

ALEX4.2

A program for the simulation and the evaluation of electoral systems

Developed at the Laboratory for Experimental and Simulative Economy of the Università del Piemonte Orientale, <http://alex.unipmn.it>

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*Please feel free to interrupt whenever you like to
ask for details*

Definition

- ABSS is an *experimental* approach:
- “ABSS models the different elements of the social systems using artificial agents, (varying on scale) and placing them in a computer simulated society to observe the behaviors of the agents. From this data it is possible to learn about the reactions of the artificial agents and translate them into the results of non-artificial agents and simulations.” (Wik.)

Agent-based social simulation, 2:

Software for ABSS

- Several simulation packages have been developed, and still are – starting (as far as I know) from the SWARM software (Univ. Of Santa Fe, mid-90s). Presently several open-source packages are available (NetLogo, Gama, Mason, Janus etc.).
- *In this 20-so years long history, a basic problem has not been resolved. Can you see which one?*

Agent-based social simulation, 2:

Limits of ABBS

- *Answer:* the Borges paradox
- J. L. Borges (1899-1986) “..The College of Geographers built
- a map of the Empire
- equal in extension to
- the empire itself...”
- *l.e. in scale 1:1*



Agent-based social simulation, 3:

The agents are incomplete

- The effects of the interactions are constrained by the features of human behavior assumed – and these features are by necessity highly stylized.
- That's why it is so difficult to find *emergent proprieties*.
- ***BUT THIS IS NOT A PROBLEM FOR ELECTORAL SIMULATIONS – can you see why?***

The topic

- *Answer:* The simulative assessment of electoral system is used to compare the results of different electoral systems given the same set of preference of thr voters.
- The starting input are the preferences; the problem of why a given voter decided to vote for a given party is irrelevant. *A human voter and an artificial one are identical.*

Advantages of simulation

- In electoral matters, simulation is much more than a useful approach – it is *the only* approach for the study of *the* basic topic, that is *the assessment of the effect of the electoral system* given the same set of preferences.
- In the real world the voters usually *vote strategically*, that is taking into account the electoral system. Hence the *real* preferences, that is the *demand* for policies cannot be observed.
- Not only. Apart for the very rare cases of perfect proportionality the parties form and coalesce according to the electoral system. The *supply* of political alternatives cannot be observed either.

Description of the simulation program ALEX 4.2, 1.

Main features and basic inputs.

- The program is written in Java, does not require additional packages
- You may introduce as many parties as you like, *but you have to order them left to right*
- The program allows to consider tens of thousands of voters – the limit is the memory of your PC.
- You may also introduce as many districts as you like, with the (constant) magnitude that you like.

Description of the simulation program ALEX 4.2, 2.

The Creation of voters

- You must input the *share of votes* of each party; given the total number of voters this determines the number of votes for each party.
- The program establishes the *full order of preferences for the parties for each voter*, through a random device: you must input the *probability* that the second preferred party is adjacent on the left-right axis, and the probability that it is adjacent to adjacent. The procedure is iterated until the full order is produced for all the voters.

Seeing the program at work, 1

generalialia

- Suppose
- 100 voters per uninominal district
- 200 uninominal districts
- 20 plurinominal districts (DM = 10)
- 5 parties, A-E, left to right
- *The “probability of choosing the preferred candidate” refers to the STV system – to be explained at length if time allows; the p inputed is the probability of choosing as the first choice a candidate belonging to the preferred party*

Uninominal Systems

Condorcet: each candidate (here, party) is compared with each other candidate in a majority contest – the one who wins all the duels wins (a cycle may occur)

- Borda: each candidate is given a number for each voter (1 for the preferred, 5 for the last) – the one with more points is elected
- Runoff majority: the “French” system
- First past the post: the “British” System
- FPTP with strategic voting: the voter (with a given prob. to be inputted) votes for the larger party of her/his side (left or right)

Proportional and mixed Systems

- The mixed member systems are partially uninominal and partially proportional
- The threshold proportionality is the “German” system
- The single transferable vote (more on this is time allows) is an overevaluated system – the candidate who obtains a given share of votes is elected, and her/his further votes are transferred to her/his second choice.

Proportionality

- The most important features of the program are the indices – they allow the comparison of systems. There are three indices of proportionality; the last two are original. I consider only index 2
- Gallagher – is a traditional one, ranging 0 to 100, comparing the share of *votes* with that of *seats*.
- Index 2: $1 - X/T$, where X is the number of seats in excess with reference to pure prop. and T the total number of seats. *It is not biased by the strategic voting.*

Governability

- In order to produce the indices of governability you must define a majority. There are 5 indices; here I comment 2.
- Index 2, the simplest: S/N , where S the number of seats of the majority and N the total number of seats.
- Index 3, that allows to consider the role of *factions* within a party: $(S/N)(N/P)^a$
- In non-proportional systems the assumption that less parties means more governability may be wrong.

