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Accidental Politicians: How Randomly Selected Legislators Can Improve Parliament Efficiency

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Historical Background: Random Selection of Governing Bodies

Today, most people think that democracy means **elections**, i.e. believe that only the electoral mechanism and the Parties' system could ensure representativeness in democracy. But in the first significant democratic experience, the **Athenian democracy**, Parties did not exist at all and random selection (**Sortition**) of Legislators was the basic criterion when some task was impossible to be executed in the Assembly, where usually Athenian citizens directly made the most important decisions.

Also other **Greek city-states** probably adopted Sortition of governing bodies, and for sure many other cities in the History used some kind of lot as rule, such as **Bologna, Parma, Vicenza, San Marino, Barcelona** and some partes of Switzerland. Lot was also used in **Florence** (13th and 14th century) and in **Venice** (from 1268 until 1797).

More recent examples and proposals...

Modern juries of randomly selected people in common law adversarial-system jurisdictions

Segoléne Royal proposal of randomly selected popular juries for controlling the work of politicians

Barnett and Carty proposal for a radical reform of the House of Lords by a random election http://www.houseoflordsreform.co.uk/

Random promotions strategies for circumventing the Peter Principle in hierarchical organizations (Andrea Rapisarda's talk)

And many others... see references at:
http://www.pluchino.it/parliament.html
http://www.conallboyle.com/ExsCurrent.html

Outline

The **main goal** of our work is to explore, through an agent based model, how the efficiency of a modern Parliament, based on the electoral mechanism and on the Parties' system, may be affected by the introduction of a given number N_{ind} of independent members, i.e. a given percentage of legislators who are not elected but randomly selected among all the existing candidates and for this reason free from the influence of the Parties.

Problems to solve:

How to model a Parliament?

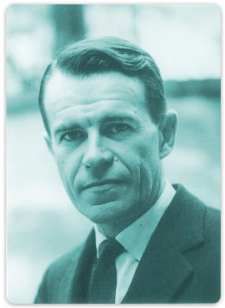
How to calculate its efficiency?

Main question to answer:

Does exist an optimal number N_{ind} of independent legislators which maximize the Parliament efficiency?

Modelling a Parliament: The Cipolla Diagram

In 1976 the Italian economist **Carlo M.Cipolla** suggested a very simple diagram (that we will call "Cipolla diagram") to describe how a given population could be characterized focusing the attention on only two features of human behavior, i.e. benefits and losses that an individual, with his/her actions, causes to him or herself (personal gain, positive or negative) and benefits and losses that the same individual causes to the other people (social gain, positive or negative):

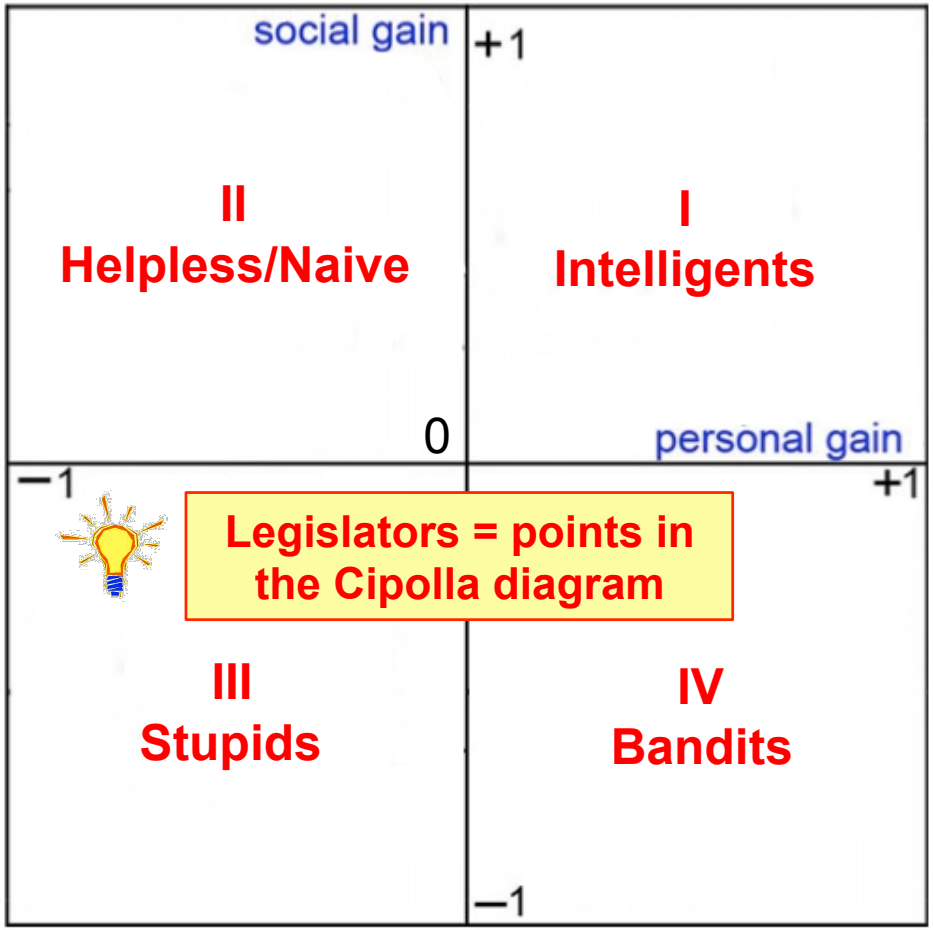


C.M.Cipolla,
"*The Basic Laws of Human Stupidity*",
The Mad Millers (1976)

Legislators:

1. Personal Interests: re-election, benefits from their position, etc.

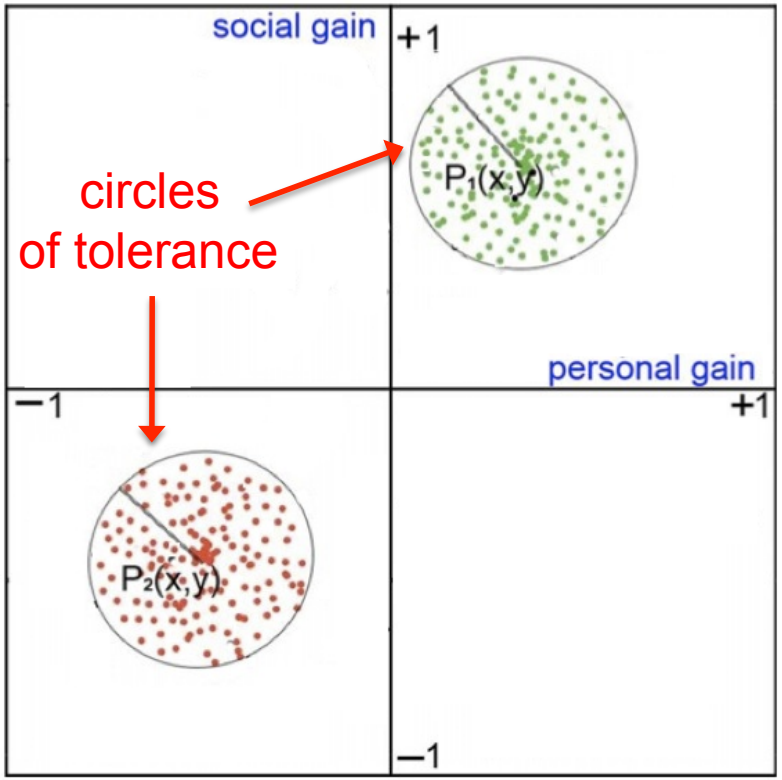
2. General Interest: to increase Social Welfare, etc.



