Polycentricity

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1 Introduction

Polycentricity is a system of many inter-dependent but autonomous decision centers operating under an over-arching set of rules and norms that they themselves set up, monitor, and enforce (V. Ostrom 1972, 1991a; E. Ostrom 1999, 2005, ch. 9; Aligica and Tarko 2012). A decision center is part of the polycentric system (rather than an outsider that may be affected by the system's actions) if they are not only subjected to those over-arching rules and norms, but also have some say in their creation, monitoring, enforcement, and change. Polycentricity is an alternative *both* to hierarchical governance, where lower level decision makers have to obey commands from higher level centers and have little say about the rules imposed upon them from the top-down, *and* to anarchic (fragmented) governance, where no commonly accepted over-arching rules and norms exist. In case of fragmented governance we cannot really speak of a "system" as there is no clear delineation between insiders and outsiders of the system.

Markets are the most well studied example of a decentralized "invisible hand" phenomenon, and the concept of polycentricity was initially developed by drawing an analogy between markets and other forms of emergent orders. However, coordination in markets occurs thanks to the operation of the price system – prices generated by supply and demand acting as "signals wrapped in an incentive" (Cowen and Tabarrok 2014). By contrast, most of the other examples of polycentric systems lack a coordination device akin to prices. Such examples include democracy as "polycentricity in the selection of political leadership and the organization of political coalitions" (V. Ostrom 1972), as well as "competitive public economies [like federalism and governance in metropolitan areas], scientific inquiry, law and adjudicatory arrangements [especially in common law and

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customary law systems], systems of governance with a separation of powers and checks and balances, and patterns of international order" (V. Ostrom 1991a).

What all these examples have in common are the following features: (1) a multiplicity of independent decision-makers (as opposed to a command-and-control hierarchy), (2) an over-arching system of rules and norms constraining these decision-makers, and (3) a complex emergent order resulting from the interactions of these decision-makers under the over-arching rules and norms, what Adam Ferguson referred to as "the result of human action but not human design." These three features are the *defining characteristics* of polycentricity, and any system that has these characteristics is a polycentric system. In practice, these features are instantiated in a wide variety of ways (Aligica and Tarko 2012). For example, the decision centers may or may not have shared common goals, their jurisdictions may or may not be territorially defined, the over-arching rules may be decided by means of a variety of collective choice arrangements, entry and exit into the polycentric system (i.e. being subjected to the rules and a participant in their creation) may be free or constrained in various ways, and various forms of information may be private or public.

What guarantees that an emergent social-institutional-political order will be efficient, i.e. that it will have desirable characteristics from the point of view of the participants? Furthermore, how can an emergent order be efficient in the absence of something like the price system to facilitate coordination? In some cases, economists have proposed price-like mechanisms for coordination, for example, Tiebout (1956) competition in a federal system is partially guided by differential tax rates acting as a type of quasi-price for the local public services, or competition within the scientific community is driven by reputation and prestige acting like a quasi-price (Tarko 2015). But, while in the case of markets we have a theory of market failure built on analyses of situations in which prices might fail to fully capture the opportunity costs of the resources being exchanged, the question of whether the emergent non-market orders are to be expected to be productive or efficient is far more difficult to address. This is so even in cases where some theory of quasi-prices is proposed, but it is of exceeding difficulty in the other.

The concept of polycentricity is supposed to help us address this question in its most general form, and, in Elinor Ostrom's account, the failure or success of an emergent order is the consequence of the nature of the over-arching rules and

norms of the underlining polycentric system. Part of her and her colleagues' work has been to try to find criteria, which she called "core design principles," under which a community is more likely to succeed in creating effective operational rules (i.e. rules that guide everyday activities and manage scarce resources) (E. Ostrom 1990, 2005). The Ostroms connect the idea of a productive emergent order to the concept of self-governance, arguing that communities are more likely to gradually zero-in on good rules, in an evolutionary fashion (Wilson, Ostrom, and Cox 2013; E. Ostrom 2014b), when they are governed in an inclusive and fair manner, such that relevant information is discovered and decision-makers are held responsible to their constituents. One can think of this as an application of the idea of Pareto efficiency to the problem of institutional design, along the lines proposed by the *Calculus of Consent* (Buchanan and Tullock 1962; E. Ostrom 2011).

Polycentricity is, hence, one of the key concepts in Elinor Ostrom's work on self-governance. Indeed, her Nobel Prize address is titled, "Beyond Markets and States: Polycentric Governance of Complex Economic Systems" (2010a). Elinor Ostrom's big idea is that we need to move beyond the strict state-market dichotomy, according to which markets should provide private and club goods, while governments should provide public goods and establish the institutions of contract and property necessary for markets to operate efficiently. This simplified picture is deceptive not only because modern states do a lot more than just provide public goods, but also because (1) states are not monolithic entities with coherent goals, but need to be understood on the basis of their complex internal structure (states themselves are polycentric), and (2) citizens in a democratic system are not mere passive consumers of the goods and services provided to them by governments and firms, and mere subjects of the rules imposed upon them, but are involved shareholders of the state and coproducers of the institutions (Parks et al. 1981; Percy 1984; Aligica and Tarko 2013; Boettke, Lemke, and Palagashvili 2014).

