

RESEARCH ARTICLE

The Ostroms on self-governance: the importance of cybernetics

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Abstract

This paper reveals a novel and perhaps surprising ingredient in the mix of influences that inspired and informed the work of Elinor and Vincent Ostrom on self-governance: cybernetics, understood as a theory of control via feedback mechanisms. Based on this crucial insight, the paper portrays self-governance as involving an architecture of multiple levels of so-called 'second order' feedback mechanisms. Such compounded systems of organization are the key to understanding any self-governance process and the paper argues that their intrinsic logic provides a critical link between the work of the Ostroms and the public choice and constitutional political economy perspectives on institutional order. The paper thereby offers both a fresh perspective on the Ostromian view of self-governance and also of also of governance theory in general.

Keywords: cybernetics; Elinor and Vincent Ostrom; self-governance; polycentricity

Introduction

The notion of *self-governance* is central to the research programme of the Bloomington School of public choice institutionalism (McGinnis and Walker, 2010; Wagner, 2005). Many of the contributions of Elinor and Vincent Ostrom can be traced back, either directly or indirectly, to a concern with self-governance and the Bloomington School arguably positioned itself as the preeminent source of work on that topic in the social, political and administrative sciences. The esteem in which Elinor Ostrom's contribution to the study of self-governance is held was, of course, most obviously apparent in her winning the Nobel Prize in economics in 2009 for her work on that topic.

However, the notion of self-governance remains rather elusive and could benefit from further attention. It may be yet another of those 'essentially contested concepts' which are, according to some scholars, at the core of any political theory or political philosophy paradigm (Gallie, 1955). But precisely because of that, it requires additional effort at clarification and perhaps in elaboration. This is precisely the task of this paper, which seeks to clarify certain aspects of the notion of self-governance by highlighting – in a manner not seen in the existing literature – the influence on it of ideas drawn from cybernetics, in particular the work of British psychiatrist and pioneer in the field of cybernetics, Ross Ashby. The paper starts by briefly revisiting the argument that the notion of self-governance is at the core of the Ostroms' programme, not just in the case of their analysis of common-pool resources (CPRs) but also in their account of democratic self-governance more generally. The account of the Ostroms' work presented there is selective, highlighting only those aspects that are most relevant

for understanding the influence of cybernetics on their thinking (see the section of the paper entitled, ‘The Ostroms’ views on self-governance: a selective summary’).

The following two sections reveal a novel and hitherto overlooked ingredient in the mix of influences on the Bloomington research programme: cybernetic theory, seen as a theory of control via feedback mechanisms, in particular as found in Ashby’s writings. The Ostroms cite Ashby’s work, but the influence of his ideas on their thinking has largely been overlooked in the secondary literature. This paper remedies that omission by analysing, explicitly and in detail, what the Ostroms took from Ashby and what his ideas contributed to their work.¹ More specifically we argue that Ashby’s work made an important contribution to the Ostroms’ analysis of self-governance in three ways. First, the Ostroms drew on Ashby’s insights into the need for variety in managing complex systems, as expressed in his so-called ‘law of requisite variety’, in order to develop their account of the principles that should inform the design of an over-arching constitutional framework suitable for harnessing the forces of spontaneous order and self-organization to good effect (discussed below, in the section of the paper headed, ‘Self-organization and self-governance’). Second, following Ashby’s claim that a *hierarchy* of feedback and control mechanisms is required for cybernetic systems to be self-organizing, the Ostroms argued that the possibility of a self-governing social system required the hierarchy of feedback and control mechanisms provided by multiple layers of rules (at the operational, collective choice, and constitutional choice levels) (see the section of the paper headed, ‘The Ashby challenge and the architecture of second order governance mechanisms’). Third, viewed in this light, one can also see why Buchanan and Tullock’s pioneering work in the field of constitutional political economy would have had an especially strong appeal for the Ostroms; Buchanan and Tullock’s distinction between different levels of rules afforded them the conceptual resources required to incorporate Ashby’s insights about the need for a hierarchy of levels of feedback and control mechanisms if self-organization is to be possible into their analysis of democratic self-governance (see the section entitled, ‘Self-governance: a restatement’).

Based on these crucial insights, the following sections will also elaborate on the concept of self-organization as an architecture of multiple levels of social feedback mechanisms. Such compounded systems of organization play a key role in the processes that make self-governance possible. Their intrinsic logic provides a critical link to the public choice and constitutional political economy perspective on institutional order, a perspective which converges naturally with (and works as an extension of) those basic insights. The result will be a more nuanced understanding of how complex phenomena such as self-governance are to be defined and a fresh view not only of how one could conceptualize the Ostromian view of self-governance at the interface of cybernetics and public choice theories, but also of governance theory in general.

The Ostroms’ views on self-governance: a selective summary

In this section, we provide a selective overview of the Ostroms’ work on self-governance, highlighting four aspects in particular which will prove to be important for understanding the influence of Ashby’s work on the Ostroms’ thinking: (i) self-organization; (ii) polycentricity; (iii) multiple levels of rules; and (iv) the relationship between the principles of spontaneous order and design in social systems.

The Bloomington programme is best known for its work on the governance of common pool resources (Ostrom, 1990). But a closer look reveals that this work is seen by the Ostroms themselves as a contribution to a more general research agenda on self-governance. As Elinor Ostrom explained, her work on how communities are sometimes able to craft rules that enable them to avoid the tragedy of the commons is an attempt to follow the strategy used by biologists studying complex processes, namely ‘identifying for empirical observation the simplest possible organism in which a process occurs in a clarified ... form’ because ‘the processes of self-organization and self-governance are easier to

¹In doing so, the paper also contributes to the small but growing literature on the influence of cybernetics on postwar social science (see, e.g., Lewis, 2016; Oliva, 2016; Paidipaty, 2020).

observe in this type of organization than in many others.’ By studying a relatively simple example of how communities can engage in self-governance by devising their own operational rules – endogenously as it were, rather than relying on some external authority to impose rules upon them – she would also be able ‘to contribute to the development of an empirically valid theory of self-organization and self-governance ... of relevance to a somewhat broader set of environments’ (1990: 26–29; also see Ostrom and Ostrom, 2009: 150, 152).² Indeed, Elinor Ostrom was eager to note that similar questions – ‘How can fallible human beings achieve and sustain self-governing entities and self-governing ways of life? How can individuals influence the rules that structure their lives?’ – were posed by foundational political and social philosophers such as Aristotle, Hamilton, Madison and Tocqueville (Ostrom and Ostrom, 2009: 159; also see Ostrom, 1990: 216).³

