for public good is one of the great scientific challenges - the measurement of longitude. In 1851 as a zero is defined the Greenwich meridian, causing significant change in the perception of the arrangement of the Earth. The Rhodes Island (resp. the Mediterranean) is no longer perceived as Geocenter and changes occur in the management of vessels - part of it is transferred from the captain to a nautical pilot which uses information generated on the ship.

In modern practice instead of the captains, the countries define rules for safe navigation and require not only from their but also by foreign vessels to move into their territorial waters under the appropriate requirements. The investments in infrastructure are growing as well as the interest in coordinating the rules in different countries. The nautical pilots were replaced by navigators who already use information generated outside the ship by using satellite technology of the Global Positioning System introduced in 1984.

4. Supervisory cooperation and game theory in the case of Bulgaria

We will present cooperative games through cooperation among supervisors of an international banking group - parent bank and overseas subsidiary bank, and for each country is identify the systemic importance and the reasons for such cooperation between home and host country (Figure 1).

Figure no. 1 Payoff matrix of cooperative game in costs sharing between supervisors for a banking group (conceptual model)

		Home country (parent bank)			
		Non-systemic importance		Systemic importance	
Host country (subsidiary)	Non-systemic importance	a	b	c	d
	Systemic importance	e	f	g	h

Quadrant *ab*. Where there is no significance for the home and host country bank systems, there is no cooperation between supervisors. The minimum volume of exchanged information determines the lowest probability of occurrence of conflict of interest. The decision for the future of the bank belongs to the banking group, expressed by the home supervisory authority. The situation is similar in the recapitalization of financial group Fortis, which due to lack of arrangements for cost sharing among supervisory authorities of home countries Belgium, Luxembourg and the Netherlands, was nationalized in 2008.

Quadrant *cd*. In EU the banking groups are key element to economic development and financial stability of the home country and overseas subsidiaries are not systemically important for the banking group. The cooperation among supervisory authorities is weak and unidirectional - from host supervisory authority to home supervisory authority, which receive consolidated information and better knows the financial situation of the banking group. The host supervisory authority participates in cooperation while respecting its public interests - providing information and refusing to bear the costs for refinancing the banking group. Case study for such a case is re-registration of Nordic financial group Nordea as a European company (Societas Europaea - SE) and the reorganization of overseas subsidiaries into branches. As a result, supervision and deposit insurance are delegated to Sweden and decreased interest in cooperation from the supervisory authorities of Denmark, Norway and Finland.

Quadrant *ef*. Foreign subsidiaries in countries with economies in transition are very important for the economic development of the host country and have little relevance to the banking group. The host supervisory authority has no grounds for cooperation - to share the costs of control and to refinance foreign subsidiaries. In most cases, the countries of Central and Eastern Europe are outside the euro area and their subsidiary banks are a source of transmission of financial problems not only to the banking group,

but to the euro area. The need for unification of the various legislations of the states in and outside the euro area in terms of supervisory engagements is reflected in the requirements of EU directives establishing a holding group of subsidiary banks in Central and Eastern Europe.

Quadrant *gh*. The high degree of cooperation is due to the systemic importance of the parent bank for the home country and the overseas subsidiary bank to the host country and for the banking group itself. The motive for cooperation is the possibility of transferring the problem to another country (contagion risk). Given the dual significance for the system in such cases can lead to over-regulation and to duplication of stability measures. Indicative in this respect is the example of the cooperation of the banking group Dexia - the supervisory authorities of Belgium, Luxembourg and France agreed to share losses through guarantees to allow the banking group to gain access to finance and undertake restructuring.

For detailed presentation of cooperative games, we will analyze the likely costs of rescuing the overseas subsidiary bank in Bulgaria, based on the following assumptions:

- In case of bankruptcy each country must repayment the guaranteed deposits that may be adopted as the costs of rescuing the bank. When the bank is part of an international banking group, the country should bear the costs of its territory.

- To measure the cost of rescuing the banking structure we choose the deposit base and calculated it as a percentage of GDP of a country, i.e. the proportion of GDP that will be used for repayment of deposits.

