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States, social capital and cooperation: looking back on *Governing the Commons*

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Abstract: This paper reflects on Eleanor Ostrom's classic book, *Governing the Commons*, and much work in sociology, political science and organization studies that has appeared since its publication. We do so in order to expand our understanding of the conditions under which cooperation occurs resulting in the production of collective goods. We explore two issues that were underdeveloped in her book that have subsequently received much attention. First, we discuss how states can facilitate cooperative behavior short of coercively imposing it on actors. Second, we discuss how social capital can facilitate or undermine cooperative behavior. In both cases we focus on the important mechanisms by which each one contributes to the development of cooperative behavior and collective goods. We conclude by extending our arguments to a brief analysis of one of the world's newest and largest collective goods – the Internet.

Keywords: Collective goods, cooperation, Internet, social capital, states

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I. Introduction

Without doubt Elinor Ostrom's (1990) classic, *Governing the Commons*, shed new light on the institutional conditions that facilitate effective management

of common pool resources through encouraging cooperative behavior. By cooperative behavior we mean more-or-less formally organized activity in the pursuit of some collective good. Since the book's publication considerable work has been done in sociology and political science that expands on various parts of her general argument. Much of this work transcends the subject of common pool resource management and extends into many other areas concerning the more basic question that lay at the heart of her book – that is, what are the institutional conditions under which people set aside their short-term individual self-interests and cooperate in the interests of the long-term common good? Among other things, much of this work draws attention to the state and to social capital as important contributors to institutionalizing cooperation and the production of collective goods. Both the state and social capital are factors that Ostrom describes in several of the empirical case studies upon which the book is based but that she does not focus on in the book's theoretical argument. Here, we explore each of these concepts in greater detail to strengthen the connections between Ostrom's work and related scholarly research in political science and sociology.

Let us be clear. First, our focus is on Ostrom's argument in *Governing the Commons*, which we use as a starting point for our analysis. We recognize that since the book's publication Ostrom has elaborated parts of her initial argument, notably that part concerned with social capital and trust (e.g. Ostrom 2003; Ostrom and Walker 2003). We appreciate the strides she has taken in this regard but still believe that other scholarship offers additional insights into the nature of cooperation and collective goods production. Second, we are interested in exploring the importance of the state and social capital not just for common pool resource management but for the production of cooperative behavior in pursuit of collective goods more generally.¹ Third, our argument should not be taken as an attack on what is missing from Ostrom's theory but rather as a sympathetic addendum to expand on less developed aspects of it.

We proceed by summarizing Ostrom's central argument in the book concerning the conditions under which successful common pool resource management is likely to occur. Next we raise some concerns about it. Then, we discuss the different

¹ Here we treat Ostrom's analysis of common pool resource systems as an example of the general class of collective goods, that is, goods that have one or more of the following qualities: non-excludable, non-rival, and joint production/maintenance. Non-excludable means that once the good is produced it is available to all, though 'all' may be restricted by geography (e.g. you have to be in the White Mountains to breathe the clean air) or other characteristics, such as citizenship. Many collective goods also must be collectively (jointly) produced either because the vastness of the resources required prevent one actor from producing it, or because it requires the contributions of many actors (e.g. a group discussion) to produce and/or protect. While common pool resources are explicitly rival goods, other examples of collective goods (including public goods, which are non-excludable and non-rival, and club goods, which are non-rival but excludable) are non-rivalrous such that consumption of the good does not reduce its availability. In general, collective goods are under-produced and/or degradable because individual and collective interests do not align, or because they lack a critical mass of potential contributors.

ways that states can facilitate cooperative behavior short of coercively imposing it on actors. We also discuss how social capital – by which we mean resources that accrue in social relationships – can facilitate or undermine cooperative behavior. For both the state and social capital we seek to discuss the important mechanisms by which each one contributes to the development of cooperative behavior for producing collective goods. The examination of causal mechanisms is often viewed as central to theory building (e.g. Elster 1989; Hedström and Swedberg 1998; Campbell 2004). Finally, we offer a few thoughts based on our arguments as they pertain to management of one of the world's newest and largest collective goods – the Internet.

