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Abstract. The choice of the electoral system should be delegated to the citizens. However, citizens are not sufficiently informed to choose the system directly. It is argued that they may instead state their preferences for two basic characteristics of a Parliament, i.e. *Governability* and *Representativeness.* It is then possible to choose the system through a purely technical procedure. An experiment illustrates the method.

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1. Introduction. The choice of the electoral system has many consequences. In another paper I briefly surveyed the literature, to find that at least sixteen political or social characteristics are affected (see Ortona, 2000). It is difficult to assess separately the effect of an electoral system on a specific characteristic; but even if we succeed, the *weight* to be assigned to each is a matter of subjective judgement -and Arrow and McKelvey[1] prohibit to pinpoint the best alternative. Hence, the best electoral system does not exist.

The very impossibility of finding the solution that maximizes the "real" social utility function is a fundamental argument in favour of democracy. My opinion cannot prove to be righter than yours; hence let us find a procedural rule that decides what to do irrespectively of the content of the alternative and of the subjects that support them. No need to pursue the discussion further, this is enough to justify what follows: if the "best" electoral system does not exist, and if the best we can do in order to make a public choice is to resort to a democratic rule, why not allow the voters to choose democratically among the possible systems? This is the argument of this paper. More precisely: we will try to reduce progressively the choice set through reasonable assumptions, to the point that the choice may be made directly by voters (sects. 2 to 5). We will conclude with an experiment of actual choice (sect. 6 to 8). However, as we will see in section 9, this will not be the end of the story.

2. What may voters vote about? To this point, the problem is "how to allow the voters to choose among electoral systems". The solution that comes immediately to mind is to let the voters vote on them. But this solution is not that viable. The electors usually do not know how an electoral system actually works, nor they are fully aware of their possible consequences. To say it with Farrell (2001, p.184), "It is pretty clear that few people actually understand much about electoral systems, and therefore it is difficult to take seriously their responses". Also, some saliencies may well influence the choice. In 1993 Italian voters moved enthusiastically (through a yes-no referendum) from proportional representation to a (mostly plural) mixed-member one, in a wave of outrage for the corruption of politicians. Apparently, they ignored the inconclusiveness of the literature on the link between electoral system and corruption, as well as the effects of such a change on other aspects more relevant than corruption. Proportional representation is presently gaining momentum in Italy; many see in it a suitable remedy to the same flaws that produced its

[1] No need, I guess, to recall Arrow's theorem; roughly speaking, McKelvey's states that if the choice is multidimensional the agenda-setter may normally establish the result. For a discussion, see f.i. Shepsle and Bonchek, 1997, p. 100.

refusal, which now are largely ascribed to plurality. To be brief, the choice of the electoral systems involves some fundamental technical aspects that must be left to the judgement of the experts[2].

Let's proceed with an example. A well-functioning democracy requests the citizens to answer to the question "How much shall we devote to health care and how much to the army", but *not* to questions like "do you prefer to invest X euros in radiotherapy and Y euros in deep-sea cruisers or B-Y euros in anti-radar missiles (provided that this has any meaning) and B'-X euros in vaccine therapy?" Given a budget constraint, we may say that voters are requested to state the *relative weight* that they assign to different basic requirements, but not the best way to implement them. The reason is that the citizens know whether they want more health care or more defence, but they do not know whether the suggested technical choices are those that best implement their wishes. In other words, if the democratic decision process works as it should work, citizens define the priorities, and technicians implement the choices that best correspond to these priorities. Once the (median) voters decided to spend X euros for defence, it is better if technicians decide how to use them.

There is no reason to modify this general procedure in the field of the choice of the electoral system. Voters should be interrogated about the *relative importance* that they assign to different desirable characters of the electoral process, but not on the way to implement them. Hence, citizens should *not* choose among, say, Borda count or Condorcet method[3]. Instead, they should decide on the relative weight to be assigned to the relevant characteristics affected by the electoral procedure. Once they performed this, it is a technical matter to pinpoint the system that best corresponds to the desiderata of voters.

3. How many characteristics? We saw that the electoral process affects a lot of characteristics. How many are relevant, and which ones? I suggest two, i. e. the efficiency in representing electors' will (*representativeness, R)* and the effect on the efficiency of the resulting government (*governability, G*). There is a very good reason to privilege R and G. To summon the citizens, through their representatives, into an ideal assembly and to form a government are the basic duties of a Parliament (in addition to making laws)[4]. Possible pitfalls of other dimensions may be managed in other moments of the political process, but this is not the case for representativeness

[2] A viable compromise could be to resort to the so-called *deliberative democracy*. We will return to this in section 9.

