Offline Meetups of German Wikipedians: Boosting or braking activity?

Working Paper

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ABSTRACT

Offline gatherings are an important aspect of the community of Wikipedians; however, they have been largely neglected by previous research. In this paper, I make use of a newly collected dataset which includes all informal meetups organised on the German Wikipedia between 2001 and 2020. I describe the meetup behaviour of the German Wikipedians and further assess to what extent meetup participation exhibits a causal effect on contribution behaviour of attendees. Results show that compared with a control group, attending meetups has a positive effect on contributing towards Wikipedia both in the short and long term.

KEYWORDS

Wikipedia, offline meetups, productivity, difference-in-differences

1 INTRODUCTION

Since its launch in 2001, the online encyclopaedia Wikipedia has become the top destination for information to many people. Wikipedia is made of user-written text: Articles are written by knowledgeable and engaged volunteers, discussions are led to deal with controversies and disputes, public messages are exchanged and the norms and rules of the platform are defined. It is an encyclopedia which anyone can edit, either anonymously or after registering with a user account. While the online component of Wikipedia is well known—it is one of the most visited websites worldwide and is the backbone of many technologies—its offline component is little known and has been largely neglected by previous research. Wikipedia is not only backed up by the Wikimedia foundation, but also characterised by regular local offline meetups, giving editors a time and place to get to know each other personally. In many cases, such meetups are publicly advertised on their own Wikipedia page allowing users to publicly sign-up and to coordinate the meetup.

Scientific knowledge on the effect of such offline meetings on the online community is sparse. However, offline meetups between Wikipedians are important to the community: Such face-to-face meetings allow to connect to others and help in times of conflict; they can fulfil a Wikipedian's needs for social contacts, community and personal exchange in the same way like other local associations [19]. The following paper addresses this gap and will whether participation in offline meetups shows a causal influence on an editor's contributing behaviour to Wikipedia.

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The paper will use data of the German speaking version of Wikipedia as it is one of the largest and most active versions[1]. Additionally, the German Wikipedia can better be understood as a community which also shares geographic proximity, enabling face-to-face meetings in a first place, in contrast to the English Wikipedia which is characterised by polyglot contributors from around the world. Lastly, meetups can be considered to play a special role in the German speaking Wikipedia: The very first global meeting of Wikipedians, the Wikimania, took place in Frankfurt am Main in 2005. From large global meetings in a metropolis like Frankfurt to small friendship gatherings in Northern German towns, from barbecues in Berlin backyards with over a hundred of attendees to Christmas market visits in close circles, from group-editing in front of computers to improve the encyclopedia to grieving the loss of long-time members when attending their funeral, the community of German Wikipedians exhibit a rich culture of meetups which lends itself to research.

2 RELATED WORK

To date, there is little previous research on face-to-face meetings of Wikipedians. A number of studies have focused on editathons—concentrated editing events where people meet with the intention to work and improve Wikipedia. Hood and Littlejohn [11] and Littlejohn et al. [13] have interviewed nine participants of an Edinburgh editathon to better understand their experiences at the edithaton, discuss the learning experience at those events and highlight that personal relationships are important to some of the participants when continuing editing Wikipedia. Also using interviews of participants of an editathon, Vetter et al. [23] found how such editatons increased (digital) critical thinking of participants. March and Dasgupta [14] have conducted interviews with 13 organisers of edithatons to understand their motivations.

A more quantitative approach combining offline data with online editing has been implemented by Farzan et al. [8]. They collected data related to 59 face-to-face editathon events and four virtual ones happening in the USA in the first quarter of 2016, collecting all attendees of the events and tracking their editing behaviour on Wikipedia in the following week. They focused on newcomers and compared editathon-attendees with a random sample of users registering at the same time but independent of these events. They found that face-to-face editathons can attract more newcomers than virtual ones, but retention of them stays challenging. While

[1]The terms *German Wikipedia* and *German speaking Wikipedia* will be used interchangeably in this paper, even though the expression *German speaking Wikipedia* is more precise.

only about 1 per cent of the random sample of newcomers keep editing one week after their registering date, about 9 per cent of the editathon attendees remain active.

As the only study focusing on informal face-to-face meetings between Wikipedians, Stegbauer [22] collected meetup data across three years of 240 meetups in Germany. His study highlights how users that are of central importance in the meetup network—attending many meetings, spanning geographical boundaries, etc.—also tend to have an important position in the online component of Wikipedia, such as being an administrator. Focusing on the effect of the first meetup of users, he found that most tend to decrease their activity in the month after the meetup compared to the month before—with the exception if they later become administrators [22].

Beyond Wikipedia, a number of studies have acknowledged the occurrence of offline interactions of online communities and discussed the interplay between the offline and the online [e.g. 2, 7, 9, 12, 15, 20, 21, 25]. Generally, studies find that offline gatherings lead to the development of stronger relationships between community members. However, these meetings can also bring along new challenges for the community as a whole: McCully et al. [15] find that meetups of a collaborative writing community strengthen online relationship but decrease the amount of participation, leading to a counter-intuitive impact on community sustainability. While offline meetings can thus be beneficial for the individual, they can have detrimental effects to the online community as a whole.

3 DATA AND METHODS

Ethical approval for this study was obtained in January 2020 by the ethical advisor of the Department of Sociology at the University of Warwick.

Online activity. All online actions contributors undertake on Wikipedia are logged. General activity data from Wikipedians was accessed through the Wikipedia data dump using the stub meta files. These log which user edited where and to what extent at what time. As Wikipedia is separated in different namespaces with different functions, two measures of activity are differentiated in the following: Total activity across all namespaces and mainspace activity. The latter refers to edits made only on articles, while the former also includes activity on discussion pages, meta pages and others. To assess the effect of meetups on editing behaviour, three different time frames are being analysed: A very short time frame of one week, a medium length time frame of one month, as well as a long term time frame of one year.

