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A Game Theory Application of the Rational Actor Model to the Russo-Georgian War

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By

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ABSTRACT

In this thesis, I analyze the Russo-Georgian War that took place in August 2008. Specifically, I make a Game Theory application of the Rational Actor Model to this concrete instance to answer the puzzle if the actions and decisions taken by the players of this game were rational. I hypothesize that the actors of the Russo-Georgian War were rational and introduce four game theoretical matrices, which I tend to refute or corroborate the latter. I analyze the official documents adopted before, during and after the conflict, including official investigations, articles, newspapers and books. Key sources of data about the preferences, goals and military buildup of the sides are A *little war that shook the world* by Ronald D. Asmus and *The Guns of August 2008 Russia`s War In Georgia* edited by Svante E. Cornell, and S. Frederick Starr. The methodological part of this work incorporates game theoretical modeling provided with an analysis of players` decisions regarding their rationality on one hand and covers aspects of incomplete, imperfect information on the other. The conclusions are uncertain. Despite this, much shall be said and analyzed about the Russo-Georgian War.

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1. Introduction

The Caucasus region (see appendix 1) and the post-Soviet countries historically were and still remain within the sphere of Russia's interest. Since the collapse of the USSR, the former Republics still "feel" a tangible influence from their northern neighbor. Despite the fact that official Moscow policy has not changed much, few could imagine that in the century of asymmetric threats, a big power needs to conduct military campaigns in order to impose its own will to its immediate neighborhood – economic and social pressure is enough. However, clashes that took place in 2008 tend to refute this claim, showing that direct military involvement may after all guarantee the implementation of the goals of powerful states or in case of failure at least maintaining status quo ante. Some may see Russia's coercive politics, namely the war with Georgia, as an attempt to take the "rightful place" in the world, but the logical question would be if it was a necessary step and to what extent the decision to go to war was rational for both sides of the conflict?

It goes beyond any doubt that Russia is a rising power, demonstrating to the western democracies and particularly to the United States of America, that the world is no longer unipolar. Its every effort is directed to regain political influence over neighbors and to strengthen positions on the international arena. Very different from the 1990's, modern Russia is being guided by a strong leader, with extremely coercive and, when needed, flexible policy and is gradually moving towards its ultimate goal – reinforcement and restoration of the spheres of own interests. The flip side of the coin is that in light of its ambitions to regain the status of a global power and a key player in the region, Russia is easily stepping over the interests of other smaller states if needed using various tools. For example, among the political tools, energy resources are a basic one. At this stage, significant oil and gas delivery to the EU and the CIS itself is carried out by Russia. The Russian Federation seems to be a very trustworthy purveyor, but some "gas incidents" in the recent past show a different

picture. Another tool of influence is support provided to the breakaway regions of Georgia and Moldova, charging (now potentially) the situation around Ukraine. It is a most effective and direct attempt of establishing control not only over these sovereign states, but at least subject to bargaining and international trade-offs. As regards military tools of "persuasion", the Russo-Georgian war can be seen as an example of coercive, aggressive policy, which will be thoroughly analyzed by many scholars and experts coming up with various conclusions and inferences in future. In this regard, my research cannot be seen as an intensive and comprehensive; however, application of rational actor model to this concrete instance will be interesting and hopefully fruitful for those who intend "going deeper" while working on this subject.

1.1 Russo-Georgian War August 2008

The war that took place in August 2008 between Georgia and Russia was the culmination of "unfriendly" relationships between these countries since the disintegration of the Soviet Union. Close observers of the situation around two conflict zones in Georgia were predicting a possibility of full scale war between Tbilisi and its northern neighbor (Cornell and Starr 2009, 64). Georgia, a country with a relatively small population and two breakaway regions – Abkhazia and South Ossetia was always considered within the interests of its immediate neighbor. Traditionally backed up from the 90`s by the Russian Federation, both regions were subject of bargaining and negotiations of big powers. With the lack of finding solution to these problems, some minor scale armed incidents took place from time to time.

Due to the fact that this conflict was not much analyzed in light of rational choice and game theoretical framework, I decided to make a contribution by making a Game Theory

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application of Rational Actor model (hereafter RAM) concretely to this instance, because inferences drawn in the end may make future researches related to this case much more fruitful. In my thesis work, I examine the events from two perspectives. First, by applying RAM to this concrete instance, I define to what extend decisions going to war taken by actors were rational and secondly I find and answer some questions concerning other alternative outcomes based on different possible actions of the players.

1.2 Debate

Despite the fact that two years have passed since the conflict and there are a quite number of solid facts presented by both its contestants and monitors, still there is no unanimous agreement on who started the war and who is more responsible for the devastating outcomes on one hand and received benefits on other. The analysis of this game (Russo-Georgian War) provides us with interesting information regarding both the theoretical and the practical side of the subject. However, it must not be forgotten that applying game theoretical models calls for additional vigilance, because it is often very difficult to make pure applications of such models to concrete cases without facing difficulties and my research was not an exception.

While applying rational actor model to the concrete instance it must be assumed rational actions can be perceived as a deliberate, goal-oriented set of actions oriented towards utility maximization (Yetiv 2004, 30). In other words, rationality is defined as "particular and very familiar class of procedures for making choices" (March 1994, 2). Pure rational choice theories imply that all actions of individuals can be ranked with a preference order and actors should not be uncertain about a choice, that is they should have "a set of complete and transitive preferences over the set of outcomes" (Morrow 1994, 18). If they prefer **A** to **B** and

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B to **C**, then they prefer **A** to **C**. In other words, they should know what will happen in case they choose any of the alternatives. Thus, pure theories of rational choice assume that all alternatives and all consequences of those alternatives are known with certainty and all preferences relevant to the choice are also known (March 1994, 4). However, in the real world assumptions named above are hardly met. For the most part decision makers do not posses perfect information and, what is also very important, their problem solving capacities are very limited – human mind is very complex, no doubt, but unfortunately, it is not almighty. That is why according to Simon (Simon 1985, 294-298), human capabilities for making rational choice are very similar to the paradigm of bounded rationality. Furthermore, while selectively making a choice through large amounts of possibilities in order to discover what other alternatives are available and what consequences they hold, decision makers do not pursue utility maximization. They usually terminate the search as soon as they find suitable and satisfactory outcome. If so, Simon (Simon 1985) is right to say that pure rational choice theory will fail to explain actors' behavior if the information on alternatives and consequences is unavailable. Nevertheless, it does not necessarily imply that it is impossible to build game theoretical model of RAM in case players do not posses complete or perfect information. Thus, to understand the behavior of decision maker it is crucial to specify what does the players of the game want, what do they know and what can they compute (Simon 1985, 295) also assuming that their preferences are complete, fixed and transitive (Gates and Humes 1997, 8).

I share the view that a Game Theoretical Modeling is very attractive because of its advantages over other approaches. It makes strong connections between theory, the model and the case they are applied to (Gates and Humes 1997, 5-6). In addition, game theoretic models imply that every player of the game has a common knowledge about the rationality of

other players, or in other words everybody knows something and everybody knows that others also know something. This is a very important and powerful assumption because it helps to understand the structure of the game, preferences of its actors and their strategic interaction (Gates and Humes 1997, 5-9). Other methodological aspects crucial for my research were derived from following books: "Games information and politics" by Scott gates, Brian D. humes"; "Game theory topics" by Evelin C. Fink, Scott Gates, Brian D. Humes; "Game theory: concepts and applications" by Frank C. Zagare.

1.3 Thesis Design

My thesis work has one research question and one hypothesis. Namely my research question is: did the players of the game take rational decisions? My hypothesis is: decisions taken by players can be considered as rational. The units of analysis in my thesis are actors who took decisions, while units of the observation are decisions themselves.

Games introduced in my thesis contain three important stages of model building: conceptualization, operationalization and interpretation (Gates and Humes 1997, 12-13). Namely, they include players, their payoffs and their nodes of decisions, actions, information sets and one of the games (Figure 3) has probability distribution for each node. Conceptualization of this particular case involves clarification and simplification (Gates and Humes 1997, 11). While working on my research, I simplified the reality in order to have a better understanding of the specific aspects related to the game. The models I built are represented in both formal and extensive forms, because the former is commonly used by social scientists while the latter represents more information regarding the game. Due to the

fact that both sides claimed they were responding to each other's actions, retrospectively these game models can be seen as sequential, not simultaneous.

Game Figure 1, which has extensive form of representation, was introduced to show that strategies available to the players were dominant; that there are no differences regarding preference ordering of the players regardless which of them was the first to start the game. Game Figure 2 and subsequent analysis goes deep into the roots of the game, covering not only the questions of rationality but also aspects shedding the light on the actors` motivations and goals. Figure 3 and 4 defer from the rest of the models. The former is based on the assumption that players did not possess complete and perfect information, while latter is a zero-sum representation of the Russo-Georgian War based on the different goals of the players then ones shown in the rest.

Each of these games is analyzed on a subject or rationality of decisions taken by the actors, possible answers and motivation of latter. Operationalization level includes delineation of the strategies that produce equilibrium outcomes. In other words, I defined strategies that offer the solution to this particular games to find out how rational were players` actions. Finally yet importantly, I interpreted particular game results to have a better understanding and explanation of the research question I intended to answer.

While working under this research I used content analysis method while analyzing the data. I analyzed the official documents adopted before, during and after the conflict, including official investigations and EU Taliagvini commission's report. Secondly, I paid an attention to the articles and newspapers addressing relevant subject, because they contained valuable information, which was also very helpful. Finally, I collected the data from books directly related to the empirical aspects of the case. In particular, I used the book "A little war

that shook the world" by Ronald D. Asmus and "Guns of August" edited by Svante E. Cornell, S. Frederick Starr. It should be mentioned here that former is a real treasure-trove for researchers who work on Russo-Georgian War or have intention to working in future, because it contains very interesting and fruitful empirical data covering both general questions of this conflict and ones related to so-called "inner kitchen" decision-making process. In addition, I sampled the data from various internet media outlets, which also provided me relevant information.

2. Representing the Conflict

In order to have a better understanding of this particular game I introduce a small chronology of the events and a map of the conflict zone.

