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Complexity, Diversity, and Governance: From Central Deliberative Governance to Polycentricity.

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Abstract: A crucial argument favoring deliberation is that it produces better decisions. This aspect is vindicated by deliberation allowing one to gather, select, and transfer relevant information when facing an issue. For this reason, deliberative experiments are a fascinating feature of contemporary societies and feed the hope for deliberative governance. In this article, I argue that well-grounded arguments vindicate this hope, but that deliberation alone, even if it transforms people's views and improves their level of information and competence, does not guarantee better decision-making considering complexity. The value of information can indeed be negative in a complex system. Therefore, I argue that the problem of the competence of a decision-making center should be side-stepped, to focus on the institutional structure able to cope with complexity, i.e., polycentric institutions allowing experiments and learning.

Keywords: Deliberation; Complexity; Decision-Making; Self-Governance.

Deliberative theories partly crossed the gap between being an ideal theory and a “working theory” (Chambers, 2003, 207), as exemplified by the numerous deliberative experiments worldwide. Citizen’s conventions, deliberative mini-publics, deliberative polling, and other deliberative innovations are promising experiences and have provoked enthusiasm among academics and non-academics. As a result, deliberative assemblies gained support to produce reasoned decisions on a set of general issues, e.g., climate policies, infrastructures, electoral design, etc., as a new form of democratic governance, albeit in many different forms (Mansbridge, 2010; Fishkin, 2018; Landmore, 2020). Some have argued that a randomly selected deliberative assembly would score better in decision-making, justifying such devices (Guerrero, 2021). In this article, I want to assess a specific claim: does the success of deliberative theories and experiments, if we grant them most of what they claim to achieve, vindicate the defense of a randomly selected deliberative assembly for the central democratic governance of our societies?

The legitimacy of randomly selected deliberative publics has been challenged in recent years (Laffont, 2015). As of now, most of the discussion revolves around the issue of legitimacy and accountability of such experiments. What would guarantee the legitimacy of decisions conducted by a deliberative assembly composed of citizens selected at random? This sparked a debate on the connection between deliberative experiments and the rest of society. Fishkin (2018) defends, for example, that it is possible to increase participation in self-governance through digital tools, to generate massive participation to generate or inform decisions.¹

In this article, I want to face another challenge to the possibility of a deliberative general assembly as an instrument of policymaking, which is the challenge of complexity. Complexity notoriously poses a problem for the government of political orders: a complex order displays several features, such as the impossibility of central control or unpredictability over the long run (see, for a general presentation, Ladyman and Wiesner, 2020). Complex systems behave differently than non-complex systems, and the question arises as to what extent our political conceptions often developed in the context of simple systems can scale up to face the specific challenges of complex systems.² A significant portion of the case for deliberative assemblies lies in their epistemic features: such assemblies would be fit to reveal, channel, and use relevant information and produce better decisions. Even if we grant that claim, this case relies on the positive value of information – that more (relevant) information, be it technical or not, always leads to improvements in decision-making –, which is challenged by core features of complex systems. My argument relies on the disconnection between the epistemic effects of deliberation, i.e., transforming individuals’ level of information and capacity to solve problems for the better, and the capacity to realize a desired state of the world, i.e., a better outcome than other decisions. If our social and economic systems are complex, this connection is not warranted, undermining the main justification for central deliberative governance.

This is hardly a surprising conclusion, but it raises the question of what alternative institutions could cope with this result: once we take complexity into account, and the

¹ See Landmore (2022) for a recent work investigating the role Artificial Intelligence could play to foster mass deliberation.

² This is not a new concern for deliberative theories, we find mentions of this challenge in Bohman (2004) Mansbridge et al. (2012), and others, such as Benson (2021).

probability that even the most competent center fails to find a correct answer to political problems, representative *and* randomly selected deliberative assemblies may be ruled out. In the last part of the paper, I show that the assumptions justifying the superiority of deliberative central governance can be used to defend a plurality of decision-making centers, regardless of whether or not these centers are deliberative. What matters most is the capacity of a political and social system to experiment and learn from feedback to adapt to new situations, rather than the competence of its central decision-making center.

Let me provide a roadmap for my argument. Section 1 unpacks the different claims of deliberative theories and shows how they are connected. Deliberation entails, in its various forms, three features: (a) a legitimacy feature, (b) a transformative feature, and (c) an improvement feature. The legitimacy feature is obtained through deliberation and depends on both (b) and (c). (b) and (c) depend on the effect of deliberation, and the capacity of deliberation to gather and transfer diverse information to the individuals, to promote better decisions. Section 2 shows that most of the discussion focuses on (b), while it is probably not the most contentious element of the theory. Indeed, we may have good reasons to consider (b) plausible. Section 3 focuses on the connection between (b) and (c) in situations of complexity. Complexity entails that the relation between the increase in the assembly's level of information and its relevance for policy is not linear. Hence even if we grant (b), (c) is not necessarily obtained, challenging (a). This leads me to my major argument in Section 4: Democratic institutions should face the issue of complexity anticipating that even the best deliberative procedure may not be able to face the challenge of (c). This calls for complementing or replacing the deliberative process with attention to the institutional design of democracies, creating feedback mechanisms, and multiplying the opportunities for the experiment by a plurality of decision centers. This invites us to switch the attention from the question of the competence of deliberative bodies (drawn by a lot or with chosen expertise) to the issue of institutional design in light of complexity (which may require a plurality of experimentative decision centers rather than fewer enlightened deliberative bodies). Finally, I propose an argument in favor of polycentric institutions specifying the conditions for their superiority.

1. The features of deliberation: legitimacy, transformation, improvement.

Unlike aggregative models of democracy, which are based on the aggregation of individual preferences through a mechanism such as voting, deliberative democrats rely on the exchange of reason between free and equal participants (Elster, 1986; Cohen, 1989; Habermas, 1996; Gutman and Thompson, 1997; Dryzek, 2000; Fishkin, 2016). Deliberative democracy, in the perspective, is valuable because it produces legitimate decisions, based on the enlightened discussion of free and equal citizens, and transforms the values and preferences of individuals, through a process of mutual justification. These theories are particularly appealing because they propose to consider individuals as able to produce enlightened decisions and self-govern while respecting others as autonomous and rational beings, who ought to be directed by reason rather than coercive power. The major upshot of such theories is the ability to define the condition of justified rules, based on political participation, within a fair procedure.