This idea becomes particularly important for development economics, where we need to understand how institutions are set up in the first place (Rajan 2004), out of the interactions of different groups responding to past failures and new perceived opportunities. Understanding how institutions emerge out of the interactions of numerous quasi-independent groups is essential for discovering the possible reasons (and remedies) for the failure to create effective institutions (E. Ostrom 1990, 2005; McGinnis 2016; Thiel, Blomquist, and Garrick 2019).

2 A brief history of the concept

2.1 Decentralized production of knowledge in markets and science

Both the word "polycentricity" and the basic idea were first introduced by the polymath Michael Polanyi as a useful concept in the mid-20th century debate in Britain about the proper organization of the scientific community (Polanyi 1951, 1962). Polanyi was responding to highly prominent calls at the time, although essentially forgotten today, to fully centralize and plan scientific research (e.g see Caldwell 2020). According to the centralization argument, scientists were wasting resources overlapping their efforts and competing with one another. Instead, scientific research was supposed to be organized as a fully comprehensive plan, where priorities would be established in a top-down fashion, and each scientist and research center would be designated a specific non-overlapping research role. This way, it was hoped, science could advance a lot faster.

Polanyi created the concept of polycentricity as a way of explaining how the scientific community was operating in a decentralized fashion, but under an overarching set of norms about the scientific method, which norms were themselves created and evolved in a decentralized fashion. Contrary to what the would-be central planners asserted, the scientific community was not wastefully chaotic and needlessly anarchic — it was exhibiting a type of *emergent order*. Furthermore, Polanyi argued that this emergent order was a lot more efficient than the proposed centralized planning, in terms of generating scientific progress. On one hand, no one knows for sure what the most promising line of research is. The central planners were delusional in thinking they could know any better than the trial-and-error process of existing polycentric science. Key scientific developments often arrive out of unexpected directions, which the central plan would not be able to guess. Instead, under the centralized system, these unexpected directions would be drained of resources and shut down. On the other hand, the incentive structure created by the proposed centralization would also be highly problematic — it would in effect re-establish an inflexible authority structure that would stifle scientific innovation.

These ideas brought Michael Polanyi in close intellectual proximity with Friedrich Hayek, who had made similar arguments about the efficiency of markets over socialist planning (Hayek 1945). Indeed, Polanyi later used the concept of

polycentricity, acknowledging that markets are also an example of a polycentric system, to engage in the socialist calculation debate (for more details on this see Aligica and Tarko 2012). Markets are a polycentric system of consumers and producers operating under the over-arching set of rules about property and contract. Nevertheless, a crucial difference existed between Polanyi's argument and Hayek's argument.

Hayek's argument about markets is that their emergent order occurs as a side-effect of the operation of prices. Prices aggregate the relevant information about the opportunity costs of various resources and create the incentives that everyone takes this information into account. In Hayek (1945)'s example, when, for some unknown reason, a resource becomes more scarce, its price rises, which, in turn, determines consumers to economize it and creates a profit opportunity to producers who find substitutes or new sources. In other words, the price change affects everyone's behavior nudging them in the direction of greater efficiency – i.e. prices create large-scale coordination, even if no one has any idea about what the actual cause of the initial shortage was.

By contrast, there is no single "signal wrapped in an incentive" in Polanyi's account of the scientific community. Reputation might serve a somewhat similar purpose to prices, as a catalyst of the emergent order, but the analogy is imperfect (Tarko 2015). Instead, the key work here for generating a productive and efficient emergent order is done by the set of over-arching rules and norms. If those over-arching rules and norms are flawed, the emergent order would become dysfunctional, i.e. the scientific community will fail at its truth-seeking goal. This idea about the role of rules and norms in enabling a productive emergent order becomes the crucial guiding principle for Vincent and Elinor Ostrom, who were also trying to make sense of emergent orders in the absence of any obvious simple "signal wrapped in an incentive."

2.2 Governance of metropolitan areas

In the late 1950s and early 1960s, Vincent Ostrom, the husband of Elinor, and a key figure in his own right in the fields of public administration and political science, and one of the founders of public choice, came up with the word "polycentricity" to mean virtually the same thing as Polanyi. He quickly found out about Polanyi's earlier work and embedded Polanyi's insights into his own analysis (e.g. see V. Ostrom 1991a). But Vincent's focus, and the reason he had

for thinking about polycentricity in the first place, was yet another example of a polycentric system – the metropolitan urban governance (Tarko 2017, ch. 1).

By the 1950s, the growing urbanization in United States had led to a curious phenomenon. Small towns had expanded so much that they came in contact with one another, and merged into single metropolitan areas. But these *de facto* unified cities did not have unified governments. They were still governed by the multitude of legacy local governments, i.e. their organization was polycentric reflecting the "multiplicity of political jurisdictions in a metropolitan area" (V. Ostrom, Tiebout, and Warren 1961). Should these small legacy governments be abolished in favor of single city governments? This became a particularly salient issue with respect to police departments. The common view at the time was that

> [f]ragmentation of police services is extreme ... Wasted energies are lost motion due to overlapping, duplication, and noncooperation are not the worst consequences of this fragmentation. Large areas of the United States – particularly rural communities and the small jurisdictions in or near metropolitan areas – lack anything resembling modern, professional police protection. (Committee for Economic Development, cited by E. Ostrom, Parks, and Whitaker 1974)

