

Who Won the Facebook Referendum?

Engagement, Tone and Nationalism on UK Party and Campaign Pages, February to June 2016

Tristan Hotham*

2026

Preprint, not peer reviewed

Abstract

Between the announcement of the EU referendum on 20 February 2016 and polling day on 23 June 2016, the Leave and Remain sides fought a large part of their campaign on Facebook. I analyse 17,657 posts from 92 UK pages, covering the official and unofficial campaigns and the main party, leader and MP pages, which together drew 33.5 million interactions. Pages aligned with Leave produced 65% of the engagement from 23% of the posts. Most of that lead comes from four large pages (Leave.EU, Vote Leave, Nigel Farage and UKIP), and it shrinks but stays positive, with wide uncertainty, when audience size is held constant. Among the three campaign pages in the data, Britain Stronger in Europe earned a median of 7,480 interactions per post, more than Vote Leave (2,844) and less than Leave.EU (9,324). I check the text coding against a sample of 360 posts coded by an AI model (Claude) from a written codebook. Against that reference coding, the dictionary measure of negativity is precise but misses about 42% of negative posts, so it understates how negative both sides were. Corrected for this, 37% of Leave posts and 42% of Remain posts were negative among campaigns, leaders and parties (difference -5 points, 95% CI -19 to $+8$). Across all pages Leave looks more negative, but that gap comes from one individual MP page, Douglas Carswell's. Leave pages were more focused on immigration (17% against 5%) and British national identity, and less focused on cooperation. Negative posts drew more engagement on both sides, by 15% on Leave pages and 41% on Remain pages when each side is modelled separately. Whether the premium differed between the sides depends on how the model is specified, so I do not claim a difference. The premium was large on the two Leave campaign pages, Leave.EU (52%) and Vote Leave (98%), but Vote Leave posted little negative content. The evidence does not support the claim that Leave won engagement by being more negative. I set out which comparisons are fair, which are not, and what the data can and cannot say about the Facebook campaign.

Keywords: Brexit; EU referendum; Facebook; engagement; negative campaigning; nationalism; Leave.EU; Vote Leave; Stronger In; text as data

*Independent researcher. Data collected between 2016 and 2020 during and after doctoral research at the University of Bath. Correspondence: contact@tristanhotham.com. The views expressed are the author's own and do not represent those of any employer.

1 Introduction

The 2016 referendum on the United Kingdom’s membership of the European Union produced a campaign in which both sides, and a set of unofficial and party-aligned actors, put large amounts of effort into Facebook. The result has since been described in terms of its social divisions (Hobolt 2016; Goodwin and Heath 2016) and of the Eurosceptic politics that preceded it (Vasilopoulou 2016). A shorter literature looks at the social media campaign itself, mostly on Twitter (Usherwood and Wright 2017; Howard and Kollanyi 2016). Facebook is less studied, even though it was where the biggest audiences were.

A popular account holds that Leave won the argument on social media because it was louder, angrier and more nationalist, and that negativity was what the platform rewarded. This paper tests the parts of that account that post-level data can test. I ask who received the engagement, whether the two sides differed in tone and content, whether negative posts were rewarded more on one side than the other, and whether the engagement itself differed in kind.

The data come from CrowdTangle and Netvizz exports that I collected between 2016 and 2020 during and after my doctoral research on the use of Facebook by UK political parties (Hotham 2021), and they extend an analysis of a single far-right page that I published as a preprint earlier this year (Hotham 2026). They cover 92 UK pages. They are not designed for a clean comparison of Leave and Remain, and a large part of the paper is about that. The Remain side in the data includes the official campaign, Britain Stronger in Europe (“Stronger In”), but no other organisation of its kind, and its Leave counterparts are an official campaign (Vote Leave) and a larger unofficial one (Leave.EU). Most of the other pages are parties, leaders and MPs whose size differs by four orders of magnitude. Where a comparison is unfair, I restrict it, match it or drop it, and I say which.

My main findings are these. First, the Leave side’s advantage in total engagement comes mainly from a few very large pages and from the volume of the two Leave campaign pages, and part of it remains when audience size is held constant. Second, Leave pages were not more negative than Remain pages in a like-for-like comparison, though they were less positive and more concerned with immigration and national identity. Third, negative posts drew more engagement on both sides, and the data do not show a robust difference between the sides in that premium. Fourth, the mix of reactions, comments and shares was similar across sides, with one notable difference in how the two official campaigns’ audiences behaved.

2 Background and Research Questions

2.1 The campaigns

David Cameron announced the referendum on 20 February 2016 after concluding a renegotiation of the UK’s terms of membership, and polling took place on 23 June 2016. The Electoral Commission designated Vote Leave and Britain Stronger in Europe as the official campaigns for each side. Leave.EU, closely linked to Nigel Farage and UKIP, competed with Vote Leave for the same supporters as an unofficial campaign, and the Conservative Party was formally neutral and divided. Labour, the Liberal Democrats, the Greens, the Scottish National Party, Plaid Cymru and the main Northern Irish parties other than the Democratic Unionist Party supported Remain. UKIP and the Democratic Unionist Party supported Leave. Stronger In became Open Britain after the vote. The window also contains the elections of 5 May 2016 to the Scottish Parliament, the National Assembly for Wales, the Northern Ireland

Assembly and the London Assembly and mayoralty, and the English local elections, which many party, leader and MP pages were fighting.

2.2 Negativity and engagement

Research on negative campaigning is divided on whether it works in votes, but is more consistent on attention: negative content is noticed and remembered (Lau and Rovner 2009; Soroka et al. 2019). In platform studies, moral-emotional and out-group content spreads further (Brady et al. 2017; Rathje et al. 2021; Berger and Milkman 2012), and in my analysis of Britain First’s page the audience engaged most with content about out-groups (Hotham 2026). This suggests that negativity should be rewarded on any political page, whatever its side. Whether it was rewarded *more* on one side is a separate question, and the one that bears on the claim that Leave won by being negative.

2.3 Nationalism and Europe

The Leave campaigns framed the vote around sovereignty, control and immigration, and the Remain campaigns around the economy, risk and cooperation. In the case of Remain, its opponents named the emphasis on economic risk “Project Fear”. If the platform rewarded identity and out-group themes, we should see higher engagement for nationalist and immigration content, and lower for cooperative content.

2.4 Research questions

RQ1. Which side received more engagement, and how much of the difference survives fair comparison? **RQ2.** Were Leave-aligned pages more negative than Remain-aligned pages? **RQ3.** Were negative posts rewarded more on the Leave side? **RQ4.** Did the two sides differ in nationalist and pan-European content, and was that content rewarded? **RQ5.** Did the nature of the engagement (reactions, comments, shares, angry reactions) differ by side? **RQ6.** How did tone and engagement change as polling day approached, and after the murder of Jo Cox on 16 June?

3 Data

3.1 Sources

I use two sources. The first is a set of six CrowdTangle historical reports, exported in October 2020, covering UK party, leader, MP and campaign pages from 2010 to 2020. They give, for each post, the page, time, format, text, image text, counts of likes, the other six reactions, comments and shares, and the page’s follower count at posting. The second is a Netvizz export of the Facebook page of the official Remain campaign, which I downloaded on 29 June 2016. The CrowdTangle reports contain no page for an official Remain campaign, so the Netvizz export fills the most important gap in the data. The export carries no page name. I identify it as Britain Stronger in Europe from its content: 16% of its posts link to the campaign’s own domain, ukstronger.in, and its last post on 23 June thanks supporters for voting Remain and for keeping Britain “stronger, safer and better off in Europe”. I did not verify the identification against the platform. Because it is a Netvizz export, it contains no follower counts and no breakdown of reactions by type.