Legislators and Parties in the Cipolla Diagram

By using the NetLogo environment we realized an Agent Based Model of a Parliament consisting of N=500 members, normally distributed within 2 circles in the Cipolla Diagram, representing 2 Parties or political Coalitions, namely P_1 (majority) and P_2 (minority). The center $P_k(x,y)$ of each Party is fixed by the average collective behavior of all its members, while the size of the respective circle indicates the extent to which the Party tolerates dissent within it: the larger the radius, the greater the degree of tolerance within the Party. Therefore, we call the circle associated to each Party circle of tolerance.

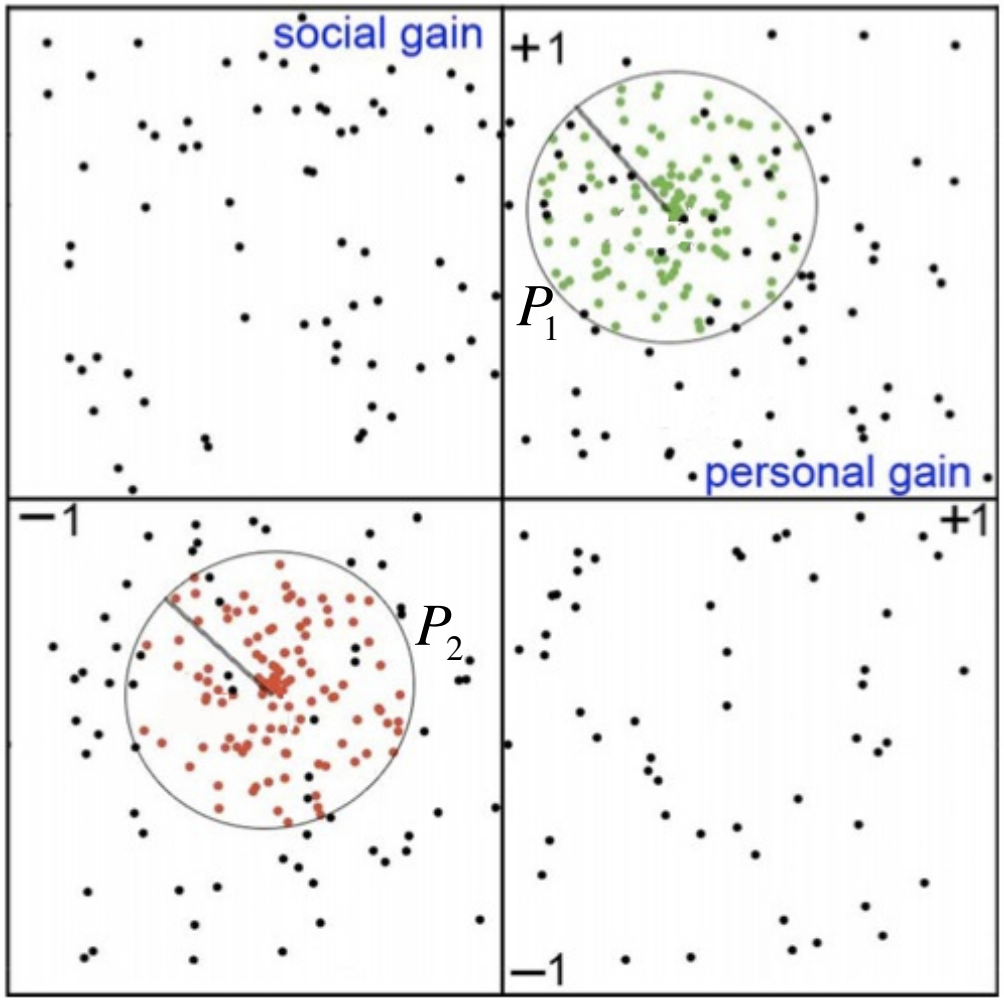
Parliament with 1 Chamber
N=500 legislators
2 Parties or Coalitions



A.Pluchino, C.Garofalo, A.Rapisarda, S.Spagano, M.Caserta, *"Accidental Politicians: How Randomly Selected Legislators Can Improve Parliament Efficiency"*, Physica A 390 (2011) 3944–3954

Introduction of N_{ind} Independent Legislators selected at random among candidates

Now let us to introduce in the Parliament a given number N_{ind} of independent members, i.e. a percentage of legislators free from the influence of the two Parties, which will be represented as free points on the Cipolla diagram:



Example of a Parliament with 2 Parties and 250 independent members (black free points) over the total of N=500 legislators.

To the two Parties or Coalitions are here assigned, respectively, 60% and 40% of the remaining $N - N_{ind}$=250 legislators.

$l_i(x,y) \equiv$

i-th independent legislator

$l_{jk}(x,y) \equiv$

j-th legislator of party *k*-th

Dynamics of the model: 2 possible actions of legislators during a Legislature L

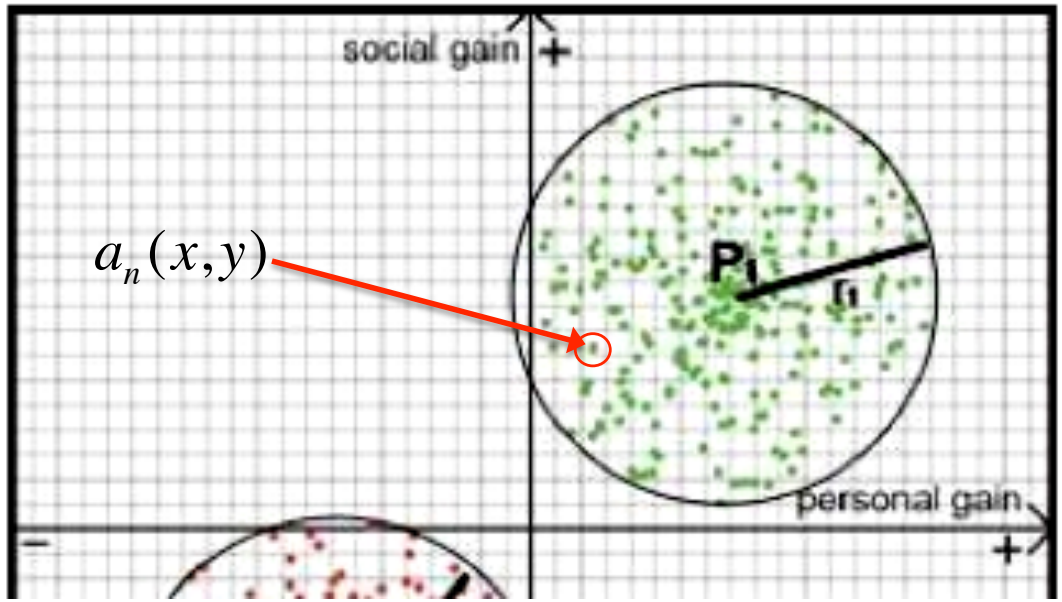
1.They propose one or more acts of Parliament

2.They vote in favour or againts the proposals

A given act of Parliament is accepted if it receives more than 50% of favorable votes

