Assessment of the severity of armed conflicts based on the changes in the quality of life

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Abstract

Armed conflicts have a significant impact on the economy and quality of life. Their severity and intensity are usually measured based on war expenditures and losses, especially direct ones. It is difficult to assess the related opportunity costs which result i.e. from the weakening trade ties if the number of states involved in the conflict is growing. The paper attempts to assess the severity of international conflicts based on their characteristics as well as indirect effects which were approximated by changes in the multi-criteria assessment of the quality of life in an affected country. Quality of life assessments is based on economic, social and political factors, all of which are reflected in current quality of life rankings.

The approach suggested in the paper allows for a comprehensive and synthetic assessment of the impact of the chosen conflict on the economy and quality of life in affected country. The paper also attempts to examine to what extent the addition of the criteria related to the quality of life changes the assessment of the severity of the conflict made only on the basis of characteristics of the conflict itself. An important element of the analysis is the length of the considered time period (from the nineteenth century). Multicriteria rankings are the main method used in the paper. .

Keywords: *armed conflicts, quality of life, multicriteria rankings*
JEL Classification: *I310, C440, F510*

1. Introduction

Conflicts affect the countries' economy and quality of life in many dimensions. First of all they change conditions under which economics operates which in turn modifies the allocation of resources, uncertainty and risk levels. Consumption of goods and services, trade (Feldman and Sadeh, 2018), education (Lai and Tyne, 2007), politics are healthcare (Lai and Tyne, 2007) are affected. The overall quality of life decreases. On the other hand it is mentioned that due to those changing conditions requiring specific actions from economic agents conflicts may also contribute to the increase of efficiency (Kang and Meernik, 2005) or development of new technologies (Ruttan, 2006). It can be shown that there is a negative relation between quality of life and the intensity of internal conflicts and a positive relationship in case of external ones (Sielska, 2018a).

The aim of the paper is to assess the severity of international (interstate) conflicts based on their characteristics as well as on indirect effects which were approximated by changes in the multi-criteria assessment of the quality of life in an affected country. The paper consists of 4 parts. In the first part data and criteria used for evaluating both conflicts and quality of life are presented. The second one describes the outranking approach and weights elicitation methods used in the study. In the last part results are presented and discussed.

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2. Data and criteria

Data for the analysis comes from the Correlates of War database (Sarkees and Wayman, 2010). We use definition provided by Sarkees, according to which interstate wars 'take place between or among (…) members of the interstate system' including additional criteria.

Some of the conflicts were removed from the study due to the lack of corresponding data which would allow the author to evaluate the quality of life in a participating country. As a result, the analysis was conducted on the basis of 44 interstate conflicts listed in table 1.

Due to the nature of the data the severity of each war was assessed from a given participants' perspective. Therefore the notation used in the next parts of the paper is as follows: state_warcode. For example GBR_65 means the conquest of Egypt evaluated from the perspective of the Great Britain.

Two war characteristics (battle-related combatant fatalities suffered by the participating state and binary variable reflecting if the participant won the conflict) were always included in the criteria set. Quality of life assessments are based on the Clioinfra data (https://www.clio-infra.eu) and (van Zanden et al., 2014) and are taken from the study by Sielska (2018b). Because the data frequency in the most cases is 10 years, all conflicts that occur in the same decade are grouped. In such cases the codes of additional conflicts appear in the war symbol after the semicolon. Four different approaches were considered for quality of life assessment. The first one (further denoted by P) is based on the criteria referring to the political state of the country including polity2 index (for years 1820–1980) and democracy index (1820–1980). Demographic approach (D) is based on the homicide rate (1820–1980), average height in population (1820–1980) and life expectancy at birth (1870–1980). Economic assessment (E) considers growth rate of GDP per capita (1820–1980), income inequality (1820–1980) and real wages of construction workers (1910–1980). Multidimensional approach (T) uses: numeracy index (1810–1970), inflation (1810–1990), GDP per capita (1810–1990), GDP per capita growth rate (1900–1990), urbanization ratio (1810–1990), average height in population (1810–1990), numeracy inequality (1830–1900), real wages of construction workers (1900–1990), average years of education (1900–1990), homicide rate (1930–1990), life expectancy (1900–1990), education inequality (1910–1990), income inequality (1950–1990), ratio of female to male life expectancy (1940–1990).