Table 1. Pages, posts and engagement by side and tier, 20 February to 23 June 2016.

Side	Tier	Pages	Posts	Engagement (m)	Median per post	Negative (dictionary)
Leave	Campaign	2	1,657	15.71	6,956	23%
Leave	Leader	2	357	3.74	6,549	26%
Leave	Party	2	349	1.99	4,199	34%
Leave	MP / individual	3	1,619	0.19	29	28%
Remain	Campaign	2	566	4.50	5,180	33%
Remain	Leader	8	1,966	4.61	200	29%
Remain	Party	10	2,564	1.94	203	25%
Remain	MP / individual	62	8,487	0.68	24	22%
Divided	Party	1	92	0.13	1,052	9%

Negative is the share of text posts classed as negative on the composite measure. The Conservative Party is classed as divided.

The window runs from 20 February 2016, the day the referendum was announced, to the end of 23 June 2016, in UK time, or from the first post if a page started later. After removing duplicates there are 17,657 posts from 92 pages. 15,571 have message text. Engagement is the sum of reactions of all types, comments and shares. Facebook introduced its differentiated reactions on 24 February 2016, so analyses of reaction types use posts from that date.

3.2 Classifying pages by side and tier

I classify each page by the stance of its organisation or person in the referendum. *Leave*: Leave.EU, Vote Leave, Nigel Farage, Boris Johnson, UKIP, the Democratic Unionist Party and three Leave-supporting MPs (Douglas Carswell, Jim Shannon and Jeffrey Donaldson). *Remain*: Britain Stronger in Europe, Scientists for EU, David Cameron, the Labour, Liberal Democrat, Green, SNP, Plaid Cymru, Sinn Féin, SDLP, Alliance and Ulster Unionist parties, their leaders, Momentum, and 62 MPs and other politicians. *Divided*: the Conservative Party, which I describe but do not assign to a side. I also assign each page to a tier: official or issue campaign, party leader, party, or MP and other individual politician.

The classification is a judgement about organisations, not about the posts. Jeremy Corbyn, for example, was a lukewarm Remain supporter, and the SNP MPs wrote about a range of other topics. Table 1 gives the numbers. The two sides are strongly unbalanced. There are 9 Leave pages and 82 Remain pages, because the Remain side includes dozens of SNP MPs whose pages are small. This is a feature of the data and not of the campaign, and it means that any comparison that pools everything is dominated by the sizes and numbers of pages on each side. I therefore make comparisons within tiers, and I always report a version that does not rely on the MP tier.

3.3 Comparability across sources

One check bears on whether the Netvizz and CrowdTangle data can be compared. The same folder also holds Netvizz exports of the Vote Leave and Leave.EU pages. For 816 Vote Leave posts that appear in both sources, the correlation between log engagement is 0.96, and for 574 Leave.EU posts it is 0.86. Netvizz engagement is about 6% higher than CrowdTangle's at the median. This suggests that the two sources count the same quantity with small differences. In the comparison of the three campaign pages I report results with Stronger In's engagement divided by 1.055, which lowers its median from 7,480 to 7,090 and changes none of the conclusions.

The CrowdTangle exports do not show the round-number ceilings that I found in the Netvizz exports in my thesis, where retrieval was limited to about 600 posts per page per year (Hotham 2021). Annual post counts per page range widely, and Vote Leave has 870 posts in the window. I treat the CrowdTangle data as a census of what the platform still held in October 2020. Pages or posts deleted before then are missing, which is a limitation that I return to.

4 Measures and Methods

4.1 Outcomes

The main outcome is $\log_{10}$ of engagement per post (plus one). Because page size differs enormously, I use two ways of making pages comparable. First, regressions include page fixed effects, so that effects are estimated within a page, and week fixed effects, which absorb the campaign’s rhythm. Second, for page-level comparisons I use engagement per 1,000 followers at the time of posting. This is not available for Stronger In or for a few other pages, so I say when the comparison excludes them.

4.2 Coding of text

I code the message text and any image text of each post with transparent dictionaries. The codes are: EU or referendum reference; Leave frame (for example “take back control”, “vote leave”) and Remain frame (“stronger in”, “vote remain”); immigration and borders; economy, jobs and trade; risk, threat and fear; British national identity and sovereignty; sub-state national identity (Scotland, Wales, Northern Ireland); cooperation and pan-European content (cooperation, partnership, solidarity, science collaboration, peace, “working together”); elites and establishment (a code that also picks up references to the Tories and to named ministers); and attack language, and attack language that names the opposing side. These dictionaries are analogous to the content codes that I applied to party posts in my thesis (Hotham 2021), but they are text-only, since I do not have the images. I also compute VADER sentiment (Hutto and Gilbert 2014) and define three tone variables. *Negative (VADER)* is a compound score of -0.25 or lower. *Negative (composite)* is a post that is VADER-negative, or contains attack language, or contains risk and threat language. The composite is my main measure, because the VADER lexicon was built for general social media text and misses the vocabulary of political conflict. *Positive* is a compound score of 0.25 or higher. The categories are not mutually exclusive, and the coding misses sarcasm, implied meaning and everything in the images.

The dictionaries are crude, and I treat them as measuring the presence of a theme or an attack word, not as a judgement of the quality of the argument. For example, risk and threat language is a measure of how much a page talks about danger, and it would score both a warning about the economy and a warning about terrorism.

4.3 Validating the coding

Dictionaries need validating, and the claim at the centre of this paper rests on a tone measure. I drew a sample of 360 text posts with at least three words, stratified by side and tier so that every cell has enough posts to judge (campaign pages 70 per side, and 25 to 55 for each leader, party and MP cell). The sample was coded for five binary codes: negative tone; immigration, borders or refugees; British identity, sovereignty or control; cooperation or pan-European content; and an imperative call to action. The

Table 2. Dictionary codes against the AI reference coding in a stratified sample of 360 posts.

Code	Reference %	Dictionary %	Precision	Recall	F1	Kappa
Negative (composite)	38	28	.80	.58	.67	.51
Negative (VADER only)	38	14	.86	.32	.47	.33
Immigration and borders	7	9	.71	.88	.79	.77
British identity and sovereignty	12	16	.52	.71	.60	.54
Cooperation, pan-European	5	6	.40	.44	.42	.39
Call to action (imperative)	39	46	.58	.69	.63	.36

Prevalences are unweighted shares of the sample. Precision is the share of dictionary-flagged posts that the reference coding also flags; recall is the share of posts flagged by the reference coding that the dictionary flags.

codebook is in Appendix B. A post is negative if its main thrust is to attack, blame, accuse, mock, warn of harm, or express anger or distress; a mention of a negative word does not make a post negative, and a positive appeal to vote does not make a post negative because the word “risk” appears in it. The coder saw only the text, and saw no page name, dictionary flag or engagement count, although many posts name a campaign or party, so the side could often be inferred. The coder was an AI model (Claude, Anthropic) working from the written codebook, not a human, so I report agreement between this reference coding and the dictionaries and not inter-coder reliability between people. I refer to it as the reference coding below. A human second coder on a subsample is the first thing that a replication should add.