[3] This example is not taken by chance. As i is well known, Borda and Condorcet could not reach an agreement on the best system.

[4] I accept the principle that the Parliament must be a "microcosm" of the society. As is well known, this view is challenged by those who assume that the Parliament must be designed so as to optimize the incentives for their members *instead* (for a brief discussion see Farrell, 2001, p.165). In my opinion, this view is flawed. To create the right incentives for MPs is a matter of *procedure*; the "instead" is by no means necessary. However, to pursue this point further goes far beyond the scope of this paper.

and governability, if we admit the sovereignty of the voters in choosing their representatives and that of the representatives in choosing the government. To give an example, we saw that corruption is probably affected by the electoral system, albeit it is not clear how. Now suppose that electoral system A performs better than system B with respect both to representativeness and governability, but worse with respect to corruption. It is possible and advisable (for the abstract, benevolent Constitutional Legislator) to choose A *and* to adopt suitable anti-corruption policies. But it is probably *not* possible (nor advisable to try) to choose B and to enhance governability and representativeness *outside* the electoral procedure, as they are entangled, so to speak, to that procedure. In other words, it is sensible to think that other facets are lexicographically subordinate with respect to R and G. If this is so, the results obtained with reference to R and G will keep their validity irrespective of their effect on other aspects judged relevant.

4. How to measure R and G? R and G may be measured through suitable indicators, provided that the data necessary to build them are available. The indices to be employed must be meaningful, but also sufficiently simple to be understood by ordinary people. Consequently, we will adopt the following ones. The *index or representativeness, r,* is simply *the percent share of seats assigned according to the share of first preferences.* The distribution of first preferences may be proxied by the distribution of seats under pure proportionality with an unique district (or large ones). In our experiment, we used nation-wide representative survey data. As for the *index of governability, g,* the common wisdom is that governability increases if the number of parties in the governing coalition decreases and the number of seats increases[5]. Hence the value of the index is simply the share (%) of seats of the governing coalition divided by the number of parties that support it. Note that both indices range from 1 to 100.

In table 1 there is an example.

Table 1: two hypothetical electoral systems with three parties.

Party	Share (%) of First Preferences	Share (%) of Seats under pure proportionality	Share (%) of Seats Under System X	Share (%) of Seats Under System Y
A	40	40	30	40
B	50	50	65	48
C	10	10	5	12

Consider system X. Were the seats distributed as the first preferences, Party A would keep all its seats, party B would lose 15% and party C would keep its 5%. Hence 15% of seats are allocated

[5] Note, however, that many authors (including the author of this paper) do not agree. See f.i. Lijphart (1999) or Farrell (2001).

not according to the distribution of first preferences, and the value of r is 85. Analogously, under system Y only 2% of seats are misallocated, and the value of r is 98. Under system X, the government will be formed by party B, with 65 seats and the value of g will be 65; while under system Y it will be formed (presumably) by parties B and C, and the value of g will be only 30[6]. Note that there is a trade-off between R and G.

Obviously, to compare electoral systems we need to compute out the seat assignment for each system *given the same set of preferences.* This may be done through simulation, as we will see in section 6.

5. A social utility function in *r* and *g*; and a choice criterion. Up to now, we managed to reduce the choice space to two dimensions. The next step is to obtain a rule to compose the two. To begin with, let's assume that there is a social utility function U(R,G), measured by u(r,g), with both first derivatives positive. Next, let's assume a *specific* form for this function; to be precise, that U is a Cobb-Douglas function, $U = Ag^a r^b$. This is probably the most audacious step of the whole procedure; however, there are three good reasons why a Cobb-Douglas function may do the job, in addition to its well-known versatility.

First, a and b are the partial elasticities of U with respect to r and g. If you are not familiar with the notion of elasticity, this means that if the value of, say, b is, say, 0.4, an increase by 1% in the value of r makes the utility grow by 0.4%. Hopefully, this makes the parameters readable for the ordinary citizen.

The second reason is a little more complicated, but also more relevant. Consider the ratio a/b, call it p. It is the *price* in terms of a relative decrease of r that the community accepts to pay for a given relative increase of g (and 1/p the opposite). If for instance p =2, it is worthwhile to accept a 20% reduction of r to gain a 10% increase in g[7].

