

How many people does it take to change a petition?

Experiments to investigate the impact of on-line social information on collective action

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Abstract

This paper tests the hypothesis that social information provided by the internet makes it possible in large groups to exert social pressure that Olson considered viable only for smaller groups. In two experiments - laboratory and field - subjects could choose to sign petitions and donate money to support causes. Participants were randomised into treatment groups that received varying information about how many other people had participated and control groups receiving no social information. Results suggest that social information has a varying effect according to the numbers provided, strongest when there are more than a million other participants, lending support to the social information hypothesis and to claims about critical mass and tipping points in political participation.

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The start of the twenty first century may well be remembered for mass mobilization. In 2002 large networks of younger activists proved to be a major political force in bringing the previously unknown Roh Moo-hyun to presidential power in Korea. In 2003 millions of people were mobilized rapidly across the world to demonstrate against their states' involvement in the Iraq war. In 2006 millions of US citizens protested against changes to US immigration policy - 500,000 in Los Angeles alone. In 2008 the United States elected its first black president, with record levels of turnout (particularly among black and first-time voters), community support, popular excitement and fund-raising from the general public. Mass demonstrations took place in Iran in protest at allegedly rigged election results in 2009, both organised and beamed across the world through internet-based communications. Political activism has taken on a global dimension, with mass demonstrations against corporate globalization attended by activists from all over the world and writing campaigns to world leaders attracting millions of supporters. Collaborative endeavours, such as the user-generated on-line encyclopaedia Wikipedia have attracted hundreds of millions of users within two or three years of their conception, with millions contributing time and effort apparently with common good goals.

What do all these developments have in common? Use of the internet played a key role. Yet the large groups that mobilized on-line around these causes should not exist according to one of the most famous classics of political science, written by the economist Mancur Olson, who must be turning in his grave. People should just drop out because of the small size of contributions and the incentives to free ride in large groups. Even after he wrote his treatise on the *Logic of Collective Action*, there was an unprecedented rise in interest group activity, which caused many

scholars to discard his claims and consign him to the history of political thought (Mueller, 1983, Crouch 1984). Does the rise in on-line mobilization mean it is time to bang another nail in the coffin of the *Logic of Collective Action*?

In fact the argument might work in Olson's favour. It could be that the very causal mechanism that Olson observed in small groups may now, in on-line environments, operate in large groups. Rather than size *per se*, Olson was really interested in the dynamics of groups' interaction, in particular the exchange of information about other participants' activities. His focus was small groups, where social incentives acted to keep people involved and to avoid free-riding, but he seemed to disregard such incentives as viable for large groups. But a new reading of *Logic* (Lupia and Sin, 2003) points to a footnote where Olson suggests that some sorts of media might exert the same kind of pressure, although at the time he wrote he envisaged the costs being out of reach of large latent groups. Lupia and Sin argue that the internet might scale up this kind of social incentive, while minimising the cost.

We test this hypothesis by examining social incentives at work when people are deciding whether to undertake a participatory act. Specifically, we look at how individuals use information about the participation of others as a way of making their decision about whether to participate or not. We label such information social information, borrowing from social psychology where social information processing is used to learn about individual behaviour by studying the informational and social environment within which that behaviour occurs and to which it adapts (Salancik and Pfeffer, 1977, 1978). Some disciplines use social information processing theory to provide a counter-argument to (for example) rational choice models in communications research (Fulk et al, 1987) or needs-based models in the field of administrative science (Salancik and Pfeffer, 1978), where behaviour is assumed to rest upon individual preferences and personality traits. In contrast, we use the term social information quite simply to indicate information about what others are doing or have done. Following the previous social science scholars whose work we review here,

we argue potential participants take this information (or, lacking this information, their perception of what it might be) into account when they are deciding whether to participate. But we believe this relationship between social information and actual participation is more complex than previous work has suggested, with both small and high numbers influencing participation.

Use of the internet as a forum for political mobilization means that there is more social information available. In countries with substantive levels of internet penetration (such as the UK, where it is now 63 per cent), many of the traditional acts of political participation are as likely to take place on-line as off-line, such as signing a petition, writing to a political representative, joining a pressure group or donating money to a cause. When such participation takes place on-line, there is a far greater possibility of the potential participant receiving real-time feedback information about how many other people have participated, something that someone who signs a petition in the street or throws money into a charity collector's bucket is unlikely to receive. The internet, therefore, changes the information environment in which people decide to participate and which scholars such as Olson analysed.

This paper investigates a growing phenomenon of the influence of social information on participation, seeking to shed new light on what motivates people to take part in collective action. This paper reports a laboratory-based and a quasi-field experiment to investigate the effect of social information in this changed environment. In both experiments, subjects were asked to sign petitions and to donate a small proportion of their turn-up fee to the cause of the petition. The experiments investigated whether seeing the numbers of other people signing (as opposed to not seeing them) influenced the willingness to sign and contribute and how the actual number of other people participating influences willingness to contribute and the direction of the influence.

First, we review the most relevant literature on social information and collective action, drawing in also work on collective action and the internet, where the internet has been hypothesised to change the information environment and influence collective decisions. We also

identify previous experimental research on which we built for our research design. Second, we outline our experimental design, hypotheses and methods. Third, we report the results of the two experiments and fourth, we discuss the implications of the findings.

Collective action and social information

In *The Logic of Collective Action*, Olson (1965) puts forward a thesis of when individuals can be incentivized to act collectively. He argues that, when organising around collective goods, small groups are more efficient and viable than large ones and that if they are not, they need to be able to coerce their members or provide selective incentives to contributors

Olson discusses collective action and group size by dividing groups into three types. First, in a small privileged group, members, or at least one of them, have an incentive to see the collective good is provided, even if they have to bear the whole burden of providing it themselves. Second, in an intermediate group no single member gets a share of the benefit sufficient to give him an incentive to provide the good himself, but the group does not have so many members that no one member will notice whether any member is or is not helping to provide the collective good. Third, in a large latent group, if one member does or does not help provide the collective good, no other member will be significantly affected and therefore none has any reason to act. Thus an individual in a latent group 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. So only a separate and selective incentive will stimulate a rational individual in a latent group to act in a group-oriented way.