Table 2 gives the results. The composite negativity measure has precision of .80 and recall of .58 (kappa .51): when it flags a post, the post is almost always negative, but it flags only about 58% of the posts that the coder judged negative. VADER alone does worse (recall .32), which is why I use the composite. The immigration code is good (kappa .77), the identity and sovereignty code adequate (.54, with false positives on Remain pages), the imperative code mediocre (.36) and the cooperation code weak (.39, on a rare category). Because the dictionary understates negativity at different rates in different parts of the data, I do not treat the dictionary shares as levels. Instead I use the validation sample to correct them. For each side-by-tier cell I add to the dictionary share in the full population the mean difference between the reference coding and the dictionary in the sample (Angelopoulos et al. 2023), and I build intervals by resampling the validation sample within cells. This keeps the full population’s information and uses the reference coding to remove the dictionary’s bias. The corrected shares therefore inherit any bias in the AI coding.

4.4 Statistical strategy

The core model regresses log engagement on a tone or content variable, controlling for format (photo, video, link, status), message length, use of a link, a hashtag, a question, an imperative, an exclamation mark and capital letters, with page and week fixed effects. Standard errors are clustered by page when there are ten or more pages in the sample and are heteroskedasticity-robust otherwise. I report effects as percentage differences, $100(10^{\hat{\beta}} - 1)$. I test the difference between the sides by comparing the coefficients from separate models for each side, which lets the controls and week effects differ by side. For the content comparison between the sides, I compare shares of posts, and build confidence intervals by resampling pages within side, which respects the fact that there are only six Leave pages among the campaigns, leaders and parties. For page-level comparisons I use permutation tests on page means. I correct families of tests with the Benjamini–Hochberg procedure (Benjamini and Hochberg 1995) and Holm’s method (Holm 1979), and I check the main result with a Poisson pseudo-maximum-likelihood

Table 3. The twelve pages with the most engagement in the window.

Page	Side	Tier	Posts	Engagement (m)	Median per post	Median followers
Leave.EU	Leave	campaign	787	9.30	9,324	697,280
Vote Leave	Leave	campaign	870	6.41	2,844	508,916
Stronger In	Remain	campaign	352	3.93	7,480	n/a
Nigel Farage	Leave	leader	251	2.96	7,533	319,085
Jeremy Corbyn	Remain	leader	244	2.83	5,836	597,465
UKIP	Leave	party	297	1.98	5,070	550,264
David Cameron	Remain	leader	146	1.19	5,880	1,086,028
Boris Johnson	Leave	leader	106	0.78	4,175	468,726
Labour	Remain	party	256	0.67	1,721	447,910
Scientists for EU	Remain	campaign	214	0.56	1,702	127,663
SNP	Remain	party	431	0.45	657	237,827
Green Party of England and Wales	Remain	party	298	0.32	450	260,973

Median followers is the median of the page’s follower count at posting; Stronger In’s Netvizz export contains no follower counts.

model (Santos Silva and Tenreiro 2006), quantile regression (Koenker and Bassett 1978), Cliff’s delta (Cliff 1993), and weighted log-odds of words (Monroe et al. 2008).

5 Results

5.1 Who received the engagement

Leave-aligned pages produced 65% of all interactions in the window and 23% of the posts. A naive reading would call this a Leave victory on Facebook. Because the two sides’ pages differ so much in number and size, it is not a fair comparison.

Table 3 lists the pages with the most engagement. Five of the top ten are Leave pages. The Remain side’s largest pages are Corbyn, Cameron and Stronger In. Most of the posts in the data (57%) are from MP pages, which are small and together account for 3% of engagement. Figure 1 shows the median and interquartile range of engagement per post by tier. The Leave side has a higher median in each of the campaign, leader and party tiers, but the leader and party medians are strongly affected by composition. The Remain leaders in the data include eight pages, six of which are far smaller than Farage’s or Johnson’s: Cameron and Corbyn, whose medians are 5,880 and 5,836, are the right comparison for Farage (7,533) and Johnson (4,175), and the gaps there are far smaller.

5.2 The official campaigns head to head

The cleanest comparison in the data is between the three campaign pages (Figure 2, Table 4). Leave.EU, Vote Leave and Stronger In were all campaign pages with posts through the whole window, and the two sources agree closely for the Leave pages (Section 3.3). Leave.EU and Vote Leave together posted 1,657 times in the window and Stronger In 352, and the two Leave pages accounted for 80% of the engagement across the three. In total, then, the Leave campaigns far out-produced the Remain campaign. That is mainly because they posted 4.7 times as often.

Per post, the picture is different. Vote Leave’s median of 2,844 is 0.38 of Stronger In’s 7,480 (95% CI for the ratio of medians 0.24 to 0.56, Cliff’s $\delta = -0.34$). Leave.EU’s median of 9,324 is 1.25 times Stronger

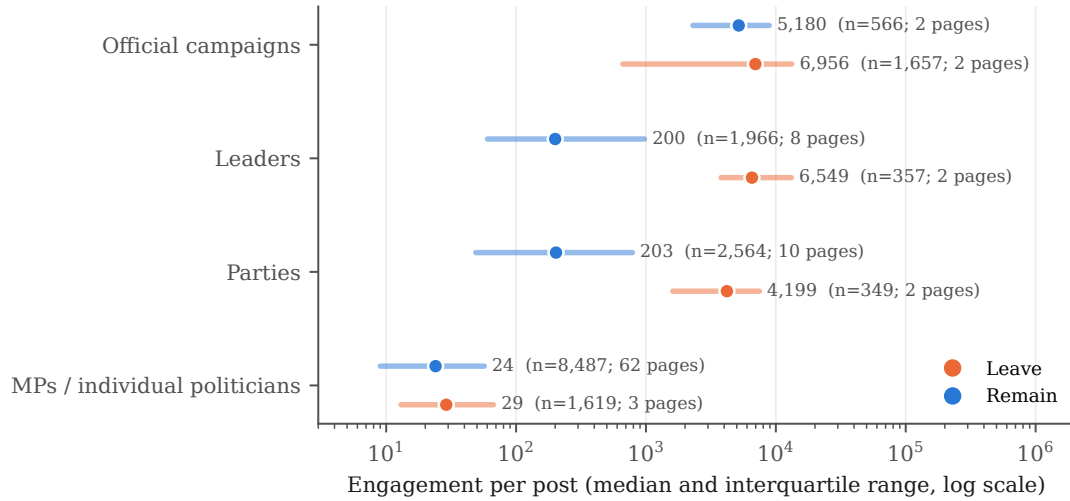


Figure 1. Engagement per post by tier and side. Dots are medians and bars are interquartile ranges. The Leave side’s higher medians in the leader and party tiers reflect the size of Farage, Johnson and UKIP relative to the many small Remain posts in the same tiers; see the text.

