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Which public goods are endangered?: How evolving communication technologies affect *The logic of collective action*

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Abstract. The theory in Mancur Olson's *The Logic of Collective Action* is built from historically uncontroversial assumptions about interpersonal communication. Today, evolving technologies are changing communication dynamics in ways that invalidate some of these once uncontroversial assumptions. *How do these changes affect Olson's thesis?* Using research tools that were not available to Olson, we differentiate collective actions that new communication technologies help from the endeavors that they hurt. In the process, we refine some of Olson's best-known ideas. For example, we find that evolving communication technologies eliminate many of the organizational advantages that Olson attributed to small groups.

1. Introduction

Mancur Olson provided 20th century social science with some of its most important new insights. His best-known contribution is *The Logic of Collective Action*, a book that converts sound microeconomic fundamentals into a paradigm-changing view of when individuals can act collectively. In the book, henceforth referred to as *Logic*, Olson identifies a critical null hypothesis:

> if the members of some group have a common interest or objective, and if they would all be better off if that objective were achieved, [then] the individuals in that group would, if they were rational and self-interested, act to achieve that objective (*Logic*, 1).

He then rejects the hypothesis, concluding that

> unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interests* (*Logic*, 2; emphasis in original).

Mancur is no longer with us, but the legacy of his *Logic* remains. It continues to help people around the world better understand the dynamics of public goods provision. But new forces are emerging, with some able to change

these dynamics. In what follows, we focus on one of these forces – *evolving communication technologies.* We argue that while evolving technologies help some collective endeavors, they endanger others. In the process, we extend *Logic*'s legacy by clarifying its applicability in a changing world.

Our argument begins with the premise that technology changes long-standing expectations about what people can learn about each other. For almost all of human history, physical impediments such as mountains, walls and long distances limited real-time monitoring of others. Cognitive constraints imposed other limits. For example, fundamental properties of short-term memory (e.g., the fact that it can store no more than a dozen items at a time) implied that a person who wanted to track the simultaneous actions of a group would succeed only if the group were small.

Evolving communication technologies, such as television and computers, undermine these expectations. Television does so by allowing people to observe far away others at a minimal cost; and this medium's evolution continually expands what people can learn. For most of the 20th century, viewers were limited to choosing from among two to five general-purpose channels. Now, cable and satellite technologies allow viewers to choose from numerous specialized information and entertainment outlets. Television changes who can track whom.

Computers change expectations in other ways. The Internet, for example, allows individuals to post, at a minimal cost, messages and images that can be viewed instantly by global audiences. It is worth remembering that as recently as the early 1990s, such actions were impossible for all but a few world leaders, public figures and entertainment companies – and even for them only at select moments. Now millions take such abilities for granted.

When people combine Internet technologies with digital imaging software (e.g., videoconferencing), they can emulate face-to-face communication with numerous and distant others. Other software allows them to record and analyze such interactions. It is, therefore, increasingly easy for people to track the activities of large groups.[1] It is also worth noting that telephones, televisions and computers were once exclusively stationary devices. Now, the profusion of wireless technology removes stationarity as a necessary condition for distance communication.

Such advances are often hailed as harbingers of great advantages to come. At first glance, collective action seems likely to benefit. After all, new opportunities for low-cost communication seem like boons to many collective endeavors. But such optimistic appraisals overlook the possibility that evolving technologies can make some collective endeavors harder to maintain or easier to destroy. Consider, for example, collective endeavors that provide specialized information as a selective incentive for participants. If evolving

technologies allow individuals to acquire the information in other ways, it can reduce individuals' incentives to join. Many professional associations (e.g., the American Association for the Advancement of Science) face this threat as the content of their journals (e.g., *Science*, for which home or office delivery of the paper version was once a main draw for members) is increasingly available online. Alternatively, consider public goods such as national security and individual property rights. For such goods to be maintained, citizens must lend their support to extant arrangements rather than anti-system alternatives. If evolving technologies make insurgent activities more feasible, then incumbent public goods providers and the services they provide can be threatened. Technological progress need not imply collective benefit.

What kinds of collective goods do evolving technologies advantage and which collective goods do they endanger? Our attempt to answer this question has two steps. First, we deconstruct Olson's *Logic*. Then, we reconstruct it to make it stronger.

