Power Users in Online Democracy: their origins and impact

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Introduction

Over the last decade the internet has been the source of a wide variety of democratic innovations, from the creation and maintenance of political forums and discussion sites to the establishment of e-petitioning platforms, voting advice applications, and social media enabled activist organisations and campaigns. The hopes that such tools could both reverse declining faith and trust in democracy and perhaps even ameliorate entrenched inequalities in democratic participation are so well known that they barely need repeating.

One well known characteristic of online participatory services is that contribution levels exhibit a highly skewed distribution, whereby the majority of people who make use of the service contribute only a little, whilst a small minority contribute a lot. In many cases this active minority, who are often described as the "power users", account for a significant percentage of all the activity taking place: they create most of the discussion threads, write most of the comments, upload most of the reviews, sign most of the petitions and so on. These exceptional activity levels mean these individuals are extraordinarily important in terms of keeping a given community alive; it also means they wield disproportionate influence within these communities. For example, the petitioning platform change.org claims a user base of more the 125 million users[1]. However research on the site revealed that 50% of the signatures on the site were made by just 5% this user group (Huang, Suh, Hill, & Hsieh, 2015).

Despite their importance and potential impact, these power users have received scant attention in the literature on online democratic participation, and indeed democracy in generally, which has typically placed much more emphasis on the other end of the scale: i.e. whether people choose to participate or not. This article aims to fill this gap. It addresses two key debates: what explains that some citizens become power users in e-participation, and what is their impact?

In order to provide an answer we focus on how power users operate in one of the most developed online political activities: e-petitioning. More than any other form of online participation, the use of e-petitions has spread in most Western democracies, while other forms of online participation tend to remain at an experimental stage or are confined to very specific purposes (Lindner and Riehm, 2009: 2). Research on e-petitioning has already shown the differences across e-petition platforms' layouts (Lidner and Riehm, 2009, 2011; Panagiotopoulos and Elliman, 2012), the general characteristics of e-petitions, like number of signers, the typology of e-petitions or the signature dynamics (Schmidt and Johnsen 2014, Hale at al. 2014, Yasseri et al. 2013), the factors that trigger the success of e-petitions (Jungherr and Jürgens, 2010), or the impact of e-petitions on public policy (Shulman, 2009; Morva, 2016). However, we still know little about who e-petitioners are and their

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[1] https://www.change.org/ Figure was correct as of November 2015

motivations to participate. The studies based on on-line surveys to e-petition platform users find that young and highly educated males sign more e-petitions (Schmidt & Johnsen, 2014; Lindner & Riehm, 2011; Carman, 2014). While population-based representative sample studies similarly show among a broad activities list, that those who feel more politically efficacious, are older and have a higher social class participate more through e-petitioning (Cantijoch, et al. 2012) but other studies do not confirm this evidence (Anduiza et al. 2010).

Despite notable exceptions (see Margetts et al. 2015, or Huang, et al. 2015) there is little evidence on what makes individuals sign e-petitions beyond the general socio-demographic factors. We have even less evidence on the frequency and prevalence of this political activity over time, which is necessary to isolate power users of e-petitions and to analyze who they are and how they influence normal users. This paper aims at being a first attempt in exploring this issue.

More specifically, the article pursues two main objectives. The first is to explain what factors lead to the emergence of power users in e-petitioning. In what respect are they different from other users who are much less active. For this first research question, we test two theories. First, we look at the importance of demographic and psychological characteristics. A huge literature within political science has highlighted the impact of socio-economic status, and its relationship to having sufficient money, time and skills, on the process of participation. Similarly, other work has shown that certain psychological characteristics make people more likely to participate. It may be that these variables have a similar impact on the process of becoming a power user. If so, demographic inequalities in political participation become worse in contexts where power users emerge. Second, borrowing from the field of social computing, we look at the impact of actual experiences with the online democratic service in question: it may be that people's initial experiences with the website in question, and whether they were successful or not, shape the likelihood of them coming back again. This is an underexplored question in political science. If so, it points to a way of enhancing civic participation in e-democracy, by trying to ensure people receive positive early experiences when they do participate.

The second objective of the paper is to understand what role power users play in shaping the dynamics of e-petitioning. The fact that some e-petitioners are more active than others is not *per se* problematic. If they are representative of the wider population of e-petitioners, their activities would simply give more visibility to the mobilisation around e-petitions. However, if power users and normal users are not alike in terms of political interest and priorities, then their much higher level of activities would bias the use of e-petitions as signals of public opinion. Power users would be able to steer e-petitioning on topics and issues that are not salient for the wider public. Starting from these premises, in the second part of the paper, we examine the impact of power users. Again we address two theories. First, we investigate whether power users are they crucial components of online democratic activity, who through their extra dedication start movements and get things going. Or are they the archetypes of Morozov's "civic promiscuity" (2011), mindlessly flooding sites with content which has little effect other than to water down the impact of the group as a whole (Lupia and Sin 2003)?

1 Theorising Power Users

We define "power users" as people who, through high levels of activity, contribute a disproportionate amount to some collective activity such as a political campaign, online discussion board, or voluntary association. They can be contrasted to the individuals who contribute a few times or even just once. Collective activities, especially online, typically have a small core of power users and a much larger periphery of infrequent users, meaning that the overall distribution of participation levels is highly right skewed or heavy tailed (Nielsen 2006)[2].