Users which have not made an edit before taking part in a meetup will be excluded from the following analyses. I will work with the difference in activity between the time after and the time before the meetup. Given that the distribution of values is highly skewed, I take the cube root of the change (this accounts for outliers and remains the direction of the change). The distribution of the calculated cube rooted changes is displayed in figure 1 for all namespaces and timeframes.

Offline activity. The majority of offline meetings of Wikipedians are organised on the platform. As the data is user-written and not process-generated, it comes in an inconsistent format. Information

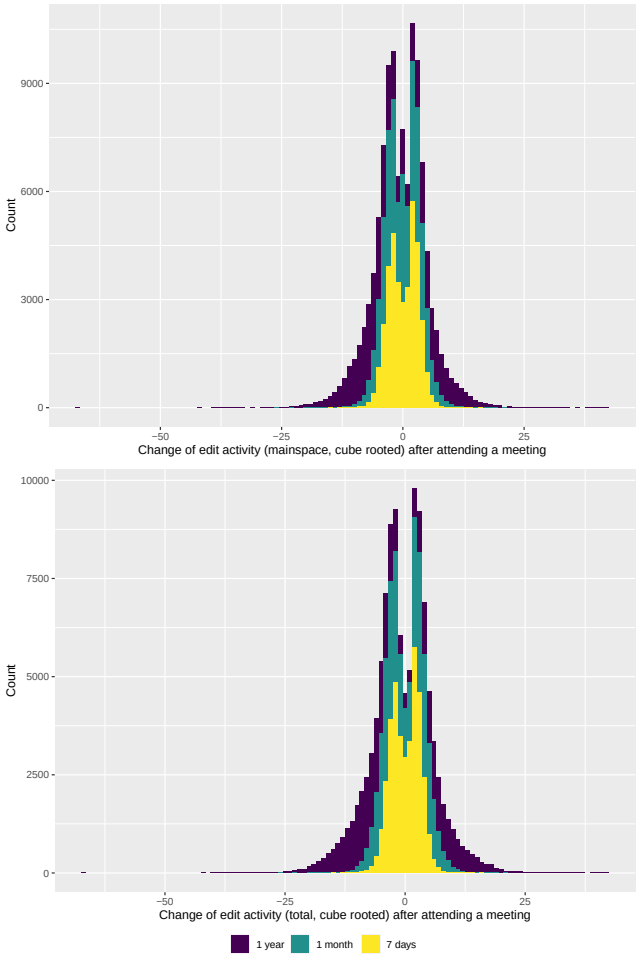

Figure 1: Change in editing behaviour after attending meetup.

on all offline meetings since launch of Wikipedia until March 2020 (when meetings stopped to take place face-to-face due to the outbreak of the Covid-19 pandemic) were collected using automated and manual web-scraping. The starting points of meetup collection were an overview list of meetings between Wikipedians[2], and other event sites[3]. Additionally, all WikiProjects[4] and task forces[5]—sort of virtual gathering spaces for contributors—were checked for meetings. Throughout the scraping of all of these pages, a snowballing approach was followed.

Some pages and meetings were excluded from the data and/or the data collection process. All meetups that took place only virtually were skipped. Also, all meetings organised on other platforms maintained by Wikimedia were excluded from data collection. Lastly,

[2]See https://de.wikipedia.org/wiki/Kategorie:Wikipedia:Treffen_der_Wikipedianer.
[3]See https://de.wikipedia.org/wiki/Kategorie:Wikipedia:Archiv/Veranstaltungen and https://de.wikipedia.org/wiki/Kategorie:Wikipedia:Versicherte_Veranstaltung.
[4]See https://de.wikipedia.org/wiki/Wikipedia:WikiProjekte.
[5]Called *Redaktionen* in the German Wikipedia, see https://de.wikipedia.org/wiki/Wikipedia:Redaktionen#Liste.

very regularly occurring meetups in community spaces[6] were excluded; this includes for example weekly office hours or very regular open editing events. The same people tended to attend these events and in many cases, users stopped to sign up online beforehand.

The meetups will be described in more detail in section 4.

Control group and control variables. This paper is concerned with the causal effect of offline meetings on the contributing behaviour of single actors. To allow the identification of a *treatment effect*, a control group is created to follow a quasi-experimental approach. Each user that attended a specific meetup was matched with a similar other (a twin), using covariate matching [26]. The population of potential twins only included users who have never taken part in any meetups. The twin was identified by comparing users based on tenure, past total activity and past recent activity and using a distance measure based on ordinary least squares.

Further control variables are included in addition to the matching procedure as a differing treatment effect might be expected. I control for the previous total level of activity up to the time of the meeting as well as the previous level of activity recently before the meeting. Tenure is measured as years passed since a user's very first edit. I also control for the year of the meetup, differentiating three equally long categories (before 2009, between 2009 and 2014, 2015 and after). I have also measured whether a user has ever been, is or will ever be an administrator; an additional interaction is included to test whether this can influence the effect of a meetup. Also, a differentiation will be made between the very first meetup of a user and all other meetups. Lastly, it will be tested whether meetups have a different effect depending on whether the meetup is of a work or social nature.

Table 1 shows descriptive information on all (uncentred) independent and dependent variables included in the models. The values of the meetup attendees (treatment group, T) and their twins (control group, C) are given separately to allow for comparison. The matching procedure has worked well, but there is a notable difference in the proportion of administrators per group[7].