Table 1. Analysed conflicts

War code (1)	War name (1)	War code (2)	War name (2)
1	Franco-Spanish War	83	Sino-Russian
4	First Russo-Turkish	85	Russo-Japanese
7	Mexican-American	94	Second Spanish-Moroccan
10	Austro-Sardinian	97	Italian-Turkish
13	First Schleswig-Holstein	106	World War I

War code (1)	War name (1)	War code (2)	War name (2)
16	Roman Republic	107	Estonian Liberation
19	La Plata	108	Latvian Liberation
22	Crimean	109	Russo-Polish
25	Anglo-Persian	116	Franco-Turkish
28	Italian Unification	118	Manchurian
31	First Spanish-Moroccan	127	Conquest of Ethiopia
40	Franco-Mexican	133	Changkufeng
46	Second Schleswig-Holstein	136	Nomonhan
49	Lopez	139	World War II
52	Naval War	142	Russo-Finnish
55	Seven Weeks	145	Franco-Thai
58	Franco-Prussian	151	Korean
61	Second Russo-Turkish	155	Sinai War
65	Conquest of Egypt	156	Soviet Invasion of Hungary
67	Sino-French	158	IfniWar
79	Spanish-American	163	Vietnam War, Phase 2
82	Boxer Rebellion	170	Second Laotian, Phase 2

3. TOPSIS method

Multicriteria ranking are constructed using the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method (Hwang and Yoon, 1981), which is also used to assess the quality of life (Sahin and Yapici Pehlivan, 2017; Sanda and Krupka, 2016; Sanda and Mandys, 2017). The first step of constructing a ranking is to evaluate all alternatives on the basis of all decision criteria taking into account criteria weights. Characteristic feature of the TOPSIS method is that the final rank of the alternative is based on its relative distances from ideal solution and negative ideal solution . Those reference points are defined according to formulas (1–4)

$$T^{+} = (t_1^{+}, t_2^{+}, \ldots, t_n^{+}) \tag{1}$$

where

$$t_j^{+} = \begin{cases} \max\limits_i t_{ij} & \text{for maximised criteria} \\ \min\limits_i t_{ij} & \text{for minimised criteria} \end{cases} \tag{2}$$

t_{ij} – evaluation of the alternative i based on j-th criterion (considering criterion importance).

$$T^{-} = (t_1^{-}, t_2^{-}, \ldots, t_n^{-}) \tag{3}$$

where

$$t_j^- = \begin{cases} \max\limits_i t_{ij} & \text{for maximised criteria} \\ \min\limits_i t_{ij} & \text{for minimised criteria} \end{cases} \tag{4}$$

The closer the alternative is to the ideal solution, the better it is considered. Similarly, the closer the alternative is to the negative ideal, the worse it is considered. The final rank is calculated based on the following relative distance:

$$D_p(a_i) = \frac{d_p^-(a_i)}{d_p^-(a_i) + d_p^+(a_i)} \tag{5}$$

Where $d_p^{-(a_i)}$ denotes to the distance to the negative ideal, and $d_p^{+(a_i)}$ denotes distance to the ideal solution.

Criteria weights were calculated using ROC (Rank Order Centroid) approach which is one of the most popular (see for example Sielska, 2015; Alfares and Duffuaa, 2016) methods which allows for eliciting criteria weights based only on the ranking of criteria. All possible sets of weights were considered, i.e. for 3 criteria we build 6 rankings, for 4–24, for 5–120 and in the last case (6 criteria) 720 rankings were constructed. Because of the limited volume of the paper we do not present the entire rankings. We focus on the leading positions and overall similarity of the rankings instead.

4. Results

The following tables present the results of ranking based on the core set of two war characteristics with addition of other criteria representing the change in the quality of life after the conflict. Because of the limited volume of the paper only median ranks are presented. Numbers in the parentheses denote median ranks obtained for the core dataset (two war characteristics only) while columns refer to the type of approach to quality of life assessment.