One important feature of this broader research programme is the idea that ‘we need to give much more attention to building the kinds of basic institutional structures that ... reestablish ... citizens as problem solvers and decision makers at the center of governance systems’ (Ostrom and Ostrom, 2009: 146). The Ostroms were also unequivocal about how their discussion of the conditions for democratic self-governance could be connected to Tocqueville’s ‘science and art of association’ as well as to *The Federalist* and its appeal to governance based on discussion, reflection and choice. The genealogy of Ostromian self-governance is thus explicitly linked to Alexander Hamilton’s question concerning whether societies of men are really capable of establishing good government by reflection and choice (Ostrom [1997], 2012: 84–85). Intrinsic to such a society are mechanisms for institutional and constitutional revision, based on reflection and choice, and also ways of equipping people with the capabilities needed to make effective use of those processes.⁴ Instead of thinking in terms of designing ideal institutions that could be exogenously imposed on the system to provide the ‘correct’ institutional framework right from the outset, the self-governance perspective suggests that we should emphasize the *endogenous* creation of the rules by citizens themselves. The ‘science and art of association’ is one of self-governance, of institutional and constitutional craftsmanship.

This is the context in which one may see polycentric forms of social organization as an essential institutional condition for self-governance. A polycentric political system is one ‘having many centres of decision-making that [are] formally independent of each other’ (Ostrom, [1972] 1999: 52). It is not only that the dispersion of decision-making capabilities characteristic of polycentricity ‘allows for substantial discretion or freedom to individuals’ and for ‘effective and regular constraint upon the actions of governmental officials’; it is also the fact that a polycentric arrangement has a built-in system of self-correction: a political system that has multiple centres of power at differing scales ‘provides more opportunity for citizens and their officials to innovate and to intervene so as to correct maldistributions of authority and outcomes’. That is the reason why polycentric systems ‘are more likely than monocentric systems to provide incentives leading to self-organized, self-corrective institutional change’ (Ostrom, 1998).

This self-corrective spontaneity is, as discussed in more detail below, a function of self-organizing tendencies occurring, under specific conditions, at several different levels within the system: ‘Patterns of organization within a polycentric system will be self-generating or self-organizing’ in the sense that ‘individuals acting at all levels will have the incentives to create or institute appropriate patterns of

²Ostrom’s interest in developing a theoretical account of the possibility of self-governance was also stimulated by mounting case study evidence indicating that users of CPRs were in fact often able to manage resources successfully themselves (Levi, 2010: 8–9; Poteete *et al.*, 2010: xxii, 31–33, 39–48, 60).

³The Bloomington School’s distinctive perspective could be even more precisely associated with a specific line of political thought in which, as Allott (2004: 162) has put it, a shift was made from *governance* as government ‘seen as the social function of a governing class’ to the liberal democratic tradition, in which ‘*government* is seen as society’s self-government’, that is to say ‘the ideal of a society which governs itself through its system of government, a society of and for the many in which the society-members are their own subjects, a body politic which, to use the ancient metaphor, is like the human body in that it is as much many as it is one’ (Allott, 2004: 191).

⁴For more on the notions of human agency and of capabilities employed in the work of the Ostroms, see Lewis and Aligica (2023).

ordered relationships' (Ostrom, 1998). Ultimately, polycentricity – seen as a structure facilitating adaptability and self-organization – exhibits a unique combination of spontaneous order features and elements that make room for deliberation, design, and relative control. Taken together, they constitute a mechanism able to lead via learning and self-correction both to the overall improvement in the system's performance and also to act as a precondition for a constructive governing process.

In developing these ideas, the Ostroms combined a long-standing tradition of political theory and philosophy centring on problems of democratic self-government with views influenced by new developments in the 1950s and 1960s in administrative science, systems theory and – to quote, as Ostrom does, the title of Herbert Simon's famous book – '*The Sciences of the Artificial*' (Ostrom, 2004: 45; Ostrom, 2005: 270–71; also see Ostrom and Ostrom, [2004] 2014: 85, and Simon, 1969): 'Many scholars', Elinor Ostrom stated, 'consider the very concept of organization to be closely tied to the presence of a central director who designed a system to operate in a particular way. Consequently, many self-organized governance systems are invisible to them'. Such forms of organization are not the consequence of central direction but 'are better viewed as complex adaptive systems'. They consist 'of rules and interacting agents' that 'produce emergent properties' and which can adapt 'by changing the rules dynamically on the basis of experience' (Ostrom and Ostrom, 2009: 156; also see Lewis, 2017).⁵

In drawing on the sciences of the artificial to develop the notion of polycentricity, the Ostroms combined, in a coherent fashion, two principles: the principle of social design based on reflection and choice, drawn from the constitutional tradition of thought; and the principle of self-organization, drawn from the tradition of spontaneous order thinking in general and the sciences of the artificial in particular. The Ostroms did so by highlighting the importance when designing an over-arching constitutional framework of acknowledging the possibility of spontaneous orders and making it possible to harness them for the common good.⁶ Two examples are discussed here:

- The first is the Ostroms' research on public services, according to which provision through a polycentric system of governance that allows a significant role for spontaneous (quasi-)market competition can lead to better outcomes than those produced by centralised (monocentric, top-down) systems of public administration. In a polycentric system, citizens 'are able to organize not just one but multiple governing authorities, as well as private arrangements, at different scales ... Each unit may exercise considerable independence to make and enforce rules within a circumscribed scope of authority for a specified geographical area'. These units may be both general-purpose or highly specialized, ranging from special districts and private associations to sub-units of a local government. All these may be 'nested in several levels of general-purpose governments' (Ostrom and Ostrom, 2009: 156–57). The Ostroms' argument, supported by extensive empirical work, is that if the over-arching institutional framework within which services are provided is designed to allow different kinds of provider, operating at varying scales of production and in overlapping jurisdictions, to vie for contracts to supply services, then competition for contracts between those providers, and also between local governmental units for citizens, can generate – as an unintended consequence – the error-correcting negative feedback required to produce outcomes superior to those typically generated by monocentric, top-down systems of provision (Ostrom, [1972] 1999, [1973] 2008: 42–64; Ostrom, 1983; Ostrom *et al.*, 1961; Ostrom and Ostrom, 2009: 156–57).
- The same approach also characterises Elinor Ostrom's work on CPRs, which suggests that if society's over-arching constitutional framework is designed to afford users of CPRs the

⁵As understood by Simon, and consistent with the Ostroms' references to his work, the sciences of artificial include approaches such as general systems theory, cybernetics and the theory of complex adaptive systems (see, e.g., Simon, 1969: 84–85).