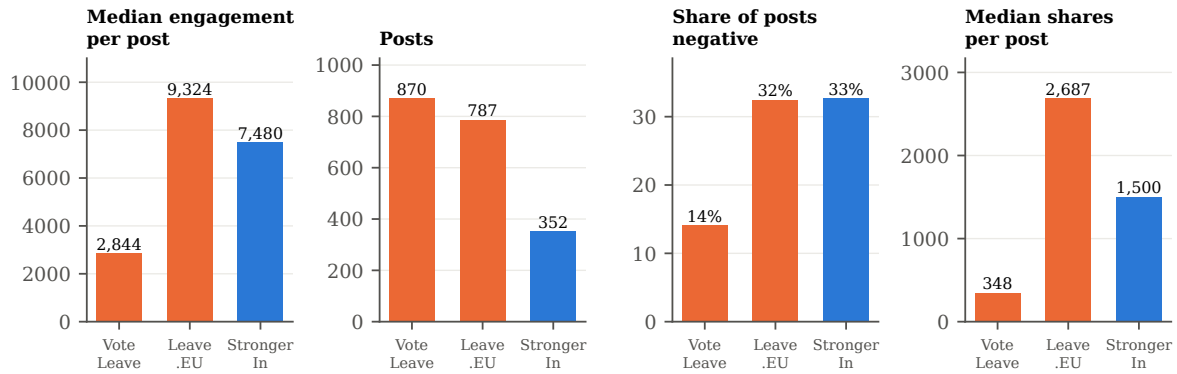


Figure 2. The three campaign pages. Stronger In data are from a Netvizz export (see Section 3.1); the Leave pages are from CrowdTangle.

In’s (95% CI 1.14 to 1.35, $\delta = 0.09$). Pooled, Leave posts on the two Leave campaign pages earned 72% less engagement than Stronger In posts (95% CI -85% to -47% , clustered by week). With format controls the gap is 26% (-45% to -2%), and with tone controls it is 17% (-34% to $+5\%$, $p = .119$). The Leave.EU result is therefore not representative of the Leave campaign as a whole: Vote Leave, the official campaign, drew less engagement per post than the official Remain campaign, and Leave.EU drew somewhat more. Vote Leave’s output was dominated by photographs (69% of posts) with a small audience response, while Stronger In used more video and links.

The composition of the engagement also differs. Stronger In’s median post attracted 2,137 comments, against 577 for Leave.EU and 254 for Vote Leave. Leave.EU’s median post was shared 2,687 times against 1,500 for Stronger In and 348 for Vote Leave. The Remain campaign’s audience talked and the Leave.EU audience shared, which is consistent with Leave.EU’s content being built for circulation. I do not read the comment counts as conversation among supporters, since comment threads on a high-profile campaign page also include opponents, and the data contain no comment text.

Table 4. The three campaign pages. Medians and the 90th percentile are interactions per post; the last four columns are percentages of text posts.

Page	Posts	Total (m)	Median	Mean	P90	Med. comm.	Med. shares	Neg.	Pos.	Immig.	Econ.
Vote Leave	870	6.41	2,844	7,369	18,275	254	348	14	35	13	12
Leave.EU	787	9.30	9,324	11,812	22,313	577	2,687	32	61	15	35
Stronger In	352	3.93	7,480	11,178	20,433	2,137	1,500	33	77	2	58

Stronger In is from a Netvizz export; the Leave pages are from CrowdTangle. Negative is the composite measure; positive is VADER ≥ 0.25 .

Table 5. Approach of each side: share of text posts carrying each code (campaigns, leaders and parties, %).

Side	Posts	EU	Neg.	Pos.	Attack	Risk	Immig.	Econ.	Ident.	Coop.	Elite	Act	Share	Ques.
Leave	2,160	71	25	49	3	14	17	22	23	4	17	51	6	11
Remain	4,503	34	27	63	1	15	5	29	6	10	15	41	14	13

EU: mentions the EU or referendum. Attack: attack language naming the opposing side. Ident.: British identity, sovereignty or control. Coop.: cooperation or pan-European. Act: contains an imperative. Share: asks the audience to share.

5.3 Leaders and parties, with size matched

Pooling leaders and parties is unfair, because Leave has two pages in each tier and Remain has eight and nine. I therefore compare page means of log engagement per 1,000 followers (excluding Stronger In and the few pages with no follower count). In the leader tier, Leave pages had higher per-follower engagement than Remain pages (170% higher, permutation $p = .064$ with two Leave and eight Remain pages) and in the party tier they were 206% higher ($p = .095$). In the MP tier the Leave pages had lower per-follower engagement (47% lower, $p = .101$). When I restrict to pages with 100,000 to 1.2 million followers, 5 Leave and 11 Remain pages, the Leave advantage is 82% and is not statistically distinguishable from zero ($p = .221$; post-level, clustered by page, $p = .351$). In short, per follower the Leave side's leaders and parties did better, but with so few Leave pages in each tier the data cannot show that this was a systematic Leave effect and not the effect of Farage's particular page. Per follower, Farage's page was the most engaged of the leader pages in the window (median 24 interactions per 1,000 followers, against 10 for Corbyn and 5.5 for Cameron).

Conditioning on audience, format and tone, Leave-aligned pages with known audiences still received more engagement per post than Remain-aligned pages (Appendix Table 9). Adding tier and audience size cuts the raw gap from 1,084% to 308%, and adding format controls leaves it at 308%. Adding the tone variable changes it to 305%, and adding topics to 202%. This is a cross-page regression with only 5 Leave pages, and it should be read as descriptive.

5.4 The approach each page and side took

Before turning to what was rewarded, I describe what each page and side actually did. Figure 3 profiles every campaign, leader and party page with at least 60 text posts: how much it talked about the referendum, how negative or positive it was, which themes it used, and whether it asked its audience to act, share or answer a question. Table 5 gives the same profile for the two sides in the like-for-like sample.

Leave.EU was the most single-minded page: 91% of its text posts concerned the EU or the referendum. It was negative in 32% of posts and positive in 61%, attacked the opposing side by name in 5% (the

	EU / referendum	Negative	Positive	Attacks opponent	Risk / threat	Immig- ration	Economy / jobs	British identity	Cooper- ation	Elites	Call to action	Share request	Question
Vote Leave (754)	58	14	35	1	7	13	12	24	2	15	47	7	8
Leave.EU (724)	91	32	61	5	20	15	35	15	6	22	60	6	17
Nigel Farage (241)	79	26	45	2	10	28	6	42	2	13	32	1	3
Boris Johnson (106)	52	27	69	8	22	15	38	22	7	15	58	2	14
UKIP (286)	67	37	54	3	19	24	21	28	3	20	48	12	11
Conservatives (75)	0	9	88	0	8	0	48	7	0	5	31	81	13
Stronger In (352)	96	33	77	3	27	2	58	9	10	4	55	42	12
Scientists for EU (210)	95	32	88	3	28	16	53	18	34	20	67	22	43
Natalie Bennett (892)	19	26	58	0	10	6	20	2	4	7	21	6	9
Jeremy Corbyn (212)	28	48	58	0	29	4	48	15	17	56	56	17	8
Leanne Wood (149)	15	26	59	1	13	3	25	5	4	17	30	5	13
David Cameron (146)	69	28	68	1	21	5	31	10	8	12	46	3	3
Caroline Lucas (100)	56	42	72	2	30	17	33	11	17	22	54	15	16
Tim Farron (69)	20	32	55	0	20	10	29	6	13	9	57	6	14
Momentum (348)	14	31	66	1	18	3	36	3	14	32	52	13	26
SNP (342)	17	10	59	0	2	1	18	3	3	14	31	2	5
Alliance (NI) (311)	7	17	51	0	7	0	9	0	2	1	20	0	2
Green Party (257)	48	31	69	1	18	12	25	4	14	23	56	19	21
Labour (230)	51	34	65	1	24	3	50	14	13	38	69	58	23
Plaid Cymru (226)	30	29	66	1	15	1	32	8	8	14	40	7	9
Sinn Féin (218)	10	32	53	0	11	1	18	4	6	4	38	6	5
Liberal Democrats (171)	39	24	68	0	13	11	19	8	22	13	63	22	15
SDLP (110)	18	25	60	0	12	5	25	2	8	7	49	0	15
UUP (97)	2	16	32	0	7	0	5	2	4	1	10	3	5

Share of text posts, %. Shading is relative within each column. Labels: orange = Leave, grey = Conservative (divided), blue = Remain; (n) = text posts.