Before the August 2008 war, the Region of Tskhinvali (see appendix 2), de facto controlled by separatists, was populated both by Georgians and by Ossetians. Villages were mixed in a chess order what actually favored the Georgian side and were under control of official Tbilisi. Tensions rose gradually starting from late July when all sides of the conflict, including the press were informing that the situation within the conflict territories was worsening. On July 28, the separatist fighters opened fire on the OSCE observers and peacekeepers, moving in the direction of the Chorbauli village, while on July 29, prior to an outbreak of hostilities; the separatist militants initiated the shelling of villages inhabited by the mixed ethnic populations (Parliament of Georgia 2009). Bombardment rounds used were outlawed under international law, because of the large caliber. The same day the OSCE observers working together with the peacekeepers were fired on (Organization for Security and Co-operation in Europe 2008). Similar accidents, reported by OSCE mission in Georgia, took place until the August 6, demonstrated continuous small clashes including shelling of the villages, artillery bombardment and numerous responses to "hostile fire" reported by sides (Parliament of Georgia 2009). On August 4-5, Tskhinvali was visited by journalists and diplomats and on 7th by Temur Yakobashvili, the Georgian minister of reintegration and Yuri Popov, chief Russian negotiator over South Ossetia. While the Georgian minister's attempt to start negotiation process failed because of Ossetian refusal to participate, Mr. Popov was more successful. He managed to contact de facto leader Eduard Kokoiti, but failed to convince latter to conduct a meeting. In a short time, General Marat Kulakhmetov, Commander of the Joint Peacekeeping Forces in the Tskhinvali region, admitted that his

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peacekeepers could not stop Ossetian combatants from shelling the villages and advised the Georgian side to declare a unilateral ceasefire, (Office of the State Minister for Reitegration 2008) which was announced by Mr. Saakashvili at 19:10 p.m. (Organization for Security and Co-operation in Europe 2008). The peace did not last long. According to Official Tbilisi, at that time troops of Russian Federation had already entered the region through the Roki tunnel (Parliament of Georgia 2009). The tunnel is approximately 3600 meters long and is one of a very few routes connecting the Georgia and the Russian Federation. Bombardment of the Georgian villages resumed from 20:30 and at around 23:35, the President of Georgia transmitted three orders to the Commander of the Joint Chiefs of Staff: to halt the invasion of the Georgian territory by the regular army of the Russian Federation; to suppress the enemy fire directed against the Georgian villages through the elimination of the weapon emplacements of the adversary in the Tskhinvali region; and ensure the security of the peaceful civilian population of the Tskhinvali region (Parliament of Georgia 2009). On the other hand, Russian President gave similar orders to his military command. Operation "Compulsion to peace" implied using all means necessary (Oreanda-Novosti 2008) to protect South Ossetian population from Georgian "aggression" and prevent such attacks in future (The Council of European Union 2009, 188-189). As a result, Georgian armed forces were forced out of the region and more then half of the country was occupied. On August 15, with the active mediation of the French President Nicolas Sarkozy, Presidents Saakashvili and Medvedev signed a ceasefire agreement containing six following points (Office of the State Minister for Reitegration 2008):

1) Adopting the regime of non-use of force;

2) Halting all military activities;

3) Ensuring free access to humanitarian aid in the region;

4) Returning the Georgian troops to their regular dispositions;

5) Returning the Russian troops to the lines held prior to the military activity empowering the Russian peacekeepers with provision of additional security measures previous to attaining an international solution;

6) Starting international discussions on preservation of security and stability in both the South Ossetia and Abkhazia regions.

Here I stop a narration of the chronology of events, because it is enough to see what preceded the war, what was a scale of escalation at that moment and what was its immediate endpoint. Later, in the thesis I pay greater attention to the events that took place in August 2008 and examine the case more thoroughly.

3. Modeling Games

3.1 Representation and analysis of the Game Figure 1

As mentioned above, this particular game took place in August 2008. The exact day of the conflict plays one of the crucial roles in the existing debate among not only players but also the rest of the world. Both sides claim that they were responding to each other's actions. More precisely, official Tbilisi states that on August 7 the Russian army troops had already entered the region, while Moscow insists that they were given an order to intervene only on the August 8. This discrepancy between actors` claims appears to be small but very important. Nevertheless, there is not a big debate about the state of nature preceding players entering the game: namely, the increased shelling and bombardment of villages populated by ethnic Georgians and ones with mixed populations controlled by the Georgian side with heavy artillery rounds.

The first game matrix is built on the assumption that facing empirical state of nature Georgian side had to make its move first. Thus, facing the situation stated above the President of Georgia issued three orders:

a) To halt the invasion of the Georgian territory by the regular army of the Russian Federation.

b) To suppress the enemy fire directed against the Georgian villages through the elimination of the weapon emplacements of the adversary in the Tskhinvali region.

c) To ensure the security of the peaceful civilian population of the Tskhinvali region.

Judging on these, an assumption can be made about the preferences of official Tbilisi. Namely, it can be said that using strategy of deploying troops in the region Georgia wanted to

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defend its population by ensuring either security and safety of the latter or – making the corridor for evacuation (as history showed). Of course, had the Russian troops been defeated, or had official Moscow ordered them out, then territorial integrity of the country would have been restored. Hence, the main preference of the Georgian side was to maintain security of the controlled enclaves and auxiliary one – possible restoration of territorial integrity.

Hence, after the bombardment of Georgian villages increased, official Tbilisi considered two following options: either to resist adversary or do nothing. At same time, Russian side had choice either to continue backing Ossetians or stop providing help. It can be assumed that Russia's interest in backing the separatist forces of the neighboring country was motivated at least by the fact that no precedent should have emerged in dealing with territorial problems in its own neighborhood neglecting Moscow's mediation; and by possibility to openly punish once friendly and now rather problematic neighbor thus ensuring status of supreme power in the region. Either way, it appears to be that Russia could not afford not to intervene but again the question would be at what price it could.

The options available for the players and outcomes related to their actions are represented in the game tree in Figure 1. Since, the given state of nature implies that Ossetians started heavy bombardment of Georgian villages and according to Georgian side the Russian troops were providing assistance to the former, we can conclude that decision-makers on at least one side were possessing perfect information about their opponent. Hence, we can consider that this particular game at least for the one side had an element of perfect information.

First decision node on the game tree belongs to the Georgian side and its strategy is either to "Resist" or "Do nothing". Then, based on the actions of the opponent, the Russian

Federation considers its own move. It also has two available strategies leading to four different outcomes. Each of the four consists of two numbers representing the payoff values. In first two game matrices, I prefer to use absolute payoff values, because they do not just represent the preference ordering, but also give a clear understanding to what extent players prefer for example outcome A over outcome B. Hence, in order to show a range between the values the highest payoff for each of the players is 10 while the lowest is -10.

Figure 1. Extensive-Form Representation of the August 2008 Russian-Georgian Game

Population oppressed; no additional Russian troops in the region.	Population oppressed; additional Russian troops in the region; Russian image decreased.	Separatist forces defeated; population security ensured; Territorial integrity restored.	Georgian forces defeated; population is evacuated; possible decrease of Russia's image.
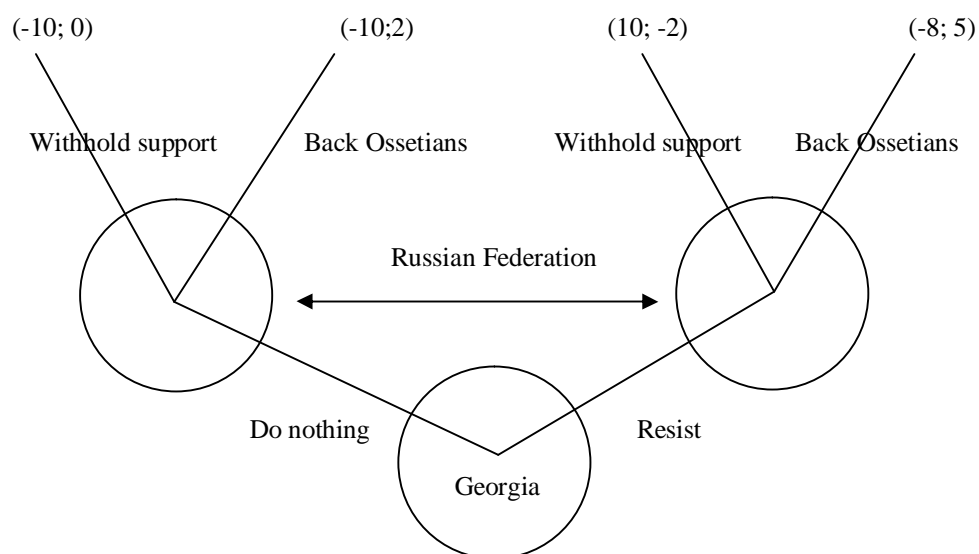
The analysis of the Figure 1 shows that choices available for the players at the same time constitute their strategies. We can also observe possible outcomes for the players should they had moved in different direction. Finding solution for the game means finding its equilibrium. Every game can have two types of equilibriums - pure or mixed strategy, but at

least one (Gates and Humes 1997, 30). Based on the given information, I delineate strategies available to the players to find possible solutions. One way to find solution in the game is to examine each player's best reply to the opponent's move.

In this game, Georgia starts first and has two strategies against two available to the Russian Federation. Moscow can make its move after Tbilisi decides to deploy or not to deploy troops in the breakaway region. Due to the fact that Georgia wants to prevent losing control over own enclave and wants to save the population, decision to deploy troops in the region is mere in line with Georgia's preferences. It seems rational if Georgia's goal is to save people by buying some time for evacuation (Asmus 2010, 189) and it is certainly not rational move, if Tbilisi wants to conquer the region by defeating an adversary like Russia. First of all, the "Do nothing" strategy will lead to deaths among the population, Georgian peacekeepers and police guarding encircled villages. Secondly, in this case government officials can hardly avoid the decline of their image even if they imply to impossibility of winning the conflict against much tougher neighbor. Choosing this strategy will lead to very unpleasant political accusations. Thus, knowing this Georgia is more likely to choose the strategy "Resist" rather than the strategy "Do nothing".

At this point, it is necessary to mention that four years before the current conflict Georgia could defend its population under almost similar circumstances. On 19 August 2004, Georgian forces managed to capture the strategic hill that was used to bomb Georgian villages pulling its forces out after the mission was over (Civil Georgia 2004). Considering this, it becomes even more tempting for official Tbilisi to choose the "Resist" strategy. It is obvious that in case Russia openly intervenes, defeat is most likely to happen but at least the population will be saved and political opponents will have little to say about the "Do nothing" policy. Thus, it is most likely that objective "minimum" will be accomplished. At

the same time, if Russia decides to stop providing support to Ossetians, then Georgia most probably will not only suppress the shelling but also will defeat all separatist forces and restore its territorial integrity. If this scenario happens, it will be beneficial for the Georgian government not only strategically but also politically.