Recently, epistemic deliberative democrats developed additional arguments in favor of deliberation based on using cognitive diversity to solve specific issues. Landemore's work (2013, 2017, 2020) is probably the best defense of such a position and formalized how deliberation could work as a mechanism of information production.³ The main claim is that a group of diverse problem-solvers possesses a better chance of solving an issue, following the Hong-Page theorem, i.e., the so-called Diversity Trumps Ability theorem (Hong and Page, 2004), which states that the error of a group equals the average error of group individuals minus the diversity of individuals composing the group. The theorem is based on a set of assumptions. The assumptions are that : (i) the problem should be difficult enough; (ii) all individuals have to be above some threshold of competence – or not below a threshold of incompetence; (iii) the set of individuals should display cognitive diversity, i.e., individuals should think differently, but be able to recognize the right answer; (iv) individuals have been part of a larger population, and they should not be too few (to represent the general diversity).⁴ Conditions (ii) and (iii) are the main points of contentions and could be translated into a competence and a willingness requirement. Let us assume for now that these conditions are fulfilled. Deliberation is, in this context, valuable because it promotes better outcomes in the form of laws or policy propositions, through the exchange of reasons and information contributing to better beliefs. In short, collective deliberation is the best process to gather, channel, and produce relevant information for better decision-making, where information stands for the knowledge of relevant facts for the issue at hand.

The case for deliberative assemblies rests on three different claims, that it is useful to distinguish:

(a) Deliberation produces legitimacy because it is based on the agreement of free and equal individuals (*the legitimacy claim*).

(b) Deliberation transforms people's preferences and levels of information on a set of issues, arguably giving them more information and better arguments, modifying or refining their values (*the transformative claim*).

(c) Deliberation improves the quality of the decision-making and produces better outcomes (*the improvement claim*).

It is important to notice that legitimacy relies on the deliberative capacity to transform people's views, and this improvement ought to be linked with the improvement in decision-making. The justification of deliberation is at least partially instrumental – albeit not completely because participation and mutual justification may be of normative value even though justification is a low quality, *ceteris paribus*. Suppose this were not the case, then any agreement could ground legitimacy, irrespective of the epistemic feature of deliberation, which is at odds with most claims of deliberative democrats and our intuition. In that case, it indeed seems that to be legitimate a decision should only be consented to, but it should be *justified* by (good) reasons, according to the major requirement that deliberation entails

³ See also Estlund (2008). The idea that deliberation is a way to reveal information and get better knowledge about the world is already formulated by Habermas (1996).

⁴ Note that Hong and Page (2004) do not refer to deliberation in their initial work. Landemore (2013) interprets their work in this direction. This will be particularly meaningful in our last section.

reason-giving and treating others as rational equals.⁵ Hence, even proceduralists have to agree that deliberation is valuable when the procedure generates better justifications through a regulated exchange of reasons.

The relation between (b) and (c) is also important to underline since the two aspects seem to work together: it is *because* deliberation informs people and makes them more aware of options, offered by diversity, that it produces better outcomes. This seems like a natural connection since a higher level of information on a set of issues ought to make individuals better equipped to solve a problem. We usually trust experts on specific issues exactly for this reason. Ultimately, the agreement of free and equal individuals relies upon more empirical elements, i.e., the actual transformation of individuals' preferences through the revelation of new information and the production of better outcomes. Hence, I would claim that (b) *and* (c) are necessary conditions for (a). Some may argue that (b) alone is sufficient even if (c) is not warranted, since deliberation might aim to inform individuals and make them better citizens. I think, however, that at least in the version of the justification of a general deliberative assembly, the argument rests on (c) as well.

Decisions' quality is of paramount importance to specify (c). We need to have good reasons to think that decision D which is the outcome of the deliberation of a deliberative body will be of better quality than what chance or another decision procedure could produce.⁶ The definition of what counts as a decision of better quality may vary, but we may agree on the following general depiction:

$D > D'$ if, when both decisions try to solve an issue I and realize a state of the world S^* , D generates a state of the world S closer to S^* than S' generated by D' .

The distance can be evaluated by the number of elements needed to be modified to go from S to S^* , or by the level of preference-satisfaction of the individuals in a given society, $D > D'$ if it allows more individuals to access superior options in their preference rankings than D' , by promoting the best solution to an optimization problem, or by maximizing expected utility of the decision-makers and the individuals who will abide by the chosen rules. Ultimately, developing a metric of the quality of the decision-making is less important for us than the fact that deliberative decisions are, in some metrics, thought to be of superior quality.⁷ The skeptical reader of any specific definition of the quality of decision-making can still follow the following argument as long as he accepts that talking about the quality of a decision in the political realm is at least meaningful.

Let us reuse Landemore's (2013, 100-102) example as an illustration: in New Haven people are complaining about recurrent assaults on a bridge. The first proposition of the police

⁵ The reason-giving requirement is central in many approaches to deliberative democracy (Gutmann and Thompson, 2004, 3).

⁶ Here one of the main alternatives would be a form of epistocracy, in which decisions are taken by an expert council, for instance. On this topic, see Brennan and Landemore (2021). I will come back to the comparison of decision-makers at the end of this article.

⁷ I may leave aside here the vexing problem of knowing what a better decision is when facing a political issue without a clear "right" answer (like in the cases where individuals must guess the weight of an animal, for instance). We may rely on a weak conception of what a "right" answer consists of, as developed by Goodin and Spierkerman (2018), which consists of the realization of the most favored option in terms of preference rankings, supposing that individuals can generate ordinal rankings. Ultimately, every measurement of the quality of the decision-making is controversial. Still, I assume on the following page that there exists an option or a set of options that can be judged superior to others uncontroversially.

is to post a car in the bridge's surroundings. Nevertheless, after some time, this solution was judged inefficient since assaults would occur when the car was away. A second proposition was to install public lights on the bridge, which was broadly accepted as a superior option. Nevertheless, the train roads under the bridge impaired electricity use on the bridge, as a city technician informed. A third and final proposition was to install solar-powered lights, subsidized by a specific fund. This last option was agreed upon as superior to the others.