Theoretically, power users can emerge in any context where participation is voluntary, where the user themselves decides how much to participate, and where there is no meaningful upper limit on potential levels of participation. The lack of a practical upper limit is crucial because this is what allows highly skewed distributions of participation to emerge. Door to door activity in a political campaign is a good example here: there is no realistic limit to the amount of leaflets one person can deliver, meaning that one dedicated person can deliver far more than a casual participant. By contrast, voting in elections is not a context where power users could emerge, as the opportunities to vote are infrequent and each person can cast only one vote per election or referendum.

A wide variety of fields have provided empirical evidence for the existence of power users. In the offline world, for example, skewed participation distributions have been observed in the cases of civic volunteering (Wilson, 2000, p. 230) and high commitment political acts such as joining marches or campaigning (Brady, Verba, & Schlozman, 1995, p. 279; Parry, 1992, p. 48). In the online world examples are more numerous: participation in online chat forums (Fisher, Smith, & Welser, 2006; Whittaker et al., 1988), social networking sites (Brandtzaeg & Heim, 2011), Wikipedia editing (Panciera, Halfaker, & Terveen, 2009), crowd science platforms (Sauermann & Franzoni, 2015) and e-petitioning websites (Huang et al., 2015) have all been shown to observe this distribution. Skewed participation dynamics are so common online that Nielsen has declared what he calls the "law" of participation inequality, arguing that "it's existed in every online community and multi-user service that has ever been studied" (Nielson, 2006).

The existence of power users in online democratic forums is arguably troubling. On the one hand, their contributions could be viewed in a positive light: in the literature on democracy, any type of participation is portrayed as something positive, a key component of "civic culture" (see the work following Almond & Verba, 1963). Studies of online forums in particular have often portrayed those who put in the effort to participate in this way in a positive light, as members answering a "higher calling" (Preece & Shneiderman, 2009, p. 24), contrasting them to free riding "drive by participants" (Boldi, Bonchi, Castillo, & Vigna, 2011) or "lurkers" (Edelmann, 2013; Sun, Rau, & Ma, 2014) who benefit from the collective action but do little or nothing to get involved[3]. However unequal participation is also widely acknowledged as a normative problem for democracy, as it translates into unequal political influence for the groups which participate the most (Gallego, 2007; Lijphart,

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[2] These skewed distributions are sometimes characterised in terms of a "power law" distribution or a "zipf curve", though as the definition of these distributions is a bit more restrictive we continue to use the more flexible term "skewed" distribution here.

[3] Of course, many authors have also defended causal participation as nevertheless legitimate and useful (see e.g. (Yeow, Johnson, & Faraj, 2006)). However the impact of this type of participation is beyond our scope here.

1997). By participating more in online democratic activities, power users give themselves more "voice" than a general user, something which potentially allows them to focus the activities of the community on their own particular interests. Power users have also been criticised for becoming possessive and territorial about the communities they contribute so much to, something which might actively put off new users (Brandtzæg & Heim, 2008).

Despite their theoretical importance, and the frequency with which they have been observed, literature in political science has thus far placed little focus on power users. Hence we know little about why they emerge. Furthermore, apart from the obvious fact that they contribute a lot, we do not know much about their direct impact. This article seeks to remedy this deficit, by answering two major questions:

1. What explains why some users become power users whilst others do not?
2. What is the impact of power users?

In theoretical terms, we base ourselves in two key literatures. First, we make use of literature on democratic participation, both on and off line, emerging from the field of political science. The main focus of the political participation literature has typically been on a binary distinction between whether to participate at all (which makes sense in contexts such as voting where all one can do is participate once). However the rate of participation is an important secondary question. Second, we look at work on user behaviour within the field of social computing, which has placed a particular focus on why people contribute to online communities and services. Within this field, the emergence of power users is a core concern: authors have sought ways both to retain these users (as core and active members of a particular website) and to encourage other users to join their ranks. Each of these literatures offers us potential reasons for the emergence of power users, and hypotheses about their potential impact. We address these two questions in turn below.

1.1 Explaining the Emergence of Power Users: Are they born or made?
Two basic theoretical perspectives on the emergence of power users can be identified: whether differences in skills and abilities make some people inherently more likely to become power users than others; or whether the history of interactions and experiences with a particular community make people gradually more or less likely to adopt the power user role. Huang et al. summarise this as the question of whether power users are "born" or "made" (Huang et al., 2015). The limited amount of empirical work there is on power users has offered more support for the born thesis, on the basis that behavioural differences between power users and normal users are apparent from early interactions with the website (Pal, Farzan, Konstan, & Kraut, 2011; Panciera et al., 2009; Panciera, Priedhorsky, Erickson, Terveen, & Thomas Erickson, 2010). However, results are by no means unanimous, with some support also being offered for the idea that power users can develop over time (Huang et al., 2015).

We will begin with the "born" thesis. This emerges from the general literature on the importance of demographic inequalities in political participation, a body of work often summarised as the resource theory of politics (Brady et al., 1995), which is of course a classic subject in political science though one which has been largely marginalised in the field of social computing. Starting with Nie and Verba (1975), a large body of empirical work in the US has documented how those on the higher rungs of the socioeconomic ladder tend to participate more. More recent empirical literature has found similar patterns in Europe (Gallego, 2007; Kittilson, 2005; Parry, 1992; Vaccari, 2013). A variety of

mechanisms create this difference: the wealthy tend to have better educational opportunities which give them the skills needed to participate, better access to information, and they also tend to move in social circles which make participation more normal. A large body of empirical evidence has been collected which suggests that, in general, these classic participation inequalities also hold true for online participatory acts (Hindman, 2009; Schlozman, Verba, & Brady, 2010; Vissers & Stolle, 2013). A variety of explanations have been offered for the replication of such patterns online, especially the need for skills and resources to access the internet in the first place (Hargittai, 2002; Norris, 2001).