1.Proposals of Acts of Parliament

Proposals do not depend on the membership of the proposing agent: during a Legislature L all the legislators propose, in a random order, one or more acts of Parliament a_n (with n = 1, . . . , N_a , being N_a= 1000 the total number of acts proposed), whose positions coincide with their position in the Cipolla diagram (i.e. $a_n(x,y) \equiv l_i(x,y)$ for every act proposed). It follows that legislators belonging to a Party can propose acts which are not perfectly in agreement with their Party's common position, as function of their distance from the center $P_k(x, y)$ of the correspondent circle of tolerance:

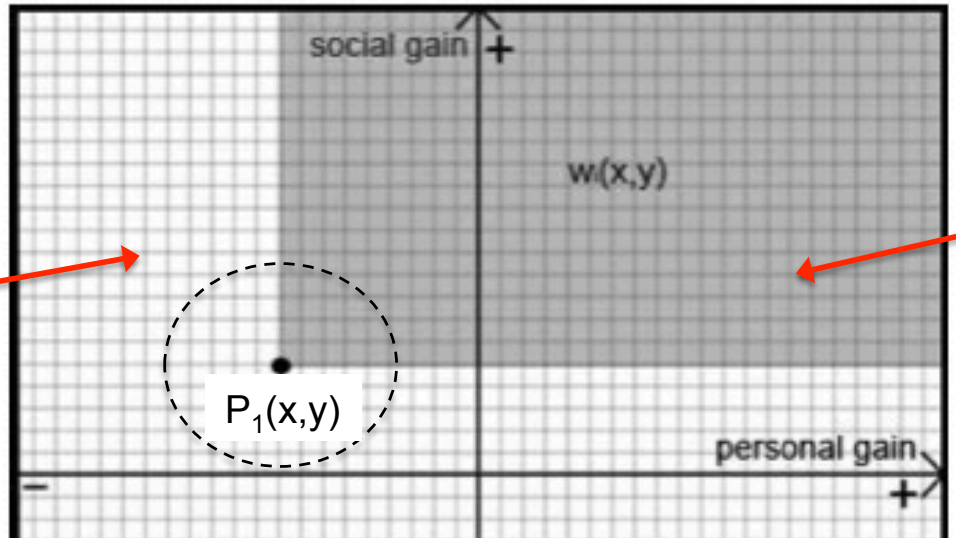


2.Voting (a): The "Acceptance Window"

The action of voting for, or against, a proposal is more complex and strictly depends on the membership of the voter and on his/her acceptance window. The acceptance window is a rectangular window on the Cipolla diagram into which a proposed act $a_n(x,y)$ has to fall in order to be accepted by the voter, whose position fixes the lower left corner of the window. This follows from the assumption that we imagine ideal legislators that only accept proposals better than their ones.

The main point is that, while each free legislator has his/her own acceptance window, so that his/her vote is independent from the others vote, all the legislators belonging to a Party always vote by using the same acceptance window, whose lower left corner corresponds to the center of the circle of tolerance of their Party. Furthermore, following the Party discipline, any member of a Party accepts all the proposals coming from any another member of the same Party.

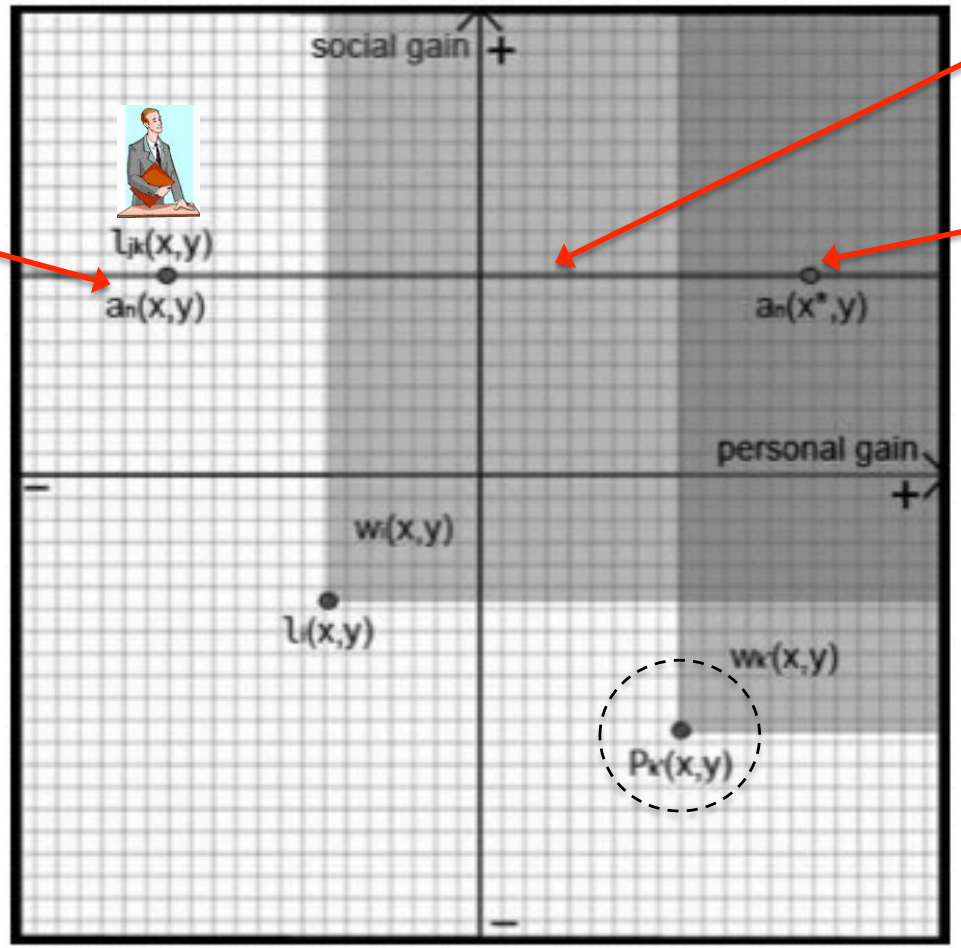
If the proposal falls out of the "acceptance window": the vote is **contrary**



If the proposal falls inside the "acceptance window": the vote is **favorable**

2.Voting (b): The "Voting Point"

But, while the social gain $y(a_n)$ of a proposal $a_n(x, y)$ can be considered unique for all the legislators, in terms of personal gain the fact that a certain proposal would be favorable for a given legislator, does not imply that it should be favorable for another legislator or for a Party. Therefore, the coordinate $x(a_n)$ of any proposed act will be expressed by a random number x^*, uniformly extracted in the interval $[-1, 1]$: it is this new position $a_n(x^*, y)$, called voting point and lying on the line $y=y(a_n)$, that has to be compared with the acceptance windows of legislators and Parties.