Our deconstruction begins by focusing on one of *Logic*'s key conditions – that optimal provision of a collective good requires that a group be *small* or *able to coerce its members* or *able to provide sufficient selective incentives to contributors*. Continuing the deconstruction, we show that a group's communicative capacity affects its ability to satisfy each part of the key condition and that evolving technologies can change these capacities. The logical conclusion of these changes undermines several widely held beliefs about collective action.

Consider, for example, the idea that "small groups are more efficient and viable than large ones" (*Logic*, 3). We find that evolving technologies weaken this claim, even making size irrelevant in some collective action contexts. Technologies have this effect by reducing groups' organizational costs (which otherwise grow with group size) or by making more difficult attempts to benefit from a group's effort without contributing to it. In other words, evolving technologies can make electronically transmitted symbols substitutes for "small group advantages" in collective action contexts.

While our deconstruction draws largely on Olson's insights, our reconstruction builds in insights from studies that did not exist when he wrote his classic treatise. The studies are: strategic communication models and bargaining models of coalition termination. The communication models show that decreasing communication costs – an effect that all of the technologies named above can have – need not make collective action more efficient. In the bargaining model we highlight, individuals can do nothing or contribute to one of three collective endeavors – an approach that differs from the convention of treating individual contributions to a collective endeavor as a product of a binary choice (i.e., "contribute to collective good X" or "do nothing.")

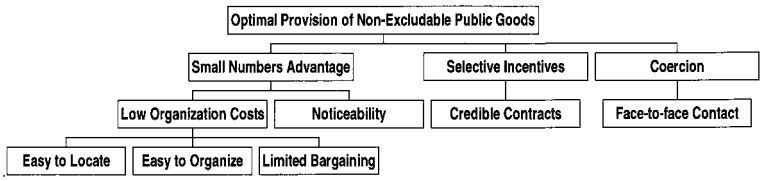

Figure 1. Our deconstruction of Olson's *Logic*

The model shows how evolving technologies affect the *relative attractiveness* of competing collective endeavors – causing some to fall apart.

In sum, evolving technologies affect opportunities and incentives that are relevant to collective action. As a result, they advantage some collective endeavors and endanger others. In this essay, we use Olson's *Logic* as the core of an approach that clarifies when and where each consequence occurs.

2. Deconstructing *Logic*

Our deconstruction of *Logic* begins by focusing on a necessary condition for optimal collective goods provision – a group must be *small* or *able to coerce its members* or *able to provide sufficient selective incentives to contributors*. We then deconstruct this condition, showing that the alleged advantages of small group size, coercion, and selective incentives each depend on underlying assumptions about communicative capacities. We follow these demonstrations with facts about how evolving technologies affect these capacities. The result is new insights on when evolving technologies help (and hurt) collective endeavors. Figure 1 depicts our deconstruction's structure.

Logic answers questions about the conditions under which non-excludable collective goods are provided optimally. Olson's approach builds from the premise that these questions "cannot be answered satisfactorily without a study of the costs and benefits of alternative courses of action open to individuals in groups of different sizes" (*Logic* 21). This approach reveals a deep conflict between personal desires and group goals.

> though all of the members of the group ... have a common interest in obtaining this collective benefit, they have no common interest in paying the cost of providing that collective good (*Logic*, 21).

Logic's main contribution is to clarify how this conflict is resolved. Its central result is:

> If the members of a large group rationally seek to maximize their personal welfare, they will not act to advance their common or group objectives

> unless there is coercion to force them to do so, or unless some separate incentive, distinct from the achievement of the common or group interest, is offered to the members of the group individually on the condition that they help bear the costs or burdens involved in the achievement of the group objectives. (*Logic*, 2)

While subsequent writers attacked various components of this conclusion, Olson defended it throughout his career, including in his final book:

> Groups can overcome the great difficulties of collective action and rationally serve their collective interests in only two circumstances. One is when the numbers in a group are fewþThe other circumstance that can enable a group to overcome the difficulties of collective action is the availability of selective incentives (Olson 2000: 87–88).

In such defenses, Olson identifies the necessary condition for collective action on which we shall focus – a group must be *small* or *able to coerce its members* or *able to provide sufficient selective incentives to contributors.* We now deconstruct the three parts of this condition in turn.

2.1. *Group size*

Olson claims that in collective action contexts, "small groups are more efficient and viable than large ones" (*Logic*, 3). We will show that evolving technologies dilute the power and reduce the applicability of this claim. We build our case by showing how evolving technologies affect *organizational costs* and *noticeability* – two factors that Olson cites (below) as causes for larger groups' comparative disadvantage.