Consider that the deliberative body must decide which option lowers the number of assaults while not costing too much. They face an optimization choice: which decision is more efficient while not exceeding the city's budget? If S is the state of the world where the assaults are significantly reduced at an acceptable cost (compared with for instance the possibility of having a police car on the bridge all the time), then deliberation produced a decision D which is superior to what some specific experts (such as the police alone) proposed and is recognized as such by every individual in the deliberative body *because* it could channel different types of information – not only about the security, but also the technical aspect of lights, the experience of the pedestrians, and so on. This solution is more satisfying and moves the world closer to S^* , the assault-free state of the world.

2. *Challenging the assumptions: is the transformative claim acceptable?*

A significant portion of the critiques of epistemic democracy focuses on the second claim, which I coined *the transformative claim*. This claim states that deliberation is valuable to the extent that it makes people change their minds, and their preferences in the discussion process, because new information is revealed and, as in the New Haven case, moves the individuals closer to the right answer, or at least more refined conceptions. This aspect is crucial to deliberative experiments. Since it attracted a lot of discussions, it is important to consider the various arguments on this claim and assess their importance for the general case for deliberation.

The conditions of the claim are that the individuals participating are competent enough to process new information and are able and willing to change their minds (recall the assumptions of the Diversity Trumps Ability theorem). Let us call these conditions the *competence* and *willingness* conditions. In addition, even when individuals are competent and willing to change their views, the deliberative process should use cognitive diversity and dispersed information. In short, the collective procedure should not display *perverse effects*.

All these conditions have been challenged, empirically and theoretically. The *competence condition* is notoriously challenged. Epistocrats such as Brennan (2016), defend that most individuals are not competent enough to participate fruitfully in collective deliberation. Caplan (2012) uses various surveys displaying the lack of competence of the medium voter on sets of political issues (economics, international relations, and so on). This critic has a long history since Lippmann (1925) was already making use of the rise of the “Great Society”, to underline the inadequacy of the myth of an “omnicompetent” voter, who

possesses neither the time nor the willingness to get informed. The capacity of individuals to recognize the best options when it is present is notoriously challenged.⁸

The *willingness condition* sustained important criticisms. Some individuals may be strongly committed to their views. This might be the case of individuals holding quasi-conspiracy beliefs, as Hobson and Niemeyer (2013) studied in the case of “climate skeptics”. Goodin and Spierkerman (2018, 94) survey the literature on this issue, showing that some erroneous beliefs are particularly sticky once they are learned, so much so that individuals tend to promote them even when explicitly refuted.

The existence of *perverse effects* in deliberative processes has attracted more attention. Several works put forward points in different directions. Sunstein (2002) notoriously developed the “law of group polarization”, stating that group deliberation could reinforce radical views rather than the attunement of conflicts. Sanders (1997) advocates that deliberation may exclude minority views with its emphasis on communicative rigor and rational discourse. Müller (2019) surveys recent psychological works on group deliberation and underlines the number of biases that may appear in the process, where the most relevant information may be lost due to the lack of identification of expertise, stubbornness, and other phenomena. Penington (2003) argues that deliberation over-emphasizes verbal communication, not allowing the use of tacit knowledge, crucial to social coordination.

In short, not only would individuals not be competent or willing enough to change their views and make the best of revealed information, but the process of collective deliberation may well impair individuals' ability to do so, undermine the capacity to discover new and relevant information or produce noise and exclusion.

Are these criticisms destructive? I do not think so. They mostly underline that we should be very cautious about the design of deliberative experiments if they are to use cognitive diversity, create inclusive groups able to channel relevant information, and avoid polarization and clashes. Scholars and experts are arguably aware of this.

Recent works by Mercier and Sperber (2011; 2017), Goodin and Spierkerman (2018) or Niemeyer et al. (2023), give us reason to think that deliberative experiments may well be successful in transforming individuals' levels of information and decision-making for the better. Goodin and Spierkerman (2018, 91) distinguish competence and knowledge. Individuals may well not be knowledgeable about a set of issues, but competent enough to identify relevant information. Furthermore, deliberative settings often target the improvement of the competence and knowledge of citizens, such that they are more likely to pass the bar of the minimal threshold. Citizens participating in citizens' conventions gain a form of expertise they did not have to begin with. The competence condition seems to be somewhat verified. Mercier and Sperber (2011; 2017), particularly support the willingness condition, since reason is, for them, communicative by nature. They draw on multiple experiments showing that individuals recognize relevant information, fake news, or fallacies. This is especially the case in dialogical situations, where individuals must convince each other and collectively assess arguments, rather than when they are taken in isolation. In short: individuals may well be poor individual reasoners, but reason evolved for collective use, and displays its best qualities

⁸ This is the so-called oracle assumption in the Hong-Page theorem, stating that individuals are competent and able to recognize the best solution to a problem. This provoked major criticism regarding the realisticness of the theorem's assumptions, especially when applied to political matters. For a discussion, see Landemore (2014).

when exercised together. Finally, Niemeyer et al. (2023) demonstrate how much the deliberative design matters for successful experiments to avoid perverse effects. Important differences occurred between groups depending on group building (are groups briefed or allowed to have informal meetings, are the deliberative norms imposed from outside or discussed by the groups, are the groups cognitively trained, etc.). Jennstal (2019) introduced the idea of measurement of complex thinking based on deliberative experiments, showcasing the cognitive gains from deliberation in some settings.

3. *Can the transformative claim ground the improvement claim? Complexity and the value of information;*

The case for the transformation claim might be somewhat convincing, but it rests on empirical studies whose results ought to be replicated and can be contested. Important work is required to assess how much preferences change in the deliberation process, what variables are important, and so on.⁹ If the reader is skeptical about this, let me propose to consider my argument as conditional: if we grant the transformative claim, we may still encounter other difficulties.