2. Ostrom's argument in *Governing the Commons*

There are, according to Ostrom, three fundamental ways in which individuals can manage common pool resource systems, such as forests, meadows and groundwater basins, and avoid the tragedy of the commons – that is, the excessive exploitation and destruction of these resources by those who need and use them. One is through external coercion from the state that limits resource use, monitors behavior and enforces compliance. Here state intervention is the key. The problem is that this requires policymakers to accurately assess the situation, and develop sufficient monitoring and effective but not excessive enforcement capacities at reasonable administrative cost. This is not always possible.

A second way is for policymakers to assign private property rights so that self-interested owners will make sure not to ruin the resource. Here the market is the key. Entrepreneurs recognize benefits that could accrue from cooperation and negotiate contracts with resource users specifying how their action is coordinated. The entrepreneur hires agents to supervise the use of her resources and receives payment from those who use them. The difficulty with markets is that assigning property rights is either not feasible, such as in marine fisheries, or not considered fair or socially equitable.

Given the inherent problems of states and markets, Ostrom turns her attention toward the third way for individuals who use these resources to extricate themselves from the tragedy of the commons. Here self-regulating associations are the key. She seeks to determine the institutional conditions under which this sort of cooperative behavior occurs and is successful. Ostrom identifies eight conditions necessary for successful cooperative governance of commons. Resource boundaries must be clearly defined. Rules regarding the provision and appropriation of resources must fit local conditions and customs. People affected by these rules must be able to help modify them. Monitoring must exist and be accountable to those who use the resources. A system of graduated sanctions must be established such that repeat offenders receive harsher punishments, but initial infractions may be only nominally sanctioned. Accessible and affordable means of conflict resolution must be provided. External government authorities must not challenge the right of resource users to devise their own collective

solutions. Finally, the use, provision, monitoring, enforcement, conflict resolution and governance activities may be organized in hierarchical layers. For example, local users may hire monitors to supervise their collective resource use and elect representatives to adjudicate disputes and levy penalties.

3. Extending the argument

Scholars have provided additional insights into two parts of Ostrom's arguments in *Governing the Commons*. One is the state, which actually appears frequently in the case studies upon which the book is based but that is set aside in her theoretical argument. The other is social capital. Researchers and theorists have spent considerable time thinking about how these things affect cooperative behavior, if not common pool resource management specifically. As we shall see, when it comes to facilitating cooperation the state is more than just a coercive actor forcing people to cooperate in order to provide revenues or other benefits to the ruler – the theoretical model that Ostrom (Chapter 2) invokes to explain why the state cannot necessarily solve the common pool resource problem. States can facilitate cooperative behavior in a variety of much more nuanced ways (Campbell and Lindberg 1990). Similarly markets are about more than just individuals taking advantage of property rights to pursue their self-interest. They also involve social capital insofar as social relationships affect information exchange and assessments of reliability such that they facilitate market-based exchange (Granovetter 1985; Uzzi 1996).

To be sure, Ostrom notes occasionally the more complex role of the state as well as the importance of social capital in some of her case studies. That is, even if she does not spend much time theorizing these things, she does describe them in some of the empirical analyses.² For instance, in several instances the state played pivotal roles in determining whether or not common pool resource management was successful. Cooperative water management in the Los Angeles, California area occurred “in the shadow of the court” (Ostrom 1990, 112) insofar as a group of several communities agreed to cooperatively limit water use in order to avoid draconian intervention by a judge who was hearing a case brought by the city of Pasadena against the group. The courts were also called in on several occasions to approve formal water management agreements. Without such approval, these agreements would presumably have failed. Indeed, in other cases, such as managing fishing rights in Turkey, Sri Lanka and Nova Scotia and irrigation rights in Sri Lanka, collective resource management failed because the state was unwilling to enforce cooperative agreements and the rules crafted by local resource users. And cattle grazing rights in communally owned Alpine meadows in Switzerland

² It is curious that she acknowledges the importance and complexity of the state in her empirical discussions but not in the theoretical ones. Indeed, in the most extended theoretical discussion of the state in the book – that is, her justification for turning away from a political analysis of common pool resource management to an associative one – the theory of the state upon which she dwells is a predatory theory.

were managed through an elaborate system of proportional representation. All of this suggests that cooperative behavior cannot be so easily separated theoretically from the state. Even in the Swiss case one might detect an echo of the state. After all, the cooperative governance of grazing rights was likely related to and perhaps modeled on the Swiss political system, which is probably the most complex system of proportional representation in the world and one to which the Swiss have grown accustomed over generations as a means of ameliorating profound religious and linguistic divisions among the population (Steinberg 1996).

