Voting rules at the Eurovision Song Contest (ESC)

Lennart Beekhuis

Supervisors: Arthur Boixel, Ulle Endriss

UvA

22 January 2019

Table of Contents

Overview of the ESC

Research questions

Results

Basic rules of the ESC

- Each *country* sends in a contestant which performs a song
- Afterwards, each country *votes* for other countries' performances
- Votes are aggregated using a *voting rule*
- Country with the *most points* wins

Research Questions

Voting Rules

- A total of 7 different voting rules have been used
- The rules belong to different *families*
- Is there a *unified framework* in which all rules can fit?

Research Questions

Voting Rules

- A total of 7 different voting rules have been used
- The rules belong to different *families*
- Is there a *unified framework* in which all rules can fit?

Research Questions

- To what extent do these rules *influence the result*?
- It is possible to *design a rule* which makes country X *win* in year Y?
- How much does *collusion* influence each country's placing?

A unified perspective

Country v in C votes by submitting a *ranking* $\succ_v$ in $\mathcal{L}(C)$ and a *scoring vector* $w_v = (w_v^1, \ldots, w_v^n)$ in $\mathcal{W}$. A *voting rule* $F_{\mathcal{W}}$ is used to select an *outcome*, a set of winning countries:

$$F_{\mathcal{W}} : (\mathcal{L}(C) \times \mathcal{W})^n \to 2^C \setminus \{\emptyset\}$$

The rule $F_{\mathcal{W}}$ will compute the *score* of each country according to the submitted ballots. Countries with the highest final score win.

$$\forall c \in C,\ score(c) = \sum_{\substack{v \in C \\ v \neq c}} w_v^{rank(c)}$$

Influence of the voting rule on the outcome

- Out of the *142* times another rule has been applied on an ESC, only *21* contests ended up with a different result (15%)
- If an outcome of an ESC changes when using one different rule, it most likely also changes when using another different rule
- Hypothesis: outcome in these ESCs was very close
- How to test this: see if we can make more than one country win!

	ESC's	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rules																											
1962		NL	GB	GB	IL	IL	IE	CH	DE	LU	IE	NO	BE	IE	GB	YU/GB	IT	SE	IE	IE	IE	NO	IE	GB	IL	IS	DK
1963		NL	GB	GB	IL	IL	IE	DE/GB	DE	LU	IE/SE	NO	BE	IE	CH	YU/GB	IT	SE	IE	IE	IE	NO	IE	GB	IL	SE	DK
'64-'66		NL	GB	GB	IL	IL	IE	CH	DE	LU	IE	NO	BE	IE	GB	GB	FR	SE	IE	IE	IE	NO	IE	GB	IL	IS	DK
1975-2012		NL	GB	FR	IL	IL	IE	GB	DE	LU	SE	NO	BE	IE	CH	YU	IT	SE	IE	IE	IE	NO	IE	GB	IL	SE	DK
'12-'15																											
'16-now																											

Figure: Outcomes for different ESC rules (1975-2000)

Make country X win in year Y

- Represent an outcome as a *set of inequalities*
- Solve using a *linear problem solver*

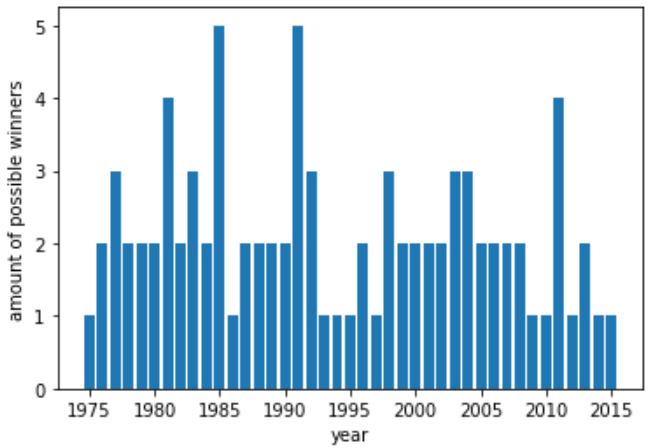
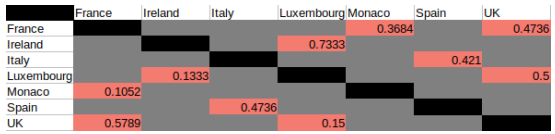