This argument bore a striking resemblance to the arguments that Polanyi had addressed earlier. The centralization of the scientific community was also advocated on the grounds that such centralization and top-down coordination would eliminate the overlapping efforts of competing scientists, and, it was argued, would create greater efficiency by reducing redundant use of resources. Similarly, one of the key arguments in favor of socialism, to which Mises and Hayek had responded in the 1920s and 1930s (Hayek 1935; 1945), was also that private enterprises in the capitalist system were redundant, producing duplicate products, while state enterprises in a socialist system would take better advantages of economies of scale, while eliminating the "waste" of the "anarchic" competitive system. In both these cases, the mistake was to ignore the possibility that a system can generate coordination in a decentralized fashion, and assume instead that the lack of top-down control implied disorder.

From a scientific point of view, the challenge was to actually built a theory of how such decentralized coordination occurs, and the concept of polycentricity was proposed in the attempt to understand how large-scale coordination can occur

even when market prices are not available, in particular within social-political orders (V. Ostrom 1972, 1991a; Tarko 2017, ch. 2). The concept is proposed as a way of "[p]enetrating an illusion of chaos and discerning regularities that appear to be created by an 'invisible hand' ... Patterns and regularities which occur under an illusion of chaos may involve an order of complexity that is counterintuitive" (V. Ostrom 1972). Can this counterintuitive order be better understood?

Building on Tiebout (1956)'s initial model of competitive local governments, Vincent Ostrom, Tiebout and Warren (1961) made a strong theoretical case that the polycentric organization of public services in metropolitan areas might actually be beneficial. Their arguments mirrored Hayek's arguments against central planning and in favor of markets, and Polanyi's arguments against the centralization of the scientific community. Later on, Elinor Ostrom and her students engaged in an extensive empirical study of metropolitan areas in United States, and of police departments in particular.[1] These empirical results dealt a serious blow to the case for consolidation:

> The presumption that economies of scale were prevalent was wrong; the presumption that you needed a single police department was wrong; and the presumption that individual departments wouldn't be smart enough to work out ways of coordinating is wrong. ... For patrolling, if you don't know the neighborhood, you can't spot the early signs of problems, and if you have five or six layers of supervision, the police chief doesn't know what's occurring on the street. (Elinor Ostrom, interviewed by Zagorski 2006)

The metropolitan police studies compared the performance of police in similar neighborhoods, and in close vicinity to each other, but with different organizations, either consolidated or polycentric.

> The consistent finding from this series of studies is that small and medium-sized police departments perform more effectively than large police departments serving similar neighborhoods, and frequently at lower costs ... Victimization rates tend to be lower, police response tends to be faster, citizens tend to be more willing to call on police, citizens tend to more positively evaluate specific contacts with the

[1] See E. Ostrom (1972) for a typical example. Many of the key Bloomington School papers on polycentricity are collected in McGinnis (1999a) and McGinnis (1999b). See Tarko (2017, ch. 1), for an overview of this literature.

> police, and citizens tend to rate police higher across a series of other evaluative questions. Further, citizens living in small communities tend to be more informed about how to change local policies, tend to know more policemen serving their neighborhoods, and call the police more frequently to obtain general information than do citizens living in large cities. Citizens served by small departments tend to receive better services at lower costs than their neighbors living in the center city. *Instead of being a "problem" for the metropolitan area, small departments frequently contribute to the improvement of police services in the area.* (E. Ostrom 2000, emphasis added)

In a nutshell, Elinor Ostrom and her students discovered that the advocates of consolidation not only proposed a highly dubious policy "reform" that was likely to make things worse, but they also had very little accurate knowledge of how police departments actually operated (e.g. see E. Ostrom, Parks, and Whitaker 1974). Many of the claims were based on imagination and theory, rather than on actual observations. Contrary to the quote from the Committee for Economic Development given earlier, Ostrom discovered that small-scale police departments actively cooperated in order to take advantage of economies of scale, rather than inefficiently duplicating their efforts. For example, jails or crime labs were in fact set up to service multiple police departments, and decentralization was adopted only when it made most sense (e.g. in case of street patrols).

Furthermore, Elinor Ostrom and her student, Gordon Whitaker, were among the first to provide an in-depth empirical political economy account of institutional racism within police departments. They noted that "[p]olice seems to be failing to serve residents of many black neighborhoods in US cities" and a key reason for this is that "[p]olice effectiveness depends, in part, on police understanding the nature of the community being served and police openness to suggestions, criticism, and complaints" (E. Ostrom and Whitaker 1974). They analyzed a range of proposed reforms and concluded that

> [c]ommunity control of police may ... provide an institutional framework for the effective expression of black citizen demands for impartial police service. ... Professionalism alone does not appear to provide sufficient controls so that police will be responsive to their needs for protection and respect. Community control places that responsibility

> on the people themselves and provides them with the mechanisms by which to exercise it. (E. Ostrom and Whitaker 1974)

This was the first example among many in which Elinor Ostrom was driven to the conclusion that collectively beneficial outcomes are the result of social-political institutions that facilitate and enable self-governance. As such, the concept of polycentricity takes a deeper political and normative significance. It is no longer only a descriptive theory designed to help us, in the words of Vincent Ostrom, discern the "[p]atterns and regularities which occur under an illusion of chaos" (V. Ostrom 1972). It is also a policy tool for helping us enhance self-governance, which can be seen to have both instrumental value (in promoting economic efficiency) and an inherent political value (e.g. see Dahl 1989).