At this stage, the argument for deliberation and its relevance for public policy-making rests on the idea that deliberation improves people's level of information and competence on an issue, making them more able to make better decisions or propose better policies. The alternative decision-making procedure may have to be defined more precisely, e.g., might an institution with highly trained civil servants or experts have better chances of solving a set of issues? Yet, let me assume the transformative claim. The bulk of my argument rests on the critique of the connection between the transformation claim and the improvement claim: that more information, refined preferences, and better arguments lead to better decisions, and that this is a sufficient argument for establishing a government by a deliberative assembly.

This connection is doubtful for two reasons. First, in a complex system, more information does not necessarily generate better decisions, such that the *positive value of information* is not warranted; second, even if deliberation leads to better decision-making, a government by a deliberative assembly may still be inferior to another option, i.e., a plurality of decision-making centers. The transformation claim thus does not imply the improvement claim (even if both may be correlated), leading us to switch our concern to the institutional conditions for information channeling and discovery in a complex system rather than the question of competence of a deliberative public. Let me start with the first reason, which rests on three arguments.

Argument 1: Information Overload.

⁹ One should underline that such studies are particularly costly and time-consuming: one should conduct qualitative interviews with each participant at the beginning of the deliberative experiment, and be able to map their preferences and views, to study the evolution throughout the process. It then requires quantitative work to study the data, and evaluative work to assess if the changes were justified by relevant information and leading to an improvement of the decision-making. Given the relative infancy of these kinds of deliberative experiments, such work is very much needed.

Our social and economic systems generate a huge amount of information. Too much information may undermine the quality of decision-making. This is the most basic feature generating a negative value of information. The effects of information overload are surveyed by Bawden and Robinson (2020). They show that having too many choices and information leads to anxiety, paralysis in decision-making, and irrational decisions, such as overconsumption. Information overload means the amount of information exceeds the capacity of a cognitive system to incorporate fruitfully new information and make trade-offs. The typical toy example is when a menu is too long and paralyzes choice, especially if a shorter menu presents the optimal option already. In this situation too much undermines the value of information, because it creates the possibility of remorse, leading to non-optimal choice. A high level of information can generate the same effects as noise, i.e., distraction, errors in judgment, tendency to overestimate or underestimate risk. Efficiency and rationality are attained through diminishing the amount of information rather than increasing it. Some empirical studies verify the connection between information overload and decreasing decision quality, based on the stress produced by informational overload. Philips-Wren and Adya (2020) survey these effects. Information overload as well as uncertainty or complex problems, generate stress for decision-makers (especially, but not only, under time constraints), leading them, for example, to be particularly risk-averse or, on the contrary, not being risk averse enough, to mis specify the problem identifying information wrongly, and so on. Information is typically positive until a threshold t is reached – usually defined as the maximal cognitive capacity of a system –, where new relevant information may have a neutral or a negative value. Heuristics are efficient in many situations because they save information treatment and research and avoid the costs of looking for new information. Improving the quality of decision-making entails using simple heuristics in complex environments, rather than mobilizing more and more relevant information (Gigerenzer, 2007; Dold, 2023).

Complex systems entail a high number of elements in interaction, and we may expect deliberative bodies to be confronted with a high amount of information. If we suppose that the cognitive capacity of such deliberative bodies is limited compared to the massive amount of potentially relevant information, information overload may occur. Nevertheless, as displayed by Bawden and Robinson (2020), particularly skilled agents may be able to filter properly the information and identify the optimum level of information to maximize the quality of the decision or identify the right simple heuristics to use when confronted with a complex problem. It is possible, following Niemeyer et al. (2023), Landemore (2020), and Mercier and Sperber (2011) that deliberative bodies generate these specific cognitive capacities. As such, the argument of information overload may not be decisive, since it is only showing that it is *possible* that more information would drive to information overload.

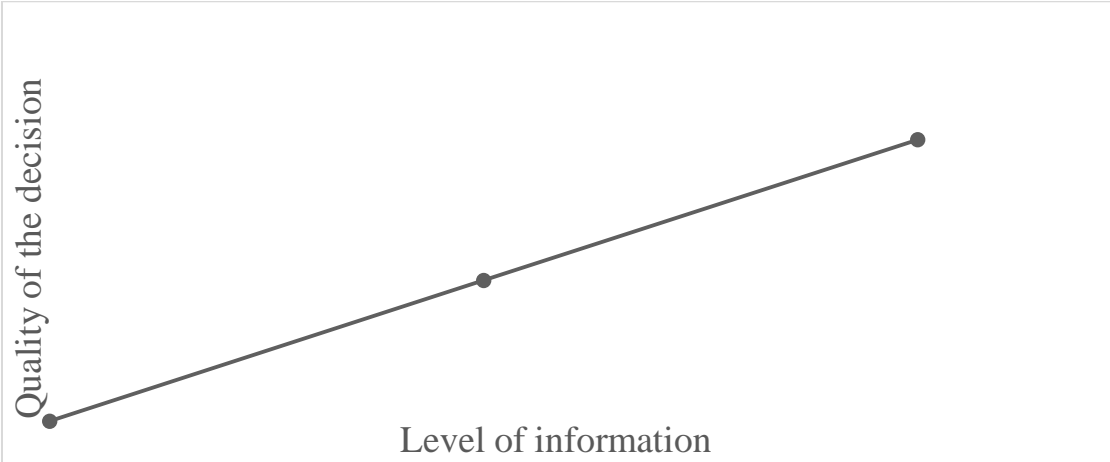
Argument 2: Closed and Open Systems.