> The standard for determining whether a group will have the capacity to act, without coercion or outside inducements, in its group interest . . . depends on whether the individual actions of any one or more members in a group are noticeable to any other individuals in the group (*Logic*, 45).

> [T]he larger the group is, the more agreement and organization it will need (*Logic*, 46).

Since communicative capacity affects both factors, and since evolving technologies can affect communicative capacity, we contend that the technologies weaken the correspondence between group size and collective success.

2.1.1. *Organizational costs*

Olson identifies "three separate but cumulative factors that keep larger groups from furthering their interests" (*Logic*, 48). The first two factors are reducible

to simple math – as the number of people in a group grows, there is a decrease in the *relative share of benefits* that any fixed-size subset of the group abstains from providing a collective good. The decrease also reduces incentives to contribute.[2] Since communication technologies do not alter this math, we turn to the remaining factor.

> Third, *the larger the number of members in the group the greater the organization costs* ... For these reasons, the larger the group the farther it will fall short of providing an optimal supply of a collective good, and very large groups normally will not, in the absence of coercion or separate, outside incentives, provide themselves with even minimal amounts of a collective good. (*Logic*, 48; underline added).

Elsewhere, Olson explains why communication costs increase with group size.

> [T]o establish a group agreement or organization will nonetheless always tend to be more difficult the larger the size of the group, for the larger the group the more difficult it will be to *locate and organize* even a subset of the group, and those in the subset will have *an incentive to continue bargaining* with the others in the group until the burden is widely shared, thereby adding to the expense of bargaining. In short, costs of organization are an increasing function of the number of individuals in the group. (*Logic*, 46; underlines added).

That the costs of locating and organizing and the costs of continued bargaining grow as does group size we treat as uncontroversial. For example, locating and organizing $N > 1$ items of any kind often takes more time that locating and organizing just one. This was especially true in the past. If group members were dispersed over a large space, then the marginal cost of locating and organizing additional members could be substantial. Moreover, more members means more possibilities for bargaining – at a minimum, an agreement must be struck with every additional member.

Evolving technologies, however, can affect both sources of organizational costs, particularly those associated with locating members. Political campaigns, for example, use electronic communications to motivate supporters and organize simultaneous public rallies in multiple and spatially dispersed places. Such levels of effectiveness were once impossible. When evolving technologies reduce organizational costs, the groups most affected are those for whom such costs were once prohibitive. If such costs are more likely to be prohibitive as group size increases then, all else constant, these technologies weaken the oft-cited bond between collective effectiveness and small numbers.

Turning to the impact of evolving technologies on the cost of continued bargaining, it is harder to draw a single inference. On the one hand, evolving technologies can decrease the expense of sending and receiving offers and counter-offers. So, evolving technologies can help groups that are otherwise crippled by communication limits that impede necessary bargaining. On the other hand, lower communication costs can prolong bargaining, and hence increase bargaining costs, by making it less expensive for participants to deliver demands.

2.1.2. *Noticeability*

Many people presume that free riding – attempts to reap the benefits of a non-exclusive collective good without contributing to it – becomes easier as group size grows. We find that evolving technologies weaken this correspondence. We bring this weakened correspondence to light by comparing privileged, intermediate, and latent groups – the three categories Olson used to organize and condense many theoretical insights. Consider his definitions of the categories:

> A 'privileged' group is a group such that each of its members, or at least one of them, has an incentive to see that the collective good is provided, even if he has to bear the whole burden of providing it himself. (*Logic*, 49–50).

> An 'intermediate' group is a group in which no single member gets a share of the benefit sufficient to give him an incentive to provide the good himself, but which *does not have so many members that no one member will notice whether any other member is or is not helping to provide the collective good.* (*Logic*, 50; underline added).

> [The latent group] is distinguished by the fact that if one member does or does not help provide the collective good, no other one member will be significantly affected and therefore none has any reason to act. Thus *an individual in a "latent" group, by definition, cannot make a noticeable contribution to any group effort,* and since no one in the group will react if he makes no contribution, he has no incentive to contribute. Accordingly, large or 'latent' groups have no incentive to act to obtain a collective good ... Only a separate and selective incentive will stimulate a rational individual in a latent group to act in a group-oriented way (*Logic*, 50–51; underline added).