Statistical approach. A quasi-experimental difference-in-differences (DiD) approach will be used to assess the effect of meetups on productive behaviour: Changes in behaviour before and after the meetup will be compared across the actual attendees (treatment group) and their twins who have not attended the corresponding meetup (control group). A DiD estimate is the difference between the change in outcomes before (pre) and after (post) a treatment in a treatment versus a control group [3, 10]:

$$(\bar{y}^{POST}_{TREAT} - \bar{y}^{PRE}_{TREAT}) - (\bar{y}^{POST}_{CONTROL} - \bar{y}^{PRE}_{CONTROL}).$$

This measure equals the estimated coefficient on the interaction of a treatment group dummy ($treat_t$) and a post-treatment dummy ($post_t$) in a regression:

$$y_i t = \beta_1 + \beta_2(treat_t) + \beta_3(post_t) + \beta_4(treat_i * post_t) + \epsilon_{it}.$$

[6]See https://de.wikipedia.org/wiki/Wikipedia:Community-Space. Community spaces tend to be financially supported by the Wikimedia foundation and offer a headquarter for both staff members as well as engaged local Wikipedians.

[7]Given the high number of observations, even the small differences between treatment and control group in the other variables become significant according to t-test and chi-squared tests.

Table 1: Descriptive information on all variables included in the models on productivity.

Group	Variable	Mean (SD) or %	Min/Max
T	Change in 7 day total edits (cube root)	0.070 (2.91)	-14.62 / 15.77
C		-0.173 (2.54)	-13.03 / 23.77
T	Change in 7 day mainspace edits (cube root)	-0.052 (2.47)	-14.29 / 15.81
C		-0.10 (2.21)	-13.03 / 23.77
T	Change in 1 month total edits (cube root)	-0.095 (4.42)	-26.32 / 21.34
C		-0.49 (3.92)	-20.14 / 35.34
T	Change in 1 month mainspace edits (cube root)	-0.077 (3.82)	-26.40 / 20.88
C		-0.34 (3.39)	-20.13 / 35.34
T	Change in 1 total year edits (cube root)	-1.75 (9.49)	-67.25 / 42.13
C		-2.71 (8.54)	-40.94 / 37.17
T	Change in 1 year mainspace edits (cube root)	-1.40 (8.14)	-67.21 / 42.02
C		-2.18 (7.31)	-40.93 / 37.49
T	Was ever admin	29.02%	
C		14.19%	
T	Total edits up to meeting (log)	8.56 (2.16)	0.69 / 14.52
C		8.45 (2.24)	0.69 / 13.16
T	Mainspace edits up to meeting (log)	7.81 (2.39)	0 / 14.50
C		7.86 (2.37)	0 / 12.91
T	Total recent 7 day edits (cube root)	3.02 (1.98)	0 / 19.97
C		2.42 (2.13)	0 / 13.44
T	Mainspace recent 7 day edits (cube root)	2.24 (1.84)	0 / 19.89
C		1.92 (1.86)	0 / 13.44
T	Total recent 1 month edits (cube root)	5.13 (3.00)	0 / 34.65
C		4.22 (3.29)	0 / 21.48
T	Mainspace recent 1 month edits (cube root)	3.96 (2.76)	0 / 34.56
C		3.42 (2.87)	0 / 21.44
T	Total recent 1 year edits (cube root)	11.93 (6.44)	0 / 86.20
C		10.17 (6.96)	0 / 43.65
T	Mainspace recent 1 year edits (cube root)	9.57 (5.75)	0 / 85.89
C		8.40 (6.08)	0 / 41.92
T	Years since first edit	5.93 (3.89)	0.00024 / 18.43
C		5.23 (3.86)	0.000023 / 18.44
T	First meetup	10.22%	
T	Work meetup	23.10%	
T	Year of meetup 03-08	21.21%	
T	Year of meetup 09-14	34.17%	
T	Year of meetup 15-20	44.62%	
T	Observations	37025	
C		36364	

T = Treatment group; *C* = Control group. The number of observations in the control group is smaller due to the same twin being assigned to users at different meetings with the same meeting features. Variables referring to meetings (first meetup, work meetup, year of meetup) are only given for the treatment group as the values for the control group is nearly identical (small deviations are cause by the difference in number of observations).

As the data exhibits a multilevel structure [18] with attendance at meetups being nested in users, mixed-effects models with random intercepts for each user are estimated and both within and between effects are differentiated and estimated for total activity and tenure [1, 4, 17].

To assess the changes in productivity, I break the process into two separate parts, similarly to the approach followed in hurdle models [6]. First, I focus on all those users that have not made an edit in the week/month/year before the meetup and dichotomously model the decision whether they make any edits after the meetup. A multilevel linear probability model (LPM) is used to model this decision [16, 24]. In the second step, only users which have made an edit in the specified time frame before the meetup are included and the change in editing is analysed using a multilevel linear model.

4 OFFLINE MEETUPS OF WIKIPEDIANS

Overall, 4408 meetups have been recorded that were organised on the German language version of Wikipedia.

Temporal distribution. The first meeting recorded took place on October 28th 2003 with five attendees in Munich, the last ones on March 13th 2020 with three attendees in Cologne and with four attendees in Leipzig. 77% of those meetups are classified as mainly

social while the other 23% are considered work meetings. Social meetups are meetups that have an inherently social component, such as the classic informal meetup (*Stammtisch*), parties and celebrations, yearly meetings, hiking trips, barbecues and similar. Work meetups are generally organised with the intention to improve Wikipedia (such as editathons, open editing events, workshop, phototours, etc.).

The distribution of meetups over time is pictured in figure 2. Please note that meetups happening in 2020 are not plotted to allow for better comparability across years as data collection did not collect any meetups after March 2020. For 2020, a total of 67 meetups were collected with 38 being social in nature (57%). The number of meetups increased steadily in the first years after the launch of the German Wikipedia until 2009, since remaining stable and counting roughly 300 meetups per year. The proportion of work meetups has been increasing over the years. While the meetups in 2020 are not plotted and data was only collected until March, the number of meetups will have reached an all-time low for this year.