Thus, it can be argued that in this game Georgia has strong dominant strategy - "Resist". If so, what forms of strategies are available to Russia? Officially, its objective is to repeal the Georgian attack and save the lives of South Ossetians, but according to Asmus, the most obvious goal Russia can have is "at minimum to consolidate Abkhaz and South Ossetian independence-most likely as a prelude for their eventual annexation" (Asmus 2010, 169). In either way, achievement of these goals requires the action. Moscow has two available strategies. Those are the "Withhold support" to Ossetians or "Back Ossetians". The "Withhold support" strategy is not beneficial for Moscow, because decision makers in Moscow know that unless the Russian Federation continues to assist its allies they will be defeated and control over the breakaway region will be lost. Hence, Russia's most optimal strategy is to continue supporting Ossetians, which will lead to the defeat of the enemy, preventing it from taking over the region; and also to the banishment of Georgian population. Thus, based on best reply correspondence it can be assumed that Russia also has pure dominant strategy in this game – "Back Ossetians". It is also dominant, because the decision makers in Moscow do not know whether Tbilisi stops after suppressing the hostile fire or will try to regain the lost province. If so, this game has a following solution: {R (B)}. It is the equilibrium solution because based on their goals, both players have dominant strategies and both are rational because they strive for utility maximization and it seems that none has the incentives to change their strategies unilaterally.

One more interesting issue to be analyzed is related to the question whether the Russian Federation will to take into the consideration or neglect Ossetians' choice. Theoretically, taking into the consideration Ossetians' will implies to the tit-for-tat strategy, which means to provide help in case of fruitful previous cooperation between the sides and to restrain in case of the opposite. However, there are at least two problems arising here. First of all, Figure 1 does not represent the involvement of Ossetia as a player. It is simply assumed that latter participates in the game in the state of nature condition. If so, there is no information showing Russian-Ossetian cooperation. Secondly, the tit-for-tat strategy simply questions the existence of Moscow's dominant strategy in this game. After all, it is hardly possible that the Russian side will endanger its preferences by building its own acting strategy based on previous cooperation with Ossetians. Russia most probably would have entered the region had Georgia chosen the "Do nothing" option or even had Ossetians been able to defeat Georgian troops on their own. Hence, despite how fruitful was the previous cooperation with De facto Tskhinvali regime, Russia has two choices: to back Ossetians regardless of their will or to choose the "Do nothing" strategy.

Analysis of game Figure 1 reveals that outcomes and preference ordering of the players does not change no matter who starts the game, leading to assumption that both Moscow and Tbilisi had dominant strategies in reality. For better understanding why those strategies were dominant and what the motivation of the players in August 2008 was, I built Figure 2. Again, it should be mentioned that while being on the edge of making very important decision, the Georgian president should have kept in mind at least three important issues: safety of own citizens living in the region mainly controlled by hostile forces; safety of the pro-Georgian Ossetian government lead by Dimitry Sanakoev and historical analogy with events that took place in 2004. In addition the main question that needed to be clarified

was how large was invasion of the neighboring country, because at that moment Mikheil Saakashvili had intelligence reports that at least some parts of Northern Caucasus volunteers and elements of Russian army had already entered the region on 6th and 7th of August respectively. Thus, facing these consequences and information provided by intelligence service, the President of Georgia entered the game what afterwards will be called by Ronald Asmus "a little war that shook the world" (Asmus 2010, 215). Like previous games shown in this work, next one is not simultaneous but sequential. This means that players are operating within given state of nature and their moves are dependent on the possible moves of the opponent. Figure 2 is an extensive representation form of this game, which contains strategies, payoffs and outcomes available to the players.
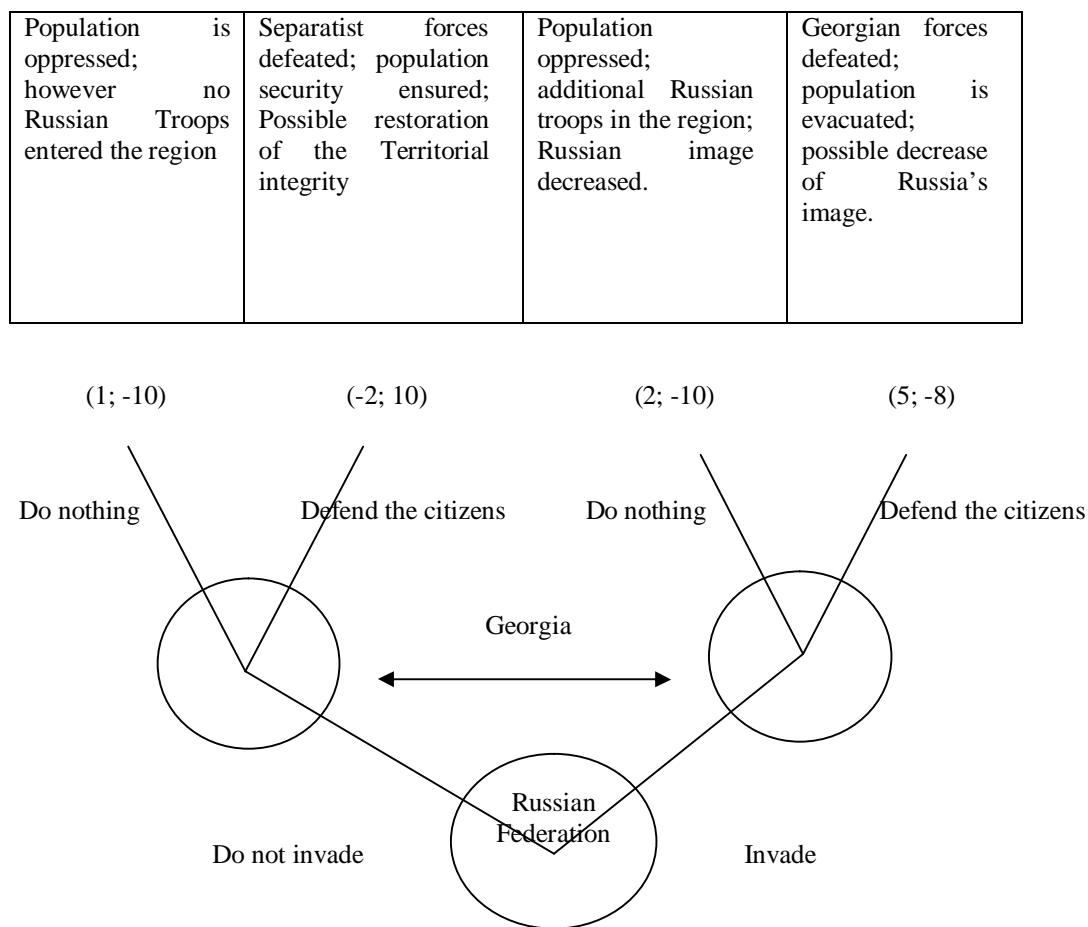
3.2 Representation and analysis of the Game Figure 2

The state of nature in this particular game is the same as shown in previous the two. Namely, Ossetian combatants shell Georgian controlled enclaves more intensively using thicker calibers. The difference here is constituted in the fact that unlike above the Russian Federation is a player who takes the first step, based on which Georgia tends to answer. What about the information the players posses about each other? Clearly, both realize and are aware about things taking place on the ground. In simple words, the Georgian side knows perfectly well that villages under its control are being continuously shelled and so does the Russian Federation. While the former should have received all information at least from the bombed enclaves themselves, the latter should have known about the situation on the ground from the Commander of the Joint Peacekeeping Forces in the Tskhinvali region General Marat Kulakhmetov, who admitted at that point that his forces could not stop Ossetians from shelling Georgian villages. Hence, the parties should have known what was going on and

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should have realized whom they were facing. If so, they possessed complete information. However, does it necessarily imply that they were also are aware of each other's goals and available strategies to achieve these goals? It is not an easy question to answer, because even now it is a subject of debate between officials and scholars. The reason for this uncertainty is rather simple due to the fact that in case these kind of information was know, one can name the side responsible for the five-day war with a significant level of confidence.

I already mentioned that it is quite difficult to argue whether actors had perfect information about each other or not, thus I analyze both possibilities. Building this particular game (Figure 2), I assume that both players had complete and perfect information. In other words, I assume that the Georgian side knew strategies available to the Russian Federation and its goals and vice versa.

Figure 2. Extensive-Form Representation of the August 2008 Russian-Georgian Game

Population is oppressed; however no Russian Troops entered the region	Separatist forces defeated; population security ensured; Possible restoration of the Territorial integrity	Population oppressed; additional Russian troops in the region; Russian image decreased.	Georgian forces defeated; population is evacuated; possible decrease of Russia's image.

(1; -10)   (-2; 10)   (2; -10)   (5; -8)

Do nothing   Defend the citizens   Do nothing   Defend the citizens

Georgia

Russian Federation

Do not invade   Invade

The analysis of this game starts with an emphasis on how many and what kind of strategies were available to actors. Figure 2 shows that the Russian Federation starts the game first and has two available options: Either restrain from doing anything or invade the region. Obviously, decision makers in Moscow should have worked out other strategies as well; however, those two were most salient at the moment. The thing is that the so-called theatre of operations was so small that it was hardly possible to maintain the status quo for a long period of time. Clearly, Ossetians would have been destroyed in a matter of two, possibly three days. Hence, strategies built on the long-term effect should have been unacceptable to official Moscow. Diplomatic efforts towards the west might have given the Georgian side enough time to crush their separatists, while options like blockade were considered as a futile attempt at least due to the geographic reasons. Therefore, if the goals of the Russian Federation, which had been supporting separatist regimes for a quite period of time, included preventing the fall of their allies under any circumstances, implementing strategies oriented towards diplomatic solution or blockade were unacceptable. Decision makers in Moscow should have known that they had to come up with strategies allowing maximum benefits in the shortest period of time. Hence, the "Invade" or on contrary "Do nothing" options were most salient.