2.3 Federalism

After these initial studies, Vincent and Elinor Ostrom went in two different but related directions. Vincent used the perspective of polycentricity and self-governance to develop a theory of federalism (V. Ostrom 1987, 1991b; Bish 1999, 2014; Wagner 2005). Most theories of federalism are concerned with describing interactions between different levels of government. As such, most of these theories tend to theorize federalism as a type of hierarchical system, in which local-level governments operate within the constraints created by upper-level governments. For example, according to a well-known theory proposed by Weingast (1995), in order to preserve the market order, the federal government needs to implement a variety of constraints upon lower-level governments, such as denying them the ability to impose tariffs upon one another.

In contrast to such theories, Vincent Ostrom noted that, particularly in the case of American federalism, it is relatively common for lower-level governments to implement laws that are at odds with higher-level laws. For example, various US states have legalized marijuana although it remains a restricted drug as far as federal law is concerned. Similarly, in the European Union, courts in individual states have nullified EU-level laws on multiple occasions. This is a principle known as "subsidiarity" according to which centralization should only happen in areas in which more local governments are unable to solve the problem. Based on this EU constitutional principle, national-level courts are given the authority to overrule and nullify EU-level laws when such laws are instances of over-reach.

As such, both American and European federalism are better understood in

terms of the checks-and-balances that different governments impose on each other – local-on-local governments, thanks to Tiebout competition, as well as between different levels, e.g. state-on-federal and federal-on-state. Not only is this checks-and-balances view a more accurate representations of the *relations* between governments, but even *individual* governments are best understood as systems populated by agents with conflicting interests, rather than homogeneous agents with clearly identifiable goals. Although some systems can be described, for all practical purposes, as idealized representative agents – i.e. as *rational* agents with as-if beliefs and goals –, according to Vincent Ostrom, governments are *not* among such systems. The errors introduced by such homogenizing idealizations far exceed the benefits one gets from the simplified picture.

Furthermore, in line with the self-governance perspective provided by the idea of polycentricity, Vincent Ostrom argued that federalism should be understood not from the point of view of governments, but from the perspective of individual citizens, i.e. in terms of the choices and opportunities it provides (Bish 2014; see also Inman and Rubinfeld 1997). As he put it, the "principles of federalism permit people to function through self-governing institutions among local, regional, and national communities of interest in organizing collective endeavors" (V. Ostrom 1987, 173). Once again, Elinor brought the empirical guns at a fight between political theorists, showing how the polycentricity perspective on federalism enlightens the debate about police consolidation (E. Ostrom 1976).

3 A practical theory of self-governance

Following the police studies, Elinor returned to the topic of her dissertation – the study of how communities or groups of communities manage to solve tragedy of the commons problems. Elinor Ostrom is most well known for studying this case of polycentric governance, and received the Nobel Prize for her efforts. This area of study was indeed particularly fruitful, as it allowed her and her collaborators to identify various core institutional principles that enabled communities to prosper.

The statement that the efficiency of an emergent social-institutional-political order depends on the over-arching rules and norms of the underlining polycentric system remains rather vague and open-ended, unless we specify more clearly the principles that these over-arching rules and norms are supposed to comply with. In other words, the claim that the key for understanding success or failures of

emergent orders rests in the study of the over-arching rules is only methodology – it tells us *where* to look for a solution, but it doesn't offer any specific guidelines with respect to what the solution might be. Is it possible to do more than just methodology? Indeed, it appears so.[2]

The first, and highly important, discovery that Elinor Ostrom made after she analyzed hundreds of case studies of various communities from around the world dealing (some successfully and some unsuccessfully) with different cases of tragedies of the commons was that there was no unique set of practical rules that guaranteed success or avoided failure. As she kept saying: "No panacea!"

Economists have used game theory to explain the nature of the problem – the common incentive problem that plagues all cases of tragedies of the commons. This is indeed part of the beauty of game theory – allowing us to see the hidden structure behind an otherwise bewildering complexity of different cases. Over-fishing in the ocean or in rivers, over-fishing lobsters in Maine, over-grazing in mountain areas around the world, deforestation, depleting underground water supplies, workers shirking at their job, workers failing to unionize because of free-riding, pollution, mass famine under farm collectivization in China's Great Leap Forward, global warming due to carbon emissions, etc. – all the *same* underlining Prisoners' Dilemma-type problem in which shirking and free-riding is the individually most beneficial choice although all would prefer that we behaved more responsibly.