⁶For a helpful discussion, see Candela (2021). Also see Aligica, 2014: 49–51, 55, 57. A similar approach can arguably be seen in some of the work of Friedrich Hayek, who sought to outline a set of constitutional and collective choice rules within which the forces of spontaneous order can work to best effect (Lewis, 2023: 11–13, 17–19). For an alternative perspective, according to which constitutions themselves are affected by spontaneous ordering processes, see Runst and Wagner (2011).

autonomy to devise their own operational rules, then a process of experimentation can be set in motion that will generate the feedback and opportunities for people to learn which rules fit their particular circumstances, often leading to better outcomes than would otherwise be possible (Ostrom, 1990, 1995, 1999: 520–30).

These examples also illustrate the importance for the Ostroms' thought of the distinction between different levels of rules (in particular between the lower-level operational rules governing people's everyday activities and the higher-level constitutional and collective choice rules that shape how the operational rules are decided upon).

The concept of polycentricity may thus be seen as a construct which helps to tie together these two otherwise apparently antagonistic principles (cf. Ostrom, [1972] 1999: 59–60). The notion of self-organization offered by the sciences of the artificial puts us in a position to think both about (a) the intentions, choices, and actions of all organizational actors – including their local and functional designs aiming at regulating and controlling interactions, transactions and collective decision making – but (b) at the same time also to think of organization less as a control-oriented structure and more as an arena in which a spontaneous process takes place. A self-organizing system is one whose parts, or local processes, interact dynamically to generate a global functional process. This systemic process is not determined by one single component; and it is not based on point-prediction control. It is achieved spontaneously, through patterns emerging as the components interact with one another. These interactions may be understood, it will be argued, as involving a concatenation of feedback mechanisms, working in conjunction with one another to regulate the system.

This account, which illuminates both the deliberate and the spontaneous elements at work, requires further explanation, to which the following sections will be dedicated. This will also enable us to reveal and explore a neglected but crucial influence on the Ostroms' work, namely cybernetics. The reason is that, as we shall see, one of the main ideas the Ostroms used to integrate the principle of design with that of spontaneous order, and also to elaborate on the nature of the feedback mechanisms through which self-organization arises, was the 'law of requisite variety' developed by a leading exponent of cybernetics, namely Ross Ashby.

Self-organization and self-governance

One of the most important contributions of our paper is that it sets out and explores in detail for the first time this neglected but crucial aspect of the Ostroms' work. Ashby's influence on the Ostroms' views was acknowledged by the Ostroms themselves, as seen in the following quote from a paper co-authored by Elinor Ostrom, but has received little attention in the secondary literature, a neglect this paper seeks to remedy (Ostrom, [1971] 2008: 115, 252 n. 2, [1988] 1999: 182–83, 1997: 121, 125, 184–85, 222–23).⁷ Vincent Ostrom

was among the first scholars to participate as a fellow at the Center for Advanced Study in the Behavioral Sciences at Stanford University (1955–56). There, he enjoyed many in-depth conversations with W. Ross Ashby, whose emphasis on requisite variety convinced Ostrom that governance systems need to be at least as complex as the physical and economic systems they are meant to govern. This concept fit nicely with Ostrom's growing appreciation of the need for policy experimentation and diverse ways of articulating and aggregating citizen preferences for policy outcomes. (McGinnis and Ostrom, 2012: 16.)

⁷Ashby's name does not appear in the indexes of the main book-length discussions of the Ostroms' work, namely Aligica and Boettke (2009), Wall (2014) and Tarko (2017). Nor does it appear in contributions to special issues of journals on the Ostroms' work, such as the *Journal of Economic Behavior and Organisation* (2005), *Public Choice* (2010), *The Good Society* (2011), the *Journal of Bioeconomics* (2013), the *Journal of Institutional Economics* (2013), and the *Journal of Theoretical Politics* (2015).

For the Ostroms, one of the main strengths of polycentric systems is of course that they facilitate the experimentation needed to enable people to discover what approach is best suited to solving the particular social problems they face. Vincent Ostrom expressed this point by referring to Ashby's 'law of requisite variety', according to which in order 'to realise specified effects, there must exist as much variety in the strategies available as there is variety in the conditions that obtain' (Ashby, 1956: 206–13; also see Ostrom, 1971: 115, [1973] 2008: 190, 193 and [1990] 1999: 411, 1997: 121–22, 125, 222 and Ostrom, [1988] 1999: 182). That is to say, by granting people the autonomy to devise their own operational rules, endogenously rather than through the intervention of some external authority, polycentric systems enable them to experiment with different sets of rules and thereby generate the variety needed for them to be able to identify rules that are well-adapted to dealing with the particular kinds of problems they face. As Vincent Ostrom later wrote, 'Ashby's theory of adaptive behaviour is today a basic foundation of my own work in political or organization theory' (2008: xxiii).⁸

Elinor Ostrom expressed similar views, having been introduced to Ashby's ideas by Vincent:

[F]rom my work in the CPR community I saw many cases and practical examples in which [self-governance] did work. I saw self-organisation in all parts of the world ... [As a result,] I got interested in the underlying rules, conditions, and design principles that induced self-organization in managing natural common property resources and how they evolved in interaction to one another. In order to study all of this, we had to deal with a maddening diversity. Vincent, who had worked with Ross Ashby ... was convinced about the need for requisite variety ... We became devoted to understanding institutional diversity and allowing for complexity where needed. (Interview with Elinor Ostrom, reported by Schacter and Toonen, 2010: 198.)

Further insight into Ashby's influence can be gleaned from a paper published by Elinor Ostrom in 1995, tellingly entitled 'Designing Complexity to Govern Complexity'. Its central theme is that

if complexity is the nature of the systems we have an interest in governing (regulating), it is essential to think seriously about the complexity in the governance systems that are proposed ... W. Ross Ashby, an eminent biologist of an earlier era, wrote a book entitled *Design for a Brain: The Origin of Adaptive Behavior* (1960) in which he developed the 'Law of Requisite Variety'. Basically, the law of requisite variety can be stated thus: Any regulative system needs as much variety in the actions that it can take as exists in the system it is regulating. Translated into the discourse concerning biological diversity, the law of requisite variety can be stated as follows: Any governance system that is designed to regulate complex biological systems must have as much variety in the actions that it can take as there exists in the systems being regulated. (Ostrom, 1995: 34.)

