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Fighting Corruption: A Counter-Corruption Fuzzy Model

[1]Bohuslav Pernica, [2]Hana Tomaskova and [3]Vlastimil Slouf
[1]Faculty of Economics and Administration, Institute for Regional and Security Sciences, University of Pardubice, 84 Studentska, 53210 Pardubice, Czech Republic
[2]Faculty of Infomatics and Management, University of Hradec Kralove, 62 Rokitanskeho, 50003 Hradec, Kralove, Czech Republic
[3]Retia as., 341 Prazska, 53002 Zelene Predmesti, Czech Republic

Abstract: Corruption became a significant global issue in the last 20 years. It happened due to transition and integration of post-communist countries with the assistance of extensive financial aid provided by the most developed countries. Researcher order to preventing from siphoning such money, post-communist countries have been forced to develop, adopt and introduce national anti and counter-corruption strategies. In essence such strategies can be constructed with the assistance of the fuzzy logic due to the complexity of environment which they ought to be implemented in and due to the vagueness of corruption as a phenomenon. So, counter corruption effort can be simulated by fuzzy models which are composed of two parts, an audit provided by experts and a strategy chosen by the ruling government. Both parts should be in synergy in order to prevent from developing of small corruption into system corruption which has a significant potential to terminate democracy and harm the national economy.

Key words: Corruption, critical infrastructure, fuzzy model, counter-corruption strategy, national economy, essence

INTRODUCTION

Although, the corruption was often present in the Western civilization across the millennia, the international community in particular Organisation for Economic Co-operation and Development (OECD., 2007, 2015) United Nations, United Nation Convention Against Corruptions and European Union has only highlighted it as a problem in the past two decades. So, this phenomenon became not only a significant and serious global issue (Holmes, 2015) but it has gotten an object of research as well. Moreover, both international and national effort to fight corruption encouraged civil society which became a substantial actor. In particular a deal of non-governmental organizations such United Nations Convention Against Corruption (UNCAC) Coalition, the global anti-corruption coalition, global open data initiative, transparency international, TRACE international (Stanley *et al*., 2014), etc., deal with the anti-corruption matters nowadays.

From an academic research point of view, the corruption is usually considered as legal (Rabrenovic *et al*., 2014) cultural, Goel and Nelson (2007), social (Banerjee *et al*., 2012) and economic (Shleifer and Vishny, 1993; Gupta *et al*., 2001; Dreher and Schneider, 2010) problem. In addition, the corruption of a vast size is jeopardy to national security (Parchomenko, 2002). Therefore, corruption is a very complex phenomenon which is not easy to investigate due to both complexity of environment which is present in and its vagueness given by substantial deficiency of direct evidence. Therefore, corruption seems to be a fuzzy problem.

The aim of that contribution is to present a fuzzy model of fighting corruption in a complex environment of a state.

MATERIALS AND METHODS

The problem statement: In social pathology's opinion, a stream in the sociology of social problems, the corruption is a social problem which affects not only individual well-being but also has potential to paralyze and decay a society finally, potential to paralyze and decay a society in the end (Horton *et al*., 1997). Furthermore, the corruption can significantly contribute not only to a gradual decline of national states, known as failed state (Shen and Williamson, 2005), it might cause their lapse and dissolution as well. Whenever bribery and corruption

Corresponding Author: Bohuslav Pernica, Faculty of Economics and Administration, Institute for Regional and Security Sciences, University of Pardubice, 84 Studentska, 53210 Pardubice, Czech Republic

are getting part of the polity, Kebele and Fric (1999) called the stage of detrimental social development as system corruption.

Because this stage of corruption is a hard fight for the police and the justice which are already themselves significantly affected by graft and jobbery, any government should take precautions against corruptions, so, it should develop, adopt and implement an anti and counter-corruption strategy in order to prevent this power from any contagion by corruption. In addition, a lot of European governments consider those national power bodies an inherent part of public service as national critical infrastructure defined in accordance with European Program for Critical Infrastructure Protection. Also, controlling (Klitgaard, 1988; Pippidi, 2013, 2015) and countering the corruption is not only to be a part of good governance (Rothstein, 2014; Charron, 2013) but it is to be believed being a part of national resilience.

Nonetheless, not only those bodies of public power coping with the corruption by taking legal actions against actors offended the law should be covered by such strategies. As a part of the public policy adopted and updated by any democratic government, the strategies ought to cover entire public service in order to prevent the whole national state from its internal decay and destruction. Despite, the fact that the corruption is usually described by researchers as static phenomenon, the public policy of fighting corruption is usually dynamic due to both the regular change of governments and changing interests of criminals who struggle to penetrate the public sector. Hence, such changing environment and political preferences cause a change of governmental priorities in countering corruption from time to time.