However, the fact that the *cause* of the problem is the same does *not* imply that the remedy is the same. This is unfortunate, but it is, nonetheless, true. The situation is even more unfortunate than most people, and most economists, assume. What Elinor Ostrom found was the remedy is substantially different even in cases that seems rather similar. Deforestation in two different places around the world will not have the same kind of institutional solution, and trying to "transplant" an institution from a successful place to another place will often inexplicably fail. Learning how to fix over-fishing in Maine will not necessarily help fixing over-fishing in Turkey. Why does it fail? Why should it be so hard to learn from other people's experiences? The problem is less with learning, and more with the expert imposition of solutions. Rules need to be monitored and enforced, and, people who don't create the rules themselves often don't understand them or don't see them as legitimate. Moreover, rules work in the

[2] For a more in-depth discussion of the core design principles see Cox, Arnold, and Villamayor Tomás (2010) and Tarko (2017, ch. 4). The account here follows the latter.

context of other rules and norms. The same rule will often work differently in two different places because of the context provided by the other existing rules and norms. These other rules and norms create different pathways for avoidance and shirking.

The Ostroms distinguish between different levels of rules (E. Ostrom and Ostrom 2004): (i) operational rules are rules about how to actually manage resources and interact with people about specific matters; (ii) collective choice rules are rules about how to decide what the operational rules are; (iii) constitutional rules are rules about how to choose the collective choice rules; and (iv) meta-constitutional norms are general criteria or cultural expectations about which kinds of lower-level rules are legitimate or not.

Because of the diversity problem mentioned above, there are relatively few direct guidelines, i.e. operational rules, that we can identify:

(1) *Excludability principle*: Clearly defined group boundaries and membership.
(2) *Graduated sanctions principle*: Graduated sanctions for breaking the rules.
(3) *Local fit principle*: Correspondence of appropriation rules to local conditions.
(4) *Fairness principle*: Proportionality between the benefits and costs of various actors.

The first one is a very basic public choice principle, and the key focus of Mancur Olson's *Logic of Collective Action* (1965). The second one is a basic law and economics principle that helps distinguish between mere errors and deliberate offenses, and also makes sure that offenders are not incentivized to compound their offenses (e.g. a robber who breaks into your house should not have the incentive to kill you if you discover him). The third one is a federalism principle according to which the scale of administration should match the scale of the problem the administration is trying to solve (V. Ostrom, Tiebout, and Warren 1961). The forth one is a social psychology principle about the nature of fairness and the kind of inequality that people are willing to tolerate (Starmans, Sheskin, and Bloom 2017).

The collective choice principles are also relatively straightforward, and, yet, in practice, they are often missing:

(5) *Accountability principle*: Monitors and enforcers of rules are accountable for their actions.

(6) *Political representation principle*: Most individuals affected by the rules are included in the collective choice group that can modify these rules.
(7) *Conflict resolution principle*: Access to low-cost local arenas for conflict resolution providing decisions perceived as fair.

These are all political economy rules about checks-and-balances, and about preventing abuses of power and limiting rent-seeking. The last one is a basic idea in the economic theory of conflict. As noted by Tullock (2005, 5), situations of conflict are inherently inefficient as they "lead to investment of resources by A to get B's property and by B to defend it. *Regardless of the outcome of the conflict*, the use of resources for this purpose is offsetting and therefore inherently wasteful." [emphasis added] Consequently, "[s]ocial contrivances for reducing such investment are, on the whole, desirable, although there may be cases where it is more efficient to place no institutional restrictions on such conflict" (Ibid.). Similarly, V. Ostrom (1997, 136), argued that "[t]he development of order out of chaos requires that each human being establish a basis for anticipating how others will behave, so that each person can act with an expectation that other persons will act with constraint." Establishing a peaceful society requires "common knowledge and shared communities of understanding" (Ibid.).

Finally, at the constitutional level:

(8) *Subsidiarity principle*: External governmental authorities recognize, at least to some extent, the right to self-organize.
(9) *Nested enterprises principle*: "Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises" (E. Ostrom 2005, 259).

These principles are in line with Vincent Ostrom's theory of federalism discussed earlier. The first of these recognizes the fact that higher-level governments often have the power to subvert local governance. As such, some explicit recognition of the right to self-govern is usually needed. The second one recognizes that the scale of different collective problems differs a lot from problem to problem, and, as such, insisting that a single apparatus, with a given scale, is responsible for solving all problems (or a large number of problems) will inevitably lead to many inefficiencies due to scale-mismatches.

As mentioned earlier, multiple phenomena can be understood as examples of polycentric systems. A provocative conjecture put forth by Vincent Ostrom holds that several of those different polycentric systems – markets, democratic

politics, federalism, common law, science, and peaceful international relations – rely upon each other and reinforce each other. As Vincent Ostrom (1991b, 237) put it, "[p]olycentricity in each unit of government ... is essential to the maintenance of polycentricity in 'the whole system of human affairs'." Similarly, Aligica (2013, 50–51) argues that

> [p]olycentricity is a complex system of powers, incentives, rules, values, and individual attitudes, all combined in a complex system of relationships at different levels. One may detect very interesting dynamics at work. Market polycentrism seems to entail judicial polycentrism. Judicial polycentrism entails political polycentrism, and in its turn political polycentrism entails constitutional polycentrism. Accepting the existence of such a systemic logic, one may visualize the entire social system as defined by underlining currents originating in pulsating polycentric domains. Polycentric order in one area entails and produces polycentrism in other areas.

The extent to which this conjecture holds is still an open question.

4 Global climate change

These core principles have been tested primarily in cases of relatively small-scale communities (e.g. see E. Ostrom 1990). There is a reasonable worry that the operation of large-scale communities requires additional ideas or maybe different principles altogether. As a practical example of how polycentricity has been used to provide a novel perspective on a large-scale problem, consider the issue of global warming (E. Ostrom 2010b, 2014a; Cole 2015).