As Ostrom goes on to note, the findings reported in *Governing the Commons*, according to which '[t]he specific rules-in-use differ markedly from one case [of successful self-governance] to the next' are in keeping with the law of requisite variety: 'Given the diversity of biological scales involved,

⁸Thus, for example, Vincent Ostrom argues that if the wide variety of public goods required by society are provided through a competitive, quasi-market process, then a variety of different approaches to provision will emerge (with some provided locally and others by larger jurisdictions), depending on the precise attributes of the goods in question: 'No single form of organisation is presumed to be 'good' for all circumstances', Ostrom ([1973] 2008: 48) contends, a point on which he elaborates by drawing once again on Ashby's law of requisite variety: 'This position stands in contrast to Wilson's presumption that there is but one rule of 'good' administration ... or Weber's presumption regarding the technical superiority of bureaucracy over any other form of organisation (Ashby, 1962)' (Ostrom [1973] 2008: 190 n. 3). The diversity of types of public enterprise that produce the services in question, each adapted to the specific attributes of the particular good it produces, is said by Ostrom to be an insight that runs through the work of organisation theorists such as Ashby (Ostrom [1973] 2008: 60–64, 193 n. 12).

Ashby's law of requisite variety commends a variety of institutional arrangements at diverse scales' (Ostrom, 1995: 35, 41; also see Ostrom, 1977: 179).⁹

What we can see here, then, are illustrations of how the Ostroms drew on Ashby's insights into the need for institutional variety in managing complex systems in order to develop an account of the principles that should inform the design of an over-arching (polycentric) constitutional framework suitable for harnessing the forces of spontaneous order and self-organization to good effect. Once aware of Ashby's influence on the views of Vincent Ostrom in particular, it also becomes easier to identify a deeper layer in his thought, also shaped by Ashby's ideas. This layer preexists his work with Tiebout and Warren and the launching of the Public Choice Society and appreciating it enables one to understand many of the enduring underlying themes in his work as the outcome of an initial impetus to build on the message of cybernetics, as it was understood in the 1950s (i.e., as a theory of systems design and control). This insight, as we shall see, centres on the requirement, initially set out by Ashby and subsequently taken up and incorporated into the work of the Bloomington School by Vincent Ostrom, for a multi-layered or nested set of rules and feedback mechanisms if a self-governing social system is to obtain. To explain this claim, we first need to explain in more detail what is meant by a cybernetic system.

A *cybernetic system* is one that produces an action in response to an input of information and which includes the results of its own action in the new information by which it modifies its subsequent behaviour. The classic example is a central heating system, which includes the house's current temperature in the information governing whether the heating will be switched on or off. The notion of 'cybernetics' was constructed by Wiener (1948: 19) from the Greek word for the art of steering, 'kybernetes'. Wiener defined it as the 'new science' of 'control and communication' (1948: 22, 19). In Latin that translates to the equivalent of 'governance' and 'governing', and the execution of the functions of the 'governor'.¹⁰ So one may see even at the level of the basic terminology and vocabulary the straightforward connection between cybernetic theories of *control* and the theories of *governance* and *social organization*. Vincent Ostrom was among the first social scientists of his generation to try to explore the implications of these ideas for the domains of the administrative and political sciences. Yet, as noted above, when it comes to the core Ostromian theme of governance systems and processes, that influence has been largely overlooked. Moreover, as argued below, the issue is crucial for obtaining a more nuanced understanding of the Ostroms' notion of self-governance.

In discussing self-organization (and, by implication, self-governance which is a subclass of the larger theme), Ashby argued that the truly interesting systems are those able to bring about changes from a 'bad', dysfunctional configuration to a 'good' one (1962: 262–63, 265–67), thereby bringing about an improvement based on one functional criterion or another. Self-organization may be seen in this respect to be the result of a feedback process adjusting in a homeostatic manner (Dupuy, 2009: 148–49). The first generation of cybernetics thinkers identified what they called 'the homeostatic mechanism' as paradigmatic for the control and organization of a variety natural and artifactual systems. A homeostatic system is one that can adapt itself to its external environment in the following sense: it will automatically alter its operations so as to neutralize the effect of changes in its external environment and maintain constant the values of certain internal target variables (Ashby, 1962: 263). This is exemplified by the human body, whose metabolic systems operate to maintain the value of certain key variables – such as body temperature and blood sugar – within the range required to sustain life (Cannon, 1932).

Central to the operation of such systems are feedback loops. A *feedback loop* is a circular arrangement of causally connected elements in which an initial cause (the 'input') propagates around the

⁹If we continue to stress the importance of simple, large-scale governance units that do not, and cannot, have the variety of response capabilities ... that complex, polycentric, multi-layered governance systems can have' – if, that is to say, Ashby's insights about the need for variety are ignored in designing the constitutional framework – then 'the goal of sustaining complex, multiscaled biological processes is unreachable' (Ostrom, 1995: 34).

¹⁰Indeed, one of the founding works of cybernetics was Scottish physicist James Clerk Maxwell's study of the working of speed governors in steam-engines, entitled 'On Governors' (Maxwell, 1868).

elements in the loop, with each element affecting the next, until the final element (the ‘output’) causally influences (or ‘feeds back’ the effect to) the first element in the cycle. For example, a rise in external temperature will cause changes in the operation of various physiological mechanisms inside the human body, which cause it to produce more sweat, thereby cooling the body and enabling it to maintain a target temperature. The existence of such negative feedback loops means that homeostatic systems can modify their own behaviour so as to achieve a particular target output or goal.¹¹ Such systems are therefore, in that sense, ‘purposeful.’ Feedback can thus be seen to be a central element in a mechanism of control.

Structures of this type, which defy external shocks to maintain the value of some key system variable, seem to capture the core logic of self-governance. The first generation of cybernetic thinkers identified what they called ‘the homeostatic mechanism’ as a model for the control and organization of a variety natural and artifactual systems. For the purposes of our discussion, the problem of conceptualizing self-governance hinges on our understanding of this ‘mechanism’. As we have seen, the emerging model has three elements: (a) circular causality; (b) a tendency towards stability; and (c) information/communication flows as an underlying linkage between the first two. We consider each in turn.