Social capital was important for successful resource management too. In Sri Lanka, individual opportunism undermined collective management of local irrigation systems until the state sent community organizers into the villages to encourage local farmers to discuss their irrigation needs and problems among themselves. This change in interaction gradually enabled farmers to perceive their interests in more collective rather than individualistic terms. In turn, they developed a sense of trust toward each other and devised new institutions for managing the irrigation system more effectively and fairly. Even the collective monitoring Ostrom identifies as so essential in the Swiss forests, for example, is only really possible when embedded in a larger context of trust among community members; monitoring as a side effect of collective activities both requires and facilitates trust. Other examples of the importance of social capital abound in Ostrom's work since publication of *Governing the Commons*.

The point is that in *Governing the Commons* Ostrom describes the importance of the state and social capital in her empirical cases but she does not spend much time theorizing them – they remain in the theoretical shadows. The role of the state is limited to setting and enforcing the “rules of the game” perhaps because the theory of the state to which she refers is one based on the strong assumption that states are predators whose primary interest in organizing collective benefits is to maximize revenues (Ostrom 1990, 41).³ States can certainly be predatory and coercive but they can also be supportive and facilitate cooperative behavior. That is, states can use carrots as well as sticks to encourage cooperative behavior. Insofar as social capital is concerned she mentions that people develop shared norms and patterns of reciprocity through localized interaction over time thereby learning to trust one another and then build institutions for managing common pool resources (Ostrom 1990, 183–84). But she does not theorize the conditions under which such interaction is likely to occur in the first place. Nor does she theorize the role of trust in solving the collective action problems of supply, commitment and monitoring. Of course, these are things that received more attention in her later work. By bringing the state and social capital out of the theoretical shadows, we believe that additional light can be shed on the conditions under which cooperative behavior occurs. Sociologists and political scientists now have much to say about this.

³ It is not surprising that Ostrom, herself a rational choice theorist, should focus on the predatory state model because it is common among rational choice theorists (e.g. North 1981; Levi 1988, 1997).

Two caveats are important. First, to her credit Ostrom developed her theory of common pool resource management inductively based on the case studies at her disposal. And most of the book is a reanalysis of already published case studies. As such, her theoretical insights were necessarily limited by the empirical material in hand. Second, as noted earlier, we are treating her discussion of common pool resources as an example of the broader category of collective goods. Though Ostrom's specific treatment of CPRs has the advantage of focusing attention on the conditions for successful maintenance of physical resource systems, we consider CPRs in the general class of collective goods (non-excludable and non-rival) that can include social as well as natural resources, which likewise entail possibilities for excessive misuse and degradation that stem from the sort of free-riding, opportunism and other problems that Ostrom associates with the tragedy of the commons. These social resources can include, for example, the Internet, or even public confidence in markets, a collective good which if depleted can destroy an industry as the 2008 US financial crisis demonstrated when banks stopped trusting one another and thus stopped lending to one another (Campbell 2011).

4. State and cooperative behavior

States facilitate cooperative behavior and the production of collective goods in various ways. Ostrom implies that this occurs typically through coercion – direct state intervention to force people to form cooperative groups. But coercion can involve a more subtle exercise of power. Much has been written about how the mere perceived threat of state intervention, rather than intervention per se, may spur people to cooperate in the production of collective goods. Indeed, in a variety of industries firm managers recognized the presence of the state's "whip in the window" and chose voluntarily to avoid it being used against them by organizing themselves into associations to set standards and otherwise self-regulate product quality and safety (Streeck and Schmitter 1985). In the early days of the dairy industry, for example, such concerns helped stimulate the formation of dairy associations that regulated the fat content and other characteristics of milk at a time when consumers and dairy farmers were up in arms over milk distributors lying about such things (Young 1991). Much the same thing happened after the partial meltdown of a commercial nuclear power plant at Three Mile Island in Pennsylvania in 1979 after which the electric utility industry, nuclear reactor manufacturers and others in the industry, who feared a major regulatory intervention from the federal government, moved proactively to establish several self-regulatory industry associations to enhance safety in the engineering, construction and operation of nuclear power plants (Campbell 1989). In both cases, it was the perceived threat of government action that triggered the development of cooperative behavior and various collective goods for participants.