Finally, with a Cobb-Douglas function the specific form of g and r becomes less cogent. Suppose that, for whatever reason, we decide that the values of g must be replaced by wg, and those of r by zr. The price of a relative increase of g is $[d(zr)/(zr)]/[(dwg)/(wg)]$, but this ratio is

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[6] Here and below I assume that the government is always formed by a minimum winning coalition of parties adjacent on the left-right axis; if more than one qualifies, the winner is the one with most seats. For a brief discussion of the MWC hypothesis, see Martelli, 1999, ch. 9.

[7] Here is the proof. from $U = Ag^a r^b$ and $a = pb$ we get

$dU = dg(bpAg^{bp-1}r^b) + dr(bAg^{bp}r^{b-1})$

If U does not change

$0 = dg(bpAg^{bp-1}r^b) + dr(bAg^{bp}r^{b-1})$

$dg(bpAg^{bp-1}r^b) = -dr(bAg^{bp}r^{b-1})$

$dr/r = -p(dg/g)$

Note that all this implies that if G is very high it is worth paying a small increase in R with a large decrease in G, and vice-versa, as it should be.

equal to [d*r*/*r*]/[d*g*/*g*], the price with the original values. In addition, it is obvious that given two electoral systems X and Y

[1] $U_x > U_y$ iff $Aw^a g^a z^b r^b > Aw^a G^a z^b R^b$

i.e. iff

[2] $g^a r^b > G^a R^b$

Hence, this inequality provides a choice criterion not only for *r* and *g* but also for the whole set of indices w*g* and z*r*, with w and z>0.

The value of p=a/b is of great importance for our discussion, as it permits to reduce the choice problem to the evaluation of a *single* figure, as follows. From [1] and [2] we get

[3] $U_x > U_y$ iff $(g/G)^{bp} > (R/r)^b$

hence the condition may be written as

[4] $p\text{Ln}(g/G) > \ln(R/r)$

i.e.

[5] $p > \ln(R/r)/\text{Ln}(g/G)$ if $g>G$ or $p < \ln(R/r)/\ln(g/G)$ if $g<G$

6. The choice experiment. Now the choice problem is simple enough to be managed by the voters. In principle, it may be solved either by a meta-decisor (like a Constitutional Benevolent Legislator), or by the voters themselves on the basis of their preference and of some decision method; I will discuss mostly the second approach, which is the main topic of this paper, while the first will be briefly addressed in the final section.

Several methods may be employed to collect the information necessary to evaluate p. In the following sections I will discuss three, and I will present the results of an experiment. The figures

for *r* and *g* for 22 electoral systems and for a unique set of preferences were obtained through simulation, by means of a quite powerful simulation program developed at the Laboratory for Experimental and Simulative Economics of the Università del Piemonte Orientale. The input was a representative survey of electoral preferences of Italian citizens collected by the Osservatorio del Nord Ovest of the Università di Torino in the first quarter of 2004[8]. To avoid long digressions, the technicalities of the simulation are in appendix, and I do not describe the program as it is illustrated in detail elsewhere[9]. The main data are in table 2.

Table 2. *r* and *g* for 22 electoral systems, Italy, 2004.

System	*g*	share of seats of the governing coalition (rounded) (+)	number of parties of the governing coalition (+)	*r*
1 Borda	27.5	55	2	66
2 Runoff plurality	30.0	60	2	66
3 Plurality	23.3	70	3	74
4 Mix-sc. (°)	20.7	61	3	85
5 Mixed (°)	20.7	62	3	82
6 Prop., 1 district	10.4	52	5	100
7 Threshold Prop.(§)	17.0	51	3	87
8 Condorcet	29.5	59	2	70
9 Prop. Hare (^)	13.5	54	4	92
10 Prop. Imp. (^)	8.7	52	6	88
11 Prop. SL (^)	13.5	54	4	94
12 Prop. DH (^)	18.0	54	3	84
13 STV NB (^)	10.6	53	5	94
14 STV D (^)	10.8	54	5	95
15 STV H (^)	10.8	54	5	91
16 Prop.Hare (&)	10.6	53	5	99
17 Prop. Imp. (&)	10.6	53	5	99
18 Prop. SL (&)	10.8	54	5	98
19 Prop. DH (&)	10.4	52	5	96
20 Mix-sc (&)	17.7	53	3	91
21 Mixed (&)	19.0	57	3	87
22 Thresh. prop. (§,&)	10.6	53	5	96

Notes to table 2

prop.=pure proportionality; STV=single transferable vote; Imp =Imperiali; S =Sainte-lague; DH=D'Hondt.
(+) Simulations were performed with 100 seats; this produced immediately the share of seats, albeit rounded.
(°) 25 seats assigned through one-district proportionality, 75 through plurality. "Sc" (for the Italian word *scorporo*) means that votes used for the proportional share are not considered for the assignment of the plurality seats.
(§) 5%.
(^) Ten ten seat districts.
(&) Five twenty seat districts. The program ran out of memory for STV.