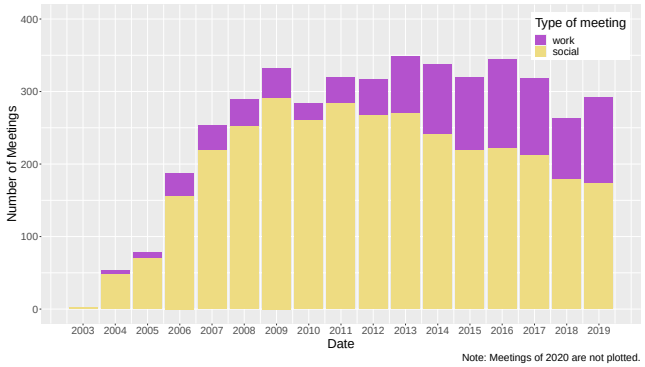

Figure 2: Temporal distribution of meetups.

Spatial distribution. The large majority of meetups organised on the German speaking Wikipedia have naturally taken place in the German speaking area: 89% (3915) took place in Germany, 6% (243) in Austria, 4% (187) in Switzerland and 0.02% (1) in Liechtenstein. Even though this captures around 99% of the meetups, the remaining percent took place in 20 different countries: Australia (5), Belgium (2), Canada (1), China (1) Czech Republic (4), Finland (6), France (3), Hungary (1), Italy (5), Japan (8), Mexico (1), the Netherlands (2), Poland (10), Slovakia (1), Slovenia (1), South Africa (1), Majorca in Spain (1), Sweden (2), the United Kingdom (6) and Ukraine (1).

The spatial global distribution of meetups is plotted in figure 3; figure 4 is restricted on meetups in the German-speaking countries Germany, Switzerland, Austria and Liechtenstein (GSA).

The average number of attendees per meetup is 8.4 (mean; median of 7, standard deviation 6.6) with a minimum of 1—meaning there were meetups where users were alone—and a maximum of 119. If a user took part at meetings, they on average joined 9.2 meetings in total (mean; median of 2, standard deviation 21.1) with a minimum of 1 and a maximum of 289 meetups.

Figure 3: Spatial distributions of meetups (world).

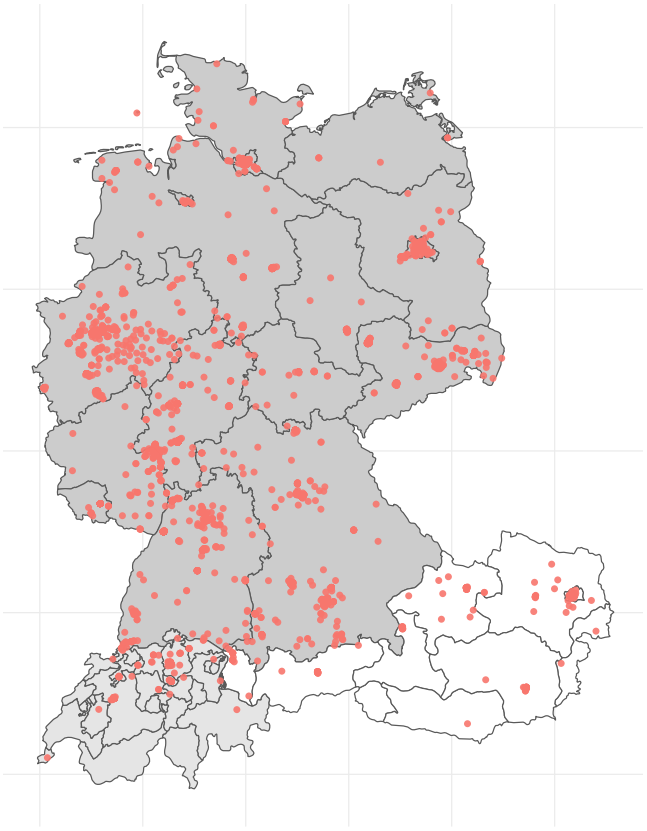

Figure 4: Spatial distributions of meetups (GSA).

Who are the users attending these meetups? In total, there are 36599 observations of Wikipedians attending meetups; 4013 different users have attended such offline gatherings. Before taking part in a meetup, users had been active on Wikipedia on average for 921.2 days (days since their first edit; median 489.4, standard deviation 1125.2, minimum -3824.1, maximum 5968.2). This means some users have taken part in a meeting about 10.5 years before they even made their first edit in the German Wikipedia, while others had already been on Wikipdia for over 16 years before meeting other Wikipedians face-to-face. Looking at the activity level of users, users have made on average 2012 edits in the Wikipedia article namespace before attending their first meetup (median 228,

standard deviation 6302.8, minimum 0, maximum 188652). Looking at all edits, the numbers are naturally slightly higher with an average of 3005 edits (median 362, standard deviation 8343.8, minimum 0, maximum 215717).

Looking at all meetups instead of just the first one attended, it is found that Wikipedians have made on average 11828 edits in the Wikipedia main namespace before attending a meetup (median 4136, standard deviation 24527.2, minimum 0, maximum 1986719), and 19608 edits in total (median 7759, standard deviation 34188.8, minimum 0, maximum 2025450). On average, the first edit was 2126 days ago, meaning almost 6 years (median 1896, standard deviation 1429.5, minimum -3824.1, maximum 6731.4). The maximum of about 18.5 years (6731 days) signifies again the long-term sustainability of Wikipedia: Users that have registered and made edits almost two decades ago still remain active meetup goers: It is undoubtedly quite remarkable that a Wikipedian who signed up in the very early days of the project—namely July 2001—still attends a meetup in December 2019.