Taking into account that each government is obligated to take precautions against actors attacking the system in corruption manners and to fight such offences in order to control and diminish the level of corruption affecting the national state vitality such effort done by incoming and leaving governments can be believed to be a kind of warfare. This specific warfare seems to be a conflict between state capabilities constituting the state power and actors pursuing either deliberately or unwittingly to undermine this power.

In particular, fighting the corruption is vital for countries with high corruption score comparable either as Corruption Perception Index (CPI) or as Trace Metrix (Stanley *et al*., 2014). Fighting the corruptions as asymmetric warfare got an issue of high importance in public policy in European states which underwent a transition their polity in the last 25 years. Such post-communist countries were often recipients of development financial aid provided by the most developed democratic countries and international organizations (Fazekas *et al*., 2014; Stoyanov *et al*., 2014), however, they were infected by pandemic corruption emerged after the end of the communism era (Karklins, 2005).

RESULTS AND DISCUSSION

Counter-corruption fuzzy model: Although, anti-corruption and counter-corruption strategies are usually designed by lawyers in principle we can:

- Determine certain capacities and capabilities of state power (P_i, i = 1, 2, …, p) and their (its) ability to be resilient against corruption (p_{jk})
- Do risk assessment, i.e. to identify some occurrence of corruption acting (K_k, k = 1, 2, …, N) in the polity
- Define anti-corruption measures (B_j, j = 1, 2, …, n)
- Set a priority (significance for strategic governing) for each capacity a capability (wP_i)
- Assess the level of risk for each corruption behavior (c_{jk})
- Evaluate each capacity and capability whether and how they are able to eliminate specific corruption acting (p_{jk})

In order to provide a better picture about mutual relations among abovementioned variable we can construct a matrix as in Fig. 1.

Going more into detail, some options may be valued higher than other. For instance, some capacities and capabilities such police, prosecuting officers, investigation office or justice are more important than

B_1		P_{11}	P_{12}			P_{1k}			P_{1N}
B_2		P_{21}	P_{22}			P_{2k}			P_{2N}
B_j		P_{j1}	P_{j2}			P_{jk}			P_{jN}
B_n		P_{n1}	P_{n2}			P_{nk}			P_{nN}
		K_1	K_2			K_k			K_N
P_1	wP_1	c_{11}	c_{12}			c_{1k}			c_{1N}
P_2	wP_2	c_{21}	c_{22}			c_{2k}			c_{2N}
P_i	wP_i	c_{i1}	c_{i2}			c_{ik}			c_{iN}
P_p	wP_p	c_{p1}	c_{p2}			c_{pk}			c_{pN}

Fig. 1: A model of fighting the corruption in the state

others, e.g., tax office, so, all capacities and capabilities are defended according to their importance in the polity wP_i. Similarly, all corruption behavior is penalized in accordance with its level of risk c_{jk}. In essence, bad habits jeopardizing the polity such political corruption and embezzlement of public money should be repressed earlier than less serious (but maybe more common) corruption offenses such embracery in the National Health Service. In order to really fight fire with fire, capacities and capabilities should be deployed in such anti-corruption activities p_{jk} where a chance of the win is the highest.

Besides, wP_i, c_{jk} and p_{jk} are of the fuzzy essence, hence, they varied from 0-1. Their values should be set by groups of experts where 0 means the most inferior rating and 1 the superior one.

The founder of fuzzy theory is Zadeh (1965). He introduced fuzzy theory in his study fuzzy sets by Zadeh (1965). Nubbaum and Finetti (1975) wrote in his book proclamation. "Probability does not exist. It is a subjective description of a person's uncertainty". The uncertainty within natural language appears because of problems with complexity, ignorance, various classes of randomness, the inability to perform adequate measurements and lack of knowledge or vagueness in the natural language. There are a small amount of problems in the world which are clearly defined. Hence, fuzzy sets provide a mathematical way to express vagueness and fuzziness in humanistic systems.

In contrast to classical sets theory where elements belong/not belong in a set and fuzzy theory measures elements in the sets by a membership function. The value of membership function is called membership value (Dubois and Prade, 1996). The fuzzy methods and their applications were published by many researchers, for example, Baas and Kwakernaak (1977), Dong and Wong (1987), Holecek *et al*. (2011, 2016, Pavlacka and Talasova (2007), Majek and Slouf (2015), Ramik and Vlach (2013) and Ramik (2014). Corruption and related issues were published by many researchers, for example, Pernica (2010, 2015), Dutta and Roy (2016), Mauro (1995), Treisman (2000), Svensson (2005) and Anderson and Tverdova (2003).