[8] I take the opportunity to thank the director of the Osservatorio, prof. Luca Ricolfi, for his kind permission to employ these data.
[9] See Bissey, Carini and Ortona, 2004.

The choice set may be considerably reduced through the exclusion of systems that are *dominated* or *weakly dominated.* A system is dominated when there is another one with higher values for both *g* and *r*, or with a higher value for one of the two figures and the same for the other; and is weakly dominated when both figures have the same value. This criterion reduces considerably the list; we are left with the 10 systems of table 3.

Table 3 Systems of table 2 surviving the elimination of dominated or weakly dominated systems.

System	*g*	*r*
2 Runoff plurality	30.0	66
3 Plurality	23.3	74
4 Mix-sc.	20.7	85
6 Prop., 1 district	10.4	100
8 Condorcet	29.5	70
11 Prop. SL	1 3.5	94
17 Prop. Imp.	10.6	99
18 Prop. SL	10.8	98
20 Mix-sc	17.7	91
21 Mixed	19.0	87

7. Voting for the electoral system. In the experiment, participants were briefly instructed on the meaning of representativeness and governability, and on how the indices *g* and *r* were computed. Then they were asked to answer the following questions:

a) System A has a value of 50 for both *r* and *g*. System B has a value of 60 for *g*. What value must B have for *r*, so that you are indifferent between A and B?

b) System A has a value of 50 for both *r* and *g*. System B has a value of 40 for *g*. What value must B have for *r*, so that you are indifferent between A and B?

The answers to each question allow for two procedures to compute the individual values of a/b, a(i)/b(i); hence we have four estimates. I illustrate them with reference to question a); the extension to question b) is straightforward.

The first procedure demands only to solve

$$A50^{a(i)}50^{b(i)} = A60^{a(i)}r_i^{b(i)}$$

For a(i)/b(i), where r_i is the answer provided by participant i.

The second applies the procedure of fn. 7, albeit with some roughness, due to the to the use of differentials to estimate large variations. The answer to the question provides an estimate of dr and dg; hence we may obtain the value of a(i)/b(i) = p(i) from the identity

$dr/r = -p(dg/g)$.

Results are summarized in table 4[10].

Table 4. Estimates of a/b

Procedure	Average	Standard Deviation	cases[11]
First, question a	0.833	0.675	84
First, Question b	0.607	0.367	89
Second, question a	0.674	0.501	84
Second, question b	0.744	0.470	89
Mean of the four procedures	0.696	0.402	80

As we saw, a system X is preferred to a system Y if $(a/b) > \ln(r_y/r_x)/\ln(g_x/g_y)$, where X is the one with the greater value of g, while if $(a/b) < \ln(r_y/r_x)/\ln(g_x/g_y)$, then Y is preferred to X. In table 5 there are the values of $\ln(r_y/r_x)/\ln(g_x/g_y)$ for every couple of systems of table 3. The value of g of the system in row is always greater than those of the systems in columns; hence, given the value of a/b, we may immediately read the preferred system for any couple.

Table 5 Threshold values of a/b (Numbers as in tables 2 and 3).

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System	2	8	3	4	21	20	11	18	17	6
2		3.501	0.452	0.681	0.604	0.609	0.443	0.387	0.390	0.392
8			0.235	0.548	0.494	0.513	0.377	0.334	0.339	0.342
3				1.171	0.793	0.752	0.438	0.365	0.369	0.373
4					0.271	0.436	0.235	0.219	0.228	0.236
21						0.634	0.226	0.211	0.221	0.231
20							0.120	0.150	0.164	0.177
11								0.187	0.214	0.237
18									0.543	0.535
17										0.527

[10] In principle, the four methods should provide the same results. Hence, the difference of the results may be read as an estimate of the relevance of framing effects. We'll come back on this in section 9.

[11] I excluded incoherent answers, i.e. answers where a (say) increase in g is compensated with an increase in r. Participants were 110.