5 RESULTS

Most users of Wikipedia have been active on Wikipedia both before and after taking part in a meetup. However, to what extent has the level of activity changed after taking part in a meetup?

For each of the three time frames analysed, a multilevel LPM is estimated on those users which have not made an edit in the corresponding time frame before. This means, the probability is estimated that someone who has not edited in the week (month/year) before the meetup makes an edit in the week (month/year) after the meetup. In a second step, only users which have made an edit before will be analysed. It will be checked to what extent users which have shown some activity before the meetup changed the extent of their editing behaviour.

Two models are presented in the form of coefficient plots (tables are in the appendix). In the first one, only the single DiD treatment effect is estimated (model in green). The second model includes additional control variables and assesses whether the treatment effect depends on the exact meeting attended and whether the user is an administrator (model in red). Estimation results are shown in coefficient plots, differentiating binary (top) and continuous (bottom) models, as well as models concerning only the article namespace (left) and those looking at activity across all namespaces (right). Predicted probabilities and predicted changes in editing extent, based on the treatment models, are calculated below and the effect of further variables is discussed.

Short term effect: One week. Figure 5 shows the short term effect of meetups on editing behaviour of Wikipedians. The binary models show the estimated effects for a user who has not edited in the seven days before the meetup. The results suggest that a user is significantly more likely to contribute towards Wikipedia in the seven days after a meetup if they went to the meetup, i.e. they are in the treatment group instead of the control group. The probability for a user to make an edit in the article namespace in the week after the meetup if they have not edited in the week before lies at 15.8 per cent if they are in the control group of twins, and rises to 36.2 per cent if they actually took part in the meetup. Across all namespaces, the probability to edit increases from 15.4 per cent to 53.2 per cent. These differences of 20.4 and 37.8 per cent respectively reflect the average treatment effect on the treated (ATT). Users in the control group make on average -0.032 edits less after the meetup in the mainspace, while attendees make -0.014 edits less; across all namespaces, users in the control group make on average -0.063 edits less, while the number of contribution of attendees stay almost unchanged (-0.0000012).

Further, users taking part in a meeting become more likely to start editing in the article namespace when taking part in a work-related meeting, and such work-meetup attendees increase the extent of their editing behaviour both in the mainspace as well as across all namespaces on average more than those attending a meetup with a more social nature.

While users attending their first meetup are less likely to start editing somewhere across all namespaces, they do on average increase their editing behaviour even more after their first meetup than after any other meetup. This effect cannot be found for the article mainspace. This might suggest it is not the number of actual productive edits which increases, but edits on other namespaces which potentially refer to the meeting or discussions with others. While administrators tend to make more edits across all namespaces—whether they have attended a meetup or not—they tend to increase their activity less both in the mainspace and across all namespaces after a meetup.

Medium term effect: One month. Looking at a longer time frame, I again find positive effects of the treatment (see figure 6): Considering users that have not edited in the month before a meetup, they become more likely to edit after the meetup if they have taken part (i.e. are in the treatment group). The predicted probability to contribute in the month after the meetup increases from 14.3 per cent to 37.3 per cent in the mainspace, if the user is in the treatment instead of the control group. The probability to edit any site on Wikipedia increases from 13.9 per cent to 50.0 per cent. Comparing the month before with the month after the meeting, users in the control group make on average -0.17 edits less in the mainspace (-0.38 across all namespaces), while meetup attendees only make -0.0048 edits less (-0.0019 across all namespaces).

Further in line with the shorter term model, there is a positive effect of work-related meetups, and administrators tend to increase their activity less after a meetup than other users.

Long term effect: One year. Lastly, how does the activity one year after a meetup compare to the activity one year before? This is the longest trend that will be analysed; the estimated effects are shown in figure 7. In general, it is only seldom the case that users which have not made an edit in the past year will do so in the next. In fact, it was never the case when focusing on total edits, so that no model was estimated.

Looking at the mainspace model, the baseline probability to edit in the next year is 6 per cent if the user did not take part in a meetup, and rises to 31 per cent if they did so. Again, there is a positive effect of taking part in a meetup, even in this very long term. Given the long-time frame, it is important to note that other things could have also changed in the year (e.g., a user could have become administrator, taken part in more meetings, etc.).

While few people start editing that have not edited before, many more change their editing behaviour which feed into the bottom

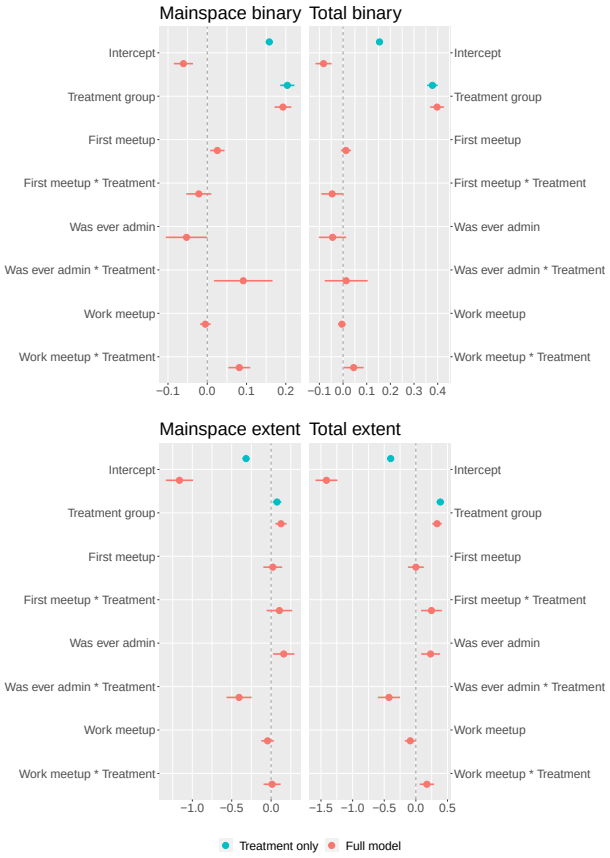

Figure 5: Change in editing behaviour after attending meetup (one week) including a 95 per cent confidence interval.