$y=y(a_n)$ line

original proposal

new voting point

Only the social gain $y(a_n)$ of a given proposal a_n is uniquely defined for all the legislators

The personal gain $x(a_n)$ of each legislator with respect to a given proposal a_n coming from another legislator is random

General Voting Algorithm

More in general, in presence of several Parties ($K \geq 2$) and of a certain number N_{ind} of independent legislators, for a given act of Parliament a_n we have the following possibilities:

PROPONENT LEGISLATOR

VOTING LEGISLATOR

		 BELONGS TO PARTY k	 BELONGS TO PARTY k'	 INDEPENDENT
 BELONGS TO PARTY k		votes in favour of the act in any case	votes in favour of the act only if the correspondent voting point lies in the acceptance window of his/her own Party	votes in favour of the act only if the correspondent voting point lies in the acceptance window of his/her own Party
 INDEPENDENT		votes in favour of the act only if the correspondent voting point lies in his/her own acceptance window		

Efficiency of Parliament during a Legislature

At this point we need some global quantity which in some way would be able to express the efficiency of the Parliament during a Legislature L, being the latter defined as a sequence (array) of N_a acts of Parliament. An immediate measure of the Parliament activity is of course the number of accepted proposals (laws), N_{acc}, expressed as a percentage of the total number of proposed acts, i.e.

$$N_{\%acc}(L) = (N_{acc}/N_a) * 100 \qquad (1)$$

Percentage of accepted proposals [0%, 100%]

But another important quantity is surely the average social welfare ensured by all the accepted acts of Parliament, expressed by:

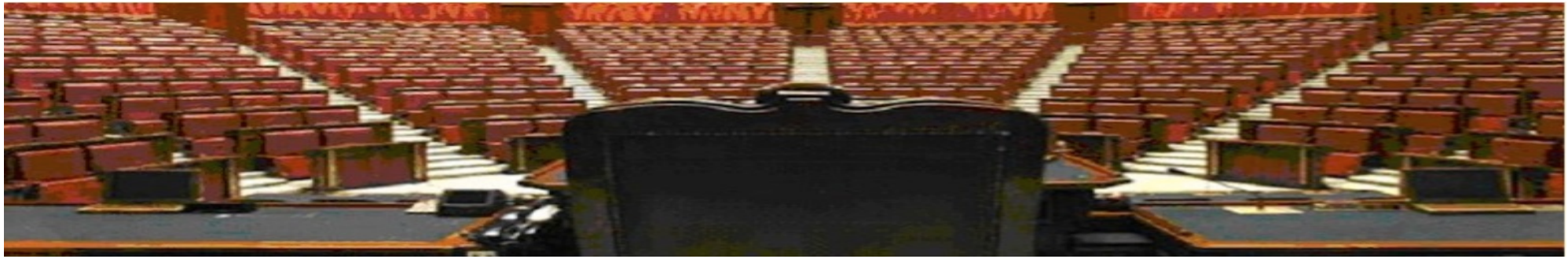
$$Y(L) = {N_{acc}}^{-1} \sum_{m=1}^{N_{acc}} y(a_m) \qquad (2)$$

Average Social Welfare ensured by the accepted proposals [-1, 1]

Therefore it is straightforward to take the product of these two quantities in order to obtain the efficiency of a Legislature:

$$Eff(L) = N_{\%acc}(L) * Y(L). \qquad (3)$$

Global efficiency [-100, 100]



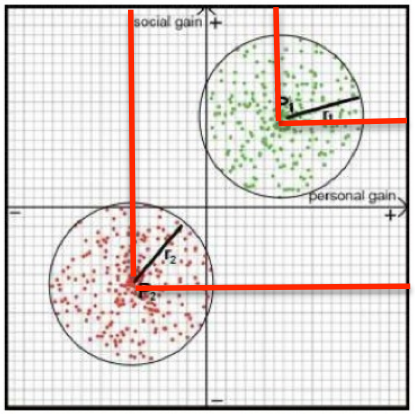
Simulations Results

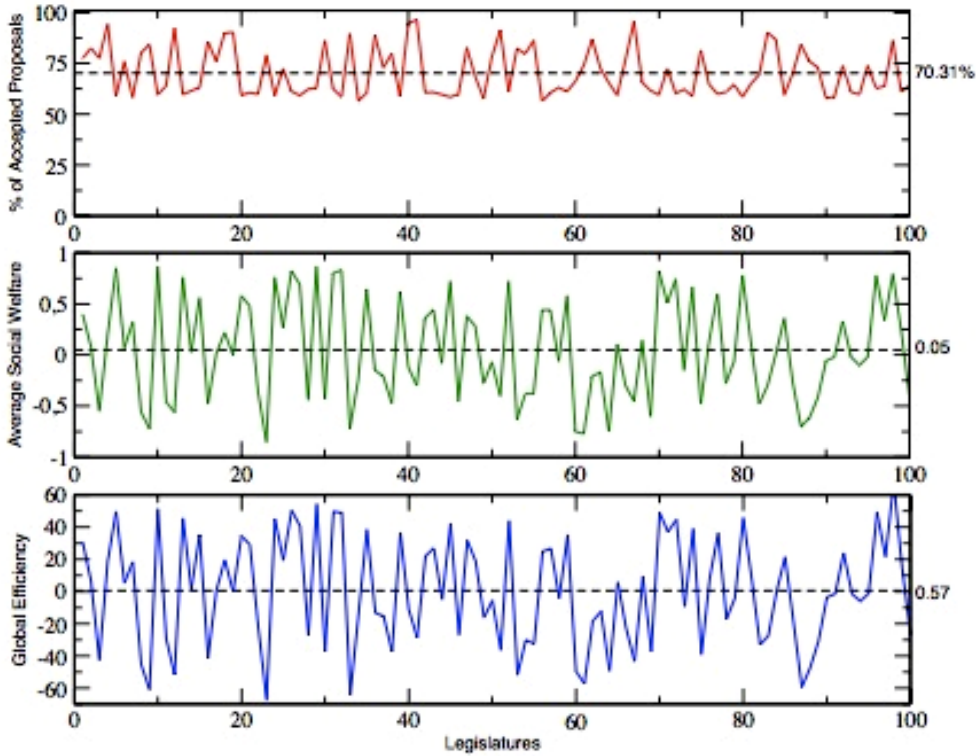
NetLogo

Simulations: Case N_{ind}=0

The efficiency of a Parliament without independent legislators strictly depends, for a given Legislature L, on the random position of the centers of the two Parties, with coordinates, respectively, $x(P_1)$, $y(P_1)$ and $x(P_2)$, $y(P_2)$ over the Cipolla diagram, but also on their size (in terms of percentage of members) and on the radius r of their circle of tolerance. Here we simulated N_L=100 Legislatures, each one with a different position of P_1 and P_2 over the Cipolla diagram. For each Legislature L_h (h = 1,...,N) the correspondent values of $N_{\%acc}(L_h)$,$Y(L_h)$ and Eff (L_h) have been plotted in three distinct panels (from top to bottom):