As noted in the introduction, some writers speculate on how widespread use of the internet could affect Olson's thesis, particularly in terms of reducing the costs of co-ordinating and participating in collective action (Bimber, 2001, 2003, 2005; Klotz, 2004; Krueger, 2002; Lev-on and Hardin, 2007, Lupia and Sin, 2003). But most pertinently for our purposes, Lupia and Sin (2003)

discuss noticeability, its inverse relationship with group size and the possible effect of the internet's capacity to provide social information as a form of coercion. Although Olson does not discuss social information explicitly, he does discuss the effect of social pressure to incentivize group members to participate, but discards it for larger groups; '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' (Olsen, 1965: 62). Lupia and Sin point to a 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.' (Olson, 1965: 63, fn8, Lupia and Sin's emphasis). Lupia and Sin point out that although the situation described in the footnote was undoubtedly correct when Olson was writing, decades later 'evolving technologies reduce substantially the costs of communicating with large audiences' (Lupia and Sin, 2003: 324). The internet and related technologies could revise the ability of large groups to apply such social pressure, via the provision of social information. It is this possibility that we test here.

Other approaches to understanding the relationship between social incentives and collective action include that developed by the sociologists Marwell and Oliver, who claim (contra Olson) that larger groups may actually find it easier to form, as their size makes it more likely they will be able to attain a 'critical mass' of activists who organise around public goods (Marwell and Oliver 1993). Marwell and Oliver argue that the costs of collective action around many public goods vary little with group size, due to jointness of supply; the cost of lobbying for a policy change, for example, is the same regardless of the number of potential contributors. In these

cases it is irrelevant to those who contribute how many others over and above the critical mass are out there, so free-riding is unlikely to be problematic: 'When a "social" solution to the collective dilemma is required, what matters is the relationship among the possible contributors in the critical mass, not the relationship among everyone in the interest group' (Marwell and Oliver: 1988: 60). So larger groups are just as likely to exhibit collective action as smaller ones, and indeed under some conditions more likely, as they are more likely to be able to assemble a critical mass of activists.

Although Marwell and Oliver's argument is persuasive in terms of justifying how large groups form contrary to Olson's predictions, their consideration of social information is incomplete. From their analysis, it is unclear how people estimate the potential size of the group or when a group reaches critical mass; nor do they develop a hypothesis of what critical mass might be. It is assumed that key participants 'make such big contributions to the cause that they know (or think they know) they can "make a difference"' (Oliver and Marwell, 1988: 7). It seems at some points that Marwell and Oliver envisage quite a small number of highly active actors for critical mass: 'larger groups....are more likely to have a critical mass of highly interested and resourceful actors' (Marwell and Oliver, 1988: 1). But they are writing in the pre-internet era, when co-ordination on a large scale was difficult to conceptualise. There are other pointers that suggest that had they been able to envisage the type of large-scale activity that can take place via on-line networks, they might have believed critical mass to be somewhat larger: 'It is not whether it is possible to mobilize everyone who would be willing to be mobilized....Rather, the issue is whether there is some social mechanism that connects enough people who have the appropriate interests and resources so that they can act' (Marwell and Oliver, 1988: 6). It could be that the internet provides this social mechanism, in the form of social information about the participation of others.

In the end, Marwell and Oliver leave a lot of questions unanswered. To answer them we turn to the work of Thomas Schelling, who considers the effect of social information on participation in the provision of collective or club goods and has also developed models of what critical mass might be in particular contexts. In *Micromotives and Macrobehaviour* (1978), Schelling points to a number of examples where people's behaviour would depend on information about how many people were behaving in a particular way; for instance, how many people attend an optional seminar, how many play volleyball how frequently, how many applaud and how loudly; how many leave the dying neighbourhood and how many people leave a failing school (Schelling, 2006: 94). He argued that the actual number representing critical mass would vary by context, but also by person (Schelling, 2006: 9). He labelled the critical mass for any individual 'k', by which he means the percentage of people expected to participate which that individual will see as sufficient for them also to participate and argued that 'k' was normally distributed, which would give an 'S'-shaped curve of people participating, shown in Figure 1. For the type of situations we analyse here, such an argument would suggest that where people think that around 45 per cent of people will participate (or receive the information that equivalent numbers have participated), the number of participants will rise sharply, because the majority (in the normal distribution of 'k') were 'waiting' for this point, representing 'critical mass' in Marwell and Oliver's terms. Whereas an investigation of 'k' is outside the scope of these experiments, we found Schelling's 'S' shaped curve useful in building our own hypothesis. Although some of his models have been extensively tested in experimental work in market settings and Colomer has adapted and developed the model for political participation (Colomer, 1995; 2010), there is no empirical test of the model for public goods.

[Figure 1 about here]

No discussion of collective action and social information would be complete without a discussion of the bandwagon effect. This comes from the field of political psychology, where researchers have argued and attempted to show that social information will lead to a bandwagon effect, a label given to a situation where the information about majority opinion will cause individuals to rally to the majority opinion. Conversely, an underdog effect is held to exist if the information causes some people to adopt a minority view (Marsh, 1985). Studies of the bandwagon effect are usually carried out on voting behaviour (where opinion polls are the social information studied) but have also been applied to public opinion on key policy issues (see Nadeau, Cloutier and Guay, 1993), reflecting the concern of such research with opinion formation. Researchers into the bandwagon effect are interested in whether potential participants change their views in response to knowing the views of others. In this sense, such research is distinct from that reported here, where the concern is with people's willingness to incur costs to support an issue with which they already agree, rather than the likelihood of them changing their mind. However, given that the effects of social information on these different parts of the decision making process can be difficult to distinguish, we use the bandwagon idea to provide an alternative hypothesis below for what effect social information might have. In fact, empirical support from experimental, quasi-experimental and non-experimental research for the bandwagon effect is sparse (see Nadeau et al, 1993 for a review but also Cain, 1978; Riker, 1986; Blais et al, 1990 who suggest that strategic voting has muddied the evidence). Where empirical support has been found in an experimental setting, it suggests that the generalised effect is around 5-7 per cent (Nadeau et al, 1993). That is, when subjects were told that opinion was growing for an issue, it meant that they were 5-7 per cent more likely to support this issue themselves, compared with a control group who were given no such information. But results like these do not lead to a curve to hypothesise the relationship between predicted and actual support; Nadeau et al (1993) found only an 'absolute' effect of information about trends with no

numbers and Marsh (1985) also found that although information about dynamic public opinion trends had an effect on support, information about static public opinion had no effect. Meanwhile, various mathematicians have attempted to plot the bandwagon curve, mostly for small numbers voting such as coalitions (Brams and Riker, 1972; Brams and Hellman, 1974) although Straffin (1977) applied it to large voting bodies. These models are highly context specific and are all applied to voting, so can do little to predict the impact of social information on participation.