One can argue that another strategy would be to make some surgical strikes to disable Georgian strategic objects, but it would probably cause serious diplomatic shootouts also not quite welcomed in Russia. The problem with the "Surgical strike" option is that the targets to be destroyed should be very well defined. In this regard, the question would have arisen what targets should be bombed when using this pre-emptive measure: ones outside or inside Tskhinvali Region, or maybe both? Had the "Surgical strikes" strategy been used to immobilize the targets outside Tskhinvali Region, diplomatic consequences might have been

very severe, implying minimum to the disproportion use of the force. The West might have not admitted that Russia supported separatists in the neighboring country but in the end it had a little power to deny Georgia's right to defend its own citizens lives on its own *de jure* controlled territory. Besides, it was obvious that small surgical strikes could hardly stop Georgian forces had the latter decided to advance into the region.

Could Russia actually bomb or threaten to bomb capital of Georgia *eo ipso* halting Georgian forces' response to separatist shelling? That is another question that is a subject of debate at this point. However, in the "Chronicles of August", a research done by Alania TV company journalists, it is argued that a massage to bomb the capital was transmitted to the Georgian government by some friendly nations (YouTube 2008, 9:20). As regards the surgical strikes solely within Tskhinvali area, they no doubt could have made more sense. Such strikes could have temporarily halt the advance of an adversary, but again not without some price. As I have already written, the region is small, with many ethnically mixed villages and ones situated in so-called chess order. Therefore, Making only air strikes without conducting ground, offensive operation would not have been very fruitful, leading to the deaths among both Georgian and Ossetian population. I am not an expert on military issues and this work is not oriented to analyze those in greater detail. My analysis is based on my own knowledge related to the subject, various data and literature I have read so far. That is why from my point of view, while analyzing this particular game (Figure 2), the "Surgical strike" strategy could not be among those preferable by decision makers in Moscow. As history showed later, both the region and the rest of the Georgia were bombed by the Russian military forces but as a part of the ground offensive operation.

Knowing what strategic options were available to the Russian Federation, the Georgian side should have also come up with the own courses of action. Decision makers in

Tbilisi knew that they should have made their move based on the steps taken by the Russian Federation. Hence, they should have worked out their strategies taking into account Russia's two possible moves: "Invade" or "Do nothing". Based on the available information Georgia should have had two possible strategies. Namely, they could have engaged the enemy or could have acquiesced in case the Russian Federation would enter the region. The question is if there were other possible strategies available to the Georgian side except ones named above. The most salient might have been a diplomatic solution, so preferable for the West and, as history showed, so little profitable for the Georgians. But actually diplomatic solution is incorporated in the "Do nothing" option available to Tbilisi, because, "Do nothing" would not have just implied doing nothing in a military sense but also being very active diplomatically, using all available levers and networks.

Aside from the diplomacy, I can name the "Suppressing fire" option, because the "Blockade" simply could not have answered the preferences of the Georgian side. First of all, it would not have make sense to make a blockade. Secondly, even if beneficial, it has been hardly achievable due to the same geographic reasons. Hence, using the "Suppressing fire" option should have been the only alternative strategy available to Georgia, aside defending or not defending its citizens in the region. The reason why I think it was not considered by Georgian decision makers is that despite its efficiency it would have caused high death rate among peaceful population, which would have clearly ruined Georgia's policy to win the "hearts and minds" of the Ossetians. Actually, this also was one of the reasons why Georgian forces were instructed not to fire against Russian peacekeepers unless they had opened the fire first (Asmus 2010, 43). Thus, in this game (Figure 2), there are two strategies available to the Russian Federation and two available to the Georgia. What about their payoffs?

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The best outcome for the Russian Federation comes when it conducts an invasion, and Georgian authorities decide to engage in fighting afterwards. The payoff for this option is represented by numerical value of **5**. It is the best desired outcome for Russian Federation because aside main goals of having stronger military presence in the region and the more homogeneous population, which would mean far less problems in future, it implies defeat of Georgian armed forces, creating instability in the country, which may possibly lead to the regime change. The difficulty here is to introduce enough evidence and heavy arguments justifying invasion of a sovereign state.

The next best outcome for the Russian Federation is when it decides to enter the region and the opponent acquiesces to such the move. This payoff has a numerical value of **2**. The reason why this option is the second best is that it still insures the achievement of some preferred goals, but not all. For instance, Moscow again has the stronger military presence and the homogeneous population in the Tskhinvali Region, but the Saakashvili government can survive with support provided by the western democracies. Of course, this kind of action comes with a price affecting prestige of the country, but by having a peacekeeping mission; it is not difficult to argue that it is done solely for stability restoration reasons. Its Moscow's next preferred because it is connected to the issue of recognition of those two breakaway regions. It is much easier to recognize separatist provinces of a neighboring country as independent states appealing to the need of defending lives of own citizens and significantly difficult if the separatists themselves are provoking escalation having no response from the opponent. However, the main criticism of this claim would be that the recognition of independence process was already underway prior to the war and would have resulted in the positive decision in the end despite 2008 drama. On 13 and 21 March 2008, the Russian Duma discussed and adopted a special resolution, which basically was supporting the

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independence of *de facto* regimes in Sokhumi and Tskhinvali (Asmus 2010, 108). If so, it would have meant no difference for the Russian Federation had the Georgian side decided to enter the region or not – the strategy "Invade" was strongly dominant.

The next preferred payoff for Russian side has a numerical value of **1**. It is related to the different strategy from invasion and is conditional. It is achievable if and only if Moscow chooses the "Do not invade" option and so does Tbilisi afterwards. So what would happen if players choose these strategies and why does it still give some benefits to the Russian side? Under such circumstances, Moscow has to rely solely on military capabilities of separatist forces and so-called north Caucasian volunteers. Obviously, even without the help provided by the latter, separatist forces armed by the Russian Federation (Asmus 2010, 146) can in the end overran the small garrisons of Georgian police and peacekeepers (500 hundred men in total) protecting Georgian enclaves. The main positive outcome for Moscow is that the Georgian enclaves will be destroyed without being involved personally and as history showed those forces participated in ethnical cleansing of Georgian villages and marauded the towns outside the conflict zone (in Cornell and Starr 2008, 176). It produces benefits in the short term, but is not very fruitful in the long one. Decision makers in Moscow should realize that after the dust of the battle is settled, they would be blamed for failing to ensure the peace in the region letting Ossetian combatants kill innocent people because of their ethnicity. The Russian Federation was a mediator in Georgian-Ossetian conflict despite the fact that its soldiers were operating under the mandate of OSCE. Hence, such move could have potentially shaken the Russian domination in the region by introducing other peacekeeping forces as mediators in the ongoing conflict. Had it happen, EU mission would have been probably acceptable for official Moscow, but had it turned out to be the one mandated under NATO umbrella, it would have been clearly regarded as a loss and diplomatic disaster. The

irony of the fate for the Georgians is that had things undergone under this scenario they would have clearly lost on the short run because of deaths of innocent people, but could have benefited in a long run if peacekeeping mission would have been changed afterwards. But, as history showed Georgian decision makers were unwilling to sacrifice the lives of their peacekeepers, police and at least some part of the population in return for possible resolution of the conflict in future.

The last payoff for Russian side has a numerical value of **-2** and it is clearly the worst one. It is achieved if Moscow chooses the "Do not invade" strategy and if Tbilisi afterwards decides to take "Defend the citizens" option. This is the worst possible outcome for the Russian Federation for several reasons. In this case, Georgia will crush separatist forces in a matter of days even if north Caucasus volunteers will back the latter. The de facto Tskhinvali regime will crumble, which will be a signal to Abkhazia that it is high time to start productive negotiations around future status of this breakaway region, because it would look like Moscow simply let it to happen by not intervening. Moreover, it will again underline Russia's incompetence in dealing with peacekeeping missions and especially one that is ongoing within its immediate neighborhood. Without the frozen conflict in the region, official Moscow will be seen as a big power giving up its interests very easily. For instance, after the Russo-Georgian War was over, President Medvedev introduced several arguments explaining why the Russian Federation recognized Georgia's breakaway regions. Among those, one was relatively new: Medvedev admitted that like others states, Russia also had "privileged interests" in regions where countries friendly to Moscow are located (Asmus 2010, 211). If granting independence to the entities like Abkhazia and South Ossetia means taking the steps in a direction of restoration of the spheres of interests, as one of official Moscow's goals, its implementation must not be questioned. Thus, it would be pointless to choose the "Do not

invade" option even if the intelligence service had predicted with significant level of confidence that Georgia was not going to engage the war. Hence, decision makers in Moscow should have known that stakes were very high and the "Do not invade" strategy would have not stood at all.

What are the payoffs of Georgia in this particular game? According to Figure 2, official Tbilisi has two possible strategies depending on the opponent's move and therefore four possible payoffs. In this game, Georgia has only one best possible payoff and three worst possible ones. The best possible outcome is assigned a numerical value of **10** and it is conditional. It is achievable if and only if the Russian Federation decides not to continue backing de facto Tskhinvali regime militarily after what Georgia will enter the game facing only separatist forces and volunteers. Had this scenario happened, Georgian armed forces would have been able to protect its citizens by crushing the separatists and probably restoring territorial integrity in a matter of days. It might have happened had the West provided all available diplomatic assistance to Georgian side or if Tbilisi has had something to offer Moscow in return. In either way, with one problem solved great amount of energy or resources would have been devoted to the other breakaway region.

The first least bad payoff for Georgia has a numerical value of **-8** and it occurs if the Russian Federation goes for using the option to "Invade" and Georgia will choose the "Defend the citizens" strategy. The question that arises here is why decision makers in Tbilisi would have considered that option at all, because obviously it was not possible to defeat an adversary like the Russian Federation. The answer to this question should be sought in the situation official Tbilisi was facing on August 7th and goals it had defined. The goals of the Georgian side can be evaluated by analyzing president Saakashvili's order issued later that day: stopping the invasion conducted by the Russian Federation military forces,

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suppressing the enemy fire towards the Georgian villages by elimination of adversary's fire positions in the region and ensuring the security of the peaceful civilian population. In order to have a better understanding of why the Georgian president issued those orders they need to be better specified. The interesting issue regarding the orders is their chronology. Note that the order to stop the invasion came first followed by the order sanctioning the elimination of adversary's positions, which were shelling Georgian villages. The third order is a matter of separate discussion and is analyzed later. So, why Saakashvili, who had to ensure the security of the Georgian population in the Tskhinvali region, would have ordered to halt the Russian invasion first?