However, despite the clear importance of skills and resources in participation, and their clear correlation with demographic background, there are also some reasons to suspect these things will be less important in the context of power users. First, in many contexts there will be little difference in skill between a casual user and a committed one: for example, once someone has mastered posting a comment once, posting more comments is straightforward. The same applies to financial resources: ability to get online is fundamental in order to participate online, but provides no reason to separate those who participate a little and those who participate a lot.

By contrast, other resources may start to become more important. In particular, power users will need to dedicate considerable time to the activity in question. Time has already been identified as a resource with an important impact on political activity (Brady et al., 1995), as well as related actions such as civic volunteering (Wilson, 2000). For example, Brady et al. have shown that having a lot of free time makes more difference to participating in political campaigns (and other similar activities) than having a high family income. Hence it may be that those with free time (rather than higher socio-economic status) are more likely to become power users. Yet, one could also question whether time is that crucial as a resource when it comes to e-petitioning. Compared to other forms of mobilization, like street demonstration or political activism, e-petitions are relatively cost-free in terms of time, as signing an e-petition takes a few seconds and a few clicks. Even creating an e-petition should not take more than a few minutes.

These diverging elements lead to unclear expectations about the actual impact of resources on becoming a power user of e-petitioning. In order to get a clearer view on the issue, we therefore propose the following first hypothesis:

H1: Those with more resources (money, time and skills) are more likely to become power users

We will now turn our attention to theories in the "made" school. These emphasise the importance of actual experiences with the particular community of action in encouraging users to become active participants, rather than pre-existing demographic characteristics. These often jump off from the observation that individuals which are power users in one context may play a much more minor role in another website (Muller, 2012): hence characteristics cannot explain everything. Of particular significance in this respect is Preece and Shneiderman's reader-to-leader framework (Preece & Shneiderman, 2009), which emerges from the field of social computing. This framework, which builds on the theory of "legitimate peripheral participation" (Lave & Wenger, 1991) emphasises the idea that new users of a website or community of practice start off by doing simple things, and then either progressively become more involved or (more commonly) decide to drop out entirely. While they feel it inevitable that most casual users of a website cannot be converted into regular ones, Preece and Shneiderman also highlight that the results of early interactions with a website can shape decisions to participate more. For example, rating systems which recognise the quality of

contributions to a website are known to increase their frequency (Preece & Shneiderman, 2009, p. 19). Evidence from online discussion boards has shown support for these ideas, with "satisfying discussions" known to increase collaboration (Schroer & Hertel, 2009) whilst getting a reply to a question posted also increases the probability of posting again (Arguello, Butler, & Joyce, 2006).

Literature in political science lends support to this view through research on the idea of political *efficacy* (that is, people's perceptions of whether their actions are likely to make a difference). Research has shown clearly that people's perceptions of the likelihood of success have an impact on the likelihood of participation (Goodin & Dryzek, 1980). These perceptions of efficacy can be shaped by life experiences (for example, unemployment is known to cause feelings of lower political efficacy Scott & Acock, 1979)); but they can also be formed by previous participative interactions (Finkel & Muller, 1998), as well as real-time information about the number of other people participating in a particular action (Hale, John, Margetts, & Yasseri, 2014). This social information is accurately reflected on e-petition platforms as they usually provide the number of people that have already signed a petition among other information. In fact, previous studies experimentally show that the number of signatures an e-petition have already registered influences the propensity to sign an e-petition (Margetts et al. 2015: Vaillant et al. 2015).

However, it is also possible that perceptions of potential efficacy and success have less impact for power users than they do for other users. For example, Margetts et al. have shown that people who are willing to initiate collective actions diverge from those willing to join in later in terms of their psychological profile (Margetts, John, Hale, & Reissfelder, 2015b). They highlight in particular that these initiators have psychological characteristics which lead them to have a lower "threshold" for participation, borrowing the terminology of Granovetter (Granovetter, 1978), who defined a participation threshold as the number of other people who have to participate in a collective activity before someone else decides to join. If power users are also those with low thresholds, then they may place less importance on actual outcomes, and be more willing to sign things regardless of their apparent chance of success. This idea receives support in a study by Huang et al. on online petitioning (Huang et al., 2015), who found that highly active users were willing to sign petitions with little chance of success.

These conflicting potential impacts of successful interaction with a website lead us to pose our second hypothesis:

H2: People who had successful initial interactions with the website are more likely to develop into power users

1.2 What is the impact of power users?
We will now move on to considering theory relating to the *impact* of power users. Two key debates can be found in this area.

The first concerns whether power users wield disproportionate influence not only through their increased activity, but also in terms of the successfulness of the activities they engage in: for example, by creating petitions which receive more signatures than average, creating discussion threads which receive lots of replies, or creating online social movements which receive more members, etc (Priedhorsky et al., 2007). Power users have often been regarded as "starters" or "leaders" of online democratic movements and associations, getting things going before other more

general users arrive (Karpf, 2011, p. 335; Margetts, John, Hale, & Reissfelder, 2015a; Preece & Shneiderman, 2009). As Kittur et al. put it when studying Wikipedia, "Like the first pioneers or the founders of a startup company, the elite few who drove the early growth of Wikipedia generated enough utility for it to take off as a more commons-oriented production model; without them, it is unlikely that Wikipedia would have succeeded" (Kittur, Chi, Pendleton, Suh, & Mytkowicz, 2007, p. 8). In addition to starting things, power users may also be crucial in keeping the community going, by replying quickly to new users, moderating and shaping the contributions of others (Lampe & Resnick, 2004), or offering them some other form of successful interaction (Arguello et al., 2006). It is for these reasons, of course, that a great deal of literature in social computing has been focussed on the issue of how to retain power users in a website, and even increase their number (see, *inter alia*, Pal et al., 2011; Preece & Shneiderman, 2009).