Beyond perceived threats of coercion, however, the state is often involved in facilitating cooperative behavior in other ways. The provision of tangible

resources is one of them. As is well known among students of collective action, grievances and the perception of common interests alone are often not enough to produce collective action and collective goods. Resources are also necessary (McCarthy and Zald 1977; Hechter 1987). And the state is frequently a source of those resources. For instance, concern mounted within the USA during the early 1980s that the US computer industry was falling behind the Japanese in the engineering of improved microprocessors. US semiconductor manufacturers and other industry members recognized the need to cooperate in developing cutting-edge technologies for the production of faster and faster computer chips. They believed that this would require the formation of a research consortium of industry members working together to devise such technologies. But the cost of doing so was estimated to be about \$1 billion, which was a sum beyond what consortium members were willing to contribute collectively. Eventually, the Department of Defense agreed to provide half the money. The result was the formation in 1987 of the Semiconductor Manufacturing Technology (Sematech) consortium in Austin, Texas for the purpose of advancing US semiconductor technology – a collective good produced and shared by all members.

The Sematech case is also instructive because a second way in which the state facilitated this association was by granting an exemption from antitrust law, which would have barred such cartel like behavior otherwise. In other words, the state had to ensure the consortium members that if they went forward with their plans the state would not rule their activities illegal. In other words, the state had to confer legitimacy on the group's cooperative activities. Similar examples abound about how the state conferred legitimacy (or not) either through the courts or legislature on various cooperative endeavors designed to produce collective goods for industries in both the USA and Abroad (e.g. Chandler 1977; Campbell and Lindberg 1990; Fligstein 1990; Roe 1994, Chapter 14). Arguably legitimacy is akin to a symbolic resource without which cooperative behavior cannot long survive.

Finally, states often help transform perceptions of the costs, benefits and therefore interests of private actors in ways that either lead to or prevent cooperative behavior in the first place. Such perceptions, of course, lay at the heart of Ostrom's rational choice model. It is well known that patterns of interaction affect how actors perceive and define their interests (e.g. Piore 1995; Fligstein 2001). Ostrom (Chapter 5) is explicit about this. Often the state plays a key role in shaping these interactions in ways that end up facilitating cooperative behavior. For instance, in the USA the state of Pennsylvania suffered a severe economic decline during the 1970s and early 1980s as its steel manufacturers experienced significant financial losses due to an increase in foreign competition. Initially, manufacturers and unions locked horns in what each side perceived to be a zero-sum game involving issues like wages, benefits, and especially factory closings. As long as this confrontational mentality persisted, things continued to stagnate. But then state officials encouraged the steel corporations, unions, and representatives from the local communities to brainstorm collectively for

solutions to the problem of local industrial decline. This effort resulted eventually in more inclusive interactions, greater appreciation for the concerns of each other, less hostility, the formation of a new collective identity, a modicum of collective trust and a variety of innovative programs – that is, collective goods – for resurrecting the local economy (Sabel 1993).

Similar stories can be told for other countries. In Germany federal statutes guarantee unions seats on corporate boards of directors and rights to participate in a wide range of corporate decision-making (Streeck 1997). Legislatively mandated works councils are another example that many Western European countries have adopted by law. Works councils are representative bodies elected by employees (regardless of union membership) in a workplace that enjoy institutionalized rights of access to important corporate information as well as rights of co-determination. Co-determination is shared decision-making about matters unrelated to wages and benefits, such as the organization of production on the shop floor, the development of job classifications, the introduction of new technologies, hiring and firing, plant closings, and more (Rogers and Streeck 1994).