On the National Security meeting held in Tserovani presidential residence on August 7 Minister of Interior Affairs, Vano Merabishvili, introduced intelligence report indicating that the Russian militaries took control over the Roki tunnel and started entering the region. According to intercepted data, the tunnel was full. At least 150 pieces of armor had entered the region, as well as the 693rd and 135 regiments of the 19th division of the Russian 58th army. The number of hostiles in the region was considered by the Georgian side as no less than a battalion (Asmus 2010, 20). For comparison, official Moscow declared that its military forces entered Tskhinvali region only on the afternoon of August 8; however, this claim is questionable. For example, Andrei Ilarionov, a former chief economic advisor to Vladimir Putin, argued that by August 7 at least 1,200 Russian soldiers were already stationed in the Tskhinvali region (in Cornell and Starr 2008, 74). Those claims are part of debate on the subject of who started the war and will not probably be clarified in a near future.

Coming back to the evening of August 7. President Saakashvili had information that Georgian villages were shelled and bombardment unlike previous times was more intense resulting in casualties among civilians and peacekeepers. Things got even more complicated

when he received intelligence reports indicating that the Russian military forces started entering the region. At minimum, it would have implied strengthening the separatists' positions and at maximum an attempt to take a capital of Georgia – Tbilisi (Asmus 2010, 49). From my point of view, Georgian officials believed the latter and of course, they had to take measures ensuring security of civilians. Hence, it can be argued that by issuing the order to halt the Russian invasion first, Saakashvili actually was confident that changing regime in the neighboring country was Moscow's main goal. In this case, for the decision makers in Tbilisi it would have been irrational to sit and wait until enough enemy forces had entered the region. But, apparently they wanted to avoid the confrontation with the Russian Federation at the same time, instructing its own forces not to fire upon the Russian peacekeepers unless they had fired first. However, this strategy does not decrease but on the contrary increases the uncertainty related to the game. The paradox is that by giving orders to attack the Russian military forces that had entered the region and at the same time forbid attacking the Russian peacekeepers unless attacked first, decision maker makes its forces on the ground more vulnerable. So, why risk a death of a single Russian peacekeeper if it can afterwards be used to justify the invasion? Two things can be said about this paradox. The first is a need to defend civilians, police, own peacekeepers and the Sanakoev administration. As regards the second, it can be the intelligence failure. Protection of own citizens can be seen as a Damocles sword for official Tbilisi and is analyzed bellow, while intelligence failure is related to the notion of uncertainty and personal factors of a decision maker. It is explored later while evaluating Figure 3, which is based on the assumption that players in Russo-Georgian War did not have perfect information.

The second order issued by the president of Georgia was elimination of adversary positions shelling the Georgian villages. As already mentioned, this time bombardment of the

civilian population was much more severe and president Saakashvili was informed about casualties among ordinary people and Georgian forces. He ordered troops to enter the region knowing that some Russian military elements had crossed the border at least twice during the day. What course of action was more rational to official Tbilisi at the moment: do nothing in a face of much stronger adversary, calling for the West and United States, or to defend the population eventually losing the war from the moment of issuing that order? The point is that in light of significant casualties among population and Georgian forces defending those civilians on the ground "Do nothing" option would have lead to bad political consequences. But, going inside would have also created huge problems when in the end it would have turned out to be that Georgian forces were crushed by the Russian military machine. The only thing that makes this move rational is saved lives of the oppressed population, the Sanakoev administration, peacekeepers and police. Sadly for Georgians and on contrary for Ossetians history showed that approximately 25, 000 people had to leave their homes during the conflict and are still unable to return; however, their lives were saved. Considering the fact that security of these citizens was one of the goals of official Tbilisi, order, granting elimination of the adversary positions shelling the villages can be considered as a rational and logical. It is a debate of territory versus the lives of the citizens and it is rational to chose to save lives of 25, 000 people at the expense of losing the territory, because had Saakashvili ordered the opposite he would have been accused acting wrong by his own people, and therefore – irrational.

The third order issued by the Georgian president meant to ensure the security of a peaceful civilian population. Can it be said that Saakashvili implied both Ossetian and Georgian population under this term? I think it can. It would have hardly meant that he had ordered to defend only those people who were standing between his forces and shelled

Georgian enclaves or even worse – only the ethnic Georgians. The president meant all the population of the region. Some can say that it is natural, that no democratic government engaged in similar conflict makes distinctions based on ethnicity, but some may say more. Namely, perhaps Tbilisi hoped that the tide of the battle could have been changed in their favor, that the West might have intervened letting the Georgians enjoy new preferable status quo, or perhaps there was hope the Russians would have chosen "Do nothing" option? These questions cannot be answered yet, but if they contain even a small seed of truth then it is understandable why the President of Georgia ordered his military forces to reach the shelled villages and evacuate people on one hand and wanted to ensure the security of the whole peaceful civilian population of Tskhinvali region on the other.

The remaining payoffs for the Georgian side are equally bad and are assigned same numerical values of **-10**. Both are associated with the "Do nothing" strategy and the only difference is that in one case Tbilisi prefers not to enter if the same is done by Moscow, who makes the first move, and in the other it acquiesces after Kremlin decides to invade. The questions here are why those payoffs can have same values and why "Do nothing" option is not beneficial to the Georgia. The answer to these questions lies in the goals of official Tbilisi. Orders issued by Saakashvili underline that his main effort was to save the lives of people living in the enclaves, by providing protection and making a corridor for evacuation in case attempt to halt adversary progress would have been futile. There were two main reasons why "Do nothing" option was actually regarded as unacceptable to the Georgian side. First of all, it would have caused the political fiasco for a president and his regime, because it would have not been tolerated by own people and the opposition, which at that time constantly urged citizens to the streets demanding the change of the government. Secondly, Georgian enclaves in South Ossetia were a key to a successful resolution of a conflict, because they

played an essential role to win "hearts and minds" policy. The Georgian government was spending many resources to make them look more attractive to Ossetians, to show a difference between *de facto* Kokoiti regime and the *de jure* Sanakoev administration; to underline that it was eager to solve the conflict by political, not military means (The Council of European Union 2009, 15). With help provided by Tbilisi, Dimitri Sanakoev became *de jure* president of South Ossetia. An ethnic Ossetian and an enemy of Tbilisi in the past, he now was a person representing interests of enclaves largely populated by Georgians or those equally mixed with Ossetians Saakashvili wanted to defend. Thus, by losing those Tbilisi was losing hope of successfully resolving the conflict. Decision makers in Tbilisi were aware about the reasons and dangers stated above and, thus should have considered "Do nothing" strategy as non-beneficial. If so, it would have made little difference for the official Tbilisi to choose "Do nothing" option both if Moscow had decided not to invade or on contrary – to intervene.

Thus far, I have introduced strategies, payoffs and outcomes available for the players. In order to find a solution for game Figure 2, I use a method of backward induction, making analysis of game by moving from the strategy of last player to the one that started the game (Gates and Humes 1997, 41). Based on the facts evaluated above it becomes obvious that Georgia will chose the option to defend its citizens. Knowing this, the Russian Federation cannot allow leaving separatist forces face to face with Georgian troops and therefore will choose the "Invade" option. Hence, strategy {I; D} is an equilibrium solution of this particular game, which is sequential and is based on perfect information. Two questions arise here. First, can it be a Nash equilibrium and second, does this game have a subgame perfect equilibrium? It might be a Nash equilibrium in case both players do not have incentives to unilaterally change their strategies, because in this case they would become even worse off.

The Russian Federation is the first one to make a move. Knowing that Georgia will order its troops to enter the region, Moscow does not have an incentive not to invade and therefore, has a dominant strategy in this game. What about Georgia? It makes its move after Russia. Decision makers in Tbilisi already know that Russian military forces have entered the region and due to the reasons stated above will still choose to defend their population. If so, players do not have incentives to unilaterally change their strategies and hence {I; (D; Dn)} is a Nash equilibrium in this particular game. Is it subgame perfect? It will be subgame perfect in case strategy D (defend the citizens) is a perfect equilibrium strategy no matter what movies will be taken by the Russian Federation. And, apparently "Defend the citizens" option is the best rational strategy for official Tbilisi, because it either results in payoff of **10** if Russia does not invade or in payoff of **-8** if latter decides to cross the border. Hence, it can be concluded that Figure 2, which is sequential and is based on the assumption players holding perfect information, has one pure equilibrium solution - {I; (D; Dn)} is a Nash equilibrium and it is a subgame perfect.

The last question I address regarding Figure 2 is if it contains more than one equilibrium solution. Since, equilibrium strategy can be considered a rational strategy for players it should be connected to their payoffs. The Russian Federation has three positive payoffs (**1**; **2** and **5**) while Georgia has only one (**10**) and their strategies are strictly dominant. Both nations will choose to enter the region regardless of the steps taken. However, in case either of them has weakly dominant strategy more equilibrium solutions might be seen in this game too. What if the Russian Federation knows in advance that Georgia is not going to intervene under any circumstances afraid to be called an aggressor? Moscow will chose the strategy "Do not invade", so will Georgia and the outcome will result in exodus of Georgian population strengthening Russia's control over the region. This

strategy can be represented in following way – {Dn; Dn}. It can be an equilibrium strategy if by choosing the "Do nothing" option Georgia acts rationally. For example, if decision makers in Tbilisi want to show that their country is not an aggressor, that the Russian Federation fails to fulfill own duties as a mediator, that its peacekeepers cannot stop Ossetian combatants from slaughtering Georgian population and therefore, negotiations format should be changed.

Another possible equilibrium situation can emerge if Georgia chooses "Do nothing" option and Russia, knowing that it will be blamed for failing peacekeeping mission, will decide to enter the region regardless Tbilisi's actions. In this case, equilibrium strategy will be {I; Dn}.

Nevertheless, these two possible equilibrium strategies can hardly be Nash equilibriums, since players of this game may have some incentives to unilaterally change their courses of action. The brightest example of this claim can be one showing Georgia changing its own strategy from "Do nothing" to one defending the population after "Do not invade" decision is made by the Russian Federation. Hence, {Dn; (Dn; D)} may be an equilibrium solution for this game but it cannot be a subgame perfect. As regards another possible solution, {I; (Dn; D)}, it can emerge as a Nash equilibrium only under certain conditions. For instance, if Georgia will decide that it is worth sacrificing lives of at least some part of own population to be better off in the long run extruding Russia's peacekeeping presence on the own territory. If this will be Georgia's real goal then {I; (Dn; D)} can be a Nash equilibrium. In case Tbilisi's strategy is weakly dominant then it may be still an equilibrium, but it cannot be subgame perfect, because Georgia may have an incentive to unilaterally switch from one strategy to another.