While group size is irrelevant to the definition of a privileged group, it is inherent in the other definitions. Indeed, Olson equates large and latent groups

in the quote. Group size, however, is not really sufficient to distinguish latent groups from others. Instead, the definition's key distinction is *noticeability* – members' ability to notice each other's actions (or inactions). In the definitions of intermediate and privileged groups, individual actions are noticed; in latent groups, they are not. Noticeability matters because without it individual actions are not seen, which facilitates free riding.

Evolving technologies affect noticeability. The Internet, for example, reduces to near zero the marginal costs of sending messages to large numbers of people. It is also one of many technologies that reduce distance-related marginal costs (e.g., it costs many people no more to send an e-mail to Tokyo or Timbuktu than it does to send an e-mail to a person 10 feet away). Moreover, merging these technologies with database software allows people to record growing ranges of activities at shrinking costs, thus countering the potential for information overload. Each of these advances weakens the dependence of noticeability on small numbers.

We contend, moreover, that evolving technologies can be more important than size in determining a group's effectiveness. Compare, for example, the abilities of a small group with bad communicative capacity to that of a large group whose technology and individual communicative incentives yield effective tracking of large populations. The small group fails Olson's criteria of noticeability. In the large group, members' actions are noticeable. For them, evolving technologies allow electronically transmitted symbols to substitute for advantages in facilitating collective goods provision that Olson attributed to small numbers.

When evolving technologies convert venues where individual actions are effectively anonymous into settings where people can hold each other accountable for their actions, they can change whether or not groups are latent. But such technologies are not sufficient to prevent free riding. Preventing free riding requires that increased observational powers be *coupled with* the ability to reward or punish individual actions that are critical to collective success. Therefore, if evolving technologies are to break the dependence of collective effectiveness on group size, coordination with a system of selective incentives –discussed below – is necessary.

2.2. *Coercion*

In addition to small numbers, Olson cites coercion as a means for accomplishing collective ends. He focuses primarily on the role of coercion in the growth of labor unions (Chapter 3) and cites various means of compulsory membership as critical to union success. Earlier, however, Olson taps the same themes in his discussion of social pressures. Since this discussion is closer to a purely

theoretical statement, we use it to clarify how evolving technologies affect coercion's viability as means for inducing collective action.

Olson states that "Economic incentives are not, to be sure, the only incentives; people are sometimes also motivated by a desire to win prestige, respect, friendship, and other social and psychological objectives" (*Logic*, 60). In his subsequent definition of social pressures and the conditions under which they can be applied, who-knows-what-about-whom is a critical factor. Olson contends that

> In general, social pressure and social incentives operate only in groups of smaller size, in groups so small that the members can have face-to-face contact with one another (*Logic*, 62).

Olson's subsequent defense of this statement clarifies the kind of assumptions about communication technology that it was reasonable for him to make. It also clarifies how we should revise this contention. His defense is as follows:

> . . . in any large group everyone cannot possibly know everyone else, and the group will *ipso facto* not be a friendship group; so a person will ordinarily not be affected socially if he fails to make sacrifices on behalf of his group's goals (*Logic*, 62).

He then clarifies his intent in an eloquent footnote:

> If the members of a latent group are somehow continuously bombarded with propaganda about the worthiness of the attempt to satisfy the common interest in question, they may perhaps in time develop social pressures not entirely unlike those that can be generated in a face-to-face group, and these social pressures may help the latent group to obtain the collective good. *A group cannot finance such propaganda unless it is already organized* and it may not be able to organize until it has already been subjected to the propaganda; so this form of social pressure is probably not ordinarily sufficient by itself to enable a group to achieve its collective goals. It would, for example, seem unlikely that there would be much prospect of success in a program to persuade farmers through propaganda to further their interest by voluntarily restricting output, unless there were some captive source of funds to finance the effort. So this form of social pressure generated by mass media does not seem likely to be an independent source of coordinated effort to bring about the satisfaction of a common interest (Logic 63: fn. 8; emphasis added).

In 1965, the situation described in the footnote was undoubtedly correct. Decades later, however, evolving technologies reduce substantially the costs of communicating with large audiences.