As in the Pennsylvania story, the German case reveals an interesting dynamic whereby the state helped transform corporate managers' perceptions of their interests in ways that benefited employees and others. The West German state passed co-determination legislation shortly after the Second World War. This meant that workers were systematically involved in corporate decision-making. Initially, managers were concerned that this would jeopardize short-term profitability as well as their managerial prerogatives. However, they came to realize that these new forms of institutionalized dialogue with workers provided benefits that enhanced the long-term competitiveness of their firms. Among other things, this dialogue facilitated collaborative problem solving and flexible labor-management relations on the shop floor, which helped firms adjust effectively to shifting market demands and new production technologies. In some cases, this enabled firms to reorient production through flexible specialization in ways that avoided firing workers or closing plants. Thus, as a result of a change in their institutionalized interactions with labor, manager's perceptions of their interests shifted, and workers and local communities as well as firms benefitted (Streeck 1997). In other words, firms were more inclined to act in concert with labor in ways that provided collective economic benefits for all.

The state's legal institutions have also facilitated deliberation, discourse, and dialogue at the community level in ways that have redefined interests in ways that led to the provision of collective goods. For example, in the area of environmental regulation Charles Sabel and his colleagues (Dorf and Sabel 1998; Karkkainen et al. 2000; Sabel et al. 2000) have examined cases in the USA where firms, local governments, local representatives of federal agencies, community members, and others have been granted legal authority by central government statutes to establish local environmental performance targets. These local actors enjoy political autonomy to collectively establish, monitor, and assess initial performance standards and adjust practice when necessary in their communities.

Later, a central government agency collects information on all of this from each locality, disseminates it across localities, and in consultation with local actors uses these data to reformulate and refine performance standards, desirable targets, and the preferred means of achieving them. In turn, the communities work with the new standards, report back to central government for further revision, and so on in an iterative process. So through an on-going dialogue between corporations and stakeholders at the community level, and between the communities and central authorities, standards, targets, and measures become benchmarks against which the local firms can then evaluate and regulate their own performance in cooperation with other actors. Firms operating under these new performance-based, discursive, rolling-rule regimes are more likely to behave in socially responsible ways that benefit everyone in the community by providing a cleaner environment, another collective good (Karkkainen et al. 2000, 691–2). This sort of legally-sanctioned dialogue-based regulation is a way to overcome the short-sightedness and adversarial self-interestedness of firms, environmentalists and community leaders that often occur through more conventional regulatory processes (Fagotto and Fung 2003; Fung 2003).

The point is that through institutionalized deliberation participants, who were previously antagonistic and uncooperative, often redefine their interests in ways that facilitate cooperative behavior directed toward the development of collective goods. But in these cases the state played a pivotal role in bringing parties to the deliberative table in the first place where communication and interest redefinition could occur. Moreover, these were not instances of state coercion but rather state participation and consultation with all the interested parties in creating common pool resources. Much research shows that in other countries where the state provides these sorts of consensus-oriented institutional forums for deliberation, regulation is far less acrimonious, participants tend to develop shared world views and common interests, and regulation is less controversial and more effective (Lundqvist 1980; Vogel 1986; Prasad 2006, 181–7).

To be sure, there is analytic space in Ostrom's theory for these sorts of state activities. Consider some of her eight institutional conditions under which cooperative behavior occurs successfully. For example, states can provide legitimacy to common pool resource management rules and help ensure that they fit local conditions and customs. States can help monitor resource use. And states can provide platforms for conflict resolution. However, whether she sees these as being important areas for state action remains unclear in the book's theoretical discussions.

But the more important point overall is that students of the production of collective goods by cooperative behavior need a more nuanced view of the state than the predatory rule model – one that recognizes the state's carrots as well as its sticks. Coercion is only one mechanism by which the state's effect can be felt. It is certainly true, as Ostrom points out, that crass state coercion is not a necessary condition for such activity. But this does not mean that we should entirely discount the state's role in these matters. After all, it is also true that the state is often

involved in other ways in providing some of the important conditions under which cooperative activity takes place for the production of collective goods. And, as we have noted, in many of the cases she describes and to which we have referred, it is hard to see how successful common pool resource management could have occurred without the state's help in these ways.