Figure no. 2. Payoff matrix of cooperative game in costs sharing between home and host supervisors (2000)

		IT			
		Non-systemic importance		Systemic importance	
BG	Non-systemic importance	0%	0%	7%	0%
	Systemic importance	0%	8%	7%	8%

To present the game theory in the case of banking supervision co-ordination, let's choose a bank group that has a subsidiary bank in Bulgaria. A good example is the banking group UniCredit, Milan and its subsidiary bank in Bulgaria – UniCredit Bulbank, Sofia. In case of eventual rescue a measure must be undertaken bottom-up - by

supervisory authorities of Bulgaria, Austria and Italy. Given the importance of subsidiary bank for financial sustainability in host country (Quadrant *ef* in Figure 1), the cooperation between supervisory authorities is asymmetrical - the authority in Bulgaria is most interested for rescue. If measures were taken in 2000 to eventually rescue the costs of repayment of deposits bailout would cost 8% of GDP for Bulgaria, for Italy - 7% (Figure 2).

There is a requirement in the EU for conglomerates with subsidiary banks outside euro area to establish a holding group for reducing contagion risk. Since 2007 Bank Austria, Vienna (holding group for UniCredit, Milan) is responsible for activities of all overseas banks of UniCredit in Central and Eastern Europe. In this situation, any eventual costs in 2015 for repayment of guaranteed deposits in UniCredit Bulbank would be 17% of Bulgaria's GDP and for Bank Austria - 33% of Austria's GDP (Figure 3).

Figure no. 3. Payoff matrix of cooperative game in costs sharing between bridge and host supervisors (2015)

		AT			
		Non-systemic importance		Systemic importance	
BG	Non-systemic importance	0%	0%	33%	0%
	Systemic importance	0%	17%	33%	17%

Given the large share of spending to GDP for Austria and transfer of financial contagion in euro area, the cooperation among supervisory authorities is shift to Quadrant *cd* in Figure 1.

Figure no. 4. Payoff matrix of cooperative game in costs sharing among supervisors for whole banking group (2015)

		IT	AT	BG	IT	AT	BG			
		Non-systemic importance			Systemic importance					
IT	AT	BG	Non-systemic importance		0%	0%	0%	27%	33%	0%
IT	AT	BG	Systemic importance		0%	0%	17%	27%	33%	17%

For completeness of the case it should be included the ultimate owner of banking group - UniCredit, Milan. For 2015 the eventual costs for repayment of deposits would be respectively: for UniCredit Bulbank - 17% of Bulgaria's GDP, for Bank Austria - 33% of Austria's GDP and for UniCredit - 27% of Italy's GDP (Figure 4).

5. Conclusion and Recommendations

The survey shows that the cooperation among supervisory authorities based on cooperative games can contribute to improved results in all the countries participating in ex-ante engagements for sharing of ex-post costs.

The need to establish preliminary international rules for supervisor cooperation stems from the shifting of attention from protecting the interests of shareholders to stakeholders. Another reason is the global economic crisis and lower level of cooperation, manifested mainly in short-term measures to stabilize the banking system in predominance of national interests. All this leads to the emergence of a new form of cooperation among supervisory authorities in individual countries and banking groups, which includes measures to rescue the assets on their territory and aims to reduce losses to local taxpayers.

The results confirm first hypothesis (*Hypothesis 1*): the game model is applicable in cooperation among banking supervisors. It is recommended for supervisors to use a cooperative game model where the parent bank and its trans-border bank subsidiaries are systematically important to both the home and host countries. In such a situation, the supervisory authorities, both in the home and host countries, are equal and bear the same responsibility.

The data partially support the second hypothesis (*Hypothesis 2*): the game model in supervisory cooperation will reduce the cost of restructuring a banking group. The

holding structure allows the transfer of funds between the subsidiary banks only with the participation of the parent bank, which forms the responsibility of the parent bank for the financial strength of the entire holding. The reduction in rescue costs of a holding group is only achieved in cases where the parent bank and trans-border subsidiary banks are systemically important institutions for the local banking system.

The complex structure of banking groups requires increasing the partners in supervisor cooperation. When the organizational structure of the banking group is a holding group, the results are improved by reducing cumulative costs for deposit repayment due to bridge authority.

In Bulgaria it is recommended cooperation among supervisory authorities to perform by hybrid model of game theory, comprising both cooperative and non-cooperative games (Nedelchev, 2016). The first games reflect the existence of a preliminary agreement in the EU, and the second - the presence of those outside the euro area. The dual status, a member of the EU and non-member of the euro area raises the need for a monitoring authority (e.g. colleges of supervisors) to comply with the ex-ante engagements.

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