Figure 3. Approach of each campaign, leader and party page (at least 60 text posts), as the share of text posts carrying each code. Shading is relative within each column. “Call to action” is a post containing an imperative such as sign, join, vote, support or stand; “share request” asks the audience to share.

highest of the campaign pages), and used call-to-action language in 60%. Immigration appeared in 15% of its posts and the economy in 35%. **Vote Leave** was a different operation: 14% of its posts were negative and only 35% positive. Its content was about sovereignty and control (24% of posts used identity or sovereignty language, 48% the Leave frame), 13% mentioned immigration and 12% the economy, and 47% of its posts asked the reader to do something. **Nigel Farage's** page was the most focused on immigration of all (28% of posts) and the least interested in the economy (6%), with 42% of posts on identity and sovereignty and few requests to share (1%). **UKIP** was the most negative of the Leave pages (37%), with 24% on immigration and 12% share requests. **Boris Johnson's** page was the most positive (69%) and the most economic (38%) of the Leave pages.

Britain Stronger in Europe talked about the EU in 96% of its posts. Its content was about the economy (58% of posts) and risk and threat (27%), with almost nothing on immigration (2%). It was positive in 77% of posts and negative in 33%, and it asked for shares in 42% of posts, at least three times the rate of any Leave page. **Scientists for EU** was the most cooperative and positive page in the data (34% cooperation, 88% positive) and the page that asked the most questions (43%). Among the Remain-aligned leaders, **Jeremy Corbyn's** page was the most negative of the large pages (48% of posts) and the most focused on elites (56%, a code that here largely captures references to the Tories), **David Cameron's** was mostly about the referendum (69% of posts) with 68% positive, and **Labour's** party page was the heaviest user of calls to action (69%) and share requests (58%) of the Remain-aligned party pages. The SNP's page was the least negative of the large pages (10%) and rarely mentioned the EU (17%) in this period. The Conservative Party's page almost never mentioned the referendum, which fits its formal neutrality, and was positive in 88% of its posts.

By side, in the like-for-like sample, Leave pages used more immigration (17% against 5%) and identity and sovereignty content (23% against 6%), asked the audience to act more often (51% of posts against 41%), and asked for shares less (6% against 14%). Remain pages used more cooperation language (10% against 4%) and more economic content (29% against 22%). The two sides differed far less in negativity, in risk and threat language and in the use of questions.

5.5 Tone: were Leave pages more negative?

At the level of the whole sample, 27% of Leave text posts and 24% of Remain text posts are negative on the composite measure. In the like-for-like sample of campaigns, leaders and parties (2,160 Leave posts from 6 pages, 4,503 Remain posts from 20 pages), 25% of Leave posts and 27% of Remain posts are negative: a difference of -2 points (95% CI -12 to $+8$, resampling pages). Leave pages were not more negative. They were less positive: 49% of Leave posts are VADER-positive against 63% of Remain posts (-26 to -1 points), and the VADER-negative shares are essentially equal (17% and 17%). The Leave side was less positive than the Remain side, and no more negative.

The validation sample shows that these dictionary shares are too low, and that the answer depends on which pages are compared (Table 6). Corrected for the dictionary's misses, 37% of Leave posts (95% CI 29 to 46) and 42% of Remain posts (32 to 53) among campaigns, leaders and parties are negative, a difference of -5 points (-19 to $+8$). Giving the three tiers equal weight leaves the conclusion where it was (-7 points, -19 to $+4$). So the like-for-like result stands: there is no evidence in these data that Leave pages were more negative than Remain pages, and the point estimate is on the other side. But roughly four in ten posts on both sides were negative on the AI reference coding, not the quarter that the dictionary suggests. When I include the MP tier and weight by posts, Leave appears more negative (48% against 28%, a difference of $+20$ points, $+9$ to $+31$). That gap is a composition effect. The Leave MP tier

Table 6. Share of text posts that are negative, dictionary against estimates corrected with the AI reference coding (%).

Comparison	Dictionary L / R	Corrected Leave	Corrected Remain	Difference (points)
Campaigns, leaders, parties (post-weighted)	28 / 28	37 (29 to 46)	42 (32 to 53)	-5 (-19 to +8)
Campaigns, leaders, parties (equal tier weights)	29 / 29	34 (27 to 41)	41 (32 to 50)	-7 (-19 to +4)
All four tiers (equal tier weights)	29 / 28	41 (34 to 47)	35 (28 to 43)	+5 (-5 to +15)
All pages (post-weighted)	28 / 25	48 (41 to 55)	28 (19 to 36)	+20 (+9 to +31)

Corrected estimates add to the dictionary share in the full population the mean difference between the AI reference coding and the dictionary in each side-by-tier cell of the validation sample. Intervals resample the validation sample within cells.

Bracketed intervals are 95%. The dictionary shares differ slightly from those given earlier because the validation frame requires at least three words.

is in effect one page: Douglas Carswell’s account supplies 96% of its posts, and 62% of the 48 Carswell posts in the validation sample were negative, against 20% of the 55 sampled posts from Remain MPs. With equal tier weights, which stops those few pages dominating, the difference falls to +5 points (-5 to +15). I do not read the pooled figure as a statement about the sides, because one page cannot stand for a tier. It does show that the claim that Leave was more negative is a claim about particular pages, and that it can be produced or lost by the choice of which pages to compare.

Among the three campaign pages, the order is revealing. The shares of negative posts are 32% for Leave.EU, 33% for Stronger In and 14% for Vote Leave. Leave.EU and Stronger In are as negative as each other, and Vote Leave, the official Leave campaign, is the least negative of the three. The AI-coded sample puts Vote Leave last again, with higher levels throughout, but it ranks Leave.EU above Stronger In: 56% of sampled Leave.EU posts (95% CI 40 to 72, $n = 36$), 47% of Stronger In’s (32 to 61, $n = 45$) and 38% of Vote Leave’s (22 to 57, $n = 34$). The intervals overlap, so I take only the weak version of the claim: Vote Leave’s output was not more negative than Stronger In’s. The risk and threat dictionary tells the same story: 27% of Stronger In’s posts use risk and threat language, against 20% for Leave.EU and 7% for Vote Leave. In this data, the claim that Remain’s official page leaned on risk and threat is supported by the dictionary, and the claim that Leave’s output was the more negative is not supported on a like-for-like comparison. Attack language that names the opposing side is more common on the Leave side (3% against 1%), and most of it comes from Leave.EU (5% of its posts).

5.6 Did negativity pay, and did it pay more for Leave?

On both sides, negative posts received more engagement than other posts by the same page in the same week (Figure 5, Table 7). On Leave pages the premium is 15% (95% CI 4 to 26%) and on Remain pages 41% (27 to 58%). A test of the difference between the two separately estimated coefficients puts the Leave premium 19% below the Remain premium ($p = .016$). That comparison is sensitive to the specification. In a single model with controls and week effects common to both sides, the Leave premium is larger than the Remain premium (50% against 30% across all pages, and 70% against 30% among campaigns, leaders and parties), and the difference is not significant with standard errors clustered by page. The Remain premium is largest in the leader tier (77%), and a Poisson model that weights the large posts finds 4% for Remain ($p = .545$) and 15% for Leave ($p = .008$). The most conservative reading is that negative posts drew more engagement on both sides and that the data do not establish a difference between the sides.