Finally, the field of communication studies includes a number of excellent reviews of the possibilities for the internet to facilitate collaboration and reduce collective action problems, notably Lev-On and Hardin (2007), Bimber (2001, 2003, 2005) and Lupia and Sin (2003), which are of relevance to this study. In particular Bimber (2001) tested for a relationship between information availability and political engagement using survey data about Internet use (finding little evidence of a relationship except for donating money), although he looked at the political information environment more generally rather than social information as investigated in this study. In the field of internet studies (broadly defined), considerable research effort has been devoted to investigating the production of on-line collective goods, particularly the user-generated encyclopaedia Wikipedia (for example, Loubser, 2009), but most quantitative work of this kind looks at governance mechanisms, divisions of labour and quality and performance in such goods and is based on the textual and structural analysis of articles. Some of this research has started to probe into motivations for participating in collective endeavours such as Wikipedia (see for example Lerner and Tirole 2002; Lakhani and von Hippel 2002; Lakhani, von Hippel and Wolf, 2005; Anthony, Smith and Williamson, 2007), but these studies do not test the effects of social information.

So far this review has made a case for reviving one of Olson's lines of argument through on-line social incentives. It has highlighted the possibility of critical points in participation rates, where participation reaches some kind of critical mass or tipping point that encourages others to

participate. In the next section, we show there is a range of experimental work looking at information effects in collective action, some of which focuses on social information and some which focuses on internet-based participation. Though none focuses on both, this paper uses them as foundations for an experimental evaluation of collective action.

The experimental method

Experiments provide the best way to evaluate how different kinds of social information affect participation, as the treatments can be manipulations of the kind of information, something that is highly tractable with current internet technology. Perhaps surprisingly, we have found little other experimental work tackling this question. The main example is Goldstein et al's (2008) widely reported experiment with the recycling of towels in hotels where a treatment group receiving a message to say that 75 per cent of other guests had recycled their towels was 26 per cent more likely than those who saw the basic environmental protection message to recycle towels themselves. Where participants were given even more local information, that is feedback information on the past recycling behaviour of guests who had used the same room, the difference with the control group was even greater at 33 per cent. Schultz (1998) conducted a randomized controlled trial examining the impact on recycling behavior of providing written feedback on individual and neighborhood-recycling behavior, finding significant increases from baseline in the frequency of participation and total amount of recycled material. The most influential treatments were door-hangers telling households the average amount of material collected from householders and the percentage participating in recycling in their locality (c. 200 houses) last week and this week. Gerber, Green and Larimer (2008) ran a large-scale field experiment to investigate the effect of social pressure on voter turnout, but in this case social pressure was applied through the effect of voters feeling that their own lack of participation

would be observable to their household or neighbours, rather than being influenced by aggregate information about what their wider community was doing.

Other work uses experiments to examine information effects on motivations to participate, but focuses more on the technology or application than social norms or information. With the related but distinct aim of examining the effect of perceptions of risk on participating in political activities, Best, Krueger and Ladewig (2007)'s experiments show that the public perceives on-line activities (such as volunteering time, donating money and signing a petition) to be riskier (in terms of an adverse consequence such as stolen personal information arising) than comparable offline ones, suggesting this as an explanation for low levels of on-line participation in comparison to offline environments (and contrary to the hopes of some observers) Best, Krueger and Ladewig, 2007: 15). Similarly, Ostveen and van den Besselaar (2004; 2006) report experiments to test the impact on voting behaviour of the perceived security of electronic voting systems, showing that the more trusted and secure a voter perceived a technology to be, the more likely they were to vote more radically. Xenos and Kyoung (2008) carried out a controlled test of the effects of youth-oriented political portals, finding only weak effects for exposure to such portals on self-reported cognitive engagement with election information. But in general there is little experimental work looking at social information effects on on-line mobilization around public goods.

Hypotheses

The purpose of our experiments is to test how social information provided via the internet affects collective action. Does such information result in the type of social pressure referred to by Olson? And is such social pressure maximised when numbers are small (so that an individual feels their action to be more noticeable) or large (so that an individual feels more bombarded with social pressure and other social incentives)? Our expectation is that information about the preferences of others will affect people's decision whether to incur costs in the pursuit of collective action. If

people know (for example) how many people have signed a petition, we hypothesise that it will affect their willingness to sign or to incur other costs in the pursuit of the issue that is being petitioned for. This generates two hypotheses:

H₁: a large number of other petitioners will encourage individuals to incur costs and sign up, providing the social pressure referred to by Olson and the likelihood of critical mass predicted by Marwell and Oliver, and Schelling.

H₂: a small number of petitioners will encourage individuals to incur costs, because they perceive that their contribution is more likely to make a difference, as originally hypothesised by Olson.

Verification of both of these hypotheses would lead us to believe that in the earliest stage of a petition, there would be very rapid joining in response to feedback information, as people feel that their contribution would make a difference. In later stages we would then expect the information to have little or even a negative effect, as people feel that they will not make much difference. At a certain point, when critical mass was reached, the information would again have a dramatically positive effect because high numbers of other signatories would exert a social pressure on individuals to sign. This would give us an overall pattern of participation that looks a little like the s-shaped diffusion curve of participation hypothesized by Thomas Schelling, shown in Figure 1 above.