The indices, 3

Continuation

- Index G3: $(S/N)(N/P)^a$ a is comprised between 0 and 1, and must be inputed.
- Consider a non-proportional system X .

S = share of seats of the governing coalition under X

N = number of parties in the governing coalition under X

P = number of parties of the minimal governing coalition *under pure proportional system* that include those that are in the majority under system X . Arguably, these parties coalesce as *factions* under X

If at one extreme $a = 0$, the parties that form the governing coalition are *real* parties. The governability increases with the share of seats of the governing coalition, and decreases with the number of allied parties. At the other extreme, if $a = 1$, the *real* parties are those that (would) exist under pure proportionality, and maintain full autonomy even if they are forced to become factions due to X .

Power indices

- The assessment of the distribution of power is more important than the assessment of proportionality and governability. The *real* assessment of both prop. And gov. Depends frome the distribution of power.

Power indices

- “The proportionality is maximal if the system is proportional and the share of seats is equal to that of votes”. It may be false – small centrist parties may enjoy too much power.
- “The governability is maximal if one party has the majority”. It may be false, the party may be a bunch of different positions.
- ALEX4.2 simulations suggest that the first assumption is true, the second is false (as we will see)

Power indices – Cont.

- As we know, the most used indices (Banzhaf's and Shapley-Shubik) are of limited use in electoral matters, as they assume *equiprobability* of coalitions.
- To make assumptions on these probabilities is unavoidable – in Political (as different from *committee* analysis).
- ALEX4.2 has 8 power indices (including S-S). I will illustrate one, ALEX2.

The indices, 7

Continuation

- Broadly speaking, the power of a given party A under system X is a weighted average (with an inputted parameter) of two components:
- A Banzhaf index computed across *contiguous* coalitions
- and the share of seats in the governing coalitions.

Power and proportionality

- So we arrive to the most basic feature of ALEX4.2: the definition of proportionality indices based not on the share of seats, but on the *share of power*. There are two such indices (bearing provisionally the name of their author, “Ortona” and “Fagnelli”).
- Ortona index is based on the difference between the distribution of power and that of *votes* under pure proportionality. The more the difference is small, the more the system is proportional.

Some applications of ALEX4.2, 1

M. Chessa and V. Fragnelli, *A note on “Measurement of disproportionality in proportional representation systems”*, Mathematical and computer modelling, 55 (2012)

- *Extends previous studies to compare 19 disproportionality indices; those based on the distribution of power may give results considerably different from the traditional ones.*

Some applications of ALEX4.2, 2

M. Migheli and G. Ortona, *Plurality, Proportionality, Governability and Factions*, Representation, 47, 1 (2011).

- It is shown, with reference to stylized Germany, The Netherlands and Italy, that a relatively limited effect of factions is sufficient to make the governability under FPTP lower than under PP.
- $G2 = S/N$; $G3 = (S/N)(N/P)^a$. We find the value a^* that makes $G3$ equal under FPTP and pure proportionality (what means that a greater value of a makes the governability higher under PP). Given a^* we compute the ratio $(G3-G2)/G2$ for FPTP, that is the relative loss of governability caused by the presence of factions. For the case of Germany, f.i., a reduction of some 30% is sufficient to make governability higher under PP.

Some applications of ALEX4.2, 3

- M. Migheli, G. Ortona and F. Ponzano, *Competition among parties and power, an empirical analysis, Annals of operations research, 215 (2014)*.
- *The hypothesis that under proportionality small parties in the centre enjoy undeserved blackmailing power is false. The reason is that the power rent in the centre produces many centrist parties, until the rent is dissipated (as suggested by McGann et al. In a 2009 paper). The simulation has been conducted on stylized Italy, the Netherlands and Germany.*

Basic *positive* considerations

- There are other features I did not discuss, like the consideration of strategic voting.
- The package comes with a some 40 page long readme file (in E, F and I).
- The program is written in Java; the readme file teaches how to modify it (f.i. to add new systems or new indices).
- It may be downoladed and used freely; the site will appear on the last slide.

Basic *negative* considerations

- The program is presently abandoned. I retired, and the technical staff has been moved to other mansions. Its maintenance is no more assured (viz. the not-improved small mistakes we saw during the presentation). It's an orphan.
- It deserves to be adapted by some scientific department and to be developed. As we saw, this may be done freely.

Final reminder

- For further comments etc, write to guido.ortona@uniupo.it
- The program may be freely downloaded, used, modified and developed. The site is
- <http://alex.unipmn.it/software.php?L=EN>
- Thank you for your attention.