The tone result for the individual campaign pages shows where negativity paid most. Negative posts on Vote Leave drew 98% more engagement than other Vote Leave posts and on Leave.EU 52% more.

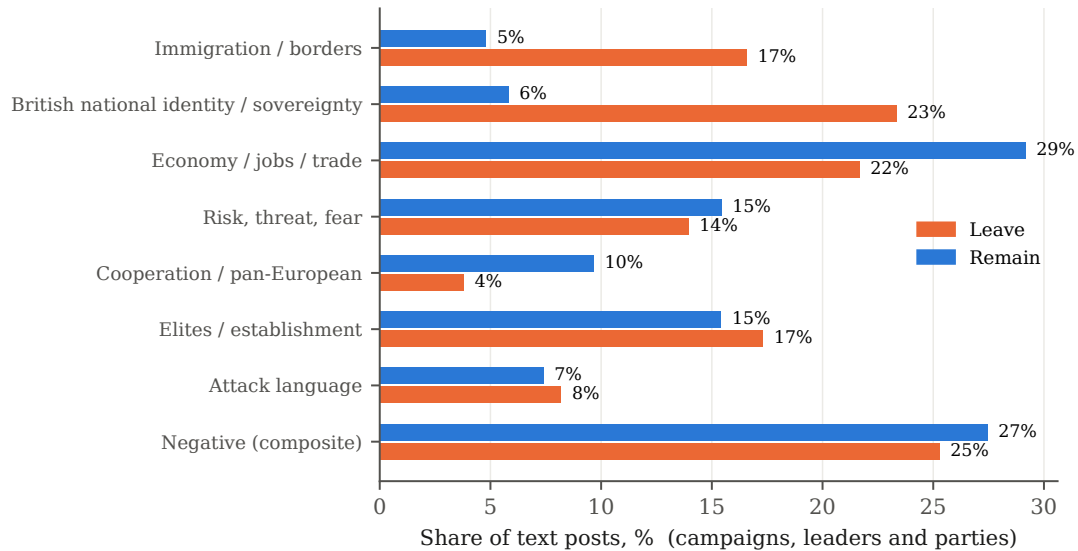


Figure 4. Content of campaigns, leaders and parties by side: share of text posts carrying each code.

On Stronger In the premium is 14% and its interval includes zero (-1 to 31%). So the Leave campaign pages were rewarded more for negativity than Stronger In was, and the claim has its best support in these two pages. But for the claim to explain Leave’s advantage, Leave must have used negativity more. Vote Leave did not (14% of posts). If Leave pages had had the Remain side’s share of negative posts, the estimated effect on their average engagement would be -0.3% . The tone mix does not explain the difference in engagement between the sides.

The other tone measures agree. VADER-negative posts earn a premium of 25% on Leave pages and 43% on Remain pages. Attack language earns 49% on Remain pages and no measurable premium on Leave pages (-2%). Risk and threat language earns 22% on Remain pages and nothing on Leave pages. Positive posts are penalised on Remain pages (-11%) and not on Leave pages ($+19\%$). On these measures, in separate models for each side, attack, risk and threat language was associated with more engagement on Remain pages than on Leave pages.

5.7 The nature of the engagement

Reaction mixes are similar across sides. Angry reactions are 2.3% of reactions on Leave pages and 2.1% on Remain pages (campaigns, leaders and parties, $p = .874$ after tier adjustment), which is low in both cases and far below the share that I found on Britain First’s page (Hotham 2026). The Remain pages attract more sad reactions (0.9% against 0.1%, $p = .012$) and somewhat more comments as a share of engagement (13% against 9%, $p = .086$). Negative posts raise the angry share on both sides, by 1.7 points on Leave pages and 2.6 on Remain pages, and shift engagement towards shares on both sides (3.2 and 2.4 points). They reduce the love share on both sides. Negative posts shift the mix of engagement in the same direction on both sides, towards angry reactions and shares. Stronger In’s export has no breakdown of reactions, so the Remain campaign tier’s reaction mix rests on Scientists for EU.

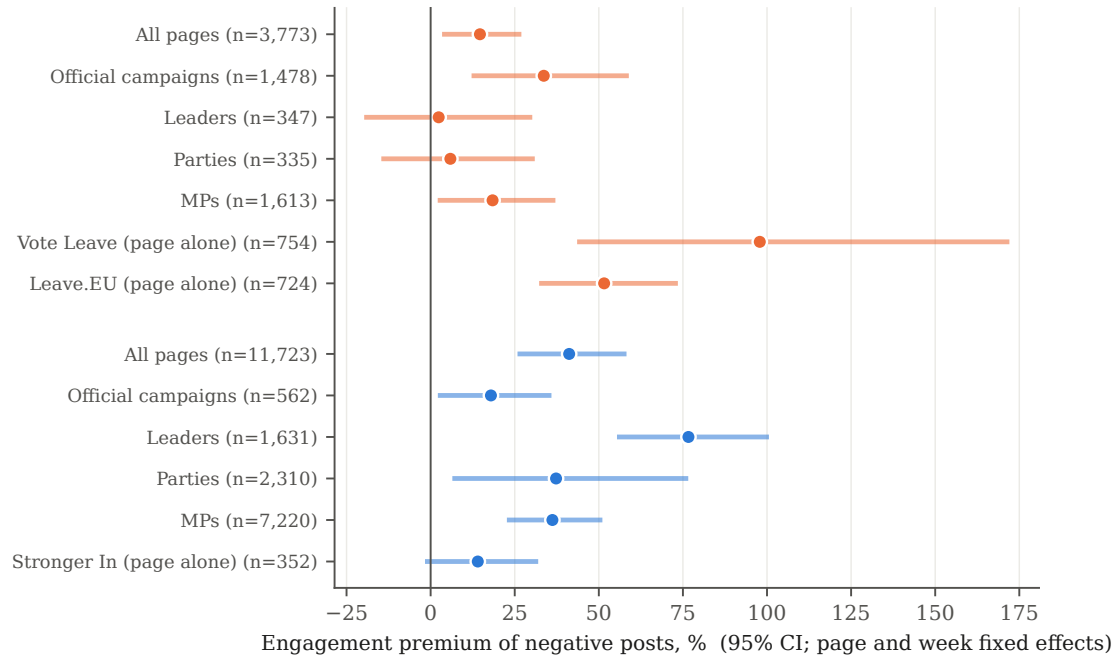


Figure 5. Engagement premium of negative posts (composite measure), by side and tier, with 95% confidence intervals. All models include page fixed effects and format controls; the all-pages and single-page models also include week fixed effects, and the tier models do not. Samples with fewer than ten pages use heteroskedasticity-robust standard errors.

5.8 Nationalist and pan-European content

Figure 4 and Table 8 compare the content of campaigns, leaders and parties. Leave posts were more likely to mention the EU or the referendum (71% against 34%) because they were on a single topic more often. They were more likely to talk about immigration and borders (17% against 5%, a difference of 12 points, CI +8 to +19), and about British national identity and sovereignty (23% against 6%, CI +11 to +28). Remain posts were more likely to talk about cooperation and pan-European themes (10% against 4%, CI -11 to -2) and about sub-state identity (21% against 3%), which reflects the weight of Scottish, Welsh and Northern Irish parties on that side. Differences in the economy (22% against 29%) and in risk and threat language (14% against 15%) are small and their intervals include zero.