The second important argument relies on the difference between closed and open systems. Optimization may be possible in a closed system where the parameters are well known, but not in an open system, characterized by the interconnectedness of different features of the world. The argument builds on Gaus's (2016) concepts of rugged landscapes when dealing with an open system, conducting to the impossibility of conducting simple optimization methods. In the New Haven case, the problem-solving process relies on many discovered information: the feasibility of options, their relative cost, what options are available, and so on. According to Landemore (2013, 107), deliberative publics are, because of this,

particularly able to cope with political problems, especially when they can take advantage of cognitive diversity, which is characterized by a diversity of perspectives able to channel or discover new relevant information. As argued above, this story amounts to an optimization under constraints. The value of information fuels optimization particularly well in closed systems, i.e., systems that stay relatively stable and do not exhibit transfer of information and interconnection with other systems. If you had to pick who to trust in the Parisian metro between your Parisian friend and your Australian friend who never lived in Paris, you would trust the Parisian, because you assume he possesses more relevant information about the metros and is, therefore, able to make better itinerary decisions. Paris metro allegedly does not change based on other events in the world. Likewise, in the New Haven case, we would probably trust the deliberative body more than any single expert participating in the discussion, because the collective possesses more relevant information on the issue at hand, i.e., insecurities on the bridge, which depends on specific parameters which can be assumed to be semi-permanent.¹⁰ However, both cases can be depicted as optimization problems in a closed world: one must solve an issue (an itinerary or a safety problem) with some constraints (time and money) with a finite set of options, and a stable state of the world (metro will not change, and we assume a baseline level of assaulting).

The value of information is verified in non-complex systems such as the Paris case or the New Haven case, where we may obtain Fig. 1.¹¹

Fig. 1: Simplified relation of the level of information to the quality of the decision in a regular landscape.



What happens if we relax these assumptions, as in most multidimensional problems a general deliberative assembly should work with? A typical example of a system displaying interdependence and non-linearity is financial markets. Consider the situation of an agent who tries to maximize her gains. The simplest strategy is the buy-and-hold strategy with a diverse portfolio. This strategy does not require any knowledge of the market or specific knowledge of financial products. It outperforms, however, many other strategies. Think of A, who gets

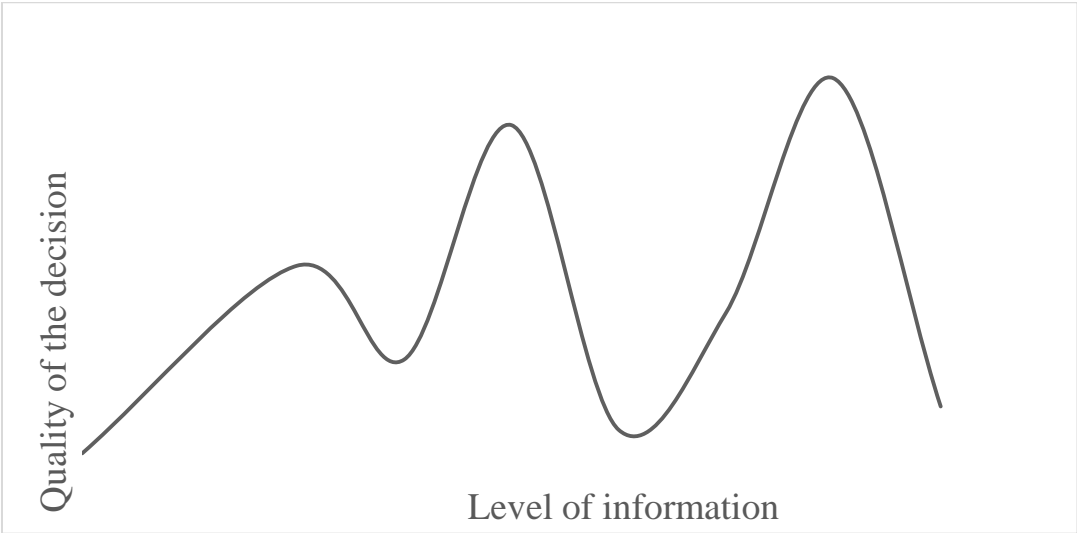
¹⁰ The New Haven case is already more complex than the Metro case, because security may depend on a variety of factors that are evolving about other macro parameters (such as level of unemployment, poverty, and so on), and meso parameters (social policies of the city or the county, the number of police officers, social norms, and so on).

¹¹ In Fig. 1, we may also represent the curve as concave rather than linear, because there are diminishing returns to new relevant information. However, this does not modify significantly our argument.

interested in finance and tries to trade actively. She certainly becomes more knowledgeable about her interests, but her active strategy underperforms. The more she tries to benefit from opportunities with expert knowledge, the less she can reliably gain from trade. A possesses more information and can explain better how the financial system operates, but you would be wrong to bet on her for more gains (Shiryayev et al., 2008). This is the case because the success of the action of A depends on the actions of an important number of other individuals, that A cannot know: the world is open because the features of the given system are interdependent with features from other systems.

The feature of interdependence creates uncertainty about how the parts of the system will react to a change in the rules. We may know well how the world would look like with one small modification, i.e., if *ceteris paribus* everyone was driving on the left. Yet, our level of confidence drops quickly when we deal with features connected with an important number of other features. Finance is a typical case where the value of an asset in the energy market may relate to weather prediction, the relative performance of energy based on weather forecasts, the state of nuclear power plants, the productivity of green energies, political negotiation between oil producers as well as labor laws in different regions or the general dynamic in the market, among other things. In the political domain, decisions are made in an open world, where the value of information is not guaranteed to be positive. Some sets of information may lead to an increase in decision-making, and a piece of added information may lead to a sudden decrease. Let us illustrate such a case with a somewhat uncontroversial example in the political realm: an assembly should decide whether or not to vaccinate a population for a potentially dangerous disease. At first, they know that the virus is very contagious, consequently, they believe it is justifiable to vaccinate everybody. After some studies, they discovered that the virus is certainly contagious, but not as deadly as they thought. This is very relevant information, and they decide it is not necessary to promote vaccination. However, they do not anticipate releasing the pressure would create a liberation effect: individuals believe the virus is not deadly anymore, hence starting to go out way more, spreading the virus, and causing more casualties. Complex and open systems produce hardly predictable feedback loops, that even experts can't easily foresee. In these systems, we may obtain Fig. 2.