Figure: Amount of solutions for each year, upperBound $= 10000$

- When outcome changed using a different rule, amount of solutions > 1

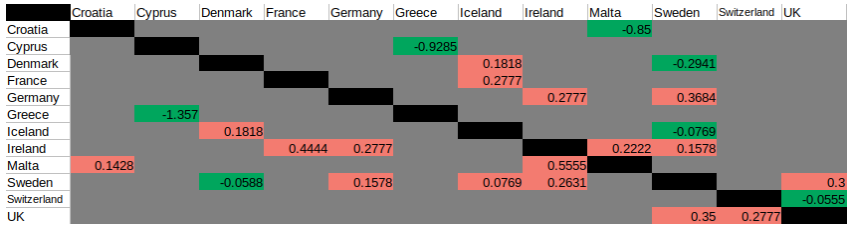
How much does collusion influence each country's placing?

- *Remove ballots* from colluding countries
- *Recompute result* and compare
- Compute the *average change* over multiple years



	France	Ireland	Italy	Luxembourg	Monaco	Spain	UK
France					0.3684		0.4736
Ireland				0.7333			
Italy						0.421	
Luxembourg		0.1333					0.5
Monaco	0.1052						
Spain			0.4736				
UK	0.5789			0.15			

Figure: Collusion effects from 1960 to 1980



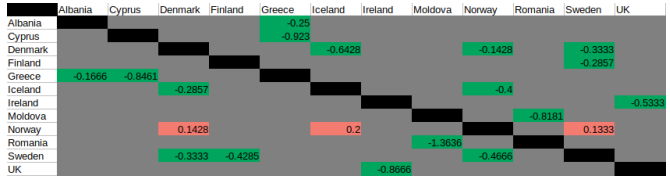
	Croatia	Cyprus	Denmark	France	Germany	Greece	Iceland	Ireland	Malta	Sweden	Switzerland	UK
Croatia									-0.85			
Cyprus						-0.9285						
Denmark							0.1818			-0.2941		
France							0.2777					
Germany								0.2777		0.3684		
Greece		-1.357										
Iceland			0.1818							-0.0769		
Ireland				0.4444	0.2777				0.2222	0.1578		
Malta	0.1428							0.5555				
Sweden			-0.0588		0.1578		0.0769	0.2631				0.3
Switzerland												-0.0555
UK										0.35	0.2777	

Figure: Collusion effects from 1980 to 2000

How much does collusion influence each country's placing?

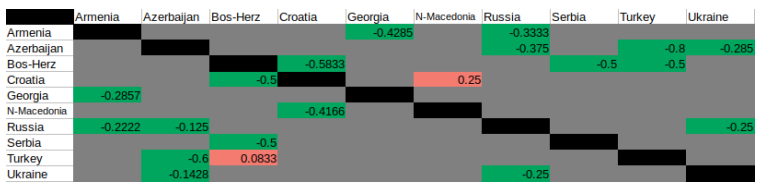
- Zero countries saw a positive effect from their collusion! (1960-1980)
- 7 out of 24 countries (29.2%) saw a positive effect from their collusion (1980-2000)
- Multiple explanations possible:
  - Small point difference introduces *variance*
  - Concluding collusion may need *higher threshold*
- Any hypotheses are welcome

How much does collusion influence each country's placing?



	Albania	Cyprus	Denmark	Finland	Greece	Iceland	Ireland	Moldova	Norway	Romania	Sweden	UK
Albania					-0.25							
Cyprus					-0.923							
Denmark						-0.6428			-0.1428		-0.3333	
Finland											-0.2857	
Greece	-0.1666	-0.8461										
Iceland			-0.2857						-0.4			
Ireland												-0.5333
Moldova										-0.8181		
Norway			0.1428			0.2					0.1333	
Romania								-1.3636				
Sweden			-0.3333	-0.4285					-0.4666			
UK							-0.8666					

Figure: Collusion effects from 2000 to 2016 (Eastern Europe)



	Armenia	Azerbaijan	Bos-Herz	Croatia	Georgia	N-Macedonia	Russia	Serbia	Turkey	Ukraine
Armenia					-0.4285		-0.3333			
Azerbaijan							-0.375		-0.8	-0.285
Bos-Herz				-0.5833				-0.5	-0.5	
Croatia			-0.5			0.25				
Georgia	-0.2857									
N-Macedonia				-0.4166						
Russia	-0.2222	-0.125								-0.25
Serbia			-0.5							
Turkey		-0.6	0.0833							
Ukraine		-0.1428					-0.25			

Figure: Collusion effects from 2000 to 2016 (other countries)

- 35 out of 40 countries (87.5%) move up in the rankings as a result of their collusion (2000-2016)