So far, I have introduced an extensive analysis of games built on assumption that players knew what type of an opponent they were facing, they were aware of strategies

available to each other and payoffs assigned to those strategies. In other words, I applied game theory to concrete instance assuming that both Russia and Georgia had complete and perfect information. However, in reality it is hardly possible to find an empirical case where one side is aware of opponent`s preference ordering and its payoffs and vice versa. Below, I analyze the Russo-Georgian War from a perspective that players of this game did not posses perfect information, though they knew that they were facing each other. Information available for players is represented in Figure 3. Please note that this time payoffs of players are not represented in solid numerical values and are only assigned letters and because of the uncertainty, Figure 3 is slightly different then a previous matrix.
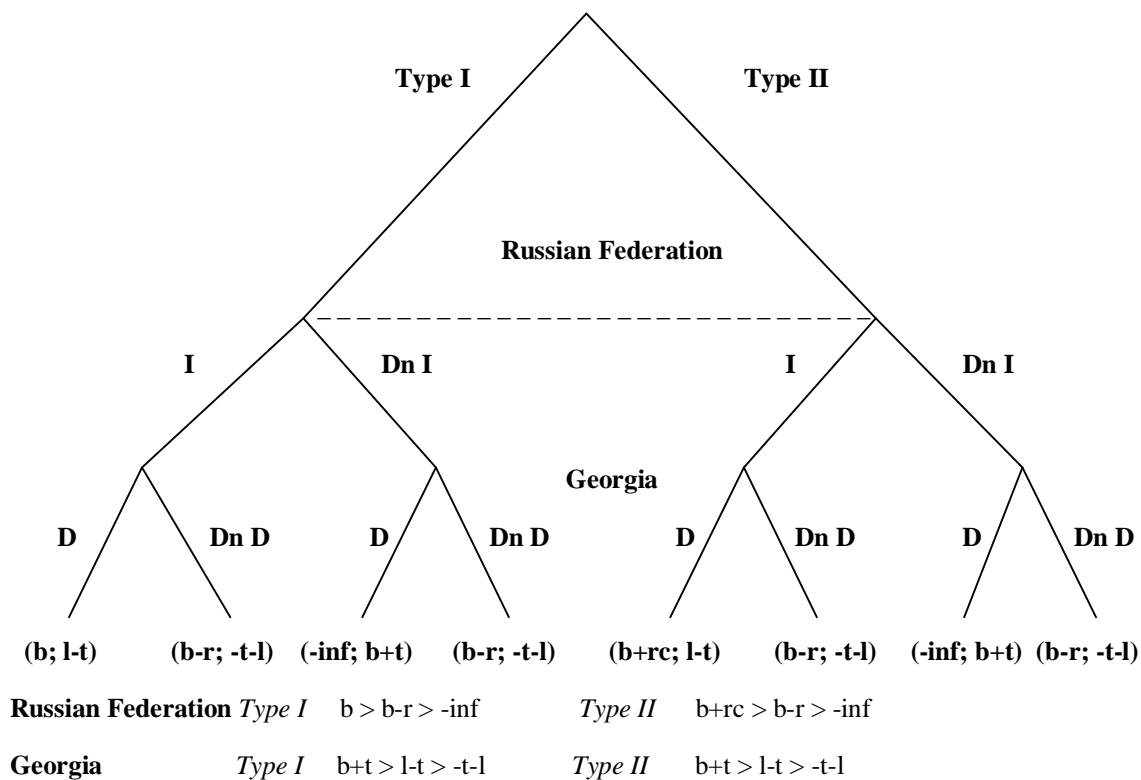
3.3 Representation and analysis of the Game Figure 3

The game of incomplete information implies that it contains an element of uncertainty (Gates and Humes 1997, 45). The state of nature in this particular game is the same as in previous ones. The difference, however, is that Georgia is not aware of Russia's goals and payoffs with certainty and neither is Russia. More precisely, on 7th of August decision makers in Tbilisi have information provided by the intelligence service that some elements of Russian military forces entered the region but their goals and precise numbers cannot be identified with certainty. Villages are shelled and president has to choose either to enter the region or to let Ossetian combatants destroy the enclaves. Saakashvili personally places a call to his Russian counterpart to find what Russia's goals are and sends his special envoy to the region in order to establish the contact on ground (Asmus 2010, 23-33).

What about the Moscow? Do the Russian decision makers know what Sakashvili's plans are at the moment? They do not with a certainty but they have their own estimates because ordered by Saakashvili Georgian militaries started to deploy at the edge of

Tskhinvali region around 18:00 hours (Asmus 2010, 32). Hence, the situation in this particular game implies following: shelling of Georgian controlled enclaves, some elements of Russian army in the region and Georgian troops deployed on its edge. Moscow had already made its move and now it is up to Georgia to answer it.

Figure 3. Extensive-Form Representation of the August 2008 Russian-Georgian Game with incomplete information

Russian Federation	*Type I*	b > b-r > -inf	*Type II*	b+rc > b-r > -inf
Georgia	*Type I*	b+t > l-t > -t-l	*Type II*	b+t > l-t > -t-l

List of acronyms: b = benefits; l = lives of the population; r = reputation; t = territory; inf = influence; rc = regime change

Since this game is one with incomplete information, payoffs do not have numerical values. The biggest problem for Georgia is to identify the goals of the opponent. In other words, decision makers in Tbilisi should identify what type of a player they are facing. Figure 3 contains two types of subgames. Type I is a subgame implying Moscow's less aggressive course of action, while Type II is one showing that Russia actually wants to achieve a regime change in the neighboring country therefore wanting to punish its opponent. Figure 3 represents the preference ordering of the actors. However, it is not enough to find a solution

of this particular game. Both sides have to assign probabilities for each other's payoffs and based on these values equilibrium(s) can be identified.

Suppose that taking into consideration various assumptions, Georgian decision makers believe with enough probability (**α > 0.5**) that in this particular game they face Type I opponent. They know that Russian troops are in the region, but they think that Moscow probably is not going to exceed the borders of the South Ossetia and most likely do not intend to march on Tbilisi. Please note that the purpose of adversary's move is yet unknown for sure but if Georgian decision makers think with probability of **α > 0.5** that Russia's main goal is not to punish Tbilisi, it may change Georgia's preference ordering resulting in a different solution. What is a preference ordering of the sides if Georgia identifies its opponent as Type I? Tbilisi obviously wants to defend its citizens and possibly not lose its controlled enclaves. It is its best payoff. The next best is to save the lives of the people even if it becomes impossible to maintain control over the enclaves. The worst outcome is one showing that again enclaves and lives are lost additionally causing some inner political problems (b+t > l-t > -t-l).

What about the opponent? In case Russia is truly Type I player, its best payoff is to benefit out of defending the Georgian forces if latter decide to fight but without losing the own reputation. Next best is again to benefit from making the conflict zone more homogeneous but this time loosing own reputation (there are two b-r payoffs here. First comes as a result of Russia entering the conflict zone, while Georgia restrains and second occurs if both players decide not to enter the region). Finally, the worst preferable outcome Moscow can have is to lose the influence in the region (b > b-r > -inf).

Figure 3 also illustrates what happens to the preference ordering of the players in case the Russian Federation is a Type II player. It changes a little. Namely, Moscow's preferences

will become b+rc > b-r > -inf while Tbilisi's will stay the same b+t > l-t > -t-l. To sum up, it can be said that if Moscow is concerned with its reputation and does not want to risk exceeding the borders of a conflict zone, then preference ordering of player 2 may be following: b > b-r > b+rc > -inf. However, in case punishment of an opponent is a goal that Russia wants to pursue no matter what then preference ordering changes into b+ch > b > b-r > -inf.

As history showed, the Georgian president was more inclined to believe that Russia was the Type II player. But nevertheless, on the edge of making the move, Tbilisi does not know with certainty whom does it face. Realizing what possible outcomes may occur, Georgian decision makers have to compare these payoff values also taking into consideration **α** (probability) and Type of the opponent they face (Gates and Humes 1997, 47). However, that is not an easy task because as I already mentioned above in games with incomplete and imperfect information players (here Georgia) are facing expected payoff problem (Gates and Humes 1997, 47). Tbilisi cannot say with certainty what Type of player it faces, but it can build its own judgment evaluating opponent's actions and strategy. At this point Saakashvili sees that Russia chose to put troops inside the region, from the point onward he should probably incline to identify his opponent as Type II. But, no matter what Type player I is facing, it has to compare its expected payoff values and afterwards make a decision how to act.

In order to define strategy choice preferable by Georgia I introduced a simple inequality represented by Gates and Humes (Gates and Humes 1997, 47). The expression to the left of inequality shows approximate value of strategy based on "Defend the citizens" option while one the right represents approximate value of "Do nothing" option:

Defend the citizens **α(b+t) + (1-α)(l-t) >** do nothing **α(-t-l) + (1-α)(-t-l)**

Georgia does not know the values of Russia's payoffs, but knows the values of its own with certainty. If we put values given in Figure 2 in this inequality we shall receive following: $\alpha 10 + (1-\alpha)(-8) > \alpha(-10) + (1-\alpha)(-10)$. Finally, we shall have: $\alpha 18 - 8 > -10$. The interesting thing emerging here is that this inequality will hardly change. It simply does not matter for Georgia how it perceives its opponent; as Type I player or II. Assigning any values from 0 to 1 to α, inequality will hold. For instance, let's assume that $\alpha = 0$; that is Tbilisi sees an opponent as Type I. In this case, the value of defending the citizens strategy is **-8** against **-10**`s "Do nothing". This would imply that inequality holds and even if it is perceived that the punishment is not Russia's main goal, priority is given to the "Defend the citizens" option. In case $\alpha = 0.5$ when Georgia is indifferent or simply cannot identify opponent as Type I or Type II, inequality still holds. This time the result is **1 > -10** implying that the strategy to defend prevails. Lastly, if decision makers in Tbilisi clearly identify the adversary as Type II, $\alpha = 1$, then the "Defend the citizens" option has a value of **10**.