The combination of these hypotheses contrasts with what we might expect from bandwagon effects. That is, the bandwagon effect would suggest a generalised linear effect of social information; the more people who support an issue, the more likely any individual is also to support it. So for a bandwagon effect we would expect a continuously positive effect of information about the participation of others, which would continuously accelerate in a cumulative way. In contrast to Schelling's s-shaped curve this effect would yield a straight line or logistic curve with a rising slope.

Research Design

The experiments tested these hypotheses by exploring the effect of information about the mobilisation of others on any one individual subject's willingness to incur costs in supporting a collective issue. In the first lab-based experiment, forty-seven individuals were randomly pooled from OxLab's subjects database (which includes both students and non-students from the city of Oxford). We provided both groups with a list of six petitions that were active at the time of the experiment on the website of the Prime Minister (<http://petitions.number10.gov.uk/>) and asked first, whether they agreed with the issues being petitioned for; second, they were asked to browse the internet during ten minutes in order to inform themselves about the given petition's issue; and third, they were queried whether they (a) would sign the petition on the issue and (b) whether they would donate a small proportion of their participation fee towards supporting the issue (or against the petition if they declined to sign it). Participants were divided into two groups: individuals assigned to the treatment group received information about how many people had signed the petition (petitions had varying numbers of signatories) whereas subjects in the control group received no such information. As we sourced the petitions from the No.10 Downing Street website, access to it was blocked during the experiment to prevent those in the second treatment from finding this information. Subjects provided socio-demographic information, attitudes, perceptions of the experiment and levels of Internet ability in a post-experiment questionnaire. Subjects were incentivized to participate by a payment of between £12 and £15, depending upon the amount they chose to donate to the various causes. All subject information was fully anonymised and no addresses were collected.

Participants were asked to consider six petitions. These addressed the following issues (the number of signatories provided to the treatment group are shown in brackets):

1. To introduce a tax on plastic carrier bags (665,768)

2. To exert pressure on the Japanese government to halt its programme of whaling (9)
3. To create a new public holiday, the National Day of Remembrance (369,492)
4. To provide free prescriptions for asthma sufferers, unrelated to income (11)
5. To employ a policy of an opt out system (instead of opt in) for organ donation (1,234,117)
6. To scrap the introduction of compulsory identity cards (6)

In order to avoid using deception in the experiment, subjects were presented with existing petitions and their actual numbers of signatories. Subjects did not actually sign the petitions during the experiment, but were provided with the opportunity to do so after completion of the experiment. All the donations that subjects chose to make were cumulated and were actually made by the research team to the causes supported after the experiment.

The quasi field experiment used a larger subject pool: 668 people, contacted and recruited from OxLab's subject database, who participated in the experiment remotely using their own internet connection. Through a web interface we designed, participants were asked to consider six issues successively and for each (a) to express their willingness to sign a petition supporting the issue and (b) donate a small amount of their participation fee to supporting the issue (or against the petition if they declined to sign it). In order to sign a petition subjects were required to provide name, email and address. While they did not really sign the petition this meant they had to incur some costs to support their statement. Participants could donate 20p towards every issue and the sum was then doubled by the experimenters. Subjects were randomly allocated across a control group (of 173) and a treatment group (of 495). All participants received the same six petitions but carrying different social information: In the control group, participants received no information about other people signing. In the treatment groups, subjects were shown two petitions in each of the following categories:

- Petitions with a very large numbers of signatories ($S > 1$ million),

- Petitions with a medium numbers of signatories ($100 < S < 1$ million),
- Petitions with very low numbers of signatories ($S < 100$).

The sub-treatment groups were as follows:

Group B (164) received two 'low-numbered' petitions, two 'high' and two 'middle'

Group C (171) received two 'middle-numbered' petitions, two 'low' and two 'high'

Group D (160) received two 'high-numbered' petitions, two 'middle' and two 'low'

In order to eliminate systematic biases of individual petitions the order in which participants were presented with the six petitions was randomized.

We incentivized the participants with a small payment (£6-£8), which varied according to the amount they chose to donate, which we paid with Amazon.co.uk vouchers. There was a pre-experiment questionnaire to establish the extent to which participants agreed (or not) with the issues in the petitions. Again, we anonymised all subject information and did not collect addresses.

The petitions were (with the high, medium and low numbers provided shown in brackets):

1. National governments should put pressure on the Chinese leadership to show restraint and respect for human rights in response to protests in Tibet
(High: 1,682,242, Medium: 1,189, Low: 76).

2. National governments should negotiate and adopt a treaty to ban the use of cluster bombs
(High: 1,200,000, Medium: 330,000, Low: 7)

3. Governments should lobby the Japanese government to stop commercial whaling of the Humpback whale
(High: 1,082,808, Medium: 57,299, Low: 98)

4. Governments should support a stronger multinational force to protect the people of the Darfur region of Sudan
(High: 1,001,012, Medium: 5,978, Low: 16)

5. World leaders should negotiate a global deal on climate change
(High: 2,600,053, Medium: 575,000, Low: 53)

6. Governments should work to negotiate new trade rules – fair rules to make a real difference in the fight against poverty
(High: 17,800,244; Medium: 22,777, Low, 25).

Again, there was no deception. The petitions were shown in generic format (to control for the reputation effect that different web platforms would bring), yet the numbers of signatories shown to the participants were taken from existing online petitions that had been created on these issues with different numbers of signatories (low, medium and high). The issues were all selected to be of international significance and petitions used were all drawn from across different geographical spaces and points in time (during the last three years). Again, subjects did not actually sign the petitions in the experiment, but at the end of the experiment the interface directed them to a site where they could. The research team made the donations to the causes when the experiment finished.