First, circular causality evokes the image of a steersman who acts on the observed consequences of his actions. This notion of circularity is strongly associated with the idea of a certain final state of stability which is maintained despite the impact of external shocks. This type of stability – or tendency towards an equilibrium – is the second salient feature. Self-organization is thus another way of describing a property emerging from the circularity of that causal mechanism. The locus of control is inside, within the boundaries of the ‘self’, not outside. In all of this, the notion of stability has to be seen in a dynamic manner. Circular causality could lead to stabilization but also – in the case of *positive* feedback – to escalation or runaway processes in which the feedback amplifies itself so that outcomes move in a dysfunctional, ‘bad’ direction. Therefore, third, there is an additional aspect that has to be introduced into the picture to complete the equilibrating and stabilization component: a certain form of meta-level control provided by a higher-level mechanism that monitors and controls and stabilizes the first, lower-level mechanism. With that, we fully bring to the floor the third key element: the one related to communication. Control is achieved via communication/information flows which connect all the parts and levels pertaining to the system. The levels of control in circular causality structures are united by ongoing communication and information flows and become the core process of interest.

These observations are the basis for the argument that follows, according to which these basic ‘cybernetic’ insights are crucial for understanding the Ostromian perspective on self-governance. More specifically, as we shall see, in light of them we can obtain deeper and fresher insight into the Ostroms’ preoccupation with the problem of the levels and meta-levels of institutional structures in particular and can understand why the dynamic interrelationships between what they have called the ‘operational’, ‘collective choice’ and ‘constitutional’ levels of governance are so crucial for their theoretical perspective.¹² These levels of governance map out the logical structure of the processes of

¹¹The feedback is ‘negative’ in this case because when information about the difference between the actual and target outcomes is feed back into the system, it changes its behaviour so as to reduce the gap between the two. Systems operating in this way can be contrasted with those operating on the basis of ‘positive’ feedback, where the system behaves so as to accentuate rather than diminish the gap between its actual and target outcomes.

¹²Three levels of rules, the Ostroms explain, cumulatively affect any setting: the operational level, the collective-choice level and the ‘constitutional’ or ‘constitutive’ decisions level. Constitutional level rules are the rules to be used in crafting the other rules, at lower levels, and as such they are governing future collective decisions. They establish who is authorized and qualified to do that crafting, under what circumstances and at what times. The collective-choice level stipulates the basic framework within which social actions take place, as well as how the working parts of this framework are to be enforced or altered in their functioning. The operational level is the level of day-to-day actions in everyday life. Its sphere is established by the higher levels. Yet it is important to note too that these actions can in their turn have an impact on the other, higher levels (Kiser and Ostrom, 1982; McGinnis, 2011a, 2011b; Ostrom, 1986).

circular causality based on feedback mechanisms. The constitution of a self-governing society has to encapsulate and reflect the operations of those mechanisms and their underlying compounded logics.¹³

An examination of the influence of cybernetics on the Ostroms' thinking can thus be seen to reveal that the key to conceptualizing self-governance lies in the operation of circular feedback mechanisms operating at multiple institutional levels. We elaborate on this point in the next section of the paper.

The Ashby challenge and the architecture of second order governance mechanisms

While developing his foundational contribution to the field of cybernetics, W. Ross Ashby identified and raised a fundamental challenge to the very possibility of conceptualizing self-organization and self-governance via first order – i.e., single level – theories of feedback. His point was that the cybernetic system in itself, viewed as a basic unit of governance, is necessary but insufficient for solving the problem of self-governance. It is only in the second-order theories, which postulate multiple feedback mechanisms operating at different hierarchical levels, that such a solution be identified.

To make his point, Ashby (1962: 267) invites the reader to imagine an automatic pilot and a plane. The automatic pilot may be set up to operate on negative feedback. Information about the system's current output – i.e., about the plane's current position, speed, etc. – will then be fed back into the system as an input so that the plane's direction, speed, etc., is altered to keep it on course and so reduce the gap between its actual and target locations. Suppose instead, however, that the autopilot works on the basis of positive feedback (so that when it feeds back into the system information about the plane's current location, etc., the autopilot operates so as to amplify the gap between the actual and target locations, sending the plane further off course). Therefore, if the autopilot is set by mistake to operate on positive rather than negative feedback, an error aggravating rather than an error correcting loop will be established, so that the system works in a 'bad', dysfunctional way. The system would be truly self-organizing, Ashby explains, if in such circumstances a change would be made in the first-level feedback loop endogenously, shifting the type of feedback from positive to negative. In other words, a fundamental correction would be made in the very structure of the core feedback mechanism, to shift it from error-aggravating to error-mitigating behaviour (1962: 267).

But Ashby (1962: 267) points out that no machine can be self-organizing in this sense. The operating setup of the initial feedback mechanism is fundamentally insufficient to solve the problem of switching from positive to negative feedback. We need, he explained, an additional variable, or mechanism, which he identifies as 'alpha'. Alpha must come from outside the system, *S*, acting on it as an input and producing from that exogenous meta-level the necessary correction in the first order mechanism (Ashby, 1962: 267–69; also see Dupuy, 2009: 151). In other words, what is needed is an additional mechanism which controls from a higher- or meta-level the first level system and which can switch the lower-level feedback from positive to negative. If the system is to be self-organizing, wrote Ashby, 'the 'self' must be enlarged to include this variable 'alpha'" (1962: 269). Ashby showed that, by definition, the cause of the required change must be in the compounded system consisting of both the system *S* plus alpha, the level and the higher- or meta-level. Moreover, the two need to satisfy certain minimal boundary conditions to qualify as a 'self'. As he put it, 'the appearance of being 'self-organizing' can be given only by the machine *S* being coupled to another machine (of one part)'. Then 'the part can be self-organizing within the whole $S + \alpha$ '. It is thus 'only in this partial and strictly qualified sense can we understand that the system is 'self-organizing' without being self-contradictory' (Ashby, 1962: 269).

¹³The distinction between these different levels is also, as noted above, critical for the Ostroms' efforts to combine the principles of design and of spontaneous order, with an over-arching set of constitutional rules being designed through 'reflection and choice' so as to allow spontaneous order processes to work at the lower level of the operational rules governing more concrete matters such as the governance of CPRs and the provision of public goods. Distinguishing between different levels of rules in this way enables the Ostroms to incorporate both evolutionary and deliberative forms of institutional development into their analysis (cf. Candela, 2021: 157).