Parliament with only 2 Parties
P_1 (60%)
P_2 (40%)
r=0.1





Many accepted proposals

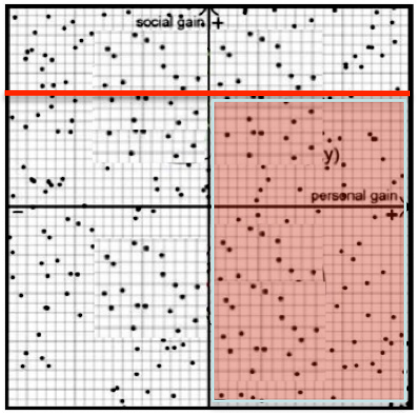
Very low average social welfare

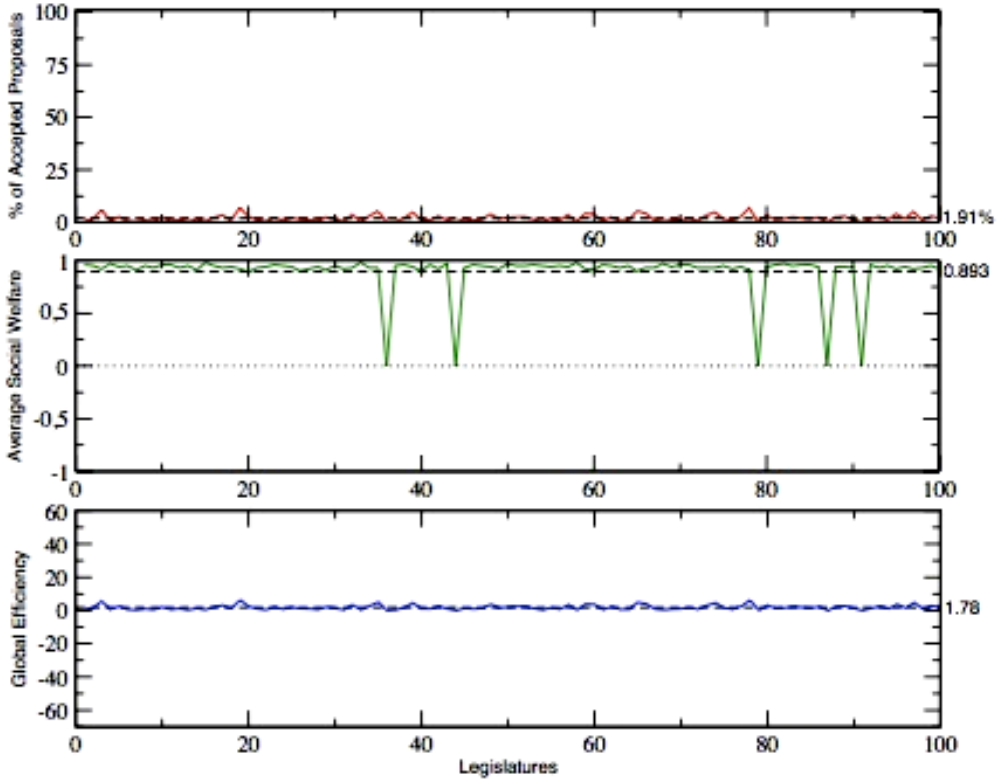
Very low global efficiency

Simulations: Case N_{ind}=N

Let us consider, now, the opposite situation in which only independent legislators are present in the Parliament. In this case no Parties exist and the points $I_i(x, y)$, corresponding to the N = 500 members of Parliament, are uniformly distributed over the Cipolla diagram (in a different way for every one of the 100 Legislatures). Now a given act of Parliament $a_n(x, y)$ will be accepted only if the majority N/2 +1 of these points will fulfill the prescriptions for voting it. But for a given value of $y(a_n)$ only about 50% of the legislators with $y(I_i) < y(a_n)$ will accept the proposal and such a number will be clearly lower than N/2 unless $y(a_n) \sim 1$. Therefore only a very small number of proposals will be accepted, but with a very high social gain.

Parliament with only independent legislators





Very few accepted proposals

Very high average social welfare

Again very low global efficiency!

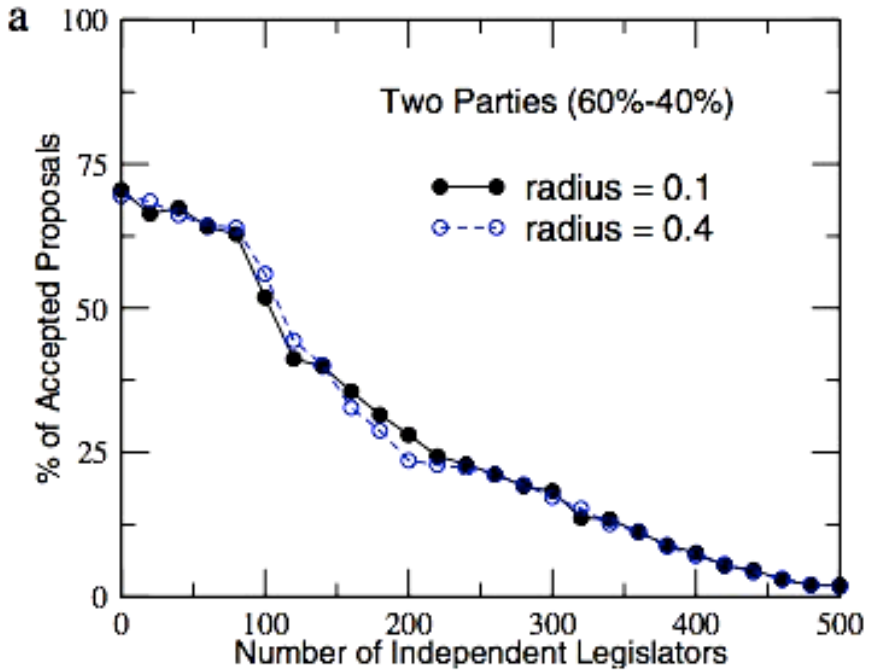
Simulations: Case N_{ind} variable

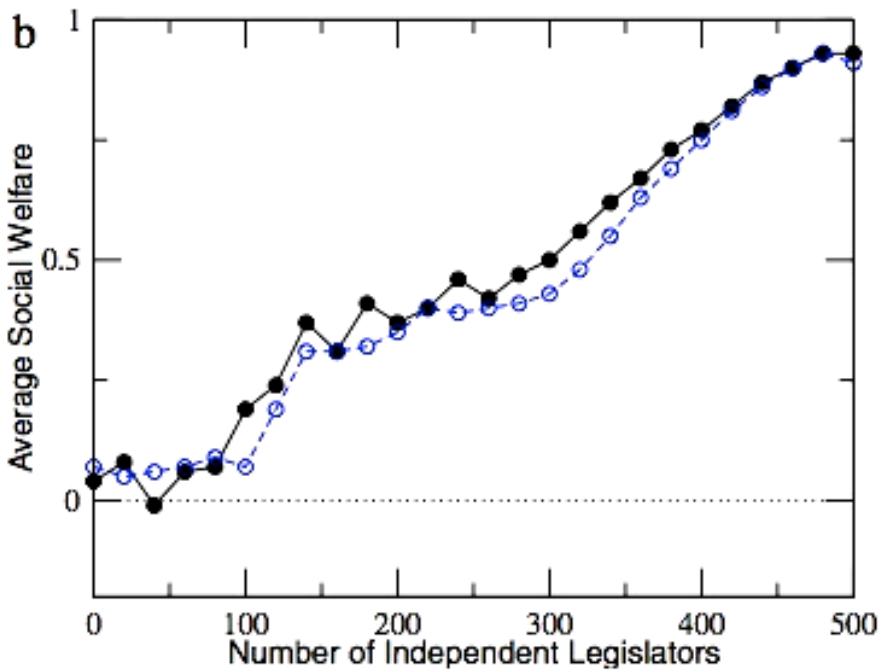
Finally let us to vary from 0 to N the number N_{ind} of independent legislators in a Parliament with N = 500 members, distributing the remaining $(N - N_{ind})$ legislators into the two Parties with percentages 60% and 40% and with radius 0.1 and 0.4 (equal for the two Parties). We see that, increasing N_{ind} :

(i) the asymptotic average number of accepted proposals $AV(N_{\%acc})$ decreases from ~70% to ~2%, see panel (a);

(ii) the asymptotic average value of the social welfare AV(Y) increases from ~0 to ~0.9, see panel (b).