Results

As there were six petitions in both laboratory and field, we stacked the data so as to examine the variation according to the numbers of signatories that subjects could see before signing, which yielded a total of 282 person-petitions for the laboratory and 4008 for the field. In the initial lab-based experiment, we found that 59 per cent of petitions were signed overall; 54 per cent in the control group and 63 per cent of the treatment group (those who received information about other people signing). We identified one issue (out of six) where subjects were significantly more likely to sign a petition if they received information that many other people had signed than if they received no information. This petition was the one supporting an opt-out system for kidney donation, the only one for which the number of signatures was over a million (1,234,117), suggesting a possible hypothesis that the threshold at which social information makes a difference could be one million. Across the six petitions there was a positive correlation with the number of other signatories (for high numbers) and an individual's likelihood of signing. The numbers of subjects were too small to come to firm conclusions about the distribution of effects on people's likelihood to participate. But the identification of a distinct effect for high numbers on the

propensity to sign and a weaker effect of medium numbers on propensity to donate (see below) fed into the design of the larger quasi-field experiment.

For the quasi-field experiment, 61.5 per cent of the petitions presented to the control group were signed. Of the petitions presented with low numbers, slightly less (-0.9 per cent) were signed and for those presented with medium numbers, slightly more (+1.9 per cent) were signed. For those presented with high numbers, 66.7 per cent were signed (that is, 5.2 per cent more than in the control group) and this result is statistically significant ($p=0.015$). The percentage of participants signing each petition are shown in Figure 2, compared with the proportion of people signing in the control group (shown as the base line). The figure shows clearly that for all petitions, high numbers had a positive effect. This is statistically significant for the climate change and fair trade petitions, measured by a Chi^2 test. This effect was strongest for the petition on fair trade, which also had by far the highest number of signatories in this category (17.8 million), leading to a possible hypothesis that the effect of high numbers varied according to the magnitude of the number of other signatures. But when we tested this hypothesis by using the logarithm of the number of signatures in a regression, we found no statistical significance.

[Figure 2 about here]

A stronger test for the actual willingness of a subject to support a petition is whether or not the subject would also commit to a donation. This would cost the subject real money and was a chance to put the money where the mouth is. On average two-thirds of those who signed a petition went on to make a donation. Interestingly, an as yet unexplained feature of the patterns of donation is that for each petition in the larger experiment, almost exactly two-thirds of those who signed went on to donate, suggesting a universal effect. Even with the rather different

experimental set-up and much smaller numbers in the laboratory experiment, a similar effect could be observed.

[Figure 3 about here]

A similar graph indicating the proportion of participants in the field experiment donating to petitions compared to the control group (broken down into petitions and treatments) is shown in Figure 3. Here the effect of the numbers is less clear, but low numbers have a negative effect in most cases except the petitions on whaling and on Darfur and high numbers have a small positive effect in all but one (the petition on cluster bombs). The difference between signing and donations is interesting, possibly due to the fact that less people donate than sign (40% versus 63%). It seems that these individuals have a higher threshold for donating and are consequently less influenced by high numbers and more easily discouraged from doing so by low numbers of other signatories.

Regression Analysis

Looking at the results across the two experiments, we run logistic regressions with signing as the dependent variable. In order to test the impact of each treatment, we run separate models for subsets of the data comprising participants of one treatment and the control groups (N=2028) and use the high, medium and low numbers as independent variables indicating social information. As the data is stacked in person-petitions, we apply a Huber-White correction to the regression coefficients in order to adjust for clustered standard errors.

We hypothesised that prior agreement to a given petition (measured in the pre-experiment questionnaire) would be a determinant of signing and should hence be included as control variable. Subjects who indicated that they strongly agree with an issue will be likely to sign the respective petition - no matter how many others have signed. Conversely we would not expect

someone to sign a petition if he strongly disagrees with the issue. Furthermore, it seemed likely that the effect of social information on an individual's likelihood to sign could vary according to the extent to which she supports the issue at stake. We hypothesised that the subjects most likely to be affected by our treatments would be subjects who do not have very strong opinions about the issue, but who express mild support opposition or indecision in the pre-questionnaire. Initial support varied across the issues; Climate Change (P5, 92%) and Fair Trade (P6, 91%) were by far the most popular issues while the Protect Darfur (P4, 77%) and End Whaling (P3, 79%) had more opponents and also the highest numbers of undecided subjects (14% and 11% respectively). As we might expect, this initial support is related to the percentages of the control group (who received no social information) who signed petitions; whaling was the least popular issue (56% of participants signed), followed by Tibet (60%) whereas climate change was the most popular (67%).

Table 1 shows the regression results for signing petitions in the laboratory and field experiments respectively. As expected, initial support for the issue had a strong positive effect, with significance at the 0.001 level. We were most interested in the impact of social information, for which we fed dichotomous variables for 'high', 'medium' and 'low' numbers. Only for high numbers did we observe a consistent effect on the likelihood of signing, significant at the .01 level for both laboratory and field experiments. To interpret the latter, we calculate that the change in likelihood of an individual signing a petition if she is shown that there is a high number of other signatories, all other things being equal, is +10%.

[Table 1 about here]

Donating to a cause, shown in Table 2, is the next step towards supporting an issue. Here, the initial support for the issue had a weaker effect on likelihood of donating for the laboratory experiment but was still strongly significant for the field experiment. For the laboratory

experiment, the middle numbers treatment had a modest negative significance at the $p < 0.1$ level, meaning that participants were less likely to donate when provided with the information that more than a hundred but less than one million other people had signed (actually, given the actual numbers used, middle numbers ranged from 300,000 to 600,000). In the quasi-field experiment, we found no effect for the low-numbers or middle-numbers treatments.

[Table 2 about here]

Discussion

Our core claim is that the large-scale movements of today operate in a way that would be comprehensible to the classic writers on collective action. For Olson, we see that the mechanisms he described for small groups seem to apply now in the age of the internet, to large groups. We did not observe the type of social pressure that would for him, cause a steadily rising participation at the low levels of participation; in fact, information that numbers were small seemed to have a negative effect for many of our petitions. But we did observe this effect at higher levels of participation, lending support to Lupia and Sin (2003)'s hypothesis.