Comparing the values of a/b with the threshold values of table 5, we obtain the preferred system for each participant (I considered only the averages of the four procedures). This is tantamount to saying that participants *vote* for the electoral systems; the results are:

Pure proportionality	21.3%
Mix-sc (5 districts)	15.0%
Mix-sc (10 districts)	6.3%
Condorcet	57.4%

And (following the plurality rule) the system to be adopted is Condorcet. Note that this result was hard to foresee from the inspection of table 3: Condorcet ranks second in *g* but only ninth in *r*.

8. A further and simpler procedure. The result of the previous section rests on the revealed preference for p. It is sensible to argue that this revelation may be affected by any sort of framing effects or misunderstandings; in this section I will employ a more arbitrary but probably sounder procedure.

Subjects must first be requested to state a *minimum threshold* for *g* and *r*, meaning that systems scoring less for one of them (or both) should not adopted, irrespectively of the value of the other; the average value is assumed as the one in effect. Also, they must decide (following the majority rule) whether *r* is more important than *g*, or vice-versa[12]. Then four results may obtain.

First, (and fortunately) only one system is over both thresholds. This is obviously the one to be chosen.

Second, all systems are below both thresholds. In this case, the system to be chosen is the one with the highest value of *r* or *g* according to which is more important.

Third, several system are over one threshold, while all are below the other; or, fourth, several system are over both thresholds. The procedure I suggest, a quasi-minimax method, is the same in both cases. As this is the case in our experiment, I will illustrate it with its data[13].

The average minimum value of *r* is 48, and of *g* is 42[14]. No system in table 3 satisfies the requirement for *g,* while *all* satisfy that for *r.* Also, 34 subjects claimed that G is more important

[12] In the experiment the question was: "To you, which is more important, Representativeness or Governability?" With six possible answers, much more important Representativeness (Governability), somewhat more important Representativeness (Governability), equally important, don't know.

than R, and 35 the contrary. A simple minimax rule would suggest to adopt the system with the highest value of *g* among those that satisfy the requirement for *r*. However, this method may trade off high increases in *r* for small gains in *g*: in our example it pinpoints runoff, with 30 for *g* and 66 for *r*, while Condorcet may provide 77 for *r* with as much as 29.5 for *g*. A more advisable procedure is to divide the systems according to the number of parties that may form the majority. Within each group the values of *g* will be very close; the system to be adopted is the one that (a) respects the basic requirement for *r* ($r > 48$, in our case) and (b) has the highest value of *r* in the group of systems with the highest values of *g*. In our case it will be (again) Condorcet; the other systems of the same group are runoff and Borda (which is dominated, with $g = 27.5$ and $r = 66$). If the binding constraint is that on *g*, suppose for instance $g > 20$ with a majority claiming that G is more relevant, the procedure suggests to pick the system with the highest value of *r* in the group with the highest values of *g* (in our case, that of 2-party governments).

Before leaving this topic, note that the occurrence of too high thresholds should not be interpreted as a proof of the naiveté of the voters; instead, it is a demand for more effective voting systems[15].

9. Final comments. The differences among the values for a/b obtained from the four methods are high, mostly if we consider the standard deviations. This indicates that the framing of the questions is relevant, not to speak of a lot of possible biases (information, selection, etc.) that may occur if we move to a representative sample. Hence, the indications of the experiment are mixed. We obtained a clear-cut result through a procedure that appears justifiable; but the possibility to assess for real the value of a/b through a democratic procedure is still quite remote. However, the approach of this paper may be useful to tackle, both analytically and empirically, an important topic, that has received too little consideration in the debate on the choice of the electoral system: that of the preferences of the voters on the matter[16]. To this aim, the inquiry of this paper could be developed along three lines. First, to improve its (very preliminary) results by resorting to the so-called *deliberative democracy*. As is well known (see f.i. Bosetti and Maffettone, 2004) this approach aims to produce a decision by a representative sample of *informed* subjects. The field of

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[13] Again, I excluded incoherent answers, i.e. answers that claimed (for instance) that R is more important than G, while answering (for instance) that in order to keep utility unaffected a decrease of 20% in g must be compensated with an increase in R greater than 20%.

[14] The questions were: "Complete the following sentence. A system with a value for Governability (Representativeness) lower than … must be rejected in any case".

[15] Actually, in this paper I did not consider two systems (not used in the real world) that produced *r* and *g* both over the chosen thresholds, i.e. VAP system (see Bissey, Carini and Ortona, 2004) and prized-plurality system with a prize sufficient to allow the largest party to govern alone.