The implications are significant. The new compounded system (S + alpha) is bound to have, again, the same type of problem as the initial, 'first level system', S. Again, let us presume that the self-governance problem is basically captured and reduced to the simple circularity of the feedback mechanism as a means of control. The new compounded system has the same difficulty when it comes to switching from one mode to another, outside of its intrinsic automatic feedback logic. A new meta-level is needed to generate the appropriate kinds of corrections and for it again to be possible to claim that the system is self-governing. In other words, self-governance requires a compounded hierarchy or system of feedback mechanisms, operating on top of each other.

Ashby was thus very explicit that in his 'first order cybernetics' there was not much room for talk of 'self-organization': 'since use of the phrase "self-organizing"', he wrote, 'tends to perpetuate a fundamentally confused and inconsistent way of looking at the subject, the phrase is probably better allowed to die out' (Ashby, 1962: 269). However, what is confused and inconsistent in 'first order cybernetics' becomes an issue of great interest and importance in 'second order cybernetics'. The latter approach is based precisely on meta-level structures and complex relationships between levels in which circularities of circularities of loops combine at multiple levels and in dynamic configurations (Dupuy, 2009: 10–11, 148–55; Froese, 2010; Heylighen and Joslyn, 2001). A reciprocal correction mechanism involving a second order or higher level underpinned by a multi-causal circularity may be theoretically imaginable. Once this perspective is taken (and irrespective of the label under which it is presented), the shift in the discussion of self-governance goes in the direction of the analysis of these complex systems of interconnected levels and meta-levels.

Self-organization seems therefore to have the form of the 'strange loop', as described by Douglas Hofstadter: 'a phenomenon [that] occurs whenever, by moving upwards (or downwards) through the levels of some hierarchical system, we unexpectedly find ourselves right back where we started'. Feenberg (1990: 725), describing the phenomenon at hand, notes that this logic of self-organization 'substitutes a democratic logic of internal self-development for the administrative logic of mechanistic control from without. Democratic notions of management and political organization can be rethought on these terms as rational systems without assuming an external source of control'. We have thus come to pinpoint the roots of the peculiar magic of the loops that make possible 'the mysterious and paradoxical and powerful idea of self-government' (Allott, 2004: 191), an idea which when it comes to human polity is expressed in 'the ideal of a society which governs itself through its system of government, a society of and for the many in which the society-members are their own subjects'. At the same time, we come to understand why the problems of levels and meta-levels of governance and institutional structures had to assume such a crucial place in the Ostroms' theories. The central role of the three institutional levels of governance (operational, collective and constitutional) in Ostromian theory emerges now not just as an inductive empirical generalization inspired by the historical reality of the American system, but also as an expression of the underlying logic of the very phenomenon of self-organization as conceptualized by cybernetics. Just as cybernetic systems in general require a hierarchy of feedback mechanisms – a system S plus alphas – if they are to be self-organizing, so too do the Ostroms, influenced by cybernetics, argue that self-governing social systems require the hierarchy of feedback mechanisms provided by multiple layers of rules (operational, collective choice, etc.). The same underlying logic seems to be at work in both cases.

We are now in a position to pinpoint the roots of the Ostroms' emphasis on multi-layered socio-institutional processes and mechanisms in their analysis of self-governance. In their view, following Ashby, self-governance is the result of the institutional embodiment of the compounded layers of feedback and circular control mechanisms and processes, underlying the social space created both deliberately and spontaneously by cooperating and competing human beings. In such social spaces, according to the Ostroms, self-governance involves a set of institutions such that authority is fragmented and sovereignty divided; the jurisdictions of different organizations overlap; and the exercise of coercion by one arm of government is checked both by the countervailing power of the other arms and also by an active and engaged citizenry, all operating within an over-arching constitutional framework designed to ensure that no institution exercises unlimited authority. It is a complex system of

countervailing controls based on multi-level feedback systems operating as corrective mechanisms. Such polycentric systems have a built-in mechanism for self-correction that often – though not, of course, always – enables them to adapt to problems and external shocks, as Elinor Ostrom observes in the following passage:

While all institutions are subject to takeover by opportunistic individuals and to the potential for perverse dynamics, a political system that has multiple centres of power at differing scales provides more opportunity for citizens and their officials to innovate and intervene so as to correct maldistributions of authority and outcomes. Thus, polycentric systems are more likely than monocentric systems to provide incentives leading to self-organised, self-corrective institutional change. (Ostrom, 1998.)

And in elaborating on this aspect of the institutional requirements for self-governance, Vincent Ostrom again draws on Ashby's work. More specifically, in the course of commenting on Madison's view that the maintenance of a limited constitutional order requires that the various arms of government be able to check one another, so that 'each is governed within the limits of the potential veto positions that can be exercised by the others' (Ostrom, [1971] 2008: 115), Ostrom writes that, 'Where a part has a power of veto in relation to the whole, the operation of the whole requires that all of the parts be in concurrence' (Ostrom, [1971] 2008: 115). In a footnote appended to this last sentence, Ostrom elaborates as follows: 'This restates the general veto theorem formulated by W. Ross Ashby in *Design for a Brain* (1960) and in *An Introduction to Cybernetics* (1956). Ashby's veto theorem and his analysis of adaptation in a multistable system is surprisingly congruent with Hamilton and Madison's formulation of the political theory of a compound republic' ([1971] 2008: 252 n. 2). What we can again see here is Ostrom drawing on Ashby's work to elaborate on the requirements for a self-governing social order.¹⁴

In brief, according to the account of the Ostroms' work presented here, self-corrective spontaneity is a function of self-organizing tendencies occurring, under specific conditions, at several different levels. Incentive alignment between the micro level and the macro structures in this respect creates conditions such that 'patterns of organization within a polycentric system will be self-generating or self-organizing' in the sense that 'individuals acting at all levels will have the incentives to create or institute appropriate patterns of ordered relationships' (also see Ostrom, [1972] 1999: 54–57, 63–65; Ostrom and Ostrom, 2009: 157).¹⁵ Put slightly differently, using the language of complex systems theory, the capacity for self-governance is an emergent property of this multi-layered system, produced by the mutually reinforcing and reciprocally correcting checks and balances and overlapping functional dimensions that characterize polycentric political systems (Ostrom and Ostrom, 2009: 156; also see Ostrom, 1999: 520–21).¹⁶

¹⁴It is also important to keep in mind that 'no guarantee exists that such systems will find combinations of rules at diverse levels that are optimal for any particular environment. In fact, one should expect that all governance systems will function less than perfectly, given the immense difficulty of fine-tuning any complex, multi-tiered system. But because polycentric systems have overlapping units, information about what has worked well in one setting can be transmitted to other units. And when small systems fail, there are larger systems to call upon – and vice versa' (Ostrom and Ostrom, 2009: 157).