For Marwell and Oliver, again we found no evidence for the type of critical mass of highly resourced actors that they envisaged. But we did find evidence for their argument that even in the pre-internet era, for large groups a larger number of people could incur smaller costs with weaker ties than Olson envisaged and the evidence we found for a tipping point at the higher end lends support to their hypothesis that some kind of punctuation occurs. The figure of one million seems higher than Marwell and Oliver (1988:1) envisaged (but did not enumerate for large groups) when they wrote of a 'critical mass of highly interested and resourceful actors'. But it could be that the provision of social information on-line provides an integrative mechanism which allows critical mass to grow, as the costs of both participation and co-ordination reduce. Marwell and Oliver

noted that if society were organized randomly 'it may be especially difficult and costly for the small number of potential contributors in a very large interest group to find one another and coordinate their actions' (6), but go on to point out that social ties are not distributed randomly and 'potential political activists associate themselves with events and organizations expressing their political concerns', thereby presumably forming networks. The internet accentuates this 'non-randomness' of social ties, providing co-ordinative mechanisms via a network of weaker links, which could come to include mere information about what the others are doing.

With these two preliminary experiments, we support Schelling's argument about a 'winning point', where social information really kicks in; the place where most people now feel that the number of expected participants is sufficient for them to participate. Our experimental set up did not allow us to estimate or provide the size of the latent group – so we could not make any claims to have verified Schelling's identification of 45 per cent as this critical mass point. Nor can we make any assertions about the lower end of the diffusion curve, where Schelling's argument depends crucially upon a small percentage of people for whom 'k' is low or zero (Schelling, 2006: 105-6), but clearly this would be a fruitful line of enquiry. The fact that we saw no relationship between the number of participants and social information after the one million mark suggests that the higher end of the participation curve is shaped in a complex way that Schelling envisages. Our experiments have established that particular tipping points and the structure of the curve will be important in predicting participation.

Researchers into the bandwagon effect would find less comfort from the results. Evidence of crucial points where social information makes a difference, others where it does not, and others where it has a negative effect, goes against the hypothesis based on bandwagon influences. As discussed above, these researchers have tended to test the effect of dynamic information about trends rather than static information about actual numbers, meaning that it is unclear where they would expect the bandwagon effect to start. But even if we were to hypothesise from our results

that it kicks in at one million, if the bandwagon effect was the most important influence here, we would have expected to see a continuously increasing influence of social information after the crucial 'million' was reached, which we did not.

Conclusion

We have come to praise Olson rather than bury him, albeit the praise is rather faint. That is, by reinterpreting one of his lines of argument for the internet era, we have found evidence that his claims about social pressure in small groups could be extended in a low cost way to large groups, making his argument more compatible with the widespread mobilizations that have taken place in the last decade. Likewise for Marwell and Oliver, we have provided evidence to support their idea of critical mass in the light of internet-enabled mobilization, although it will be a much larger mass, integrated via far weaker ties, than they imagined. In the particular circumstances examined here, where participants are in a local setting but are being presented with potentially enormous numbers of participants with global reach, it suggest that critical mass for some of our subjects was around one million.

Internet-enabled social information does not challenge the assumptions of these authors, rather it remodels the cost benefit equation of political participation. These experiments suggest that trends and patterns of participation are more complex than either of these arguments anticipated and that a more nuanced model is required. Our experiments test a portion of Schelling's diffusion curve, but the results suggest that further research along these lines could prove fruitful. There seem to be key points where social information makes a significant difference. We also found some evidence for a limited negative effect of information that middle and low numbers of other people have participated, supporting the lower end of Schelling's diffusion curve.

While internet research abounds with claims of how the internet enhances political participation, empirical evidence is scarce. Experiments of this kind could prove to be a fruitful way to establish specific internet effects (as they have in the field of public administration where members of the same research team have used experiments to investigate how citizens find government-related information on-line, see Escher and Margetts, 2007; Margetts and Escher, 2008; Dunleavy et al, 2007). These results provide insight into the influence of one type of social information; the raw numbers of other people participating, but there is potential for further investigation into the influence of other types of social information. In our experiments, subjects could only see the raw numbers of other people currently participating, rather than any information about the personality of other participants, their socio-demographic status, or their experience of past participation. Newer features of the internet allow the provision of these other types of information, particularly those associated with so-called 'Web 2.0' technologies based on user-generated content, which include recommender systems, reputation systems, blogs, user feedback applications, video sharing sites and discussion streams such as Twitter. When used for political activity, these applications allow participants to see many other types of social information. For example, they can see other participants' comments and feedback in real time and information about how people 'like them' in terms of preferences have behaved. They can see what other participants are willing to pledge if other people also participate (see www.pledgebank.org). These types of social information are likely to have an even greater and more complex effect on political participation. The experiments reported here should be helpful in providing a pointer for future study of the implications of these other types of social information.

As well as having methodological and theoretical implications, research of this kind could also inform design of participatory initiatives, in terms of when it is good to give information and when it is not. In designing the experiment, we found a huge range of on-line petitions set up by non-governmental organizations and individuals, some of which gave no information at all about

how many people who had participated and some of which gave full information. Our findings suggest that there are circumstances where it makes sense to withhold such information (when numbers are below a million) and circumstances where it makes sense to provide it (when numbers are higher than one million), as well as circumstances where it makes no difference.

The phenomena noted in the opening paragraph of this article point to the changing scope and nature of mass mobilization, for example in terms of size and geographical reach and demographic make-up. We do not make any claims about the effectiveness of these mobilizations; indeed, at the time of writing President Roh has left office under a cloud of scandal and committed suicide, war is still being fought in Iraq, the ruling powers in Iran have resisted the protests and President Obama, although still massively popular, faces a towering weight of expectation that some doubt he will be able to fulfil. But the significance of these mobilizations remains as an indication of a changed environment for political participation. Understanding this changed world will be a key challenge for political science in the future. In the US for example, the 2008 election of Obama was massively affected by the cumulation of millions of small-scale activities (such as video-sharing, micro-participation in the campaign, individual donations) with readily available information about these activities (such as video downloads, activities undertaken, donations made) shaping patterns of participation. This was a true change in the light bulb of political participation, alluded to in the title of this paper. Such an increase in political participation is enabled by the vast reach of internet, where it takes both no-one and everyone to change a petition. In this way, these experiments show the importance of the increasing automation of political activity and the capacity of the internet to provide real-time information about the participation of others.