On the basis of our discussion about the emergence of power users, two potential reasons can be offered as to why they might be more effective than regular users. First, they may start off with more skills in terms of democratic processes and democratic campaigning, be better able to articulate their opinions, and hence better able to convince others to follow them. These are, of course, the same reasons that demographic advantages are held to privilege participation: they may also privilege successful participation. Second, over a long history of interaction with a site, they may come to learn why some things are successful whilst others aren't, and thus become more adept at starting successful initiatives.

This line of thinking leads us to the development of our first impact hypothesis:

> *H3: Power users will be more successful than regular users in their interactions with online democratic websites*

The second facet of impact concerns whether the interests of power users diverge in important ways from the interests of normal users (Oser, Leighley, & Winneg, 2014). In this perspective, power users exacerbate participation inequality by focussing the community in question on their particular interests which might be distinct from the interests of the wider group.

We identify two potential reasons for this. First, as we have already referred to above, power users are likely to have lower participation thresholds, and hence be willing to sign petitions which have little chance of success (Huang et al., 2015; Margetts et al., 2015b). This may allow them to participate in a wider range of topics, many of which may be of niche interest. Morozov has referred to this type of person as a "promiscuous clicktivist", who satisfies an urge to participate in the democratic process by participating in a "mad shopping binge" in online democratic forums, simply clicking on anything that has the slightest appeal (Morozov, 2011, p. 190). In broader democratic theory, this type of impact might be considered similar to that of the "floating voters" of post-war democracy, who voted with little forethought or clear interest in politics, but who nevertheless were crucial for deciding the overall result (Benewick, Birch, Blumler, & Ewbank, 1969). This claim, of course, would contradict the idea that power user interventions are more successful than those of normal users. Indeed, by engaging in such a scattergun way, they dilute their own impact (a similar point has been made by Lupia and Sin with regards to the proliferation of online democratic activity - see Lupia & Sin, 2003).

A second potential reason comes from May's "curvilinear" theory of political party membership, which suggests that party members will be more radical than either elected politicians or the average voter (May, 1972). May's theory, for which there is considerable supporting evidence (though not all studies have agreed with it – see e.g. Kitschelt, 1989; Norris, 1995), revolves around the incentives for participation in parties. The costs of participation in terms of time are, he notes, very high (and arguably the same is the case for online power users): hence the pay-off must be equally high. However, he also notes that many pay-offs available to politicians (such as the chance of holding office or helping constituents) are unavailable to party members. He concludes that radical ideological principles hence are the only satisfactory way of explaining party membership. These principles almost inevitably diverge (or at least consist of stronger versions of) both politicians themselves and people who merely vote for a party.

These lines of thinking lead us to develop our second impact hypothesis:

H4: Power users will have substantially different topic interests to normal users

2 Data and Method: Study of e-petitioning site

The aim of our theoretical section was to develop hypotheses which applied to power users in a variety of different online democratic settings. In this section, we will move on to describe the specific data and methodology we use to test our hypotheses. The empirical section of our study is based on the electronic petitioning website *lapetition.be*. The website was created in 2006 by a small group of Belgian citizens with no political affiliation who set up an online petition to oppose the expulsion of two citizens from Congo that were residing in Belgium. This experience led them to develop a website that offered free hosting for any e-petition proposed by citizens or civic associations. The website has become one of the most widely used e-petition websites in Belgium and France, and also hosts petitions from a variety of other Francophone countries such as Canada and Switzerland.

An electronic petitioning website is a useful case on which to test our hypotheses for several reasons. Most importantly, it is an area where power users can emerge: a user of such a website can effectively sign an unlimited number of petitions. In addition to this, apart from the act of voting itself, signing a petition has always been one of the most frequently conducted participative acts (Cruickshank & Smith, 2011; Contamin, 2012). This is useful because this means the user base for electronic petition websites is large, which makes the amount of power users more likely to be large as well. E-petitioning is also a broad activity: petitions are user generated, and can be essentially started on any topic of interest. This allows us to assess the extent to which different types of users are interested in different types of topic. Finally, although power users can emerge in e-petitioning sites in general, they cannot emerge for specific petitions: each user can sign a petition only once. This allows us to assess the success of petitions created by different types of user in an unbiased way, as people cannot sign their own petition more than once.

The group hosting the website agreed to provide us with anonymised user information for the purpose of the study which covered the entire period from 2006 – 2015. Making use of website interaction data is vital for the purposes of our study because we have to be able to observe how user behaviour changes over time. Whole population data is also especially useful for the purposes

of studying power users, again because they are quite few in number. However, making use of this type of observational data also implies a number of limitations in the way variables are coded (as, we have to work with available data rather than being able to design measures ourselves), which we will discuss below. A further limitation is that users are identified through email addresses on the website: if someone changes their email address, they will hence be recorded as a new user.