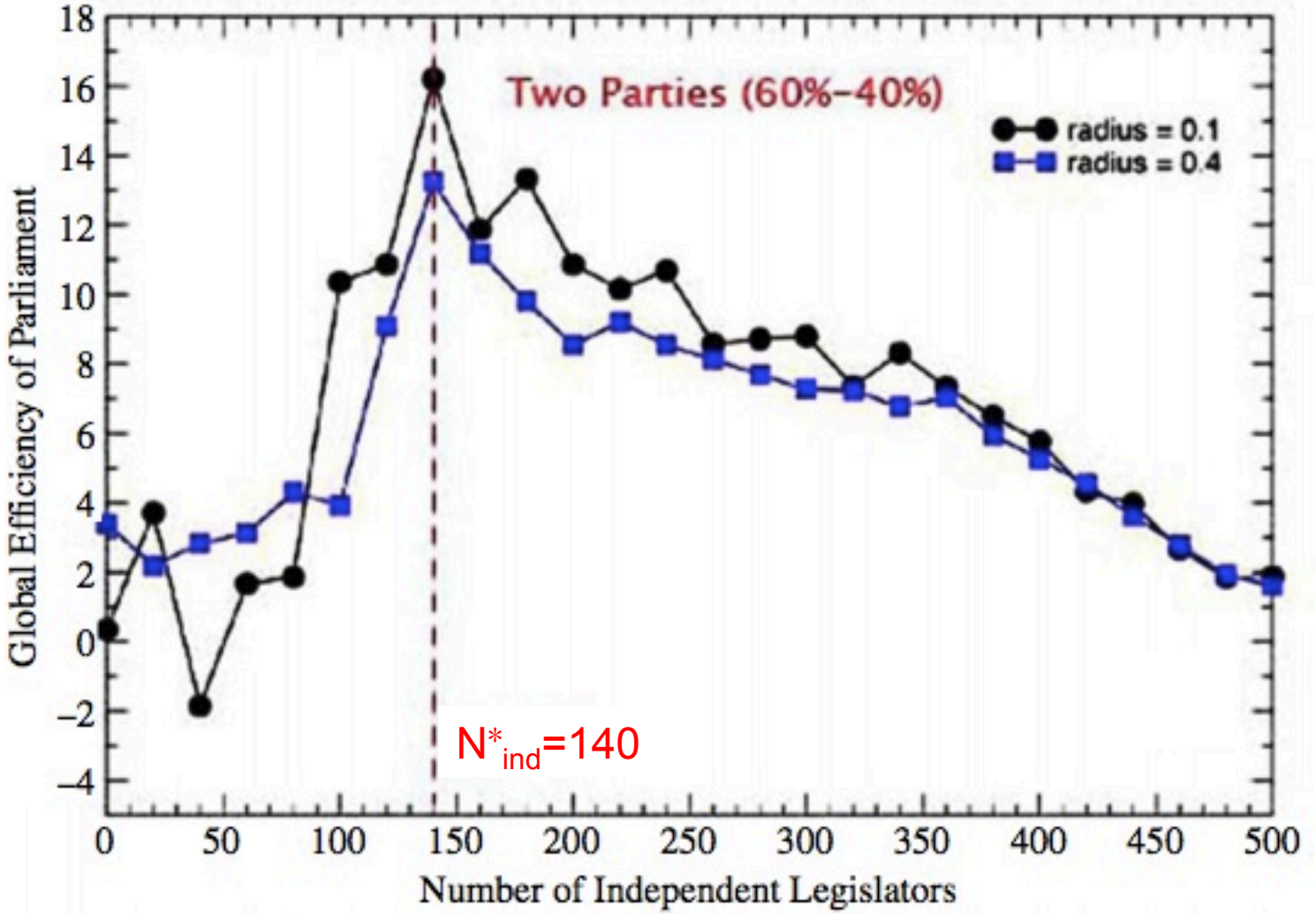
In both cases the increase/decrease is monotonic but also non linear and it is not so much influenced by the value of r.





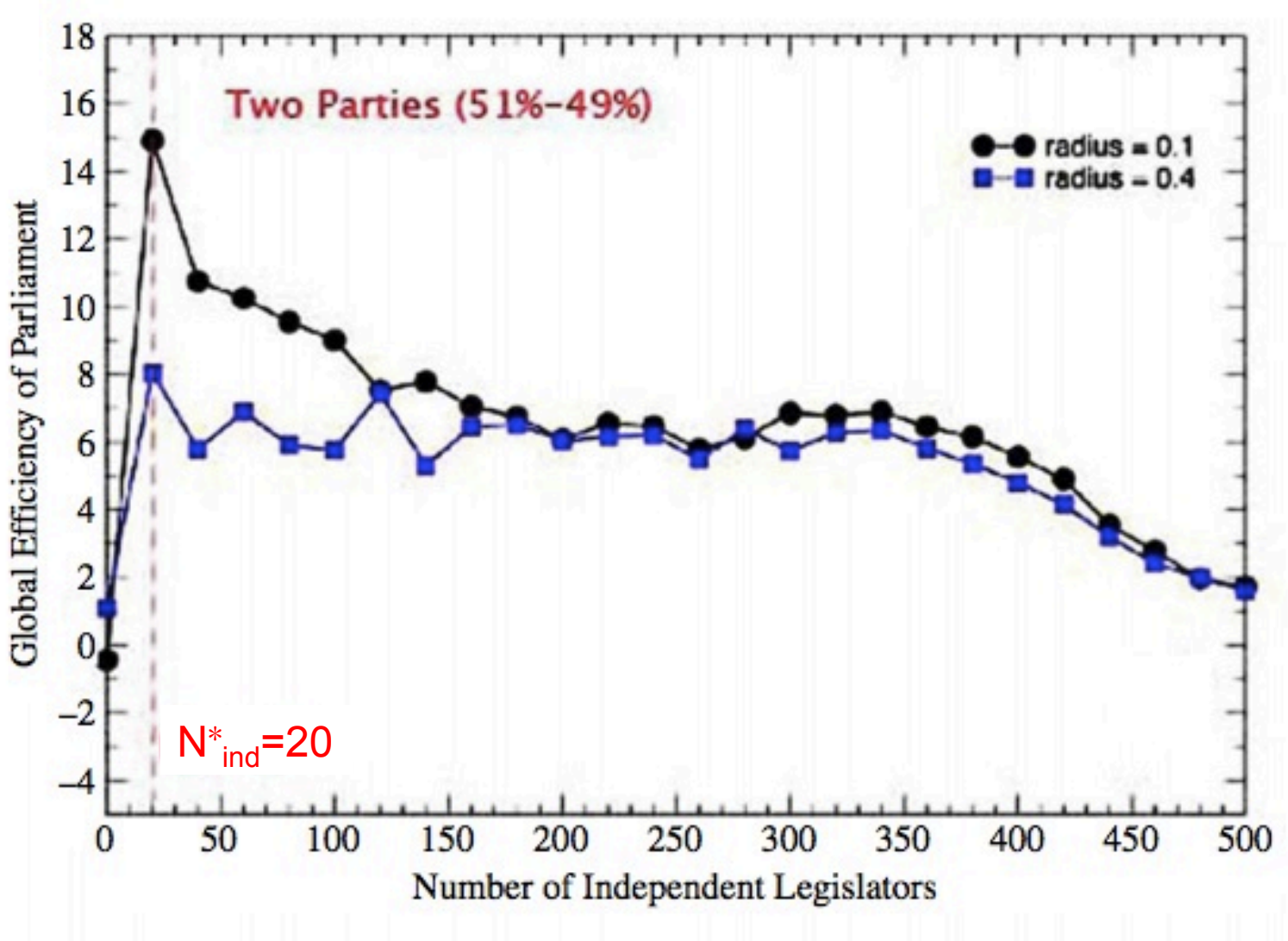
Global Efficiency: Case N_{ind} variable