Fig. 2: Relation of the level of information to the quality of the decision in a rugged landscape.



How strong is this argument to advocate the possibility of a negative value of information? It is useful to assess this in light of the best theories for deliberative assembly governance. Landmore argues that for most political problems, we cannot know in advance where the relevant information will come from, and hence we must maximize cognitive diversity in deliberative publics. A diversity of cognitive profiles will potentially be more apt to reveal the unsuspected connections between a decision and many other spheres. Diversity is particularly significant *because* political problems are multidimensional and complex. Recently Benson (2021) proposed a model of the gains of diversity even when relaxing some assumptions of Landmore's model (above all the oracle assumption, i.e., that individuals are better than random at choosing the best option), to show that diverse general deliberative assemblies may cope well with complex political problems (e.g., environmental, security, economic problems), because of cognitive skills diminishing returns. Even though deliberative assemblies may not be guaranteed to make the best decision, it is still possible they possess the *highest chances* of success in tracking them.

Complexity 3: Persistent novelty: the dynamic feature of complex systems.

Three important features of complex systems are of interest to make an additional argument. First, complex systems are characterized by a multiplicity of elements, in our case individuals and institutions, which are heterogeneous. Individuals, for example, have different preferences, evaluations, and values. Second, the interaction between the elements produces specific phenomena, such as spontaneous orders, emergence, nonlinearity, or feedback loops, which make the system difficult to model. Each of these phenomena entails that the system possesses features that do not wholly depend on the features of the elements. A typical social example is the market, where the price is driven by a multiplicity of individual choices (from the consumer side and the offering side, but also adaptive behaviors for innovation and so on), without being reducible to some sets of actions. Third and because of this phenomenon, complex systems are especially hard to predict and direct.¹² Hayek (1945) is well-known for developing the consequences of complex systems for human societies, emphasizing the importance of impersonal coordination devices such as the market, in contrast with centralized bureaucratic control. All large-scale societies probably displayed complex features in the past. Still, we have good reasons to think that our socio-political systems are becoming increasingly complex, i.e., our world is more diverse, more connected, open, more interdependent, and more adaptive (Page, 2015), making complexity particularly relevant. Adaptiveness was particularly stressed by Gaus (2021), who contends that in any system displaying freedom of choice generates unpredictability because individuals will react to any new set of constraints.

Deciding to institute the state of the world S in complex systems, depends on relevant knowledge of :

- (a) the state of the world S_{-j} .

¹² Page (2011) and Landyman and Wiesner (2020) offer a general understanding of complex systems. Gaus (2016, 2022) applies some insights to political philosophy. I follow this move in Colin-Jaeger (2024b).

(b) how decision D will produce S through a set of mechanisms M , given the assumption that every other thing remains equal.

And (c) how the entities in the system will adapt to D . Even granting that most individuals would agree that S is closer to S^* than every other alternative, based on relevant information about the issue at hand (say, how to deal with unemployment in a country).

All three components are problematic : (a) is challenged if the system is non-linear when slight departure from initial conditions (that may not be measurable) exist. A small amount of mis-specification may lead the decision astray. (b) because social and political complex systems rely on a set of rules, for instance about freedom, property rights, contract law, and other formal rules, but also culture, habits, and traditions, that are more informal, as well as phenomena, such as unemployment rate, investment rate, demographic change, and so on, and these rules and phenomena jointly produce a state of the world. A modification of one factor interacts with the whole system and modifies the equilibria that exist. Every attempt to optimize along one metric produces a rugged optimization system, where a slight difference in information may produce radically different outcomes. (c) is challenged for the same reason because the individuals and institutions will react to the change in the rules and their structure, hence producing adaptations that will transform the system in return. We may well grant that some phenomena are not possible, but within the set of possible options, we do not know what will occur.

Given non-linearity and irreducibility, complex systems reduce the probability that new information has a positive value in dealing with a problem. Deciding based on a larger set of information on S_{-j} might then be detrimental to the capacity of D to produce S , because we simply do not know if the information, we deem relevant *ex-ante* will produce the expected outcome *ex-post* or create perverse effects. The main feature here is “persistent novelty” (Holland, 2014, 10), which challenges the claim that any good decision at a moment T for S_{-j} will be a good decision for S at T_{+j} . The production of novelty generates unawareness by the decision-makers, meaning that D doesn’t know that they do not know some important facts that will be relevant to assessing the quality of the decision-making. Unawareness directly leads to a negative value of information (Li, 2004). The concept of unawareness refers to things that one does not know, and that one does not know one does not know. It is useful to distinguish between risk, ambiguity, and unawareness. Risk consists in a situation where one can map the different possibilities and assign probabilities to them, ambiguity in a situation where one can map the different possibilities but where it is difficult to assign probabilities, while unawareness refers to a situation where one is not able to map all the possibilities because one cannot conceive of them. A situation where one can define what one knows, the set of feasible alternatives, and what one is uncertain about, with probabilities, is defined by awareness (because one knows what he does not know and can put probabilities on what he does not know, or to assess the importance of it). In contrast, a situation of unawareness is a situation characterized by the possibility of not knowing relevant facts and not knowing that we do not know them, while these facts could modify the decision we make. Unawareness suggests that agents are unaware that more information *ex-ante* can harm them when they are making decisions, and therefore unable to identify what new information they might have to search for. Finance, again, is a typical example of this, because *ex ante* relevant information can lead investors astray from the research of new information (Galanis, 2014). Unawareness may be due to psychological factors (such as lack of attention), epistemic

default (something someone should have been considering but forgot), or the impossibility of mapping ex-ante every option, and even less assigning them a probability when dealing with complex systems.

Complex systems, because of unpredictability, generate changes relevant to decision-making, which may undermine the value of ex-ante information. If these changes are partly unpredictable, they generate unawareness, because agents in the decision situation do not know that they do not know these features and consequently that they should update their information set. Coming back to Hayek (1945), this corresponds to his argument against central planning: even knowing all the relevant equations about offer and demand for every good in society at one moment in time, we are not able to efficiently plan the economy because the market constantly generates new information through the interactions of the individuals, who use local and tacit knowledge, notwithstanding innovation and interconnectedness of open economies. Therefore, it is in theory possible that the relation between the level of information and the quality of a decision takes the shape of Fig. 2.