Due to the fact that inequality holds under any value of Alfa from zero to one, it can be concluded that Georgia is indifferent in its perception of the adversary. For Tbilisi, it will be rational to choose to defend its own enclaves both if Moscow pushes to punish the neighbor or not. Based on this payoff values and Georgia's beliefs about Type of opponent it faces (probability) solution of the game can be found. Again, it appears that Tbilisi has a dominant strategy and therefore will choose D regardless of the opponent's choice. The same can be said about Moscow's strategy, because the "Do nothing" option is beneficial if and only if Georgia would also prefer to restrain from going into the region. Hence, both in cases of incomplete perfect information Russia will most probably invade the region. The difference will be to what extent. If Russia is the Type I player then it will claim that its goal

is to restore the status quo ante. If Russia is the Type II player, then it will likely punish Georgia by conducting actions leading to regime change in the latter.

Nevertheless, the equilibrium solution for this particular game will be {I; (D; D)}. It is slightly different from the one given in Figure 2, which is {I; (D; Dn)}. Here, unlike in a game with complete and perfect information, Georgia prefers to choose strategy D regardless of opponent's move and so does the Russian Federation. In other words, it is a pooling equilibrium, because player one chooses to act in a same way no matter of its type, meaning that player two cannot learn anything observing the actions of the former (Fink, Gates, and Humes 1998, 21).

But does it have to learn anything? Since, the "punishment" or "not punishment" is incorporated in the "Invade" strategy; it makes a little sense for Georgians to guess the Type of player they face. For example, they will never know whom they face unless the opponent invades only the region or goes for a whole country. In addition, Tbilisi's own estimates show that it is rational to choose an option to defend its own enclaves both when Moscow is selected by nature as Type I or Type II player. In other words, based on the equation introduced above, expected values of strategy D will be always more than expected values for strategy Dn. Thus, Georgia does not really need to distinguish between the types of the players. If so:

1) Russia will choose strategy *I* if nature chooses Russia as *Type I*

   Choose strategy *I* if nature chooses Russia as *Type II*

2) Georgia will choose strategy *D* if Russia has chosen strategy *I*

   Choose strategy *D* if Russia has chosen strategy *Dn I*

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Theoretically, knowing that Tbilisi will choose D, Moscow might even be indifferent choosing between acting as Type I or Type II. The question whether to punish or not is a matter of empirics and unfortunately could not be shown in Figure 3. I hope that those who shall work on the subject in future will overcome this problem. As regards the empirics, history showed that nature chose Russia as a Type II player and it severely punished an opponent by establishing control not over the conflict zone but almost over the whole country.

Are there other equilibrium solutions in this game? In order to answer this question, all the other strategy combinations for both players should be examined. However, based on the payoffs and types of the strategies available to the players of this particular game, it became impossible. All other interactions between strategies of player 1 and player 2 are simply eliminated under given conditions. It appears that based on data represented in Figure 3 the Russian Federation will always chose the strategy I, while Georgia will always go for the strategy D. These strategies are dominant because they always promise best outcomes regardless opponent's moves. Nevertheless, I believe that scholars working on same subject will be able to find other equilibrium solutions of Russo-Georgia war based on different payoff values and goals of the players.

The last issue I analyze related to the Figure 3 is the notion of uncertainty and its role in games of incomplete information. As I have already mentioned, uncertainty is usually a key to fiasco outcomes for a decision maker, because it implies either a lack of information or its bad interpretation. Both may be responsible for bad outcome in the end. It is difficult to answer to what extent these factors affected decisions of Tbilisi and Moscow back in August 2008. Probably memoirs written by authors of those events or people from inner circles in

future will highlight some missing tiers of the whole story. Until then scholars can hypothesize or draw conclusions by making theoretical applications to empirical cases.

Decision maker as an individual or a member of a group operates as a decision-making unit oriented to produce a concrete outcome through the implementation of various strategies (for instance advisors in presidents' cabinets). In either case, the individuals can be named and viewed as the primary source of the decision-making process itself, because, as links between social structures and outcomes, later are ultimately reduced to explanations in terms of individual action (Carlsnaes 2006, 335). Hence, while engaged in a decision-making process, actors usually select particular strategy from a given set of strategies, which consists of the various decision sequences called choices, in turn made at various decision points called moves.

Actors are assumed to be able to make critical evaluations and comparisons of "consequences associated with the set of possible outcomes" (Zagare 1984, 12). Strategic behavior is usually dependant on actions and moves of the opponents, because they seek to influence opponent's choice by working on his expectations of how his behavior is related to one's own. Besides, each actor's best choice depends on moves he or she expects his or her opponents to do (Allison and Zelikow 1999, 41). This aggregation of decision-makers' choices and actions underline complexity of process itself, making great emphasis on environment where decision are made. Thus, if environment has the element of uncertainty as it is shown in Figure 3, decision-making unit should have problems regarding possessed information or/and data interpretation.

According to Schelling (in Allison and Zelikow 1999, 40-41), strategy analyzes and explains the maze of national actions and reactions as more or less advantageous moves in a game of interdependent conflict. He clarifies critical importance of the issue of information,

as a basis of actors' actions, and notion of interdependence, related to ability making best possible choices depending on choices made by opponents (in Allison and Zelikow 1999, 41). While this claim is plausible, it does not mean that decision-makers necessarily posses full and reliable information when fulfilling their daily activities. In other words, uncertain environments put constraints on actors` problem solving capabilities, which may lead to fiasco outcomes.

Was it a case with Georgia when its forces entered the conflict zone? Well, according to Simon (Simon 1985, 296; 303), principles of pure rationality cannot really make good predictions about various political phenomena if they neglect relevant auxiliary assumptions and do not imply the importance of the extensive empirical research. Moreover, he argues that decision-makers usually terminate search as soon as they come up with suitable and satisfactory outcome (Simon 1985, 295). Simon proposes that in order to understand this kind of behavior it is necessary to specify what the problem solver wants, knows, and can compute (Simon 1985, 295).

This claim has a point but it is also debatable, because usually it never works in a way that for example U.S. presidential advisers either terminate search in terms of incomplete and imperfect information or accept satisfactory outcome. Uncertainty pushes decision maker to assign estimates, form expectations or as it is argued by Simon – come up with auxiliary assumptions (Simon 1985, 296-297). For instance, examples of decisions made under uncertainty like "Bay of pigs" and "Cuban missile crisis" illustrate that even in terms of uncertainty decision makers were trying to achieve best possible positive outcomes. Hence, if the situation involves uncertainties, actors prefer at least to choose alternative for which the expected utility is the highest. By expecting utility of an alternative is meant the average of the utilities of the different possible outcomes, each weighted by the probability that the outcome will ensure if the alternative question is chosen (Simon 1985, 296).

The equation showing average value of different strategies shows that Tbilisi was rational when choosing strategy D, because it promised most benefits. Thus, from theoretical standpoint when operating in uncertain environment Georgian decision makers were rational. When uncertainty is high, success or failure related to both the decision-making process and its outcome depends on the relationship "between the importance of an assessment and the likelihood that latter will be accurate" (Betts 2007, 31). Thus, alongside available data individual factors also play very important role. Decision makers may misinterpret even relatively full information sets.

Obviously, data provided by the intelligence service of Georgia was solid but was not full. Tbilisi knew about opponent's actions, but did not know why unlike 2004 the Russian Federation decided to cross the border with certainty. As it is pointed out by Ronald Asmus: "President Saakashvili's decision to fight … was a desperate response to what he believed was imminent threat of the ethnic cleansing of tens thousands of Georgian citizens, the possible loss of South Ossetia and Abkhazia once and for all, a possible Russian assault on Tbilisi itself" (Asmus 2010, 10). Here it can be seen that personal factor is responsible for Georgians regarded Russia as the Type II player, one that was going to punish them anyways. Nevertheless, the very fact that decision-makers operate in the fundamentally uncertain environment, that actors themselves generate uncertainties leads to the realization that occurrence of strategic surprises is a natural way of things. However, it does not imply that decisions taken under conditions of uncertainty will always lead to bad outcomes. In the end, it all depends on the capabilities and resources available to the players and Georgia is far not Russia in light of latter.

3.4 Representation and analysis of the Game Figure 4

While it is still difficult to say to what extent uncertainty affected decisions of official Moscow and Tbilisi in August 2008, determination and readiness of Moscow to deal with the problem remains remarkable. The fact that the Russian Federation could deploy around 40, 000 troops to Georgia in only five days underlines the importance of the problem for Moscow and raises at least two questions: what were its real goals and did it consider the game in a zero sum terms (Asmus 2010, 165).

Officially, operation "Compulsion to peace" intended to stop genocide of Ossetian people by reinforcing own peacekeepers and drawing Georgian forces out of the region. However, in reality Russia's military operation exceeded the conflict zone heavily, resulting in almost total occupation of Georgia's soil. Accusations of official Moscow that Georgians made genocide of Ossetian population in the conflict zone were dismissed by Tagliavini Report as "neither founded in law nor substantiated by factual evidence" (Asmus 2010, 221). Moreover, while the report indicates that Georgia was the first one to fire in this war, it clearly states that Russia's military operation "cannot be regarded as even remotely commensurate with the threat to Russian peacekeepers in South Ossetia" (Asmus 2010, 221) and also concludes that distribution of Russian passports in the region during past years was an illegal action. The very fact that Moscow intervened with all its might and deterrence indicates that literarily speaking too much was put on the table, that the stakes were high.

So, what made Russia's strategy in this game strictly dominant? According to Asmus (Asmus 2010, 108; 170-182) and Felgenhauer (in Cornell and Starr 2008, 162), Moscow's real goals were different then just defending Ossetian population. Namely, the most interesting were to eliminate Georgian control over the enclaves inside conflict region, achieve regime change and make sure Georgia cannot enter the NATO. If those were main

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goals for the Russian Federation and if Georgia's goal was to protect own population possibly saving status quo ante or even restoring territorial integrity, then it is possible to analyze Russo-Georgian war from zero-sum retrospective insight. Figure 4 is a normal form of representation of this game.