5. Social capital and cooperative behavior

Ostrom explores directly how cooperative behavior is difficult to achieve and institutionalize in common pool resource systems due to the conflicts of short-term individual self-interests that can thwart or undermine sustained management of these systems – a classic collective action problem. In focusing on institutional arrangements, her analysis refers to but does not directly examine how the social capital among users of common pool resources might help them overcome obstacles to collective action, or alternatively, might inhibit collective institution building. Literatures on social capital, social norms, and trust have explored in detail how and when social relationships involving resource-based interdependence, as is characteristic of common pool resource systems, affect the likelihood of cooperative behavior. By social capital we mean the resources, such as information and social control, that accrue in social relationships. Similarly, social norms and trust operate via social relationships to coordinate behavior in ways that can facilitate cooperation, though not always. Since the publication of *Governing the Commons*, Ostrom (2003; Ostrom and Walker 2003) has contributed to some of this research literature so she is well aware of the importance of social mechanisms such as trust in common pool resource systems. Here, we examine some of the findings from this literature that shed light on the role of social capital in cooperative behavior in general and the management of common pool resource systems in particular.

Consider the problem of compliance. Cooperation necessary to maintain common pool resource systems over time depends on actors' compliance with the group – often in conflict with their own individual short-term interests. Situations involving resource interdependence, such as in CPRs, entail uncertainty about other people's motives and future likelihood of compliance, which raises a fundamental dilemma of trust (Luhmann 1979; Coleman 1990; Heimer 2001; Hardin 2002; Molm et al. 2000). Although information is a straightforward remedy to uncertainty, gathering and evaluating information is costly and difficult (Simon 1955; Kollock and O'Brien 1992). Further, because "minds are private" intentions cannot be known directly (Rasmusen 1989; Kreps 1990). Social capital influences the availability and valuation of information about peers and potential cooperation partners. Actors embedded in a social network have information about a partner's behavior history either from direct experience or from others in the network (Granovetter 1985; Greif 1989, 1993). For instance, Brian Uzzi (1996) found that manufacturers in the New York City garment district had more information about suppliers with whom they had done business for a long time

than other suppliers. In turn, the relationships between manufacturers and long-term suppliers were more likely to lead to cooperation than the relationships with short-term suppliers. Information about a partner's past reliability increases the likelihood of successful cooperation (Dawes 1980; Raub and Weesie 1990; Burt and Knez 1996; Anthony et al. 2010).

Uncertainty can also stem from lack of information about a peer's competence to deliver on promises (Akerlof 1970; Barber 1983, 9–15; Kollock 1994; Heimer 2001, 44). That is, a peer may fail to cooperate either because she is unwilling to do so or because she is unable, a distinct problem of capability or competence (Coleman 1990, 96). Perceptions also matter: A party may be unwilling to trust another actor who she believes is incapable of cooperation, even when such concerns are unjustified. When there is uncertainty about competence or capability to honor agreements (i.e. cooperate), actors will seek committed social relationships (Greif 1989, 1993; Kollock 1994; DiMaggio and Louch 1998). That is, social capital compensates for lack of information regarding others' capabilities. For example, microcredit borrowing groups compensate for their individual member's deficits in creditworthiness (Anthony and Horne 2003; Anthony 2005).

Social capital also can provide incentives that ensure compliance of peers in the future. For example, micro-credit borrowing groups not only provide information about reliability for individual borrowers with low credit ratings, they also create incentives for ongoing compliance (loan repayment) with the group (Anthony 2005). Robert Axelrod's (1984) concept of the "shadow of the future" captures this idea where repeated and on-going interactions tend to dissuade opportunistic behavior because mistreating an exchange partner today can have negative consequences for oneself later (see also Hardin 2002, 19).