Petitions Signed	Users		Signatures		Petitions	
1	386543	73.3%	386543	30.3%	487	21.2%
2-10	125067	23.7%	408275	32.0%	1166	50.7%
11-50	13701	2.6%	284176	22.3%	425	18.5%
51-100	1494	0.3%	101727	8.0%	93	4.0%
101+	539	0.1%	93998	7.4%	128	5.6%
Total	527344		1274719		2299	

Table 1: Distribution of users of lapetition.be per e-petitions signed

In total, over 15,000 e-petitions were created on the website between 2006 and 2015, whilst almost 4 million e-signatures were registered on the website by nearly 2 million users. For the analyses in this paper, we decided to focus solely on users based in France, which left us with a sub total of 527,344 users. Initial descriptive statistics on the activity levels of this set of users are provided in table one. As will be evident, distribution of activity on the site follows the same highly skewed distribution observed in other websites. At one end of the spectrum, 73% of users of the site signed just one petition. This group of users is important in absolute terms: they account for over 30% of the overall signatures made on the site. Yet we can also see that they punch below their weight to a considerable degree in terms of the amount of voice they have on the site: if we measure this in terms of number of signatures made, it is less than half of what it should be. At the other end of the spectrum, 0.1% of users signed more than 100 petitions, which is equal of 7.4% of the total signatures on the site. The voice of a member of this group is almost 200 times as much as the voice of a member of the 1 signature group[4].

We will now describe how we code the independent variables relevant to the study. We divide up the description according to hypothesis that is being tested by each variable or set of variables.

2.1 H1: Resources

We will first consider the construction of variables related to the *resources* of the user of the petitioning website: namely, their wealth, their education and the amount of free time they have at their disposal. These allow us to test H1. We make use of proxy measures for all of these variables. As we have highlighted above, the use of proxies is a necessary sacrifice in this case, as it allows us to make use of this whole of population big data which is vital for identifying power users.

For determining the wealth and education of individual users, we make use of automatic geolocation techniques to assign individuals to small administrative areas in France, known as *communes*. Each *commune* can be connected to census level data on both the median income of the

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[4] Voice = % of signatures created / % of people in group. In a perfectly equal setting, voice would = 1

population in the area (which we use to test our wealth hypothesis) and the number of people with a university degree in the area (which we use to test our education hypothesis). We freely admit that these proxies are imperfect: of course, just because a user lives in a wealthy area, does not mean they are themselves wealthy. Yet at a large scale the test should still be valid: if wealth is important in generating power users, then wealthy areas ought to produce more power users on aggregate (with the same applying, of course, for education).

To determine the amount of time an individual user has available, we make use of information about their employment status. When signing a petition, individuals are asked what their profession is. The information entered in response is "free text": i.e. individuals can respond however they want, rather than selecting from a list of options. This resulted in a list of hundreds of thousands of different answers. We selected all professions which appeared at least 1,000 times in this list (i.e., 1,000 people listed them as a response). Two authors of the paper then coded each of the professions into one of five general categories: employed; unemployed; housewife/househusband; student or retired. The authors had a 98% agreement rate, which gave a Krippendorff's alpha of 0.94. Further information on the coding can be found in the appendix.

2.2 H2: Interactions

Our interaction hypothesis states that people with successful initial interactions with a website will be more likely to develop into power users. To assess this, we simply measured the final number of signatures achieved by the first petition a user signed. We assume that the more signatures this petition receives, the greater the signal a user receives about the success of the collective endeavour in which they just participated, and hence the potential efficacy of their actions in terms of signing more petitions. Of course, this measure does not take into account the *actual* success of a petition (i.e. whether it succeeded in its aim, for example by altering government policy). This would also be interesting to measure but would require substantially different data.

However, as we described above, the fact that power users may also have lower participation *thresholds* may confound the effect of this variable: as power users may be more willing to sign petitions which have a low number of signatures at the time. Such petitions are, clearly, less likely to be successful. Hence we also include as a further variable a measure of the average number of signatures which had already been made on each petition that a given user signed. This allows us, in a way, to specify a user's "threshold": the amount of signatures they typically like to see on another petition before they also sign it. Including this variable as a covariate also allows us to measure the impact of the final outcome of a petition independent of the fact that some people are likely to select petitions which have higher or lower initial numbers of signatures.

2.3 H3: Success

Our third hypothesis specified that power users were more likely to have successful interactions with an online community than normal users. In the context of our petitions website, we measure this by looking at the outcomes of petitions created by users. The success of a petition was simply defined as the final number of signatures it receives, which was simple to measure with our data.

2.4 H4: Topic

Our final hypothesis specified that power users ought to have significantly different interests to normal users. In the context of a petitioning website, interests can be defined as the topic of

petitions which are either signed or created by a given user. The topic of a petition is a piece of data which also came from the website: when creating petitions, users themselves are asked to assign them into one of a limited number of topic categories: "Animal Protection", "Art and Culture", "Environment", "Human Rights", "Humour", "Leisure", "Politics", "Others" and "Social Issues".

2.5 Control Variables

Finally, we decided to include two general control variables in the study. First, we coded the gender of participants, on the basis of their first name. This coding was performed automatically. Second, we included the dates when users first started using the website: people who have been using it since its inception are, naturally, much more likely to have signed more petitions than people who have only just discovered it.

3 Analysis

In this section, we will move on to present the results of our study. As we have two main research questions, the results section is divided into two parts. The first part seeks to explain why some users become power users whilst others do not; the second seeks to analyse the impact of power users.