Now, one might answer the challenge of complexity faced by virtually all systems of decision-making, not only deliberative assemblies. So far, I have only shown that this challenge is very potent for deliberative assemblies, but not that they are particularly doomed to fail compared with other traditional types of governance, such as expert assemblies, representative assemblies, and others. On the contrary, we may have good hopes that deliberative assemblies made of randomly selected citizens would cope better with the challenges than other alternatives. The value of information might be negative in some situations, but the average value of information would be the best as possible in a complex world. I suggest that the previous arguments invite us to look in another direction.

4. Dealing with complexity: From the competence issue to institutional diversity.

One of the central claims in favor of deliberative assemblies is that these assemblies discover, channel, and use more relevant knowledge, generating better decisions, and making them particularly fit to make decisions in a complex system. In the previous section, I mostly attacked the connection between the transformation claim and the transformative claim, showing that more information does not necessarily imply better decisions, undermining one of the central tenets of the epistemic qualities of deliberative assemblies using cognitive diversity. However, complex systems pose a problem for any kind of decision-making.

In this section, I want to face one of the main consequences of my arguments: it is more important to think of institutions able to cope with complexity rather than arguing about which central mechanism of decision-making produces better decision-making. Even though deliberative assemblies may well have the best chances of reaching a good decision, the possibility of a negative value of information generates enormous risks for any political community. Most of the debate between deliberative experiments and their alternative relies on the question of expertise and competence, i.e., are the various assemblies able to use, transfer, and apply relevant information to solve problems, does the deliberative alternative

score better than the epistocratic one? This is a very important debate.¹³ Nevertheless, my arguments suggest it is probably not the main debate. The main argument I develop is based on institutional diversity and the advantages of a plurality of decision centers compared with one competent decision center.

A plurality of decision centers scores better than a central deliberative assembly composed of diverse citizens, even when granting that this produces the best epistemic situation. I argued that deliberative assemblies may encounter the problem of the negative value of information in complex systems. Nevertheless, my argument only shows that negative values of information are a possibility. In the long run, deliberative assemblies might be the best we have to maximize the expected utility associated with decision-making. Put simply, there might be a 30% chance that a deliberative assembly *D* fails to identify the best option, but it may still be the best chance that we have given uncertainty.¹⁴ Following *D*'s decisions would still maximize expected utility and produce a state of the world *S* as close as possible to the ideal *S**.

However, if we want to maximize the possibility of finding the best solution to a problem, it is important not to stick with one decision, but to promote the possibility of making many different decisions, even when the different decision-makers have a lower chance of making the right decision than the central one. The basic assumption in our discussion above lies in the fact that we take the deliberative assembly as a unique center of decision-making, or within a network of institutions playing different roles.¹⁵ I propose to relax this assumption and switch our attention to the institutional design able to cope with the challenge of complexity, i.e., reaching the right decision when dealing with the potential negative value of information. This entails the multiplication of decision centers in a polycentric organization, either with a federalist territorial organization leaving a degree of autonomy to the federated entities or through the application of the subsidiarity principle.

Why would this lead us toward better chances to reach the correct decision (if it exists)? Let us take the following toy example: the general deliberative assembly possesses a 70% chance of making the right decision; while there are five other decision centers, that face the same problem, and have a 30% chance of making the right decision – since they do not benefit from the epistemic advantages of the deliberative body and its cognitive diversity, but could only ask for experts, a reduced number of citizen or representatives. In this case, one maximizes the probability of finding the right decision when establishing multiple decision-makers, because there is an 83% chance that one of the five assemblies makes the right

¹³ See Brennan and Landemore (2021) for a general presentation of this debate.

¹⁴ In the following sentences, I will use the language of probability, even though invoking probability distribution entails that we know the chances of finding the good decision from an epistemically favored viewpoint (a godlike viewpoint having access to the relative frequencies, for instance). Of course, for most decisions, this is exactly what is controversial: we do not know the relative frequencies of events in a complex system when modifying important parameters, and we cannot rely on revealed information if we have a potential negative value of information. I, however, use the probability language to make the argument as simple as possible.

¹⁵ Mansbridge et al. (2012), defend a systemic turn in deliberative democracy, concerning the debate over the legitimacy of deliberative assemblies. They mostly emphasize the necessary connection between different types of institutions for the public to get informed by other associations, courts, legislatures, and so on. Deliberation should therefore occur at the level of the system rather than only at the level of one public. This contribution is fundamental, but I highlight something different, related to the necessity to allow for multiple centers of decision-making at the legislative level.

decision.¹⁶ Moreover, the more decision centers there are, the better the chances are, even when the probability for one decision center to find the right answer drops.¹⁷ As long as the differences in chances are not too important, a multiplicity of decision centers is superior to a very competent assembly. Even if we grant the epistemic qualities of deliberative assemblies in revealing and using the information to make better decisions, it seems a model of multiple decision centers possesses better chances to achieve the same quality of decision-making without needing similar chances of making the right decision.

When dealing with complexity, a diversity of decision centers scores better than a very competent center if the following conditions are verified:

- (i) *Non-zero Probabilities*: The probability of the competent center finding the right answer is not 1, and the probability for each of the multiple decision centers to get the right answer is not 0.
- (ii) *Number of Decision Centers*: When the probability of each decision center finding the right answer is very low, there should be a sufficient number of decision centers such that the combined probability of getting the right answer from at least one of these centers surpasses the probability of the competent center finding the right answer.
- (iii) *Policy Diversity*: The multiple decision centers should explore different policies or approaches when facing similar problems, ensuring a diversity of strategies.
- (iv) *Independence of Decision Centers*: The probability of finding the right answer should be independent for each center, ensuring that the success or failure of one does not influence the others (at least synchronically).
- (v) *No external cost*: While the different centers should explore a diversity of strategies, they should not do so at the expense of others, e.g., experimenting with new ways to free-ride on others.