Figure 6: Change in editing behaviour after attending meetup (one month). Note: 95 per cent confidence interval.

models in figure 7: Again, users that took part in a meetup edit more. While members of the control group make on average -12.49 edits less in the mainspace (-20.29 across all namespaces) in the year after the meetup, meetup attendees only make -3.81 edits less (-5.03 across all namespaces).

Also, there is a positive effect of the main effect of the first meetup in the models analysing the extent of changes in editing behaviour, however it is negative for the treatment group. Users actually attending their first meetup have a smaller increase in activity in the long term compared to other meetups. Looking at this long term trend, there is no effect of adminship or the work or social nature of meetings.

In all models, the main effect of being in the treatment group is positive and highly significant.

6 DISCUSSION AND CONCLUSION

This paper has investigated to what extent offline meetups influence the productive online behaviour of Wikipedians. It was analysed how users change their editing behaviour after a meetup in comparison to before. In comparison with a control group, I found that across all time frames observed (one week, one month, one year), attending an offline meetup has a positive effect on the contribution behaviour of users. It is not necessarily the case that users increase their contributions after a meetup in comparison to before the meetup, but their reduction in contribution is less than the reduction a comparable control group experiences. The difference-in-differences design can reveal that even though there is a general trend to decrease editing behaviour across time, this decrease is significantly smaller for the treatment group of meetup attendees. Generally, users attending a meetup are much more likely to start contributing again after a meetup if they have not been editing articles before.

Concerning the activity level of administrators, I do only find partial support for the previous findings by [22]. While he found increased editing behaviour particularly for administrators, I find that administrators tend to make more edits—whether they have attended a meetup or not—but that they tend to increase their activity less after a meetup than other users. Concerning the comparison of work-related meetings with more social meetings, I find that attending a work-related offline meetup has a stronger, positive effect on editing behaviour than social meetings. When looking at the long time frame of one year, it does not significantly matter whether the meetup attended was of a social or work nature.

In summary, there are positive effects for the community of Wikipedians after face-to-face meetings. In comparison to a matching control group, those attending a meeting become or remain

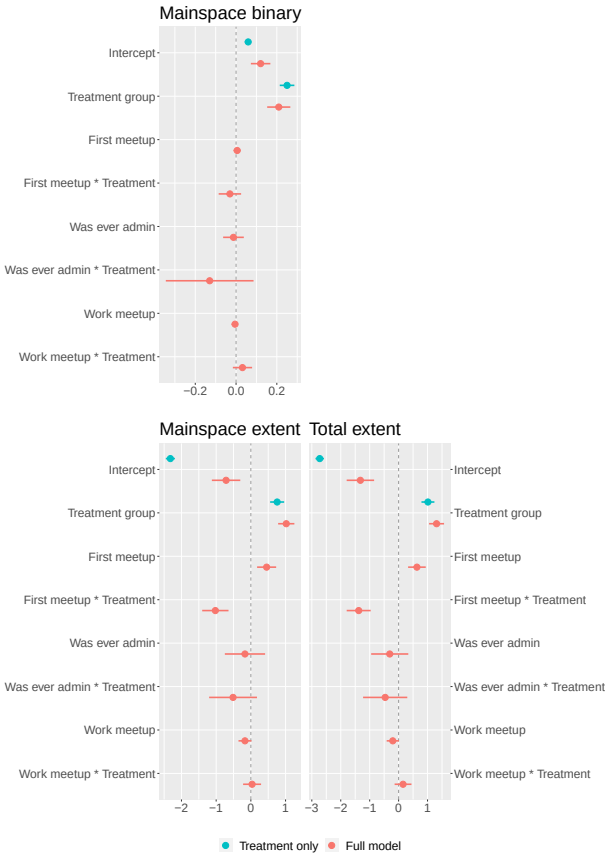

Figure 7: Change in editing behaviour after attending meetup (one year). Note: 95 per cent confidence interval.

more active to the project. In comparison to other online communities, offline gatherings do seem to support the community. This is, of course, an effect of the average. An analysis like this naturally ignores potential negative changes to individual users.

Limitations and future research. This study has a number of limitations which must be discussed, and which also offer future research opportunities. This study has compared before and after levels of activity in different time frames around a meetup. Other approaches could be feasible and lead to more fine-grained results concerning the short and long term effect of meetups. For example, the collection of daily activity rates could be used in an interrupted time series approach [5].

There might also be some biases in the data. Meetup attendance was collected from protocols after the meetup if possible; in most cases however, attendance is taken from the registration of interest written before the meetup took place. It is, of course, not mandatory to sign up for a meeting before attending; it is also not mandatory to attend after registering or deregister if not attending. It can thus be expected that there are some errors in the attendance lists.

Furthermore, newcomers—defined as users not having made an edit before taking part in a meetup—have been excluded in this study. The analysis could be extended to specifically focus on newcomers [such as the study of 8], comparing the Wikipedia trajectories of those starting with an offline encounter with a comparable control group of users which has registered at the same point in time but has not taken part in a meetup.

Also, focusing on shorter time frames could allow more in-depth analysis of meetup dynamics. Future work could also focus specifically on community spaces which have been excluded in this paper. They exhibit a very different dynamic than the more informally organised meetups. Still, they form an important part of the meetup culture on Wikipedia.

More generally, it is important to note that this study has only focused on the German speaking Wikipedia. To understand the community as a whole, it is important to continue this work across other language versions.