Table 2. Most severe conflicts. Evaluation based on 3 criteria

Conflict	P	T	E	D
ARG_49	3.5 (17.0)			
BRA_49	4.5 (21.0)			
ESP_158				1.0 (4.0)
ESP_31				6.5 (9.5)
ESP_52			2.0 (26.0)	
ESP_94			4.5 (8.0)	6.0 (7.0)
FRA_1		1.0 (37.0)		3.0 (5.0)

Conflict	P	T	E	D
FRA_139;145	1.0 (36.0)			
FRA_16		4.0 (36.0)	4.0 (7.0)	6.0 (6.0)
FRA_40	2.0 (40.0)			
FRA_82			3.0 (2.0)	
GBR_22;25		2.0 (25.0)		
GBR_82				2.0 (2.0)
MEX_40	4.0 (41.0)			
NLD_139		3.0 (30.0)		
NLD_151			1.0 (25.0)	
USA_79		5.0 (34.0)		

It should be noted that evaluations obtained by TOPSIS method are relative. Therefore conflicts that involve only one of the analysed states are more likely to be ranked higher than conflicts involving most of the states and to the similar degree. In case of the results presented in table 2 it can be seen that the additional criteria change the first positions. For example Franco-Spanish war for France (FRA_1) is considered the most severe for the general point of view, while its median rank is 37 if assessed only on the basis of core criteria. This is the most distinct example, but it can be clearly seen that the changes in the quality of life (measured by any approach) provide additional information. Including additional criteria, connected to different spheres of the quality of life leads to different conclusions. For example the impact of Ifni War on the demographic and social situation of Spain is clearly visible (ESP_158), as well as the effect of Korean war on the economics of Netherlands (NLD_151). The effect of both II World War and Franco-Thai War on the political situation of France was assessed as significant.

Table 3. Most severe conflicts. Evaluation based on 4 criteria

Conflict	P+T	E+P	E+T	E+D	D+P	D+T
ARG_49	6.0 (10.0)					
ESP_158				6.0 (4.0)		
ESP_31					5 (9)	
ESP_52				1.0 (19.0)		
ESP_94				3.5 (7.0)		
FRA_1	2.0 (5.0)		1.5 (5.0)	6.0 (5.0)		1.0 (4.0)
FRA_139;145	2.5 (20.0)	1.5 (24.5)			1.0 (18.5)	
FRA_16			5.0 (6.0)	5.0 (6.0)		3.0 (5.0)

Conflict	P+T	E+P	E+T	E+D	D+P	D+T
FRA_22;28		6.5 (15.5)			4.0 (11.0)	
FRA_40	5.0 (22.0)	3.0 (26.5)			2.0 (20.5)	
FRA_67						5.0 (6.0)
FRA_82				2.0 (1.0)		
GBR_22;25	2.0 (12.0)	5.0 (14.0)	2.5 (12.0)		4.0 (10.0)	2.0 (8.0)
GBR_65					7.0 (3.0)	
ITA_127						4.0 (7.0)
NLD_139	3.5 (9.0)		3.0 (10.0)			
NLD_151		2.0 (21.5)	2.5 (20.0)			
USA_79			6.0 (8.0)			

In the case of 4 criteria evaluation (two war characteristics and two different approaches to quality of life measurement) similar conclusions may be drawn. Top positions in rankings change depending on the criteria taken into account (table 3). Evaluation based on 5 criteria (table 4) leads to similar conclusions. It should be noted, however, that in this case Franco-Spanish war for France (FRA_1) once again can be assessed as critical. Boxer Rebellion (82) and Crimean war (22) are ranked high considering their impact on different countries. In general approach if whole set of criteria is taken into account Korean (151), Sinai (155) and Ifni (158) wars are ranked highest (table 5). In all cases (3, 4 and 5 criteria) 2 groups of conflicts can be distinguished. For some wars, severity is rated significantly higher if the quality of life is taken into account, while for the other group additional criteria do not affect the rank. In case of 3 criteria first group includes i.e. Franco-Mexican war (40) assessed from French perspective and naval war (ESP_52) while both Franco-Spanish War (1) and Boxer Rebellion for France (82) belong to the other group. In case of 4 criteria respective examples are: Korean War (NLD_151) and Boxer Rebellion (FRA_82).

However, it should be also noted that the approach to the quality of life cannot be neglected. For example in the case of Franco-Mexican war (FRA_40) taking into account political, demographic and total set of criteria (P+D+T) do not provide much additional information, while other approaches do, which results in the change of ranks.