This result is very close to the DTA (Diversity Trumps Ability theorem) conditions used by deliberative democrats, and there are similarities, because this solution also relies on diversity, especially the diversity of perspectives (including political and axiological perspectives, not only cognitive diversity), while assuming problems are difficult enough (which they are, assuming even moderate complexity). One should note, nevertheless, that this set of conditions is less restrictive than the DTA's conditions. Because we do not assume that the members have an above-average chance of finding the right answer, or that everyone can identify the superior option when it exists (the oracle assumption). It is enough that the chances of the decision centers are above 0% and the chances of the deliberative assembly are not 100%, which seems very reasonable given the arguments developed in section 3. For our argument, the core assumption is (ii), as it encompasses the others. Specifically, condition (ii) emphasizes that institutional diversity outperforms the diversity found in deliberative assemblies if:

$$P_M > 1 - (1 - P_C)^{1/n}$$

¹⁶ The explanation is the following: There is a probability of 0.70^5 that all the five assemblies fail, which gives roughly 0.17 probability that they all do, hence 0.83 of getting the right answer. This result holds if the probability of each assembly making the right decision is above 0.24.

¹⁷ For example, with ten decision centers with 15% chance, we would have 0.85^{10} , leading to 1- 0.85^{10} chances that all of the decision centers fail, which corresponds to 0.19, so 81% chances of getting the right answer.

where: P_M is the probability that one of the decision centers finds the right answer, P_C is the probability that the competent center finds the right answer, and n is the number of decision centers. For instance, with $P_M > 1 - (1 - 0.70)^{1/10}$, meaning that for a probability of 0.7 for the central assembly, the probability of each decision center should be at least 0.06697 for the decision centers to have a combined equal chance than the central assembly to find the right answer, i.e., that at least one decision centers find it. This rule allows for great differences in competence (0.70 vs 0.06) to still be outscored by the effect of institutional diversity. Some situations may not meet this criterion, but this does not require every decision center to have a “good chance” of finding the right answer, regardless of what that may be. Some centers may even have very low chances, making them particularly “incompetent,” yet they still contribute to the overall probability of success due to the sheer number of centers and the independence of their decisions.

The most controversial assumption might be (iii) because it supposes (a) that each decision center tries to answer one similar problem, and (b) that they propose different answers. (a) certainly, calls for a common recognition of the problems and the ability to identify what parameters are comparable. As we know, this encounters the vexing problem of external validity, and the possibility of stating that the situation in one jurisdiction is really “similar” to the situation in another¹⁸; (b) supposes that the different decision centers are diverse enough to propose different experimentations, even when they have little chance of succeeding a priori, while some jurisdictions may offer very close experimentations. Moreover, (a) and (b) may pull in different directions, since the recognition of a similar problem would require institutional proximity, while a diversity of experimentations leads the institutional systems apart.

Answering fully these concerns would require another article, but I think these issues are not deadly. First, some sets of issues can be shared by all the decision centers, i.e., climate change, pandemics, or economic crises, and we can identify some problems as being similar when institutional frameworks differ, e.g., compare the effects of educational policies in different countries isolating variables. Of course, this is not always so obvious, but it is at least feasible. Recognizing problems as similar does not require sharing the same institutional framework and does not commit us to fall back on a single center of decision-making. Second, the diversity of experiments can be fueled by diversity in values and perspectives. The most extreme case would be charter cities and kibbutz cases, experimenting based on quasi-utopian values, but it is also possible to encourage diversity with specific subsidies to innovative experiments to solve problems.¹⁹

This argument builds the ground for an epistemic superiority of polycentric democratic governance in light of the possibility of the negative value of information. The same argument justifying deliberative diverse assemblies to cope with complexity leads us to the defense plurality of decision centers to face the issue, given the possibility of failure in light of the impossibility of ensuring the rightfulness of decisions in situations of complexity. This invites us to defend a polycentric model of political governance, in which territorial

¹⁸ Cartwright (2012) offers an important argument discussing external validity with the example of randomized controlled trials.

¹⁹ Müller (2019) defends charter cities and local experiments, based on the recognition of deep value disagreement. Nozick (1974, 329) mentions in passing the possibility of encouraging experiments, before dropping the possibility.

entities enjoy some degree of autonomy in policymaking and allow others to learn from their decisions.

5. *Another route towards polycentricity*

In this article, I defend that one of the main claims of deliberative democrats, i.e., that more information entails better decision-making, is not warranted in situations of complexity. This entails that information may have a negative value, introducing limits to political knowledge. I contend that these limits invite us to switch our attention from the issue of the competence of assemblies, based on random sortition or expertise, to the issue of institutional design, especially the framework that could allow us to cope with complexity and the constant possibility of decision-making failures. I argue that a plurality of decision-making centers outscores one competent decision-center, within a set of reasonable assumptions. Complexity indeed challenges core assumptions of our philosophical paraphernalia, i.e., the ideas of stability of a just society, or the connexion between knowledge of our political ideal and its realization. Rather than thinking of what unique set of ideas could be implemented to construct a just society, the challenge of complexity leads us to defend a social system in which multiple experiments can be conducted and jurisdictions learn from each other.

Ultimately, I advocate a polycentric system in which decision centers are given a substantial degree of autonomy, to experiment with various rules and institutions when confronting a problem. This defense shows that polycentric systems may realize one of the democratic goals better than central democratic institutions which are perceived as the *nec plus ultra* of democratic guidance because they allow the system to find (or have better chances to find) the correct answer to political problems. Deliberation may be valuable for other reasons – developing civic virtues, generating bottom-up support or justification for political decisions and policies – is not able to justify, even when it leads to epistemic improvements and efficient use of cognitive diversity, the central governance of complex orders by a deliberative assembly. Indeed, the same ideas that support the epistemic claim for democracy lead us to defend a polycentric system, which is more fit to deal with complex systems and their challenges. The defense of polycentricity I offer requires, however, work to specify which institutions could verify the conditions of the argument I offered in this article.

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