Global warming is a typical tragedy of the commons problem in which most people would be better off if carbon emissions were lower, but everyone also has the incentive to shirk. Moral self-restraint can only get us so far (not very far).

The typical point of view is to believe that *because* the scale of the problem is global, the scale of the solution should also be global. This is not entirely unreasonable, and it is in fact in line with the "local fit principle" mentioned above. Indeed, V. Ostrom, Tiebout, and Warren (1961) use air pollution as an example of the importance of local fit, explaining that air pollution in California could not be addressed while the policy was too localized – the source of the pollution was often outside of the jurisdiction that was affected by pollution and

which tried to fix the problem (this is also in line with the "political representation principle"). Air pollution was addressed more successfully when the task of environmental policy was moved at state level.

This being said, Elinor Ostrom argued that, in case of global warming, the above assumption, that the scale of the problem implies the scale of the jurisdiction, was actually dangerously misguided. The scale of the problem is global, but the transaction costs of building a global policy consensus are so large that we risk end up doing almost nothing. If everyone is focused on the wrong scale, mitigation efforts are wasted lobbying for unfeasible global policies. These efforts would be better spent on more realistic *and more local* policies.

The problem with local policies for addressing global warming is that none of them, by themselves, can do much of a dent in addressing the problem. If California or Germany adopt some "climate policy," they are easy to ridicule as engaging in mere "virtue signaling" because such policies obviously cannot have much of an effect globally. But this is where the emergent order perspective of polycentricity comes into play. Elinor Ostrom's point is that the result that we want – a sufficiently large reduction in global emissions – can be the outcome of an emergent order, emerging out of the interactions of many localized policies, rather than being the outcome of a single top-down global policy. A large diversity of localized policies is more politically feasible than a single meaningful global policy, and, as such, the polycentric approach could have a bigger aggregate effect in terms of actual emissions reductions.

So, is this polycentric account of a global problem at odds with the "core design principles" described above? It does seem so, strictly speaking. However, a more insightful perspective is to say that transaction costs need to be considered more carefully. Small scale communities have small transaction costs in terms of creating, changing, monitoring, and enforcing rules. As such, the problem of transaction costs is in the background. But when we are analyzing problems with severe transaction costs, e.g. due to much larger populations or larger geographical or temporal scales, the principles need to be re-assessed. Elinor Ostrom has, in fact, always insisted that these principles should not be used mechanically, as a mere check list. But why not use them as a check list? To put it in economic terms, there are costs and benefits to sticking to those principles, and the transaction costs may become so high that the costs go beyond the benefits. In the example of global warming, sticking to the local fit

principle becomes positively harmful and probably hampers our ability to solve the problem. Another answer, that may complicate matters even more, is that significant transaction costs can also affect how the different principles interact with one another.

We can also use this example to amend my earlier description of the relationship between the concept of polycentricity and that of emergent order. It is often the case that the over-arching rules are the object of collective choice, and the nature of the emergent order is determined by those rules. This is indeed the bulk of the examples studied by Elinor Ostrom. But it may also be the case that the over-arching rules are fixed – or changing them in a timely fashion is politically unfeasible – as in the case of climate policy at a global level. If the over-arching rules are *not* the object of collective choice, one needs to refocus on the fact that maybe different emergent orders are possible under the same over-arching rules. In other words, maybe the emergent order is not *determined* by those rules, but merely constrained by them. Phenomena like path-dependence or collective blind-spots may be highly relevant. In the case of global warming, Ostrom is arguing that one important collective blind-spot we have is that global problems require global solutions.

5 Conclusion

To summarize, the concept of polycentricity has been developed with two (related) goals in mind: (1) as a descriptive tool for understanding emergent social-institutional-political orders, especially emergent orders that lack a price system as a coordination device; and (2) as a normative policy tool for enabling greater levels of self-governance. Polycentricity plays an important role in emphasizing that centralized coordination is not the only possible form of coordination (Table 1).

From a normative point of view, polycentricity helps strengthen the arguments against hierarchical control and in favor of self-governance. A key argument in favor of hierarchy is that the absence of hierarchy leads to chaos and disorder, but not only can order exist without top-down design and control, but such self-governing bottom-up emergent orders are often more productive, more equitable, and more resilient.

Table 1: Types of governance systems

	Centralized	**Decentralized**
Coordinated	Top-down hierarchical (coordination as command-and-control)	Polycentricity (coordination as emergent order)
Not coordinated	Rent-seeking (decentralized lobbying to a central authority)	Fragmented (anarchic)

This being said, not *any* imaginable emergent order is productive, equitable, and resilient. Only a sub-set of them are, and a key advance made by Elinor Ostrom and her collaborators was to identify a set of "core principles" describing which types of social choice institutions are more likely to generate good practical results. These core principles form in effect a practical theory of self-governance. However, as emphasized by Elinor herself, as well as by some of the researchers following in her footsteps (e.g. see especially Cox, Arnold, and Villamayor Tomás 2010; and the discussion in Tarko 2017, ch. 4) we are still probably far from done. A key active research area involves the attempt to develop a framework of analysis that applies to larger scale systems (e.g. see McGinnis and Ostrom 2014; Cox 2014), under the assumption that Ostrom's core principles, discovered in the context of analyzing relatively small-scale societies, are incomplete or maybe even unhelpful for large-scale cases.