At a minimum, a single farmer with an inexpensive PC, widely available software, and a low-cost Internet service provider can make a web page viewable by millions. If the farmer spends more, he can buy an electronic mailing list that allows him to send messages to thousands or potential contributors. Will these entreaties be persuasive? Later in the paper, we use insights from strategic communication models to address this question. For now, we merely recognize that when Olson wrote *Logic*, it was impossible for a single farmer (or any equivalently positioned individual) to communicate with numbers sufficient to provide the collective good in question. Now it is possible for this farmer to apply social pressure in a way that his grandfather would have thought unimaginable. Something fundamental has changed.

Devices that increase individual capacities for real-time monitoring allow for the imposition of "social pressures" that were once limited to groups whose members lived in close proximity. For examples, one need look no further than the virtual communities that emerge in e-mail based list servers, web-based chat rooms, and auction sites such as EBay. These collective endeavors generate valuable non-excludable benefits (in that the content they produce is public) by using software that records individual actions. Technologies allow participants to police destructive behaviors and enforce deliberative norms that promote collectively valuable interactions (see, e.g., Resnick and Zeckhauser N.d.). Such uses of technology weaken the claim that effective coercion requires small numbers.

2.3. *Selective incentives*

A selective incentive is an excludable good that is provided to contributors only. Communication technologies affect when selective incentives are effective. They do this because the application of such incentives requires a contract – explicit or implicit – of the following form: in exchange for my sacrifice of X today, some subset of the collective will provide me with selective incentives Y now or in a future period. Such contracts have terms that must be communicated and enforced to be effective. Therefore, the expected return from making or accepting such offers depends on people's communicative capacities; in particular, their credibility.

If members of a latent group offer a selective incentive contract to prospective contributors who are uncertain about the group's willingness or ability to follow the contract, then the offer is more likely to be declined. Communication technologies, however, can change which offers are credible. Suppose, for example, that an implicit contract promises a selective

incentive to be delivered within 10 days. If the potential contributor cannot track the actions of those who offered the contract, the promise may be seen as less likely to be kept. However, given a communication technology that allows less expensive or more effective tracking, the same transaction may becomes less risky and, hence, more likely to be accepted. Later, we turn to post-*Logic* branches of economic theory, such as strategic communication models, to further clarify the correspondence between evolving technologies and credibility.

How evolving technologies affect selective incentives is not limited to changing credibility. Some selective incentives take the form of "contributors-only" information. In cases where potential members find such information valuable, the incentive to join can be powerful. Evolving technologies affect such incentives in multiple ways.

On the positive side of the ledger, evolving technologies make many kinds of information less expensive to collect and distribute. Where previous generations needed to go to libraries or other physical locations to collect information, current generations can do so from anywhere that a suitable wireless device can operate. Where previous generations needed costly physical stock such as printing presses and paper to record and disseminate private information, current generations can record and store information on tiny microchips. And where previous generations had to pay relatively large costs to send bulky materials over long distances, recent generations send large documents through the air with the press of a button. All of these changes are a boon for those who want to offer information as an incentive to others.

On the other hand, the same technological advances may give prospective contributors opportunities to obtain information on their own, which reduce the value of the incentive. As professional associations are learning, for example, once journal content is available online – particularly to institutional subscribers – demand for memberships decrease. For such groups, evolving technologies make some collective endeavors more difficult to maintain.

3. Reconstructing *Logic*

Our deconstruction of *Logic* raises important questions about the conditions under which a group can act collectively. These questions concern the relationship between group size and collective effectiveness, the conditions under which selective incentives are a viable means for recruiting contributors, and the sustainability of currently successful collective endeavors. While Olson's *Logic* provides important clues about the impact of evolving technologies, we now refine these answers further.

We begin by using strategic communication models to clarify how evolving technologies affect credibility in ways that affect the viability of selective incentives. We then use a bargaining model to further clarify the kinds of collective endeavors that evolving technologies endanger.

3.1. *Strategic communication models*

We can use strategic communication models to better understand how evolving technologies affect credibility.[3] These game theoretic models have two basic types – *signaling models* and *cheap talk models*. For initial insights, we turn to seminal models. We then use more recent models to distill additional lessons.

The seminal *signaling model* (Spence 1973) focuses on the plight of an employer who seeks new workers. While the employer prefers to hire skilled applicants, she cannot observe applicants' skill levels in advance. However, she knows that skilled applicants can purchase a tangible good – formal education – at a lower cost than can unskilled applicants. Moreover, she can observe whether a particular applicant bought an education (i.e., obtained a degree). The model's conclusion is that the degree persuades the employer of an applicant's skill level if unobservable skill levels and observable education levels are sufficiently correlated.