Due to fact that each government is limited by its budget constraints, its counter-corruption capacities and capabilities are limited as well. Consequently, there are only two orders of importance, first of all there is a request to defend against corruption such parts of the national state power which are recoverable only with difficulties (e.g., due to lack of suitable staff) highly vulnerable, often a soft target of corruption and their decay may cause a failed state. Due to fact that corruption is not to eradicate

B_1		0.8	0.6	0.0	
B_2		0.0	0.9	0.1	
B_3		0.3	0.7	0.2	
		K_1	K_2	K_3	
P_1	0.3	0.5	0.0	0.0	
P_2	0.9	0.5	0.8	0.3	
P_3	0.2	0.0	0.7	0.9	
F_{KP} (an audit)			$F_{KP} = \max\{0; wP_i+c_{ik}-1\}$		
		0.0	0.0	0.0	
		0.4	0.7	0.2	
		0.0	0.0	0.1	
Σ		0.4	0.7	0.3	$F_{KP}>0$
		0.57	1.0	0.43	$F_{KP\,norm} = \frac{F_{KP}}{\max F_{KP}}$
F_{BK} (an action plan)			$F_{BK} = \max\{0; F_{KP\,norm}+p_{jk}-1\}$		
PP_1		0.37	0.6	0.0	
PP_2		0.0	0.9	0.0	
PP_3		0.0	0.7	0.0	

Fig. 2: A model of fighting the corruption in the state, an example

(Holmes, 2015) as a rationale procedure seems to be fighting the system relations in descending order, i.e., whenever $wP_i = 1$, $c_{jk} = 1$ and $p_{jk} = 1$ at the same time there is necessary to take measure on fighting the corruption behavior or environment.

As mentioned before, controlling of corruption is a complex problem ergo we shall split it into two sub-procedures F_{KP}, a determination of level corruption threats to the polity and F_{BK}, a design of anti-corruption measures. F_{KP} as F_{BK} varied from 0-1.

Whenever $F_{KP} \rightarrow 1$ there is not only a need to eliminate the corruption acting because corruption can erode a part of the polity but there is a political demand from constituent to fight the corruption more intensive because the corruption became vivid to a majority of constituents. F_{KP} represents an anti-corruption audit, a due diligence.

While F_{KP} is a procedure operated by experts F_{BK} is a procedure of setting a governmental strategy, so, it is affected by political preferences, ethics, cultural values and objectives of public policy promised by an elected government. F_{BK} represents a counter-corruption action plan usually updated on annually basis.

A counter-corruption strategy; An example: Thera are certain distinguished capacities and capabilities of state power: P_1 ($wP_1 = 0.3$), P_2 ($wP_2 = 0.9$) and P_3 ($wP_3 = 0.2$) which have been found as vital, so, called state pillars defendable with measures B_1-B_3. These pillars of state power are threatened by particular types of corruption acting. Each type of such acting can erode the state power in a different way (Fig. 2).

In order to set the interconnections effect of corruption on the pillars, it is necessary to do risk assessment. Taking a concrete case, the most risky corruption acting is supposed K_2 and P_2 has the highest priority at the moment. In addition, this relationship has been valued in aggregate rating by experts as the foremost perilous menace to the polity.

Figure 2, the due diligence F_{KP} is follow by an action plan F_{BK}. There are only three counter-corruption measures: B_1-B_3. Regarding the variability of corruption acting they are not universal. The government ought to choose the measures with a puissant impact effect in order to discourage criminals from corruption acting eroding the state power. Here, B_2 seems to be the panacea for the attrition of level of system corruption.

In addition, to choosing the best option at the moment (1 year action plan) for beating the corruption in the polity, the fuzzy model offers an environment for scrutinizing other options. In fact, countering the corruption is not optimizing problem but a complex one. Speaking about countering the corruption as a specific warfare an action plan usually contains a set of measures which should by applied as a holistic system taking into account not only preferences (some measures, e.g., arresting the politicians are favored in the nation more than other) but changes in the environment as well. From such point of view, the fuzzy models may be a good vehicle for understanding the corruption in society and economy.

CONCLUSION

Corruption is a menace to the economy, society and national state an asymmetric threat with a significant potential of destruction of business as well as the power of national states. In essence, the corruption is a complex but vague social problem due to lack of direct evidence its presence in the polity, so, both the corruption and fighting it might be considered as fuzzy problem. A national counter-corruption strategy can be constructed with the assistance of theory of fuzzy sets.

In quest of modeling a rational public policy (Crawford, 2006) of fighting the corruption, a counter-corruption fuzzy model should be set up with two parts which represent on the one hand, a due diligence of the polity provided by experts and on the other one a counter-corruption strategy, a political action plan adopted by the government. In order to avoid growing the corruption into the system one both parts should be in synergy. In order to understand to dynamics of corruption, fuzzy models can be really helpful, in particular in testing the anti-corruption policy before issuing the action plan.

Due to fact that corruption is not directly measurable, there may be more issues of good governance policy linked with corruption for instance, corruption and patronage (Flinders, 2014) which might be operationalized by the concept of fuzzy logic. Hence, such models may be vital to healthy development of post-communist countries.

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