3.1 Are power users born or made?

In this first part of the analysis, we seek to explain the emergence of power users on the lapetition.be website. As we described in the theoretical section, we have two main hypotheses to test: first, that this is a result of *resource* effects, with people with more wealth, more education and more time more likely to participate more (H1); second, as a result of *learning*, i.e. interactions with the website, with successful interactions likely to promote further levels of signatures (H2).

We address these questions in table two, which contains a series of regression models. Model 1 is a multilevel zero-truncated poisson regression. We make use of a multilevel model because we have two demographic variables (level of education and median income) which are measured at the area level rather than the individual level. We use a poisson distribution because this is appropriate for the count data that we have in our dataset; the zero-truncated distribution is furthermore appropriate because there are no zero values in our dataset (i.e., we do not observe the group of people who have signed no petitions)[5].

Model 1 provides an overall answer to the question of why some people sign more than others. However, these are average effects, which will furthermore be biased towards the small end of the scale, which is where the majority of the data is. However, our interest is in the factors separating out those at the lower end of the scale with those at the very high end. Hence we also produce models 2-5, which are a series of multilevel logistic regressions. Each regression model tries to assess the probability that a user belongs to the category which signed more than 100 petitions compared to one other category of users (e.g., having signed 1 petition, or 2-10 petitions, etc.). For each model those users which are not in one of the two categories are discarded. This allows us to get at the issue of the characteristics that truly distinguish "normal" users from power users.

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[5] As we might expect the data also suffers from a problem of over-dispersion. We use an individual level random effects terms to control for this over-dispersion.

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	Number of petitions signed	Chances of signing...			
	Poisson Count Model	1 vs 100+	2-10 vs 100+	11-50 vs 100+	50-100 vs 100+
	(1)	(2)	(3)	(4)	(5)
Average Income	-0.002	0.06	0.12	0.01	-0.17
Percent of Higher Education	0.01	-0.06	-0.13	-0.07	0.05
Homemaker	-0.15***	-1.02**	-0.93**	-0.71	-0.78
Retired	0.09***	0.33*	0.15	0.01	-0.07
Student	-0.20***	-0.85***	-0.47**	-0.41*	-0.22
Unemployed	0.25***	1.28***	1.03***	0.49***	0.36*
Result of First Petition	0.09***	0.63***	0.38***	0.14*	0.02
Average threshold	-0.16***	-3.66***	-2.61***	-2.00***	-1.28***
Male	-0.25***	-0.70***	-0.50***	-0.10	0.54**
First Signature Date	-0.20***	-0.94***	-0.60***	-0.16**	-0.15
Constant	0.74***	-7.44***	-6.40***	-4.48***	-1.58***
Observations	162,368	108,444	46,801	6,866	1,100
Log Likelihood	-325,392.50	-1,665.93	-1,488.75	-934.17	-498.44
Akaike Inf. Crit.	650,811.00	3,355.87	3,001.50	1,892.35	1,020.88
Bayesian Inf. Crit.	650,941.00	3,470.99	3,106.54	1,974.36	1,080.92

Dependent variable:

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table Two: Explaining the Emergence of Power Users

There are a variety of things worth noting from the models. First, we find no support for the idea that either wealth or educational resources make a difference to the amount of petitions signed (in either the poisson regression or logistic regressions). This stands in interesting contrast to a variety of literature which has continually found these variables to be relevant for online political participation (and, indeed, participation in general). As we describe in the theory section, this offers support to the idea that, although wealth and education might be crucial enablers of participation, they do not make a difference to volume of participation[6].

By contrast, we find good support for the idea that *time* makes a difference. Hence overall we have partial support for H1. In our poisson regression, the categorical time variable shows that, compared to those with a job, retired and unemployed people typically sign more petitions. In our set of logistic regressions, both of these variables are significant predictors when comparing the group that has signed 1 petition with the group that has signed 100+. Unemployment continues to be a significant predictor right up to the comparison between the 50-100 and 100+ group (though the strength of the effect declines). In other words, having extra time seems very significant in explaining the emergence of power users. In substantive terms, it also seems significant that those with more

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[6] A potential objection to our claim is that, as wealth, education and employment status are likely all highly correlated, they cannot easily be interpreted within the same model. Hence we also produced a series of further versions of model 1, each containing only one of our demographic variables. The results, which can be found in the appendix, were however identical.

time, the unemployed, might typically be perceived as participating less in many other forms of democracy.

We also find good support for H2, that the results of the first petition make a difference. This difference is found both in our poisson regression and in all of our logistic regressions, with the exception of the comparison between 51-100 and 100+ groups. It is intriguing to note that the initial experience with a site has an apparently long lasting effect, such that someone with initial positive results might not only be likely to sign more, but more likely to fall into the 51-100 category rather than the 11-50 category. However, the effect does seem to decline, no longer making a difference between the largest two groups.