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Appendix 1: Wording of Petitions and Numbers Presented to Subjects

Petition 1: Tibet

Statement: *National governments should put pressure on the Chinese leadership to show restraint and respect for human rights in response to protests in Tibet.*

Petition: We the undersigned call on the government to call an urgent meeting of the United Nations Security Council to discuss the current situation in Tibet and we petition Chinese President Hu Jintao to show restraint and respect for human rights in your response to the protests in Tibet, and to address the concerns of all Tibetans by opening meaningful dialogue with the Dalai Lama. Only dialogue and reform will bring lasting stability. China's brightest future, and its most positive relationship with the world, lies in harmonious development, dialogue and respect.

High: 1,682,242 [Avaaz, live]

Medium: 1,189 [my-cause-com]

Low: 76 [Downing Street, live].

Petition 2: Ban Cluster Bombs

Statement: *National governments should negotiate and adopt a treaty to ban the use of cluster bombs.*

Petition: Cluster munitions have no place in a civilised world. We the undersigned petition all governments meeting in Oslo in December 2008 to negotiate and adopt a treaty to ban cluster bombs with no exceptions, no delays and no loopholes, and provide all necessary assistance to affected communities and victims.

Medium: 330,000 [Handicap International <http://www.handicap-international.org.uk>]

Low: 7 [No. 10 Downing Street]

High: 1,200,000 [International Campaign to Ban Landmines, organised by Handicap International, see <http://www.stopclustermunitions.org/>]

Petition 3: End to whaling

Statement: *Governments should lobby the Japanese government to stop commercial whaling of the Humpback whale.*

Petition: We the undersigned wish to show our support for an end to whaling, adding our voices to the global campaign to protect these precious mammals from extinction. We ask world leaders to force Japan to withdraw from its decision to reintroduce commercial whaling of the Humpback whale.

Low: 98 [No. 10 Downing St]

Medium: 57,299 [care2petitionsite, live]

High: 1,082,808 [www.whalesrevenge.com]

Petition 4: Protect the people of Darfur

Statement: *Governments should support a stronger multinational force to protect the people of the Darfur region of Sudan.*

Petition: We the undersigned petition the government to support a stronger multinational force to protect the people of Darfur and to seriously press for the establishment of a functioning ceasefire

Low: 15 [No. 10 Downing Street].

Medium: 5,978 [www.petitiononline.com]

High: 1 million [The Save Darfur Coalition www.savedarfur.org]

Petition 5: Climate Change

Statement: *World leaders should negotiate a global deal on climate change.*

Petition: We the undersigned petition world leaders to pull together an effective and fair global deal on climate change.

Low: 53 [No. 10 Downing St].

Medium: 575,000 [Oxfam]

High: 2.6 million [petition to Hilary Benn, Sec of State for Environment Food and Rural Affairs]

Petition 6: Fair trade

Statement: Governments should work to negotiate new trade rules – fair rules to make a real and positive difference in the fight against poverty.

Petition: We the undersigned press decision-makers and governments to negotiate for new trade rules – fair rules to make a real and positive difference in the fight against poverty – and to operate according to the principles of ‘fair trade’.

High: 17.8 million [Big Noise petition convened by Oxfam’s Make Trade Fair campaign

<http://www.maketradefair.com/en/index.htm>]

Medium: 22,777 [US version of the Big Noise at <http://www.thepetitionsite.com>]

Low: 25 signatures [No. 10 Downing St].

Figures and Tables

Figure 1: Relationship between participation and expected participation according to Schelling (2006: 104)

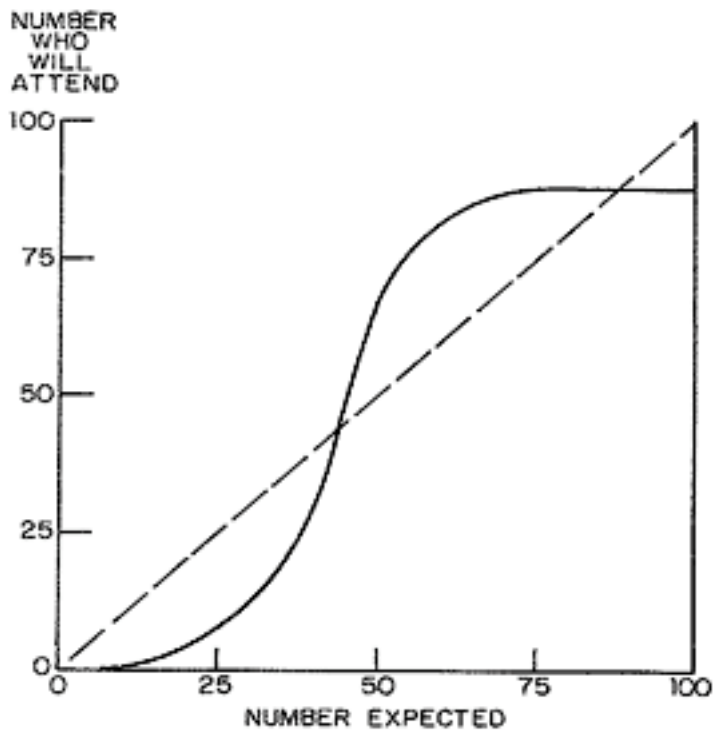


Figure 2: Subjects Signing Petitions in Field Experiment (by number of other signatories)