Table 4. Most severe conflicts. Evaluation based on 5 criteria

Conflict	E+D+T	E+D+P	P+D+T	P+E+T
ESP_52		3.0 (16.5)		
FRA_1	1.0 (4.0)		1.5 (14.0)	2.0 (5.0)
FRA_139;145		2.0 (18.5)	2.5 (5.5)	3.0 (19.0)

Conflict	E+D+T	E+D+P	P+D+T	P+E+T
FRA_16	4.0 (5.0)			
FRA_22;28		6.5 (11.0)		
FRA_40	3.0 (15.5)	2.0 (20.5)	4.0 (4.5)	5.0 (20.0)
FRA_67			6.0 (12.0)	
FRA_82	3.0 (1.0)	6.0 (1.0)		
GBR_139	6.0 (14.5)			
GBR_22;25	3.0 (8.0)	5.0 (10.0)	2.0 (11.0)	3.0 (11.0)
GBR_65			6.0 (15.0)	
ITA_127	7.0 (7.0)			
NLD_139				4.0 (9.0)
NLD_151				3.0 (18.0)
USA_79				8.0 (8.0)

Table 5. Evaluation based on 6 criteria

Conflict	Median rank (including effects on the quality of life)	Median rank (not including effects on the quality of life)
FRA_1		4.0
FRA_139	8.0	
FRA_151;155;158	1.0	
FRA_16	8.0	5.0
FRA_22;28	6.0	
FRA_67	4.0	
FRA_82		1.0
GBR_151;155	7.0	
GBR_65	7.0	3.0
GBR_82	4.0	2.0

In the final step we assessed the similarity of core and more complex rankings that take into account the quality of life. Spearman rank correlation coefficients are presented in fig. 1. In general, rankings with additional criteria are not similar to the original ones, build only on basis of war characteristics. The greatest similarity can be observed in case of demographic and economic changes. It is worth pointing out that about half of the relations are insignificant (at significance level 0.01) which is represented on the plot by the blank bars.

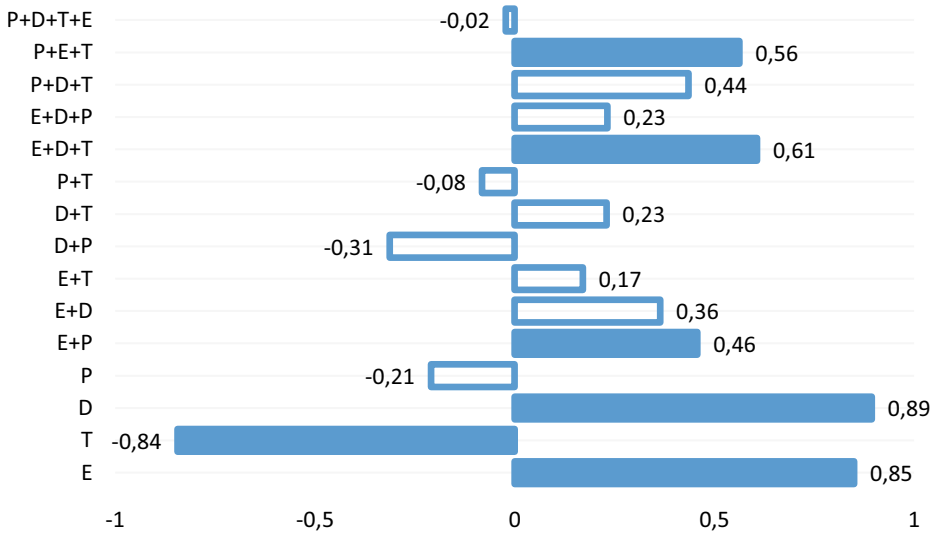

Fig. 1. Rank correlation coefficients

Conclusions

Severity of 44 interstate conflicts was assessed on the basis of both conflict characteristics and its' impact on the relative quality of life in a participating country. The results show that for all approaches to the quality of life measurement additional criteria change positions in the rankings. Secondly, those changes depend on the criteria and approach used. It means that even if changes in one sphere of well-being are reflected by the changes in the other (e.g. economic conditions influence society and demography and vice versa) none of them should be neglected while building a ranking. In general, some sets of criteria connected to the quality of life do not provide additional information even if some of the individual criteria, included in respective sets do. Due to this fact we may conclude that it is not only possible to assess the severity of each conflict, but to describe those spheres of wellbeing which are not significantly affected by the conflict.

The overall similarity of rankings built based on war characteristics only and more complex rankings is high only if demographic or economic approaches are considered.

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