Social experiments based on exchange theory support these conclusions. For example, several studies demonstrate that dyadic reciprocal exchange relations facilitate group-level cooperation (Yamagishi and Cook 1993; Molm et al. 2000; McCabe 2003). Similarly, interdependent social ties reduce the costs of cooperation within a group because group members reward those who sanction non-compliance (Horne 2001). Researchers have also found that interpersonal reciprocity leads to greater feelings of fairness and trust because reciprocity both creates future obligations for group members and has symbolic value as a "collective good" (Molm et al. 2000; Molm 2003). Common pool resource systems in which community members have high levels of social capital via reciprocal relationships that convey information about the relative trustworthiness of group members may be more able and likely to collectively organize the informal institutions that Ostrom defines as necessary to maintain their resource systems.

Paradoxically, however, strong social relationships may also undermine cooperation. Andreas Flache and Michael Macy (1996) found that strong dyadic ties between group members did not always produce cooperation in their simulated groups. They referred to this failure as the "weakness of strong ties." Furthermore, Flache (1996; 2002) described the "double edge" of strong social ties in which actors with strong ties may refrain from sanctioning for fear that doing so would

damage their established relationships (see also Wittek et al. 2003; Langfred 2004). Some researchers have found that high levels of trust in work teams made members less likely to monitor one another, resulting in low overall team performance (Langfred 2004). Taking all of this into consideration, then, social capital can also undermine cooperation, which is why some researchers talk about “negative social capital” that diminishes rather than facilitates cooperative behavior (e.g. Portes and Sensenbrenner 1993; Portes and Landolt 1996; Portes 1998).⁴

Interdependent relationships can also give rise to norms capable of coordinating behavior to overcome collective action problems (e.g. Heckathorn 1990; Hechter and Opp 2001). Indeed, in *Governing the Commons* Ostrom recognizes that social norms serve as a coordinating mechanism in longstanding common pool resource systems (1990, 88–9, 205–7). But she also acknowledges that her own treatment of norms is superficial (Ostrom 1990, 243, n12). Norms communicate information to people that help form their expectations about the future behavior of others. Norms also communicate information about the shared meaning and value of behavior, which provide further signals about the expected behavior of others (Knight 2001). Of course, sociologists have long held that norms carry symbolic as well as instrumental value (Parsons 1937; Durkheim [1893] 1984).

In coming full circle in our argument, more formal structures, including state regulations and policies, can also facilitate common norms, values and expectations, which bolster trust in a group. For instance, Knight (2001) argues that laws that increase equality of status and decrease conflicts of interest among citizens can facilitate trust within and across groups. Similarly, Rothstein and Ulsaner (2005) argue that universal as opposed to means-tested government policies send signals to citizens that people share a common destiny and have similar values. Laws, policies and norms signaling interdependence and a common identity can encourage generalized trust – that is, the belief that most other people in a group can be trusted – which in turn can facilitate cooperative behavior oriented toward the collective good (but see also Hardin 2002). This may be one reason why levels of generalized trust are higher in countries with extensive universal welfare state programs than in countries without such programs (Katzenstein 2000; Campbell and Hall 2009). Indeed, as we argued earlier, the state sometimes facilitates the development of social capital by encouraging people with apparently opposing interests to come together in order to recognize or develop interdependencies that may enable cooperation for the common good.

Given the importance of gathering information, monitoring and sanctioning in *Governing the Commons*, research on the nature and impact of social capital on

⁴ Robert Putnam (2000, 21–22; 350–363) also describes the “dark side of social capital,” although not in ways that bear directly on the conditions under which a group engages in cooperative behavior within the group. Rather he focuses on the sometimes negative implications of strong social relations – what he calls bonding ties – for out-group members, such as discrimination and exclusion (see also Kaufman 2002).

cooperative behavior is extremely relevant for understanding the conditions under which common pool resource systems succeed or fail. Such analyses serve as an important addendum to Ostrom's initial argument as she herself has acknowledged (Ostrom 2003; Ostrom and Walker 2003).

6. Conclusion

Governing the Commons made major strides identifying institutional criteria necessary for effective common pool resource management and collective goods production in general. However, it tended to downplay the roles of the state and social capital in institution building. Our goal has been to underscore how the state and social capital provide additional mechanisms that facilitate cooperative behavior in the production of institutions to produce/maintain collective goods. We end by showing why these things are important for understanding the possibilities for successfully managing and protecting one of the newest and largest collective goods systems in the world – the Internet.