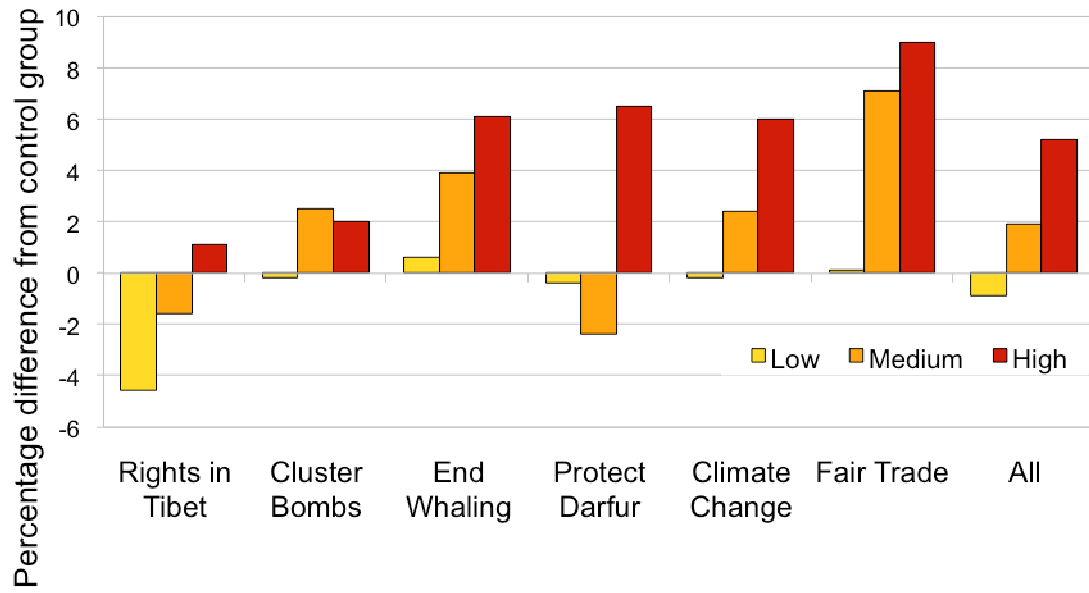


Figure 3: Subjects Donating to Petitions in Field Experiment (by number of other signatories)

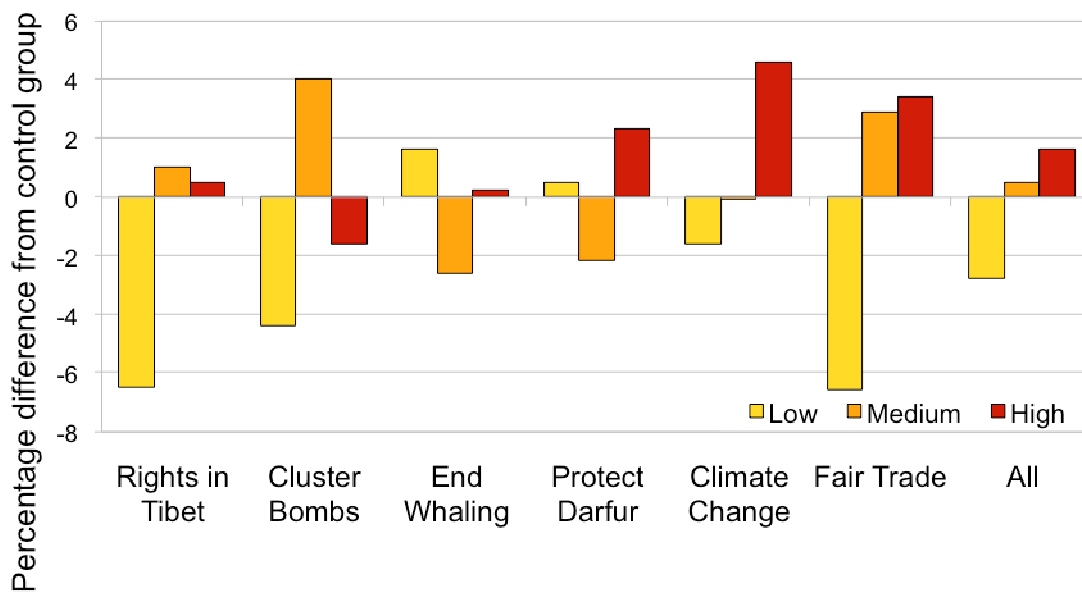


Table 1. Logistic Regression for Signing Petitions.

Model	Laboratory						Field											
	M1		M2		M3		M4		M5		M6							
	β	(s.e)	β	(s.e)	β	(s.e)	β	(s.e)	β	(s.e)	β	(s.e)						
Constant	-0.93	0.37	-0.70	0.32	*	-0.88	0.34	*	-1.14	0.19	***	-1.33	0.21	***	-1.22	0.20	***	
Agree with Issue	1.68	0.43	***	1.36	0.36	***	1.62	0.38	***	1.89	0.19	***	2.09	0.21	***	1.98	0.20	***
Social Information																		
High Numbers	2.21	0.81	**						0.27	0.1	**							
Med. Numbers				0.02	0.39							0.09	0.101					
Low Numbers						0.38	0.37								-0.03	0.1001		
N	167			190			213			2028			2028			2028		
LogLikelihood	-78.90			-100.38			-105.20			-1110.71			-1128.15			-1152.44		

†: p<0.1, *: p<0.05, **: p<0.01, ***: p<0.001 (two-tailed tests)

Table 2. Logistic Regression for Donating to Petitions

Model	Laboratory			M2			M3			Field			M5			M6		
	M1			M2			M3			M4			M5			M6		
	β	(s.e)		β	(s.e)		β	(s.e)		β	(s.e)		β	(s.e)		β	(s.e)	
Constant	-1.42	0.40	***	-1.29	0.38	***	-1.39	0.39	***	-2.01	0.25	***	-2.52	0.31	***	-2.62	0.33	***
Agree with Issue	0.89	0.44	*	0.73	0.42	†	0.86	0.43	*	1.81	0.25	***	2.33	0.31	***	2.43	0.33	***
Social Information																		
High Numbers	0.37	0.50								0.07	0.09							
Med. Numbers				-0.85	0.49	*							0.03	0.096				
Low Numbers							-0.24	0.36								-0.13	0.09	
N	167			190			213			2028			2028			2028		
LogLikelihood	-85.45			-89.33			-105.13			-1228.25			-1213.56			-1202.80		

†: p<0.1, *: p<0.05, **: p<0.01, ***: p<0.001 (two-tailed tests)