The potential alteration of effects over time, as people sign more and more petitions, is intriguing and points to a second line of investigation about learning. If people are stimulated to sign another petition by the results of the previous one, to what extent does that effect "persist" over time? We address this question in figure one, which looks at the extent to which the result of one petition influences the chances of user signing a further one. Each point in the model represents the coefficient from a simple logistic regression where the independent variable is the final number of signatures when a user signed petition p_i and the dependent variable is whether the user signed petition p_{i+1}. As with table two, the average signature volume of a petition when signed by the user is included as a control variable.
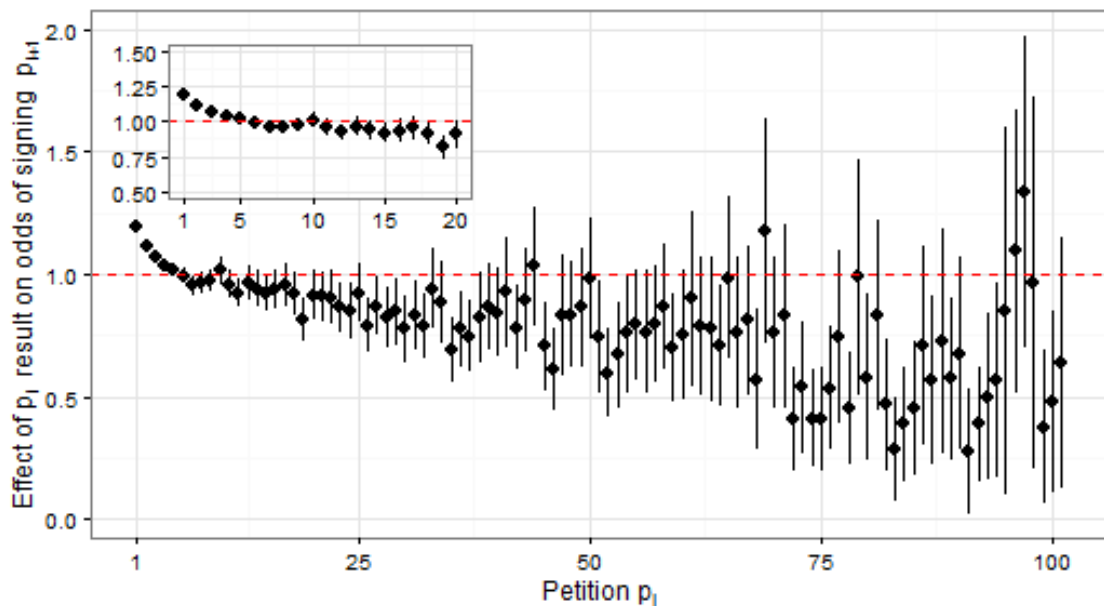

Figure 1: Effect of result of petition pi on the chances of signing the pi+1 petitions. Ranges around points indicate 1.96 standard errors. Inset shows effect sizes for the first 20 petitions.

The results of the image are quite striking. We can see that the results of the first four petitions have a positive impact, after which time the impact is largely statistically indistinguishable from 0 (though sometimes even negative). What this shows is that positive learning effects only seem to occur in the first few interactions with a site: after this point, users appear to cease being interested in signals about the potential efficacy of their actions.

3.2 What is the impact of power users?

In this second section, we will move on to addressing the "impact" of power users. We test two hypotheses in this section. First we will look at H3, which concerns the extent to which the petitions power users create are more successful than those created by the average user. This is tackled in table three, which presents two linear regressions seeking to explain the amount of signatures a petition receives. The signature variable is log transformed to prevent a few extremely highly performing petitions disproportionately influencing the results. Similar to the logic in table two above, the first model contains a single independent variable of theoretical interest: the number of signatures made by the creator of a given petition. In the second model, this continuous variable is turned into a categorical one, to try and identify the particular impact of power users.

	Dependent variable:	
	Petition result	
	(1)	(2)
Number of petitions signed by creator (log transformed)	0.07^{***}	
2-10		0.12^{***}
11-50		0.14^{***}
51-100		0.20^{***}
100+		-0.10
Animal Protection	1.01^{***}	1.02^{***}
Art and Culture	0.27^{***}	0.27^{***}
Environment	0.30^{***}	0.29^{***}
Human Rights	0.12^{***}	0.12^{***}
Humour	-0.49^{***}	-0.49^{***}
Leisure	-0.11^{***}	-0.12^{***}
Others	-0.05^{*}	-0.05^{**}
Social Issues	0.08^{***}	0.07^{**}
Date of first signature	0.01^{*}	0.02^{*}
Constant	1.30^{***}	1.26^{***}
Observations	9,348	9,348
R^2	0.17	0.17
Adjusted R^2	0.17	0.17
Residual Std. Error	0.82 (df = 9337)	0.82 (df = 9334)
F Statistic	187.57^{***} (df = 10; 9337)	147.40^{***} (df = 13; 9334)
Note:		$^{*}p<0.1;\ ^{**}p<0.05;\ ^{***}p<0.01$

Table 3: Linear regression explaining the amount of signatures received by a petition

This model provides support for H3, by lending weight to the idea that people who have signed more petitions also end up creating more successful ones. This effect can be seen even when comparing those who have signed 2-10 petitions with those who have signed one, though it gets stronger as more petitions are signed. However, there is an exception to this, which is that we found no statistically significant effect for those who signed more than 100 petitions when compared to those who signed just 1. We will return to this point below.