The Internet, i.e. the global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP), was developed initially with public resources, much of which came from the state, specifically the US Department of Defense. Today, Internet infrastructure is owned and maintained by a vast and diverse collection of public and private entities, no one of which can produce it independently. It has no centralized governance. Two non-profit organizations [the Internet Corporation for Assigned Names and Numbers (ICANN) and the Internet Engineering Task Force (IETF)] oversee some of the technical aspects of the system, but the vast body of content and services available on the Internet (i.e. the World Wide Web) is more like a commons (e.g. Hess and Ostrom 2003; cf. Hofmøkl 2010). It is largely open (i.e. non-excludable) to anyone who wants to use it if they have the appropriate technology. Unlike a commons, however, the Internet is non-rivalrous in the sense that one person's use of access to and use of it does not inhibit another person's access and use, with obvious caveats for inequalities in access to devices and networks, which are not trivial (Warschauer 2003).

Despite being non-excludable and non-rival, the Internet is like common pool resource systems (and collective goods in general) in that individual users' actions to and in the system have implications not only for other users but for the integrity of the system itself. For example, consider the major cyber attacks against the USA and South Korean government Web sites in 2009 that were perpetrated by a "botnet" system (e.g. Sang-Hun and Markoff 2009). Botnets are collections of infected computers used by hackers to perform malicious activities, such as attacking and disabling websites (e.g. denial of service attacks). Botnets are created when individual users mistakenly or inadvertently download files that contain malicious code that enables the hackers to compromise and take over their computers. Users who do not use or update security software, or fail to regularly install patches to their systems are more vulnerable to malicious code.

Most owners of such compromised computers are completely unaware that their system is being used by a botnet, let alone that it is being used to attack other users or sites. As in other commons, the behavior of a few narrowly self-interested or malicious individuals, as well as the unknowing actions of other users, can threaten the viability of the entire system.

Managing the Internet successfully will require an appropriate combination of rules, often originating from the state, institutions for interaction and monitoring, and some level of trust among individual users. For example, in the USA, rules such as Net Neutrality require Internet Service Providers to treat all Internet traffic the same regardless of service or content type. Rules like this, established by the state, encourage the Internet to function more like a commons than a private network. Moreover, many bounded groups, such as Wikipedia, Linux, and eBay among many others, thrive within the Internet by creating institutional rules to cooperatively self-govern their part of the commons (Kollock 1999; Markus et al. 2000; Anthony et al. 2009). Finally, trust-based social relations and the interaction dynamics that arise from them facilitate cooperation in each of these groups. Contributors to Wikipedia, for instance, take it upon themselves to ensure that postings to the site are factually accurate (Anthony et al. 2009).

It is worth mentioning briefly that Net Neutrality is currently under attack in the USA from corporate and other interests. Some Internet Service Providers, for example, argue that removing Net Neutrality would allow them to provide additional services to consumers willing to pay, such as faster service or increased security to protect from malicious software, such as botnets. A change from Net Neutrality could have significant implications for the Internet commons insofar as it alters the types of interaction, cooperative behavior and institutional rules that make self-governance possible and effective. For instance, as noted earlier, to the extent that state policies promote equality – such as equal access to and use of the Internet via the Net Neutrality rule – they reinforce the interdependence of all users on the Internet. Shifts in rules, such as eliminating Net Neutrality, or worse, creating rules that privilege the property rights and decisions of specific actors, can undermine the possibilities for cooperative behavior and the establishment of self-governing institutional mechanisms. Proponents of democratic self-governance of the Internet need to understand how various governance mechanisms (state policies, self-governing institutions, and social interaction) fit together to facilitate (and in some cases, undermine) the Internet commons.

The same is true for those who want to better understand how tragedies of the commons are avoided in more standard common pool resource systems. *Governing the Commons* has provided invaluable insights into this phenomenon. And to reiterate, we hold Ostrom's arguments in high regard. Our purpose in this paper has been to show how other mechanisms relatively under developed in her initial argument – one regarding the state and another regarding social capital – also facilitate cooperative behavior. We suspect that important research and theorizing will continue to build on and around Ostrom's work in fruitful ways for many years to come.

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