The seminal *cheap talk model* (Crawford and Sobel, 1982) has similar dynamics. It features a speaker and a receiver. The receiver's job is to make a choice. Before the receiver chooses, a speaker advises her about the consequences of her choice. Unlike the receiver, the speaker knows these consequences. The model's conclusion is that effective communication requires a speaker and receiver to have *common interests*.

Both results share a common intuition: if choices that are good for the receiver also benefit the speaker, then the speaker has an incentive to reveal what he knows and the receiver should believe what she hears (see also Farrell and Gibbons, 1989). By contrast, if what is good for a speaker is bad for a receiver, and vice versa, then the opportunity cost of speaking (as compared to saying nothing) or of following a speaker's advice (as opposed to ignoring it) is high.

These findings imply that if group members employ a technology that decreases the cost of communication to large or geographically dispersed groups, the extent of interest commonality among group members affects the technology's impact. When interests are sufficiently convergent, evolving technologies can transform groups once crippled by large numbers into groups capable of collective success. As interests diverge, technology's impact diminishes.

Subsequent models further clarify how evolving technologies affect collective action. Consider, for example, models developed by Lupia and McCubbins (1998). They examine the effect of exogenous forces such as penalties for lying (a cost for making false statements), and threats of verification (with probability $0 \leq v \leq 1$, the receiver learns the truth value of the sender's statement before she acts on it). The implication of their work for *Logic* is as follows: when interest commonality *or external forces* (which they show to be substitutes for one another under specific conditions) provide sufficient incentives for truthful revelation, new technologies are best positioned to reduce organizational costs and increase noticeability. For groups whose desire to act collectively is overwhelmed by geographical distance or large numbers, such technologies can yield greater effectiveness. Moreover, if these technologies make verification easier to accomplish or penalties for lying easier to apply, then they can reduce uncertainty pertaining to selective incentive contracts – which can yield even more collective success.

Their findings also suggest collective endeavors that evolving technologies endanger. Consider, for example, situations where credibility requires costly signaling (e.g., cases where individuals otherwise lack sufficient evidence of common interests and where sufficient penalties for lying and verification threats cannot be implemented). In such cases, technologies that reduce signaling costs can reduce members' abilities to assess others' credibility. For example, before e-mail it was relatively costly for constituents to contact their congressional representatives. Therefore, when representatives were flooded with mail and phone calls from constituents, it was treated as a credible signal of public concern. Now, several technologies permit a constant deluge of citizen contact. While this change has salubrious aspects in other domains, large numbers of constituent messages are now less credible signals of public demand. To the extent that collectively beneficial activities still depend on such credibility inferences being made, evolving technologies make the activities less likely.

3.2. *Bargaining model insights*

The preceding sections clarify how technological advances affect collective actions. While such advances make new kinds of collective action possible, we now focus more on the endeavors they endanger. We do so by adapting a model of coalition termination, originally developed to explain the fall of governing coalitions in parliamentary democracies (Lupia and Strom, 1995). As applied here, the model clarifies when evolving technologies provide group members with the ability and incentive to exchange their contribution to current collective arrangements for other opportunities.

The model begins with the premise that individuals have a limited capacity to contribute to group efforts. In it, actors can contribute to no more than one of three collective endeavors and no collective endeavor succeeds without a minimal degree of participation – our model involves three individuals and we assume that a collective good is produced if at least two individuals contribute to it.

Initially, two of the three actors provide a collective good. We call the group containing these actors the *incumbent collective goods provider*. A third actor is not a contributor. A technological change then occurs, which can affect the utility consequences of available actions.

The actions available to each actor are: "contribute to no collective good", or "contribute to one of the three potential collective goods." The potential collective goods are those that are produced by each possible combination of two actors (e.g., actors 1 and 2 provide "good 1–2," actors 1 and 3 produce "good 1–3" and so on.) Each actor derives a distinct value from each collective good (e.g., actor 1 may derive more utility from "good 1–2" than from "good 1–3") and, as is true in *Logic*, "each individual in a group may place a different value upon the collective good wanted by his group" (*Logic*, 22; e.g., actor 2 may derive more utility from "good 1–2" than does actor 1).