Finally, we will now address H4, which concerns the topics in which different types of users are interested. In the theoretical section, we speculated that normal users and power users will have

substantially different tastes, with the unusual ideological beliefs of power users acting as a stimulant for them to sign more petitions.
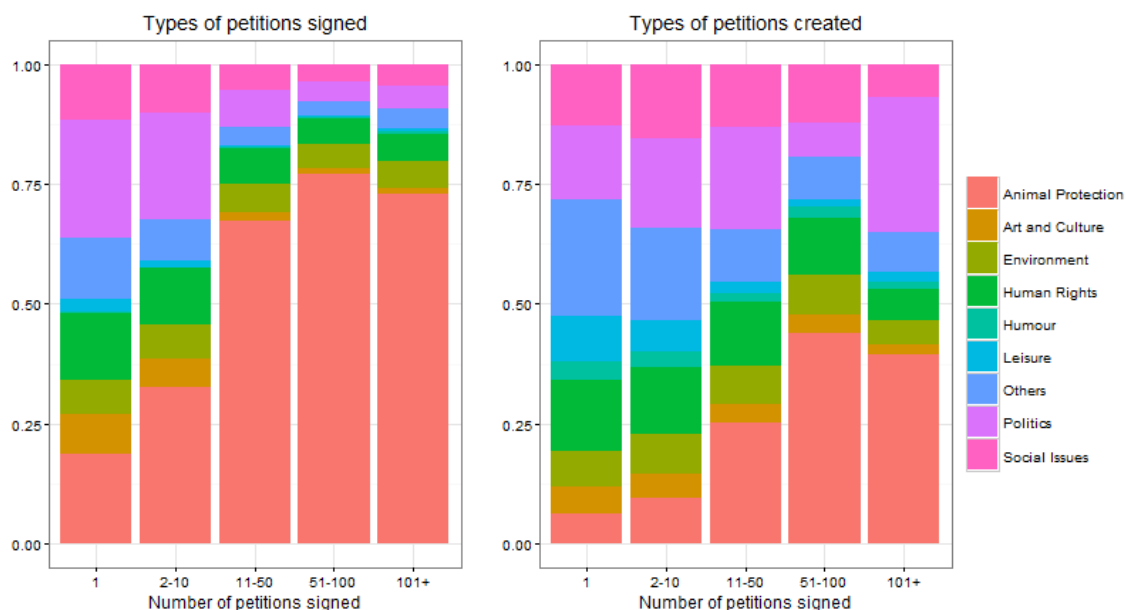

Figure 2: Types of petitions signed (left panel) and created (right panel) by different types of user

We address this question in figure two, which looks at the type of petition signed according to the amount of previous petitions people have signed. The results of this graphic are again quite striking. First time signatures (the left panel) are distributed into quite a wide range of categories: politics, human rights, environment, arts and culture and social affairs all receive some representation. By contrast, those who sign the most petitions tend to focus almost exclusively on animal protection and animal rights. This shows that the interests of those who sign the most are quite different from casual users of the site. The same relationship can also be seen if we consider the types of petitions created (the right panel). Intriguingly, however, the difference is less stark. Hence whilst very active users seem to almost exclusively focus on signing animal rights petitions, the subset of very active users who create petitions do so in a more balanced way across topic categories. Furthermore, similar to our conclusion in the regression model above, we can see that the group which sign more than 100 petitions are subtly different from the group that sign 51-100: they are if anything less interested in animal rights, whilst in terms of petitions created they have a stronger interest in politics than any other group in the site.

4 Discussion and Conclusion

In this final section, we will seek to draw out the theoretical implications of our findings. We demonstrated two main points. First, we have shown that power users have a significant impact. Importantly, this was not just in terms of the overall volume of signatures, but also in terms of creating more successful petitions. This matters because, as we also demonstrated, the substantive interests of power users are quite different from normal users. Hence, and this is the crucial point, we may have a very biased view of what people are interested in and concerned about if we focus on the topics where the majority of signatures take place: as they are likely to be generated by a minority of highly active users. This suggests that online democratic mechanisms need to take steps to promote the views of the majority of users who are less active, or at least limit the activity of the

highly active. One example of this would be to only allow people to sign one petition per month (in the same way that people only vote periodically at election time). It would be especially crucial if major democratic institutions follow the example of the German Bundestag or of the British House of Commons. Both institutions have institutionalized platforms of online petitioning that guarantee that petitions reaching a certain amount of signatures would automatically initiate either parliamentary debates or public hearings in parliament on the topic of the e-petition. In these cases, e-petitions are used as indicators of what the public wants representative institutions to debate about. But if the process of e-petitioning is driven by power users that are not representative of the wider population, that do not care about the same issues, there would be severe flaws in using e-petitions to feed into the work of representative institutions.

The disproportionate impact of power users also makes it even more vital to understand the reasons for their emergence. This was our second major area of findings. We showed little support for some of the traditional determinants of participation: wealthier areas did not produce more power users, nor did more educated ones. By contrast, even though unemployed people constituted a small absolute number of people who used the site (less than 10%), we showed that they were the most active in terms of number of petitions signed (averaging more than 5 per person). We attribute this to them having more time that others, which is of course another resource. In this way, they appear to redress some of the inequality caused by traditional participation deficits.

We also moved beyond resource theory to investigate psychological and experiential components of participation. We demonstrated good support for the idea that power users are people who have low thresholds for participation, and who are willing to get things started. This is seen both by the fact that they create lots of petitions and they sign other petitions which have few signatures, which may act as a way of getting things going. Furthermore, we demonstrated support for the idea that people learn from their initial experiences with a site, with people who signed a successful petition more likely to come back than those who signed a failing petition. These effects were surprisingly persistent: having an initial early success improved not just the chances of returning once, but the chances of coming back lots of times. However, the learning effect also declined quickly: the volume of signatures found on petitions which were fourth or later in a series of signatures was no longer associated with any increased likelihood of signing more. This finding seems of particular significance for the design of democratic websites: they need to seek ways to give people initial successful interactions in order to encourage further use of such sites.

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