But the more interesting thing is that, considering the product of the previous two curves, i.e. plotting the global efficiency of the Parliament as function of N_{ind}, it appears a pronounced peak in correspondence of a well defined value N^*_{ind} of independent legislators:



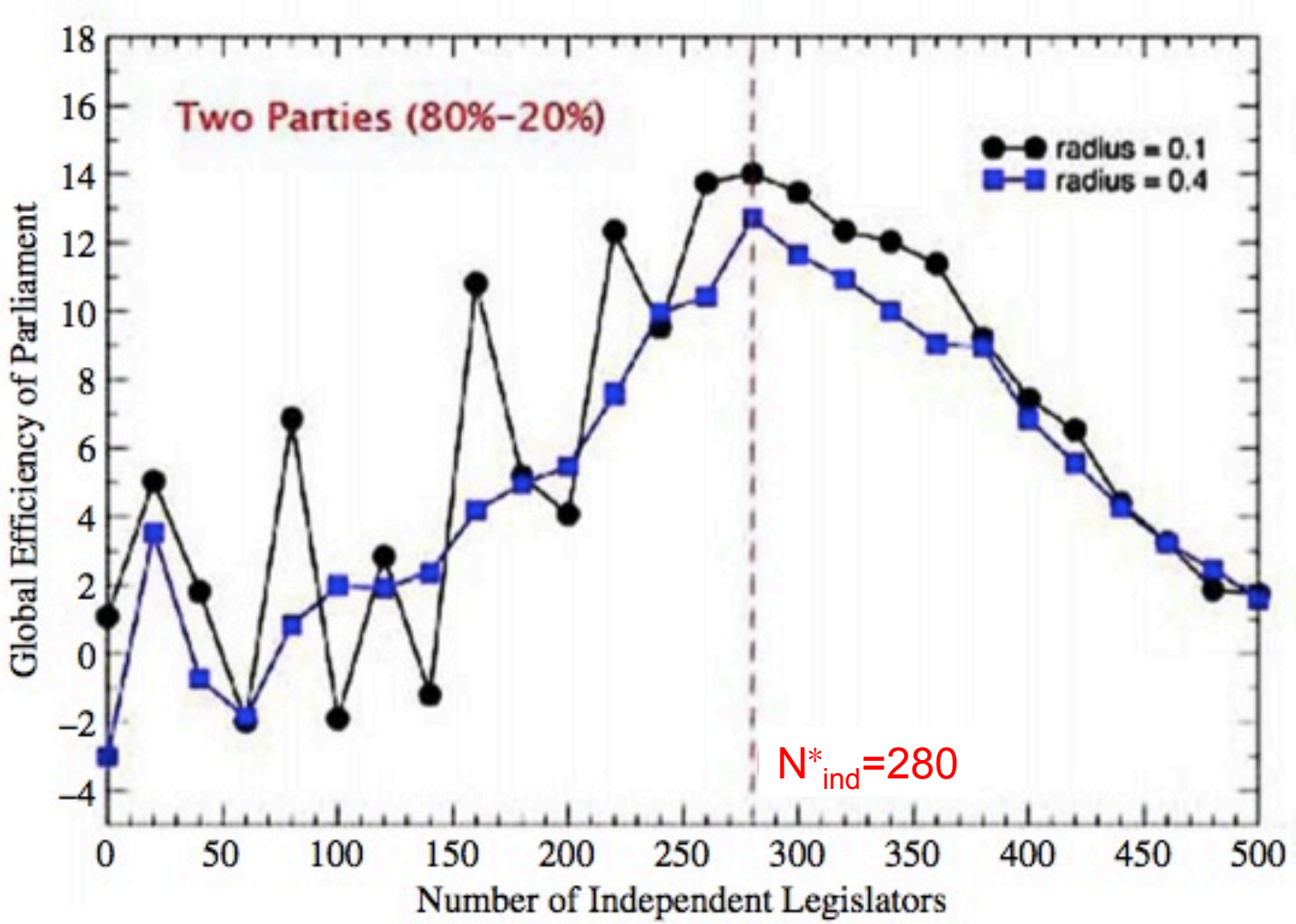
Global Efficiency: Case N_{ind} variable

This peak shifts on the left if one reduces the size p of the majority Party $P_{1...}$



Global Efficiency: Case N_{ind} variable

...and shifts on the right if one increases the size of the majority Party:

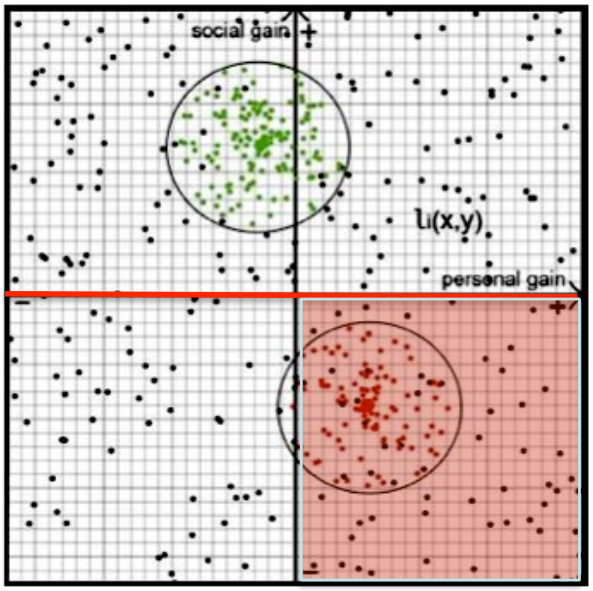


Efficiency Golden Rule

Even if it is absolutely not trivial to describe analytically the behavior of the system in this general case $0 < N_{ind} < N$, quite surprisingly a simple formulation exists to work out the optimal number N^*_{ind} of independent legislators as function of the size p (in percentage) of the majority Party.

Actually, we could argue that, in a given Legislature with two Parties of different sizes, none of which holding the absolute majority of the members in the Parliament (due to the presence of independent members), N^*_{ind} would be in some way associated to the minimum number of independent legislators which, added to the majority Party P_1, allows it to reach the threshold of $N/2 + 1$ members necessary to accept a given proposal.