Which, if any, collective good is provided follows a bargaining process in which actors make offers in exchange for contributions. Each offer specifies what share of available selective incentives will go to each actor. If actors make no offers and do not contribute to a collective good, then they pay no costs and receive a utility based on the value of any collective goods provided.[4] Otherwise, their utility is reduced by the amount of their contribution and the cost of making an offer.

Lupia and Strom (1995: 656) find that the incumbent collective good provider survives only if every possible pair of actors (i.e., every alternative collective good provider) contains one member who prefers the incumbent arrangement to either having no collective good provided or the best alternative arrangement available to it. Comparative statics reveal the kinds of incumbent collective goods providers that are most and least likely to survive. To see how, note first that if there exists an alternate collective good that provides individuals with greater utility than no collective good, then offers will be made to individuals who (1) suffer most if no collective good is provided, and who (2) derive little utility from the collective good that will result of other coalitions occurs. Such actors will have low bargaining power and require few selective incentives in return for a contribution

Evolving technologies have an impact by affecting the numbered factors. If, for example, evolving technologies increase the value of the outcomes individuals can produce without acting collectively, then these individuals have

greater bargaining power, which in turn reduces the set of selective incentive contracts they will accept, and can topple the incumbent collective good providing coalition. Put another way, technological changes that increase the utility of coalescing with other actors endangers incumbent collective goods providers not merely by giving contributors another place to go, but also by making them less likely to renew the existing terms of their selective incentive agreement.

Alternatively, by increasing noticeability, decreasing organizational costs, or increasing the range over which credible commitments are possible, evolving technologies can transform formerly unattractive partners into attractive ones. And what are the welfare consequences of such changes? The answer is not as obvious as it may first appear. Indeed, it is trivial to prove that evolving technologies need not increase produce social welfare. For an example, one need look no further than terrorist attacks on the United States and the ways in which cell phones, videotapes and the Internet helped to draw people from the collectives to which they once contributed to endeavors, such as Al Qaeda, that took thousands of innocent lives.

4. Conclusion

Evolving communication technologies affect several factors that used to distinguish effective collectives from ineffective ones. Technologies that reduce the cost of sending information long distances (or to many people) can reduce organizational costs, increase noticeability, and make ineffective communicative networks effective. If group members' interests are sufficiently common, or if they interact in contexts that induce them to share information, these technologies can also make selective incentives a more viable recruitment strategy. Evolving technologies, as a result, change which groups can and cannot act collectively; doing so in a way that undermines many widely held beliefs about the logic of collective action. In particular, evolving technologies can erase the disadvantages of being large – which should change the rule of thumb that many people use to distinguish latent groups from other kinds.

While it is natural to assume that any technology that reduces costs relevant to collective action makes it easier, we have also identified circumstances where evolving technologies create new problems. Such circumstances are characterized by technologies that make communication more difficult (by allowing key individuals to better mask their activities), increase the relative benefits of free riding, or increase the utility people can achieve without collective goods.

In sum, our work shows the importance of being more specific about the role of communication in theories of collective action. Without such specificity, it is difficult to understand whether and how technological advances that change communicative incentives and opportunities alter who joins with whom. We encourage other scholars to pursue this line of argument with even greater precision. In addition to extending the spirit of Mancur Olson's approach to the problem of collective action, such research will also extend *Logic*'s substantive legacy.

Notes

1. Gates (1999) describes how the evolution of such technologies has changed organizational capacity. Consider, for example, McDonald's restaurants who, through the use of evolving technologies, now can tailor marketing and internal allocation strategies around real-time tallies of sales at all of its restaurants.
2. "First, the larger the group, the smaller the fraction of the total group benefit any person acting in the group receives, and the less adequate the reward for any group-oriented action, and the farther the group falls short of getting an optimal supply of the collective good, even if it should get some. Second, since the larger the group, the smaller the share of the benefit going to any one individual, or to any (absolutely) small subset of members of the group, the less the likelihood that any small subset of the group, much less any single individual, will gain enough from getting the collective good to bear the burden of providing even a small amount of it . . . " (*Logic*, 48).
3. This description follows Druckman and Lupia (N.d.).
4. The correspondence between this essay's description and phenomena in the original model are as follows:

This article	Lupia and Strom (1995)
Collective goods	The policies produced by parliamentary majorities.
Individuals	Parties
Technological change	A change in the consequences of replacing the current government.
Contributing to a collective good	Membership in government
The share of available selective incentives	Power within the coalition
No collective good is provided	Dissolution

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