Figure 4. Normal-Form Representation of the August 2008 Russian-Georgian Game

	Georgia	
	Defend the enclaves	Do Nothing
Back Ossetians **Russia-Ossetia**	**A.** War **(3; 3)**	**C.** Russia establishes military presence leading to possible regime change; Georgia loses control over its enclaves; population oppressed **(4;1)**
Do Nothing	**B.** Russia loses control in the region; Georgia restores its territorial integrity **(1;4)**	**D.** Russia fails to achieve regime change and to stop Georgian integration to NATO; Georgia loses control over its enclaves; population oppressed **(2;2)**

The essence of zero-sum game lies in a fact that players' preferences are exactly the opposite (Zagare 1984, 21) and goals of the actors listed above actually show the conflict of interests. Unlike in previous games, Russia-Ossetia is presented as one player, because both have common preference to eliminate the Georgian presence in the conflict zone. The matrix shows four possible outcomes based on strategies available to players and their payoffs. Note that this time payoff values have range from one to four, because the aim of this particular game is not to show exact complexity and weights of preferred choices, but rather to introduce zero-sum character of the conflict.

In order to select a strategy in zero sum game, players can first observe which strategies maximize their security level and which on contrary make them vulnerable. According to maximin principle, when these are defined, players can see what courses of action they should take to achieve maximization of their security level (Zagare 1984, 23). Figure 4 shows that Russia-Ossetian security level is high if it chooses the offensive strategy (Back Ossetians). The same can be said about security level of Georgia, which is maximized if Tbilisi chooses to protect the enclaves. Thus, in order to maximize own security levels Russia has to back Ossetians and Georgia has to defend own enclaves. If players of this particular game follow this theoretical principle, then they chose their best, optimal strategies, which will shall lead them to outcome A. Outcome A contains the same payoff values for both Tbilisi and Moscow and is achieved because none of the players have an incentive to unilaterally change their strategies. Hence, {B; D} is an equilibrium of this particular game. However, it should be noted that it is achievable only if both players are determined to follow their best security maximizing choices. In case, for some reasons they do not follow this principle, the outcome may not result in any equilibrium solution at all. The thing is that if maximin principle is complied then it simply does not matter for player I to know about opponent's choice or not. But, if for some reason player II chooses not to follow utility maximizing principle and player I would know about it then former may be punished (Zagare 1984, 31) (or vice versa). For instance, it may happen if Russia will chose "Do nothing" strategy and Georgia, knowing about it in advance, will chose strategy to "Defend the enclaves".

This particular game has another possible equilibrium solution. If players do not follow maximin principle and if their strategies are not dominant, then they might end up with outcome D. This time equilibrium solution is {Dn; Dn}. The possible motivation for

Russian Federation to choose strategy Dn should be fear to lose own reputation and hope that Georgia will not engage separatist forces fearing to provoke a retaliation. Theoretically, it is still an equilibrium, despite the fact that Russia's main goal to achieve regime change and stop Georgia from entering NATO is not achieved and Georgia, with the government intact and having no obstacles towards NATO integration, loses enclaves inside the conflict zone.

This type of equilibrium is usually hard to achieve, because players have no incentives to risk their security levels in non-repeated games; however, in case the game is repeated, then under some circumstances players can chose sub-optimal strategy among available to benefit on the long run. Hence, Figure 4 shows that in this particular game there are only two possible equilibrium solutions and due to the fact that this game is not repeated outcome will most likely result in solution {B; D}.

4. Conclusions

The Russo-Georgian War that took place in August 2008 was the culmination of the fast deteriorating relationships between Moscow and Tbilisi. It raised many discussions among politicians, historians and scholars. This thesis made a game theoretical application of Rational Actor Model (RAM) to this concrete historical event. In particular, it answered the question whether decisions taken by actors could be regarded as rational. In order to test this I built four different games related to the Russo-Georgian war trying to analyze decisions taken by actors, focusing on various circumstances and trying to define equilibrium solution of each of these games. I also tried to define other alternative outcomes; solutions of the game that could have possibly emerged had players of this game acted in a different manner.

The four game theoretical models included three crucial stages of model building: conceptualization, operationalization and interpretation. The formal structure of each game included players, their payoffs and their nodes of decisions, actions and information sets. Operationalization of all four games showed that game theoretical application of RAM to this empirical case was successful. In addition, I was able to delineate strategies available to players and found solutions to all four game instances, which leads to the conclusion that decisions taken by both players were rational.

Analysis of game Figure 1 showed that outcomes and preference ordering of the players do not change no matter who starts the game, leading to assumption that both Moscow and Tbilisi have dominant strategies in this game. For better understanding why those strategies were dominant and what the players` motivation were I introduced game Figure 2, a sequential game with complete and perfect information. Analysis showed that the main argument for the Russian Federation to pursue dominant strategy in this game was the fact that, on the one hand, it maximized its utility which was rational, and on other the "Do

nothing option" would have lead to the loss of reputation. As regards Georgia, it appeared that its dominant strategy was based merely on two things: necessity to defend its own enclaves and allies (the Sanakoev administration) and the negative political consequences had the "Do nothing" strategy been chosen.

Since the majority of games do not necessarily imply existence of complete and perfect information, I built another game model which included probability distribution for each node. Conceptualization of Figure 3 showed that Georgia would always go for the strategy "Defend the enclaves", because regardless of α value - that is regardless of how Georgians perceived their opponent (Type I or Type II) - Tbilisi was better off defending controlled villages. Another interesting finding was that Georgia was not able to understand Russia's intentions by observing the actions, unless the latter made it clear. That is, had the Russian Federation gone beyond the conflict zone it would have been regarded as a Type II player; had it stopped the conflict without occupying the rest of the Georgia, it would have been regarded as a Type I player. Hence, according to game theoretical concepts, player 1 (Russia) would at least have entered the region, with incentives to unilaterally change the strategy - to punish or not punish the opponent - and player 2 (Georgia) would have chosen to maximize its security level regardless opponent's moves.

The determination and readiness of Moscow to deal with the problem was remarkable. Suggestions of some experts like Asmus, Illarionov and Felgenhauer introduced above about Russia's real goals, together with the presence of dominant strategies for both players, raised questions about zero-sum character of this game, which was presented in Figure 4. The analysis showed that, first of all, it was possible that players considered themselves on zero-sum terms, and secondly, it once again underlined that depending on their

goals and preference ordering each would have chosen strategies maximizing own security levels regardless opponent's move.

In the end, I would like to reiterate that my research has been a successful attempt of game theory application to the particular case of the Russo-Georgian War. The problems I encountered while working on it were related first of all to the absence of rich data, so, the conclusions are uncertain. Nevertheless, I am sure that my work has provided some insights concerning those tragic events of August 2008 while still leaving other questions unanswered. However, when more data becomes available more light will be shed on this particular case, making application of other game theoretical or decision-making theories and, therefore further contribution, possible.
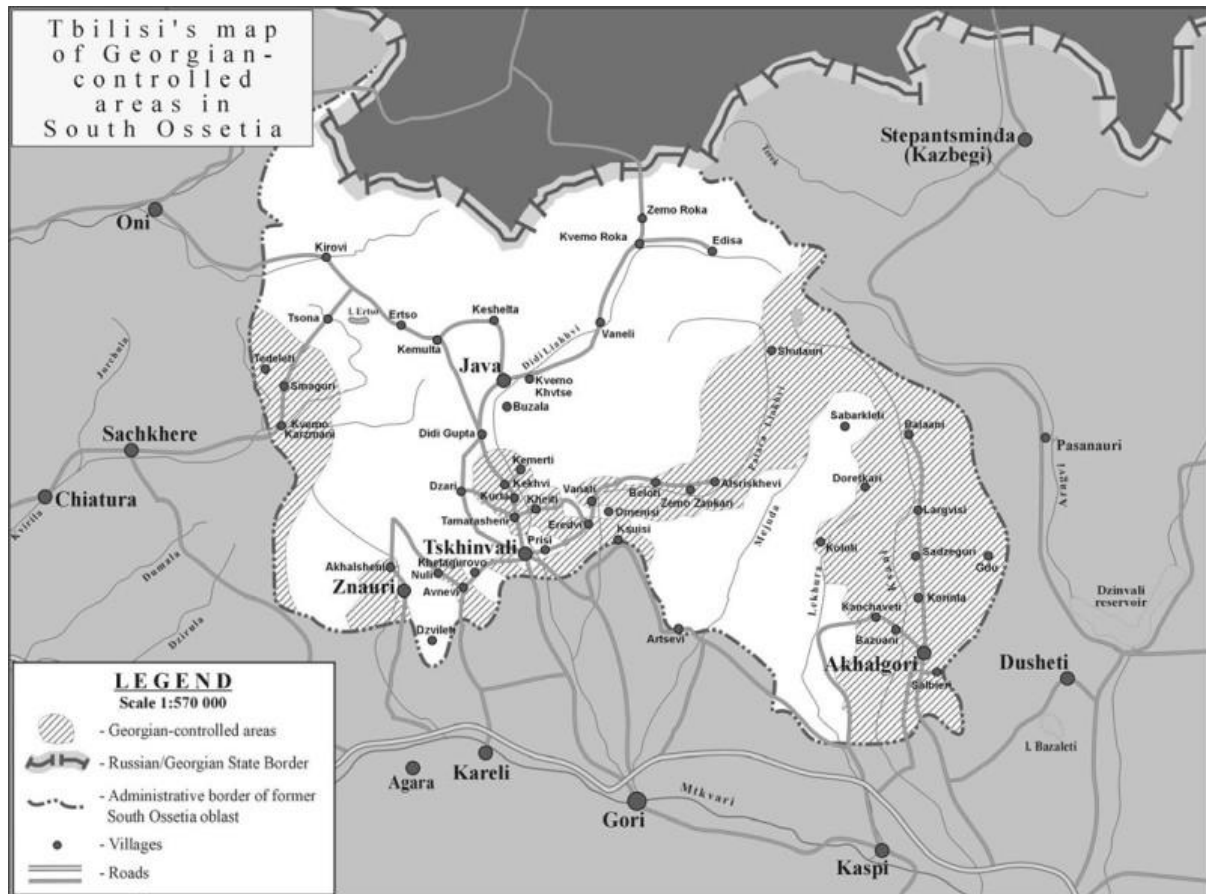
Appendices

Appendix 1

Map of the Caucasus Region (Georgia)

Source: University of Texas At Austin (University of Texas Libraries).

Appendix 2

Map of the Tskhinvali region (South Ossetia) representing the Georgian controlled areas prior the conflict

Source: University of Texas At Austin (University of Texas Libraries).

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