Notwithstanding these limitations, this study was the first large-scale analysis of the effect of informal meetups in the German Wikipedia. It has shown that meetups have on average positive effects on the individual contribution behaviour. While studies of other online communities have shown that offline gatherings between community members can have detrimental effects to the community as a whole, this does not seem to be the case for the German Wikipedia.

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A REGRESSION MODELS

	Mainspace binary	Mainspace binary	Mainspace continuous	Mainspace continuous	Total binary	Total binary	Total continuous	Total continuous
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.1580 (0.0045)***	−0.0607 (0.0125)***	−0.3176 (0.0198)***	−1.1636 (0.0884)***	0.1540 (0.0048)***	−0.0824 (0.0174)***	−0.3977 (0.0218)***	−1.4135 (0.0884)***
Treatment group (Ref.: Control)	0.2039 (0.0092)***	0.1928 (0.0110)***	0.0754 (0.0274)**	0.1259 (0.0363)***	0.3778 (0.0113)***	0.3974 (0.0150)***	0.3870 (0.0299)***	0.3353 (0.0384)***
First meetup (Ref.: Later meetup)		0.0257 (0.0094)**		0.0215 (0.0611)		0.0122 (0.0108)		0.0002 (0.0639)
First meetup * Treatment		−0.0216 (0.0162)		0.1058 (0.0827)		−0.0461 (0.0235)*		0.2466 (0.0842)**
Was ever admin (Ref.: Never)		−0.0528 (0.0269)+		0.1607 (0.0690)*		−0.0443 (0.0293)		0.2334 (0.0758)**
Was ever admin * Treatment		0.0917 (0.0380)*		−0.4066 (0.0813)***		0.0133 (0.0463)		−0.4251 (0.0895)***
Work meetup (Ref.: Social)		−0.0048 (0.0069)		−0.0448 (0.0409)		−0.0048 (0.0075)		−0.0892 (0.0436)*
Work meetup * Treatment		0.0817 (0.0142)***		0.0130 (0.0553)		0.0450 (0.0213)*		0.1743 (0.0578)**
Mainspace edits up to meeting (log, cwc)		0.0264 (0.0105)*		0.1659 (0.0305)***				
Mainspace edits up to meeting (log, cm)		0.0517 (0.0017)***		0.3251 (0.0147)***				
Total edits up to meeting (log, cwc)						0.0284 (0.0175)		0.1815 (0.0315)***
Total edits up to meeting (log, cm)						0.0456 (0.0023)***		0.3548 (0.0141)***
Mainspace edits 7 days before (cube-root, cwc)				−1.0710 (0.0111)***				
Mainspace edits 7 days before (cube-root, cm)				−0.4339 (0.0156)***				
Total edits 7 days before (cube-root, cwc)								−1.0611 (0.0109)***
Total edits 7 days before (cube-root, cm)								−0.4503 (0.0153)***
Year of meetup: 09-14 (Ref.: 03-08)		0.0150 (0.0127)		0.0571 (0.0499)		0.0128 (0.0146)		0.1382 (0.0516)**
Year of meetup: 15-20 (Ref.: 03-08)		−0.0115 (0.0113)		−0.2053 (0.0339)***		0.0022 (0.0141)		−0.1371 (0.0358)***
Years since first edit (cwc)		−0.0294 (0.0023)***		−0.1486 (0.0080)***		−0.0264 (0.0026)***		−0.1851 (0.0085)***
Years since first edit (cm)		−0.0121 (0.0014)***		−0.0644 (0.0069)***		−0.0086 (0.0016)***		−0.0661 (0.0072)***
AIC	19942	18676	250524	241893	12601	12002	294450	285461
BIC	19974	18803	250560	242052	12631	12124	294486	285622
Log Likelihood	−9966.87	−9321.76	−125258.11	−120928.29	−6296.27	−5985.08	−147221.24	−142712.42
Num. obs.	21646	21645	51743	51743	15044	15043	58345	58345
Num. groups: id	7160	7160	7122	7122	5720	5720	8319	8319
Var: id (Intercept)	0.0455	0.0349	0.0608	0.1535	0.0504	0.0450	0.1112	0.1972
Var: Residual	0.1218	0.1175	7.3623	6.1523	0.1064	0.1028	9.0114	7.6478