¹⁵In Vincent Ostrom's words, 'For a polycentric system to manifest 'spontaneity' in the development of ordered relationships, self-organising tendencies will have to occur at several different levels of conduct' ([1972] 1999: 59).

¹⁶There is one important issue outstanding, namely the question of the collective entity – the 'self' – involved in this account of self-governance in social settings. We can follow Sørensen and Triantafillou (2009: 2) in observing that 'the notion of 'self' – used in the context of self-governance – allows for 'a variety of individual and collective selves of which some are public and some are private'. But the specific way the term 'self' is used in the literature on self-governance presumes that these agents act not due merely 'to some innate quality', but also 'due to the social and political processes in which the self is embedded'. In other words, the accent is put not only on the individuals and their inner attributes (important though they are) but also on structural and systemic processes which incorporate and transcend the individual. The institutional structure channeling and constraining those processes is the place where 'the mysterious phenomenon of self-governance' emerges (Sørensen and Triantafillou, 1990: 2).

Self-governance: a restatement

We are now in the position to outline the multi-level aspects and logic involved in self-governance.¹⁷ At the first level we have the fundamental logic of the homeostatic mechanism based on the elementary feedback principle. It is the underlying logic of an entire range of phenomena, pertaining to different ontological realms (physical, biological, and social). Three elements are notable in this emerging model: (a) circular causality, (b) a tendency towards stability and (c) information/communication flows as an inherent linkage between the first two. On top of that is the point, drawn from ‘second order cybernetics’, that self-organization requires multiple feedback mechanisms operating at different hierarchical levels. It is only then that the emergence of self-governance becomes possible. These mechanisms integrate the governors and the governed into a circular system operating through distributed decision centres – polycentric structures which generate both the checks-and-balances and the experimentation and learning needed to discover the rules, at various levels, that make effective self-governance possible. Thus, the logic of feedback mechanisms operating in a multi-level hierarchy brings us to an understanding of self-governance.

We can make this analysis of self-governance a little more concrete by specifying the particular elements pertaining to human societies and their specific differences using the Institutional Analysis and Development (IAD) framework developed by the Ostroms. As McGinnis (2011a) describes it, the IAD framework is a tool designed to help us understand how institutions operate and change over time. It assigns all pertinent explanatory factors to categories while at the same time locating these categories within a foundational structure of logical relationships. Central to the IAD framework is the unit known as an *action arena*. This has two components: an *action situation*; and an *actor* component. The *action situation* is the social space where individuals ‘interact, exchange goods and services, engage in appropriation and provision activities, solve problems, or fight’ and is determined by the *rules* organizing inter-individual relationships, the attributes of the *physical world*, and the *nature of the community* within which the arena is located (Ostrom *et al.*, 1994: 28). The second component consists of the people or actors who inhabit the action situation (who occupy various kinds of social position, have preferences, information-processing capabilities, selection criteria, and resources). Those people decide how to act in light of the information they possess, etc., leading to outcomes which at in turn have feedback effects on the action arena (see Figure 1).

The fact that action arenas are linked across several hierarchical levels leads us to the issue of nestedness (that is, the way that people may be members of a village, say, which is in turn part of a state, which forms part of a country, etc.). The different layers or levels of institutions have to be considered in a systematic manner, as do the hierarchical rule clusters governing the relations between institutions at different levels. The very idea of feedback is materialized in sets of rules which are nested in other sets of rules that define the nature of, and way of changing, the first set of rules. The rules used at one level are always interconnected with other sets of rules. At this point one can see more clearly how the nested and the overlapping nature of action arenas, patterns of interactions and their consequences brings naturally to the fore the logic of ‘second order cybernetics’.

The feedback mechanisms in question involve people – the users of a CPR, say – who are faced with unsatisfactory outcomes adopting a ‘level-shifting’ strategy (McGinnis, 2011b: 59) whereby they seek to use higher-level collective choice rules in order to change the operational rules governing their interactions with the resource so as to produce outcomes closer to those they deem satisfactory (i.e. negative feedback).¹⁸ Just as Ashby says that improving outcomes at one level of a cybernetic system

¹⁷Our approach is ontological in the sense that it seeks to outline the nature of a phenomenon, in this case self-governance, identifying its key elements along with the main causal mechanisms associated with it (Goertz, 2020: 5). For a discussion of the Ostroms’ commitments to an ontologically realist orientation, see Lewis (2021) and Lewis and Runde (2024).

¹⁸This process, whereby people draw on pre-existing collective choice rules to devise new operational rules, is an example of what the Ostroms refer to as ‘artisanship’. Artisanship is defined as the process through which people create artifacts, defined as ‘anything created by human beings with reference to the use of learning and knowledge to serve human purposes’ (Ostrom, 1980: 309). Understood thus, artifacts include the operational rules people used to manage CPRs. Accordingly,

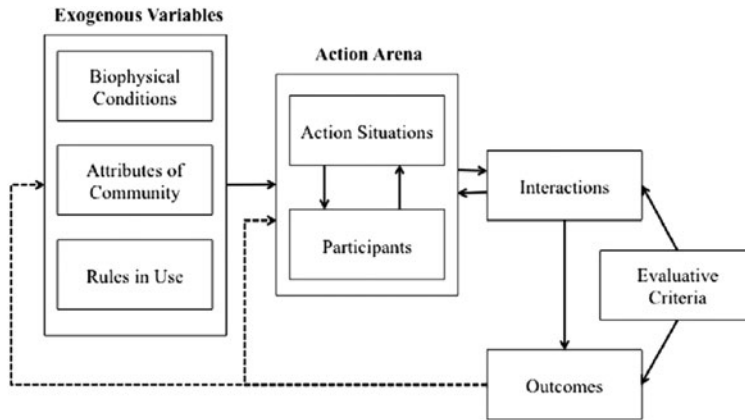


Figure 1. A framework for institutional analysis (Aligica, 2014: 88; based on Ostrom *et al.*, 1994).