References

Aligica, Paul Dragos. 2013. *Institutional Diversity and Political Economy: The Ostroms and Beyond*. Oxford and New York: Oxford University Press.

Aligica, Paul Dragos, and Vlad Tarko. 2012. "Polycentricity: From Polanyi to Ostrom, and Beyond." *Governance-an International Journal of Policy and Administration* 25 (2): 237–62.

———. 2013. "Co-Production, Polycentricity, and Value Heterogeneity: The Ostroms' Public Choice Institutionalism Revisited." *American Political Science Review* 107 (04): 726–41.

Bish, Robert L. 1999. "Federalist Theory and Polycentricity: Learning from Local Governments." In *Limiting Leviathan*, edited by Donald P. Racheter and Richard E. Wagner. Cheltenham, UK ; Northampton, MA, USA: Edward Elgar.

———. 2014. "Vincent Ostrom's Contributions to Political Economy." *Publius: The Journal of Federalism* 44 (2): 227–48. http://publius.oxfordjournals.org/content/44/2/227.

Boettke, Peter J., Jayme S. Lemke, and Liya Palagashvili. 2014. "Polycentricity, Self-Governance, and the Art & Science of Association." *The Review of Austrian Economics* 28 (3): 311–35.

Buchanan, James M., and Gordon Tullock. 1962. *The Calculus of Consent: Logical Foundations of Constitutional Democracy*. Indianapolis: Liberty Fund [1999].

Caldwell, Bruce. 2020. "*The Road to Serfdom* After 75 Years." *Journal of Economic Literature* 58 (3): 720–48. https://doi.org/10.1257/jel.20191542.

Cole, Daniel H. 2015. "Advantages of a Polycentric Approach to Climate Change Policy." *Nature Climate Change* 5 (2): 114–18. https://doi.org/10.1038/nclimate2490.

Cowen, Tyler, and Alex Tabarrok. 2014. *Modern Principles of Economics*. Third edition. New York: Worth Publishers.

Cox, Michael E. 2014. "Understanding Large Social-Ecological Systems: Introducing the SESMAD Project." *International Journal of the Commons* 8 (2): 265–76. https://doi.org/10.18352/ijc.406.

Cox, Michael E., Gwen Arnold, and Sergio Villamayor Tomás. 2010. "A Review of Design Principles for Community-Based Natural Resource Management." *Ecology and Society* 15 (4): 38. http://www.ecologyandsociety.org/vol15/iss4/art38/.

Dahl, Robert Alan. 1989. *Democracy and Its Critics*. New Haven: Yale University Press.

Hayek, Friedrich A., ed. 1935. *Collectivist Economic Planning: Critical Studies on the Possibilities of Socialism*. London: Routledge.

———. 1945. "The Use of Knowledge in Society." *The American Economic*

Review 35 (4): 519–30.

Inman, Robert P, and Daniel L Rubinfeld. 1997. "Rethinking Federalism." *Journal of Economic Perspectives* 11 (4): 43–64.

McGinnis, Michael D., ed. 1999a. *Polycentric Governance and Development: Readings from the Workshop in Political Theory and Policy Analysis*. Michigan: University of Michigan Press.

———, ed. 1999b. *Polycentricity and Local Public Economies: Readings from the Workshop in Political Theory and Policy Analysis*. Michigan: University of Michigan Press.

———. 2016. "Polycentric Governance in Theory and Practice: Dimensions of Aspirations and Practical Limitations." Indiana University, Bloomington.

McGinnis, Michael D., and Elinor Ostrom. 2014. "Social-Ecological System Framework: Initial Changes and Continuing Challenges." *Ecology and Society* 19 (2). http://www.ecologyandsociety.org/vol19/iss2/art30/.

Olson, Mancur. 1965. *Logic of Collective Action: Public Goods and the Theory of Groups*. Harvard University Press.

Ostrom, Elinor. 1972. "Metropolitan Reform: Propositions Derived from Two Traditions." *Social Science Quarterly* 53 (3): 474–93.

———. 1976. "Size and Performance in a Federal System." *Publius* 6 (2): 33–73. https://doi.org/10.2307/3329539.

———. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge; New York: Cambridge University Press.

———. 1999. "Polycentricity, Complexity, and the Commons." *The Good Society* 9 (2): 37–41.

———. 2000. "The Danger of Self-Evident Truths." *PS: Political Science & Politics* 33 (March): 33–46. https://doi.org/10.2307/420774.

———. 2005. *Understanding Institutional Diversity*. Princeton: Princeton University Press.

———. 2010a. "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." *American Economic Review* 100 (3): 641–72. http://pubs.aeaweb.org/doi/abs/10.1257/aer.100.3.641.

———. 2010b. "Polycentric Systems for Coping with Collective Action and Global Environmental Change." *Global Environmental Change*, 20th Anniversary Special issue, 20 (4): 550–57.

———. 2011. "Honoring James Buchanan." *Journal of Economic Behavior & Organization*, Special issue on the work of James Buchanan, 80 (2): 370–73. https://doi.org/10.1016/j.jebo.2011.04.002.