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.1$

Table 2: Changes in editing behaviour, 7 days

	Mainspace binary	Mainspace binary	Mainspace continuous	Mainspace continuous	Total binary	Total binary	Total continuous	Total continuous
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.1427 (0.0054)***	−0.0130 (0.0173)	−0.5523 (0.0262)***	−1.5179 (0.1086)***	0.1393 (0.0061)***	−0.0024 (0.0226)	−0.7216 (0.0288)***	−1.9431 (0.1149)***
Treatment group (Ref.: Control)	0.2301 (0.0121)***	0.2537 (0.0152)***	0.3839 (0.0363)***	0.3237 (0.0487)***	0.3604 (0.0184)***	0.4179 (0.0253)***	0.5969 (0.0395)***	0.4600 (0.0528)***
First meetup (Ref.: Later meetup)		0.0287 (0.0113)*		−0.0437 (0.0807)		−0.0044 (0.0129)		0.0069 (0.0864)
First meetup * Treatment		−0.0628 (0.0205)**		0.1835 (0.1089)+		−0.0737 (0.0373)*		0.2556 (0.1137)*
Was ever admin (Ref.: Never)		−0.0060 (0.0402)		0.1324 (0.0948)		0.0262 (0.0405)		0.3151 (0.1044)**
Was ever admin * Treatment		0.0623 (0.0609)		−0.3208 (0.1121)**		−0.1178 (0.1017)		−0.3786 (0.1237)**
Work meetup (Ref.: Social)		0.0037 (0.0076)		−0.1104 (0.0552)*		0.0026 (0.0077)		−0.0825 (0.0606)
Work meetup * Treatment		0.0744 (0.0172)***		0.1936 (0.0748)**		0.0086 (0.0329)		0.2802 (0.0810)***
Mainspace edits up to meeting (log, cwc)		−0.0059 (0.0128)		−0.1031 (0.0413)*				
Mainspace edits up to meeting (log, cm)		0.0435 (0.0022)***		0.3508 (0.0193)***				
Total edits up to meeting (log, cwc)						−0.0025 (0.0215)		−0.0529 (0.0446)
Total edits up to meeting (log, cm)						0.0321 (0.0029)***		0.3816 (0.0195)***
Mainspace edits 1 month before (cube-root, cwc)				−1.0812 (0.0111)***				
Mainspace edits 1 month before (cube-root, cm)				−0.3075 (0.0139)***				
Total edits 1 month before (cube-root, cwc)								−1.0431 (0.0112)***
Total edits 1 month before (cube-root, cm)								−0.3108 (0.0137)***
Year of meetup: 09-14 (Ref.: 03-08)		0.0033 (0.0178)		0.0932 (0.0662)		0.0238 (0.0202)		0.1924 (0.0707)**
Year of meetup: 15-20 (Ref.: 03-08)		−0.0086 (0.0163)		−0.2832 (0.0460)***		0.0050 (0.0172)		−0.1938 (0.0501)***
Years since first edit (cwc)		−0.0247 (0.0029)***		−0.2137 (0.0109)***		−0.0237 (0.0034)***		−0.2609 (0.0121)***
Years since first edit (cm)		−0.0108 (0.0018)***		−0.0455 (0.0093)***		−0.0103 (0.0020)***		−0.0428 (0.0098)***
AIC	9721	9154	336391	327252	4509	4325	376041	367446
BIC	9751	9274	336427	327415	4537	4438	376077	367610
Log Likelihood	−4856.58	−4561.01	−168191.69	−163608.22	−2250.27	−2146.58	−188016.26	−183705.19
Num. obs.	13188	13188	60201	60200	8734	8734	64655	64654
Num. groups: id	4767	4767	8586	8586	3167	3167	9868	9868
Var: id (Intercept)	0.0630	0.0546	0.1050	0.3024	0.0693	0.0673	0.1420	0.3581
Var: Residual	0.0909	0.0882	15.5448	13.1933	0.0673	0.0652	19.5240	16.9119

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.1$

Table 3: Changes in editing behaviour, 1 month

	Mainspace binary	Mainspace binary	Mainspace continuous	Mainspace continuous	Total continuous	Total continuous
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	0.0595 (0.0058)***	0.1205 (0.0244)***	−2.3199 (0.0668)***	−0.7142 (0.2089)***	−2.7273 (0.0745)***	−1.3211 (0.2420)***
Treatment group (Ref.: Control)	0.2502 (0.0183)***	0.2095 (0.0290)***	0.7578 (0.1030)***	1.0204 (0.1193)***	1.0139 (0.1141)***	1.3121 (0.1320)***
First meetup (Ref.: Later meetup)		0.0055 (0.0086)		0.4546 (0.1402)**		0.6331 (0.1557)***
First meetup * Treatment		−0.0302 (0.0281)		−1.0231 (0.1934)***		−1.3796 (0.2119)***
Was ever admin (Ref.: Never)		−0.0127 (0.0259)		−0.1696 (0.2960)		−0.3068 (0.3274)
Was ever admin * Treatment		−0.1294 (0.1098)		−0.5131 (0.3517)		−0.4641 (0.3897)
Work meetup (Ref.: Social)		−0.0049 (0.0034)		−0.1697 (0.0951)+		−0.2018 (0.1075)+
Work meetup * Treatment		0.0315 (0.0241)		0.0357 (0.1320)		0.1531 (0.1486)
Mainspace edits up to meeting (log, cwc)		−0.1707 (0.0261)***		−4.2646 (0.0779)***		
Mainspace edits up to meeting (log, cm)		0.0077 (0.0025)**		−0.3451 (0.0462)***		
Total edits up to meeting (log, cwc)						−5.0936 (0.0888)***
Total edits up to meeting (log, cm)						−0.2749 (0.0504)***
Mainspace edits 1 year before (cube-root, cwc)				−1.2202 (0.0125)***		
Mainspace edits 1 year before (cube-root, cm)				−0.0709 (0.0185)***		
Total edits 1 year before (cube-root, cwc)						−1.1628 (0.0127)***
Total edits 1 year before (cube-root, cm)						−0.1053 (0.0185)***
Year of meetup: 09-14 (Ref.: 03-08)		−0.0431 (0.0259)+		1.5116 (0.1315)***		1.8094 (0.1454)***
Year of meetup: 15-20 (Ref.: 03-08)		−0.0559 (0.0223)*		0.1755 (0.0890)*		0.2913 (0.0999)**
Years since first edit (cwc)		−0.0014 (0.0026)		−0.0879 (0.0214)***		−0.0993 (0.0250)***
Years since first edit (cm)		−0.0081 (0.0020)***		0.2253 (0.0217)***		0.2294 (0.0237)***
AIC	−1850	−2147	468363	448372	502243	481840
BIC	−1823	−2039	468400	448536	502279	482004
Log Likelihood	928.81	1089.36	−234177.57	−224168.01	−251117.28	−240901.82
Num. obs.	6021	6021	67368	67367	69479	69478
Num. groups: id	2206	2206	10108	10108	11031	11031
Var: id (Intercept)	0.0783	0.0722	6.6014	7.2262	8.4361	8.6866
Var: Residual	0.0210	0.0198	57.8883	42.2524	76.3483	56.0703

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.1$

Table 4: Changes in editing behaviour, 1 year