The “pan-European” category is rare on both sides. Even on Stronger In, the share of posts using cooperative language is 10%, and the Remain campaign’s distinctive vocabulary is about the economy and about “jobs”, “science”, “research” and “family” (Figure 6). The Leave campaigns’ distinctive vocabulary is “control”, “take”, “back”, “immigration”, “borders”, “Brussels” and Cameron’s name. In its text, the Remain campaign spoke more about the economy, jobs and risk than about European cooperation.

Was this content rewarded? Within a page and a week, immigration content attracted 28% more engagement on Leave pages (BH-adjusted $p < .001$) and +9% on Remain pages ($p = .121$). Content that explicitly invoked the Leave frame earned +69% on Leave pages and +17% on Remain pages. Content about British identity and sovereignty earned +32% on Leave pages and +34% on Remain pages, so it was rewarded about equally on the two sides. Cooperative content earned -29% on Leave pages and +6% on Remain pages, with no clear premium on either. Content naming elites and the establishment earned +27% and +40%. Calls to register or vote were penalised on both sides (-51% and -37%). Posts

Table 7. Engagement premium of negative posts (composite measure).

Side	Sample	Posts	Premium	95% CI
Leave	All pages	3,773	+15%	4 to 26
Leave	Official campaigns	1,478	+34%	13 to 58
Leave	Leaders	347	+2%	−19 to 30
Leave	Parties	335	+6%	−14 to 30
Leave	MPs	1,613	+18%	3 to 36
Remain	All pages	11,723	+41%	27 to 58
Remain	Official campaigns	562	+18%	3 to 35
Remain	Leaders	1,631	+77%	56 to 100
Remain	Parties	2,310	+37%	7 to 76
Remain	MPs	7,220	+36%	23 to 50
Leave	Vote Leave (page alone)	754	+98%	44 to 171
Leave	Leave.EU (page alone)	724	+52%	33 to 73
Remain	Stronger In (page alone)	352	+14%	−1 to 31

Percentage difference in engagement between negative and other posts by the same page, controlling for format and post features. The all-pages and single-page rows also include week fixed effects; the tier rows do not. Samples with fewer than ten pages use heteroskedasticity-robust standard errors, which do not allow for correlation within pages.

containing an imperative, my measure of calls to action, were rewarded on Leave pages (+47%) and penalised on Remain pages (−11%). The themes that the Leave side used more of, immigration and the “take back control” frame, earned a premium on its own pages that they did not clearly earn on Remain pages. This pattern differs from the negativity explanation: on Leave pages, posts using the Leave side’s own themes and calls to action drew more engagement.

5.9 Dynamics and the murder of Jo Cox

Figure 7 shows median engagement and the share of negative posts week by week. Median engagement per post rose through the campaign on Remain pages, and was flat on Leave pages, though this partly reflects which pages were posting. Across all pages of each side, with page fixed effects, the share of negative posts on the Remain side fell by 0.34 points a week ($p = .009$), and was flat on the Leave side (+0.18 points a week, $p = .579$). The Remain side was therefore less negative at the end of the campaign than at the start, which does not fit a story of an escalating Project Fear, although the composite measure is not a measure of Project Fear. I have not separated this from changes in which Remain pages were posting.

Both sides suspended campaigning after the murder of Jo Cox on 16 June. On the Leave side, campaign, leader and party pages posted nothing on 17 June (against 26 posts on 16 June and 14 on 18 June), and Remain-side pages posted 47, 22 and 8 times on 16, 17 and 18 June, against 52, 68 and 58 on 13 to 15 June. Posts in the three-day pause drew a higher median engagement than before it (Leave 8,342 against 6,124; Remain 946 against 247), although these medians are not adjusted for which pages posted. The dictionary counts words such as “attack” and “terror”, so it classifies posts about the killing as negative, and the negative shares in the pause (33% and 40%) should not be read as hostile campaigning.

Table 8. Content of Leave and Remain campaigns, leaders and parties (share of text posts, %).

Code	Leave	Remain	Diff. (points)	95% CI
Mentions EU / referendum	71	34	+37	13 to +57
Negative (composite)	25	27	−2	−12 to +8
Negative (VADER)	17	17	+0	−6 to +7
Positive (VADER)	49	63	−13	−26 to −1
Attack language naming the opposing side	3	1	+3	1 to +5
Risk, threat, fear	14	15	−1	−9 to +5
Immigration, borders	17	5	+12	8 to +19
Economy, jobs, trade	22	29	−7	−21 to +5
British identity, sovereignty, control	23	6	+18	11 to +28
Cooperation, pan-European	4	10	−6	−11 to −2
Scottish, Welsh, Irish identity	3	21	−17	−32 to −5
Elites, establishment	17	15	+2	−7 to +9
Leave frame	46	10	+36	20 to +46
Remain frame	11	20	−9	−23 to +1

Leave: 2,160 posts from 6 pages; Remain: 4,503 posts from 20 pages. Confidence intervals resample pages within side.

5.10 Robustness

Table 10 shows the tone premium for subsamples. The Leave estimates are positive in every one, ranging from 6% to 27%, and the Remain OLS estimates range from 40% to 49% (the Poisson estimate is 4%). Leaving out one page at a time moves the Leave estimate between 7% and 23% and the Remain estimate between 36% and 44%. Quantile regressions give a Leave premium of 17% at the lower quartile, 14% at the median and 9% at the upper quartile, and 39%, 37% and 30% for Remain. Excluding the SNP family, the Northern Irish and Irish pages, the MP tier or the campaign pages leaves the sign and rough size of the results unchanged. None of these checks reverses the sign of the premium on either side. The Leave all-pages estimate rests on nine pages, however, and a wild cluster bootstrap by page gives $p = .14$, so its interval in Table 7, which does not allow for correlation within pages, is too narrow.

6 Discussion

The popular account, in which Leave won on Facebook by being louder, angrier and more negative, has three parts. The data support the first in one sense: Leave-aligned pages produced most of the engagement, and the Leave campaign pages out-posted the Remain campaign page by a large margin. The data do not support the second. Leave pages were no more negative than Remain pages when campaigns, leaders and parties are compared, the official Leave campaign was the least negative of the three campaign pages, and the official Remain campaign was as negative as Leave.EU and used more risk and threat language than either Leave page. The pooled comparison of all pages shows Leave as more negative, but only because of a few individual Leave MP pages, and I treat that as a feature of those pages. They do not support the third either: negative posts drew more engagement on both sides, and the data do not establish that the premium was larger on the Leave side.