We discovered that such a number is equal to $N^*_{ind} / 4$ so we easily obtain:



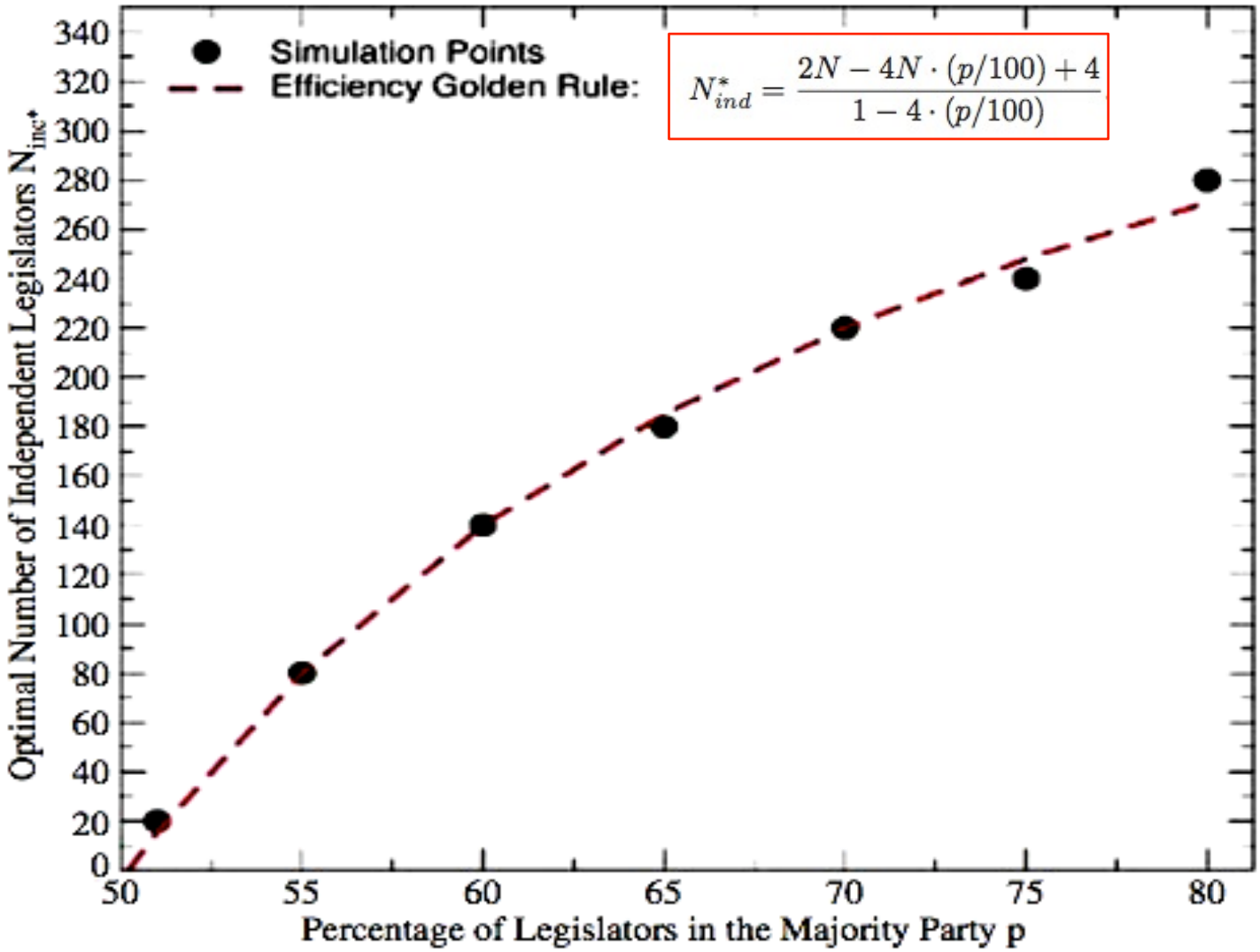
$$(N - N^*_{ind}) \cdot \frac{p}{100} + \frac{N^*_{ind}}{4} = \frac{N}{2} + 1$$

Efficiency Golden Rule

$$N^*_{ind} = \frac{2N - 4N \cdot (p/100) + 4}{1 - 4 \cdot (p/100)}$$

Efficiency Golden Rule

The analytical curve outcoming from the efficiency golden rule perfectly fits the simulation points:

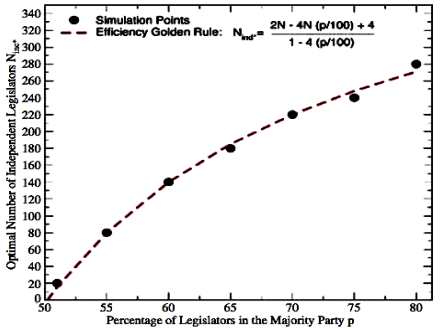


Thinking to a Practical Application...

The knowledge of the golden rule gives us the possibility to imagine an immediate practical application to real elections for a Parliament with N=500:

STEP 1: Regular elections establish the relative proportion of the two Parties or Coalitions, for example 55% to P_1 and 45% to P_2;

STEP 2: From that proportion, the golden rule allows to calculate the number of independent legislators required to optimize the efficiency of the Parliament, in this case 80;



STEP 3: Then, 80 seats will be assigned to individuals picked up at random from a given list of candidates (i.e. ordinary citizens fitting the requirements), and the remaing positions will be assigned with a standard procedure to candidates of the two Parties in the proportion established by the elections.

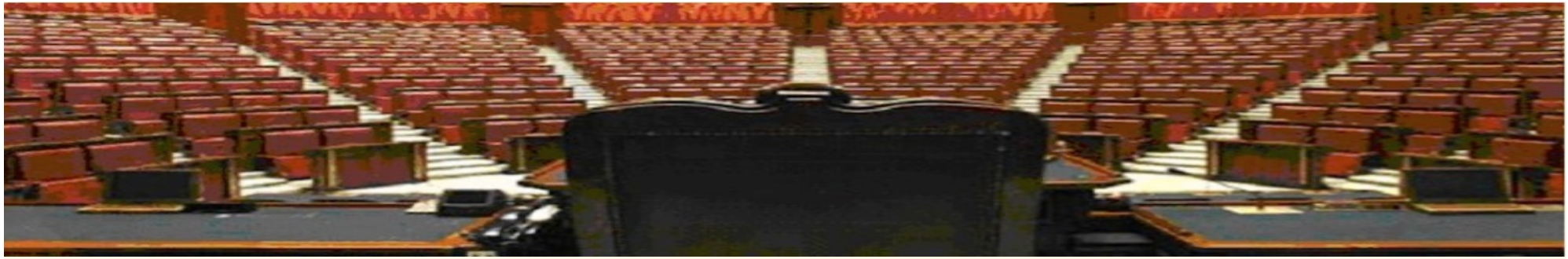
Of course, the independent members, once selected for a given legislature, should not be candidates in any successive legislature, to avoid the risk of being "captured" by existing Parties or Coalitions.

Summary and Perspectives

We showed in a quantitative way that the introduction of a well-defined (and predictable) number of randomly selected members into a simple model of Parliament improves the efficiency of this institution through the maximization of the product between the number of accepted laws and the overall social welfare ensured by these laws.

Of course our prototypical model of Parliament does not represent all the real parliamentary institutions around the world in their detailed variety, so there could be many possible ways to extend it...

- It would be interesting to study the consequences of different electoral systems by introducing more than two Parties or Coalitions in the Parliament;
- Also the government form could be important: our simple model is directly compatible with a presidential system, therefore could be interesting to analyze the case of a parliamentary system, where do exist a relationship between Parliament and Government;
- For simplicity, we chose to study a unicameral Parliament, whereas several countries adopt bicameralism. So, simulating another chamber could lead to subsequent interesting extensions of the model.



Thank you for your attention

Main References:

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Supplementary on-line material at:

http://www.pluchino.it/parliament.html

http://www.pluchino.it/ignobel.html