———. 2014a. "A Polycentric Approach for Coping with Climate Change." *Annals of Economics and Finance* 15 (1): 97–134.

———. 2014b. "Collective Action and the Evolution of Social Norms." *Journal of Natural Resources Policy Research* 6 (4): 235–52. https://doi.org/10.1080/19390459.2014.935173.

Ostrom, Elinor, and Vincent Ostrom. 2004. "The Quest for Meaning in Public Choice." *American Journal of Economics and Sociology* 63 (1): 105–47.

Ostrom, Elinor, Roger B. Parks, and Gordon P. Whitaker. 1974. "Defining and Measuring Structural Variations in Interorganizational Arrangements." *Publius* 4 (4): 87–108. https://doi.org/10.2307/3329480.

Ostrom, Elinor, and Gordon P. Whitaker. 1974. "Community Control and Governmental Responsiveness: The Case of Police in Black Neighborhoods." In *Polycentricity and Local Public Economies: Readings from the Workshop in Political Theory and Policy Analysis*, edited by Michael D. McGinnis. Michigan: University of Michigan Press, 1999.

Ostrom, Vincent. 1972. "Polycentricity (Part 1 and 2)." In *Polycentricity and Local Public Economies*, edited by Michael D. McGinnis, 52-74 and 119-138. Michigan: University of Michigan Press, 1999.

———. 1987. *The Political Theory of a Compound Republic: Designing the American Experiment*. Third, revised edition. Lanham, Md: Lexington Books.

———. 1991a. "Polycentricity: The Structural Basis of Self-Governing Systems." In *The Meaning of American Federalism*, 223–48. San Francisco, Calif: ICS Press.

———. 1991b. *The Meaning of American Federalism*. San Francisco, Calif: ICS Press.

———. 1997. *The Meaning of Democracy and the Vulnerabilities of Democracies: A Response to Tocqueville's Challenge*. Ann Arbor: University of Michigan Press.

Ostrom, Vincent, Charles M Tiebout, and Robert Warren. 1961. "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry." *American Political Science Review* 55 (4): 831–42.

Parks, Roger B., Paula C. Baker, Larry Kiser, Ronald Oakerson, Elinor Ostrom, Vincent Ostrom, Stephen L. Percy, Martha B. Vandivort, Gordon P. Whitaker, and Rick Wilson. 1981. "Consumers as Coproducers of Public Services: Some Economic and Institutional Considerations." *Policy Studies Journal* 9 (7): 1001–11. https://doi.org/10.1111/j.1541-0072.1981.tb01208.x.

Percy, Stephen L. 1984. "Citizen Participation in the Coproduction of Urban Services." *Urban Affairs Review* 19 (4): 431–46. https://doi.org/10.1177/004208168401900403.

Polanyi, Michael. 1951. *The Logic of Liberty*. London and New York: Routledge.

———. 1962. "The Republic of Science: Its Political and Economic Theory." *Minerva* 1 (1): 54–73. https://doi.org/10.1023/A:1026591624255.

Rajan, Raghuram. 2004. "Assume Anarchy." *Finance and Development* 41 (3): 56–57.

Starmans, Christina, Mark Sheskin, and Paul Bloom. 2017. "Why People Prefer Unequal Societies." *Nature Human Behaviour* 1 (4): 1–7.

Tarko, Vlad. 2015. "Polycentric Structure and Informal Norms: Competition and Coordination Within the Scientific Community." *Innovation: The European Journal of Social Science Research* 28 (1): 63–80. https://doi.org/10.1080/13511610.2014.985194.

———. 2017. *Elinor Ostrom: An Intellectual Biography*. London: Rowman & Littlefield.

Thiel, Andreas, William A. Blomquist, and Dustin E. Garrick, eds. 2019. *Governing Complexity: Analyzing and Applying Polycentricity*. Cambridge, United Kingdom ; New York, NY, USA: Cambridge University Press.

Tiebout, Charles M. 1956. "A Pure Theory of Local Expenditures." *Journal of Political Economy* 64 (5): 416–24.

Tullock, Gordon. 2005. *The Social Dilemma: Of Autocracy, Revolution, Coup d'Etat, and War*. Indianapolis: Liberty Fund.

Wagner, Richard E. 2005. "Self-Governance, Polycentrism, and Federalism: Recurring Themes in Vincent Ostrom's Scholarly Oeuvre." *Journal of Economic Behavior & Organization* 57 (2): 173–88. https://doi.org/10.1016/j.jebo.2004.06.015.

Weingast, Barry R. 1995. "The Economic Role of Political Institutions: Market-Preserving Federalism and Economic Development." *Journal of Law, Economics, & Organization* 11 (1): 1–31. http://www.jstor.org/stable/765068.

Wilson, David Sloan, Elinor Ostrom, and Michael E. Cox. 2013. "Generalizing the Core Design Principles for the Efficacy of Groups." *Journal of Economic Behavior & Organization* 90 (June): S21–32. https://doi.org/10.1016/j.jebo.2012.12.010.

Zagorski, Nick. 2006. "Profile of Elinor Ostrom." *Proceedings of the National Academy of Sciences* 103 (51): 19221–23. https://doi.org/10.1073/pnas.0609919103.