[16] For an introductory discussion, see Farrell, 2001, p. 183 ff.

this paper is clearly one where information may substantially improve the reliability of the answers[17]. Second, to further improve the criterion to rank-order electoral systems on the basis of the preference for R and G, starting from the discussion in section 8. It goes without saying that all this may be implemented only through simulation, as it requires to compare different electoral systems across the same set of preferences. Further improvements of the simulation program (also to include additional systems) will be useful. Finally, the decision on the relative weight of a and b could be delegated to a Constitutional Legislator (hopefully benevolent), on the basis of theoretical considerations. The availability of an "official" value of p could allow to choose the electoral system *after the vote.* This would guarantee the right choice, and would help contrasting the rent-catching on the electoral systems (see the introductory chapters of Shugart and Wattenberg, 2001). I do not make suggestions on this point, as this is not the subject of this paper.

Finally, I must emphasize a serious weakness of this paper, i.e. the uncertain reliability of index *g*. While it is natural to define *r* as the share of seats misallocated, the definition of *g* rests on the assumption that the governability increases if the number of parties in the governing coalition decreases. As we saw, this assumption is quite debated, and not well established empirically. A better definition of *g* is desirable, and it could arguably modify the results of this paper; but this conclusion holds for the whole theoretical debate on electoral systems.

Appendix. Data and simulations. The simulations have been produced by ALEX3, a program developed at the Laboratory for Experimental and Simulative Economics of the Università del Piemonte Orientale in Alessandria, Italy. For a description, see Bissey, Carini and Ortona, 2004. Input data have been provided by a representative, nation-wide survey of electoral preferences in Italy performed in the first quarter of 2004 by the Osservatorio del Nord Ovest (Università di Torino), with 5347 valid observations. 15 parties were listed, plus a comprehensive item "others" (with 0.8% of first preferences altogether). For computing reasons I excluded six with less than 1.5% of preferences, for a total of 4.8%[18]. Note that the rankings of several parties are closely correlated; actually, a latent-class procedure performed on the same data suggests that real parties are only seven (see Di Pasquale, 2002). The first preferences have been employed as votes. Condorcet, Borda and STV require a full ordering of preferences for each voter. These orderings are generated by the program, through a couple of parameters that fix the probability that the second

[17] A focus-group exercise made in the UK in 1998 produced a sharp change in opinions after a two hour discussion, from quite rough to more elaborate opinions. See Farrell and Gallagher, 1999.

[18] The number of parties affects the processing capabilities of the program irrespectively of their votes, due to the combinatorial computing requested by Condorcet, Borda and STV. A new version of the program (ALEX4), close to be completed, will allow to process many more cases.

preferred party is next or second-to-next to the first one on the left-right axis[19]. Survey data allow to fix the first parameter, through the answer to the question "would you consider to vote for party X". The party with most answers "yes" has been considered the second preferred party. On the average, the probability of choosing as second preferred party a party adjacent to the first one resulted 0.70, and this is the value of the first parameter. That of the second has been fixed arbitrarily at the default value of the program, 0.2. For STV, the program requires also the probability that the second preferred *candidate* belongs to the preferred *party*; lacking this information, this value has been arbitrarily set at the default value, 0.9[20]. The program considers the geographical concentration of votes; the requested parameters (number of constituencies where the party is concentrated and concentration factor[21]) have been estimated through the real data of the election of 2001. I supposed 100 plurality districts, each with 100 (virtual) voters. Resulting data are summarized in table A, where parties are listed left to right and defined by their official acronym, when existing. Finally, note that the indices produced by a typical output of the simulation program are slightly different from the ones employed here. I modified them as they are less readable for ordinary subjects[22].

Table A. Summary input data.

Party	Votes (%)	Number of districts where the party is concentrated	Concentration factor
PRC	6.36	12	1.43
Green	4.67	-	-
DS	22.60	22	1.68
DL ("Daisy")	13.76	9	1.32
Italy of the Values	4.16	-	-
UDC	3.77	-	-
FI	22.34	4	1.28
LN	8.18	31	2.76
AN	14.16	21	1.47

[19] Here and below, the procedure is iterated until the full ordering is generated.
[20] Here and above, all the residual probabilities are uniformly distributed.
[21] The concentration factor of a party in a district is the ratio between the share of votes of that party in the district and nation-wide. I considered only the parties and the districts were the factor was greater than 1.25.
[22] The two series are highly correlated (r = 0.963 for *r* and 0.994 for *g*).

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