requires the presence of a higher-level mechanism – an alpha – for changing the working of the lower-level system (S), so too in cases of successful self-governance people ‘switch back and forth between operational-, collective- and constitutional choice rules’, drawing on the latter to facilitate their efforts at crafting operational rules (Ostrom, 1990: 50; also see Ostrom, 1985) (see Figure 2).¹⁹

If this level-shifting approach is taken, the higher-level (collective and constitutional) rules and procedures that define how decisions over lower-level (operational) rules are made become centrally important. Here is the junction point between this line of argument and Buchanan and Tullock’s (1962) pioneering *Calculus of Consent*. If the logic of cybernetics suggests that a higher-level mechanism or alpha is needed for self-organization to obtain, then in applying that logic to social systems it is clear that a higher-level set of rules, operating above the operational rules governing people’s everyday activities, is needed for a social system to be self-organizing. Viewed in that light, one can see why the work of Buchanan and Tullock would have a strong appeal for the Ostroms; Buchanan and Tullock’s distinction between different levels of rules afforded the Ostroms the conceptual resources needed to respond to Ashby insights about the requirements for a genuinely self-organizing system, with the higher-level collective choice rules constituting the mechanism or alpha needed to facilitate self-organization at the lower level of the operational rules.

The Ostroms’ decision to embrace the Public Choice revolution set in motion by Buchanan and Tullock’s pioneering work can thus be seen to be more than merely accidental or incidental. Viewed from the vantage point provided by Ashby’s work, something like the constitutional political economy approach advanced by Buchanan and Tullock, as part of their broader contribution to the development of public choice theory, had to be an intrinsic part of a consistent theory of self-governance of the kind the Ostroms were striving to develop, precisely because Buchanan and Tullock’s distinction between different levels of rules offered a means of understanding how it might be possible for people to deal with the ‘second order’, structural and meta-level control problem that arises in systems where citizen-artisans are trying to organize their interactions on the basis of deliberation and choice. In striving to develop a deeper understanding of self-governance, therefore, from the vantage point offered by Ashby’s work on self-organization, one can see more clearly why the Ostroms would have had strong reasons for incorporating into their conceptual framework the

Elinor Ostrom refers to the process whereby people draw on pre-existing collective choice rules in order to craft new operational rules as artisanship (Ostrom, 1990: 185, 2005: 132–33).

¹⁹If, however, people are unable to switch between levels in this way, then – as Ostrom puts it – they become ‘stuck in a single-tier world. The structure of their problems is given to them’ because they lack the opportunity to devise new operational rules that will enable them to manage the CPR effectively (Ostrom, 1990: 54).

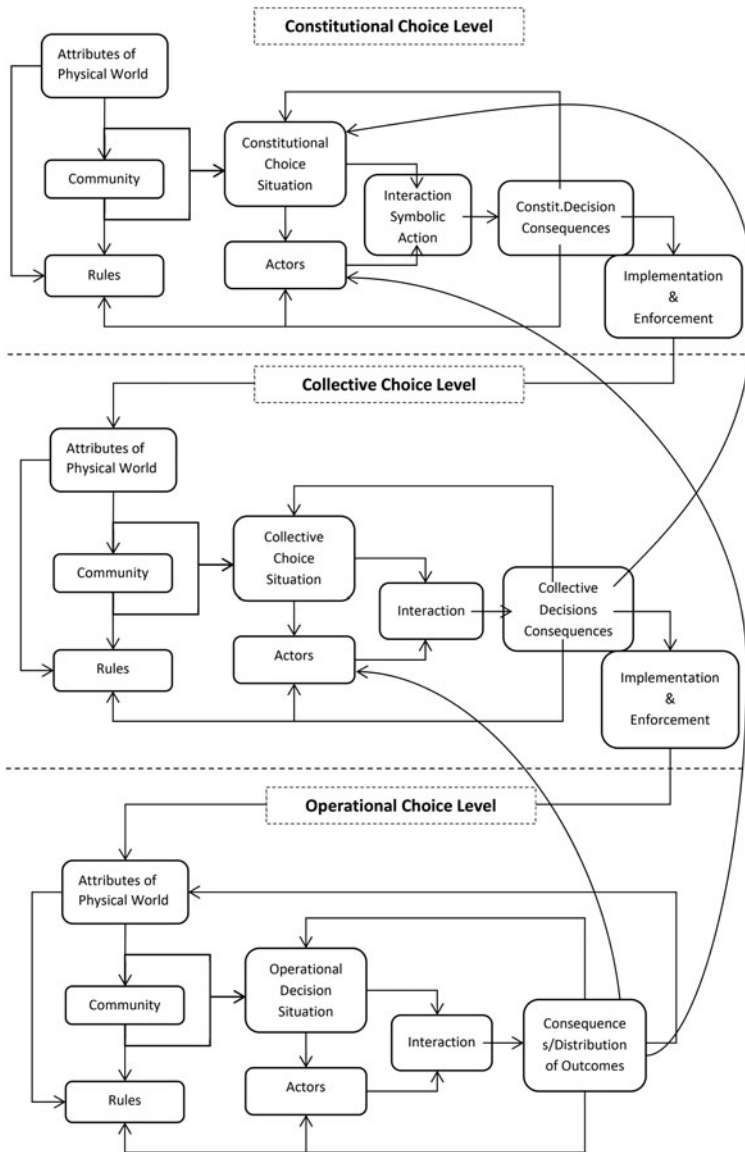


Figure 2. The three decision/institutional levels through IAD lenses. Based on McGinnis, 1999: 6.

contributions of the ‘no name field’ whose emergence was catalysed by Buchanan and Tullock’s work at the beginning of the 1960s (Ostrom, 1964).

Conclusion

Our investigation has outlined the hitherto unappreciated influence of cybernetics, in particular the work of Ross Ashby, on the Ostroms’ work on self-governance. In doing so, it has highlighted important features of the nature of self-governance, including both the ‘requisite variety’ needed for adaptive experimentation and also the centrality of hierarchical layers of circular feedback and control mechanisms. It has also been argued that this emphasis on multiple levels of feedback mechanisms created an

affinity between the Ostroms' emerging account of self-governance and the emphasis on multiple levels of rules found in Buchanan and Tullock's pioneering work on constitutional political economy. The convergence of the cybernetics and self-governance literatures with the constitutional political economy and public choice approaches has thus also been illuminated in a fresh and perhaps unexpected way.²⁰

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