What the data do show is more specific. First, negative posts drew more engagement on both sides, which fits my analysis of Britain First (Hotham 2026) and the wider literature (Brady et al. 2017; Rathje et al. 2021). Second, the Leave side’s content was more focused on immigration, borders and national identity,

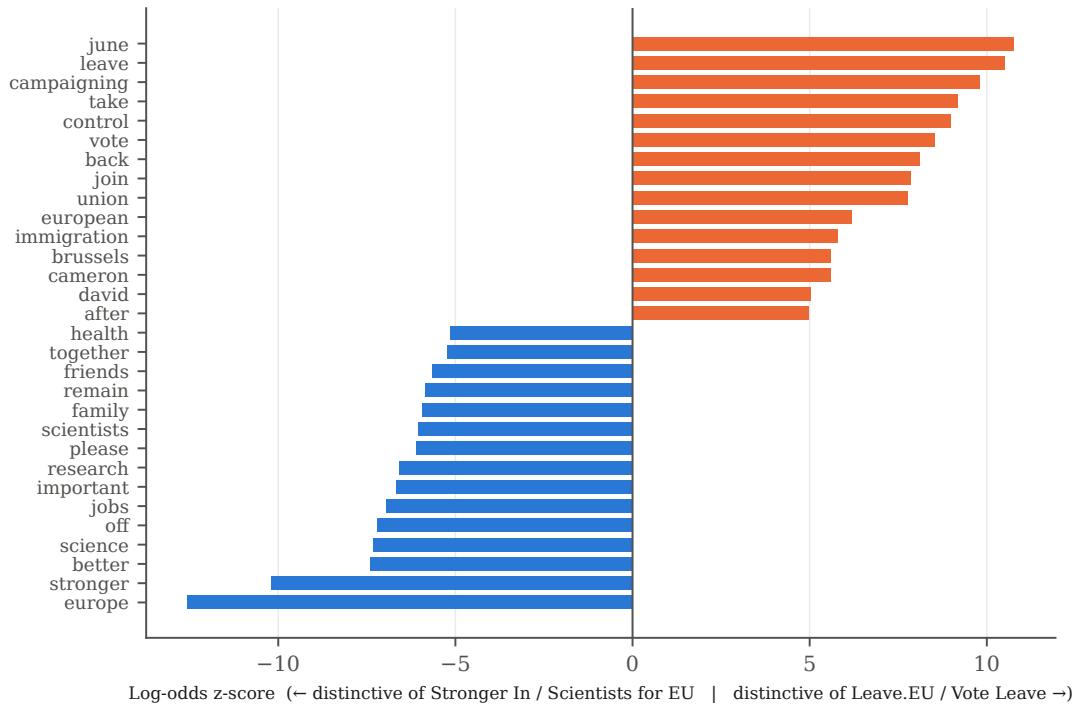


Figure 6. Words most distinctive of the official campaigns. Weighted log-odds z-scores with an informative prior (Monroe et al. 2008); document frequencies, text posts of Leave.EU, Vote Leave, Stronger In and Scientists for EU, words appearing in at least 20 posts. Platform boilerplate removed.

and on Leave pages these themes earned a premium. Third, the Leave side’s strongest per-follower performer was Farage’s page, and its biggest campaign page, Leave.EU, drew a more shared and less commented audience than Stronger In’s, which is consistent with content built for circulation. Fourth, the official Leave campaign’s page did less well per post than the official Remain campaign’s. It was the volume of its output, and the presence of Leave.EU, that gave the Leave campaigns the lead over the Remain campaign in total.

The comparison with the claims about negativity is worth stating carefully. The data show that the Leave campaign pages that posted negative content were rewarded more for it than the Remain campaign page was, and this may be one source of the popular impression. But the effect on the sides’ totals is nil, because the Leave side did not post more of it. That Vote Leave posted so little negative content, while Leave.EU posted as much as Stronger In, suggests that the label “the Leave campaign” hides two different operations.

These results have a limit that I want to be clear about. They describe what the audiences of these pages did, on these pages. Engagement on Facebook is an unrepresentative sample of voters. Reach and persuasion cannot be measured with these data, and I make no claim about what influenced the vote.

7 Limitations

The Remain side is not symmetric to the Leave side in the data. There is one official Remain campaign page against two Leave campaign pages, and no Remain counterpart to Leave.EU or Farage’s following. Many Remain pages are those of individual SNP MPs. The comparisons I report are matched by tier, bootstrapped by page, or restricted to the pages that can be compared, and I note where the number

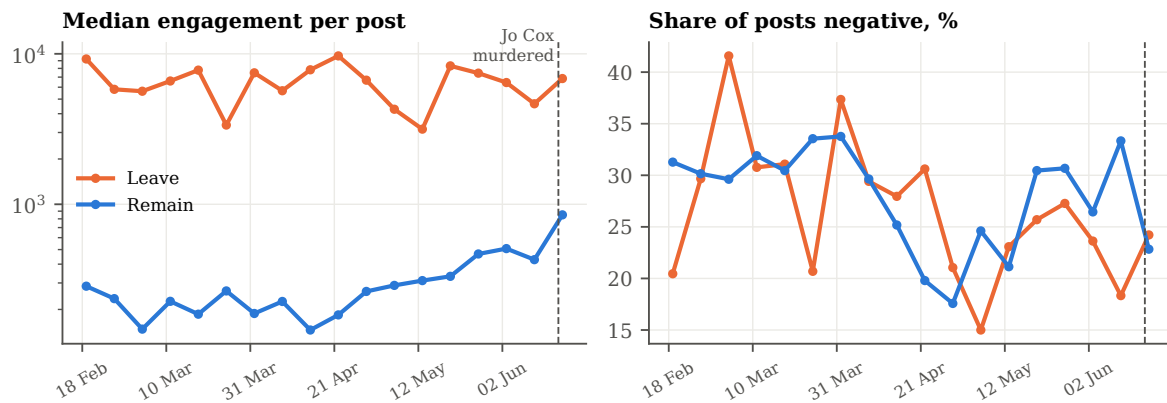


Figure 7. Weekly median engagement per post and share of negative posts, campaigns, leaders and parties. Weeks run Friday to Thursday. The dashed line marks the murder of Jo Cox on 16 June.

of pages is small. Six Leave pages are in the campaign, leader and party tiers, and the confidence intervals for the sides’ differences reflect that. The Stronger In data come from a different source from the others, without follower counts or reaction types, and its identification rests on its content. The Conservative Party, a large page that was divided, is excluded from the side comparisons. Pages that were deleted before October 2020 are missing, and posts deleted by their owners or by the platform are missing too: the Netvizz export of the Vote Leave page, taken in June 2016, holds 895 posts dated 20 February to 23 June 2016, against 870 in CrowdTangle. Many party, leader and MP pages were also fighting the elections of 5 May 2016; before that date, Remain-side party pages mentioned the EU or the referendum in 9% of their text posts, against 52% afterwards, so part of what I measure on those pages is election campaigning, not referendum campaigning. The dictionaries are crude and text-only: they cannot see images, which carry much of the campaigns’ content. The validation sample shows that the composite negativity measure misses about 42% of negative posts. I correct the shares with it, but not the engagement premiums, which are estimated with the dictionary measure and are probably attenuated by the misclassification, possibly by different amounts on the two sides. The validation sample has 360 posts, so the corrected shares have wide intervals, especially for single pages. The reference coder was an AI model working from a written codebook and not a pair of human coders, so the agreement figures are not inter-coder reliability, the corrected shares rest on the model’s judgements, and the codebook’s definition of negativity, which counts sarcasm, mockery and accusation, is a choice that I have tried to apply the same way to both sides. Associations are observational, and engagement depends on the platform’s ranking algorithm, which I cannot observe. I did not collect or analyse comments, so I cannot say who was engaging or what they said.

8 Conclusion

Leave pages drew more Facebook engagement than Remain pages in the 2016 campaign, mostly because a few of them were very large and because the two Leave campaign pages posted far more than the Remain campaign page. Per post, the official Remain campaign beat the official Leave campaign and trailed the unofficial one. The Leave pages were not more negative than the Remain pages once campaigns, leaders and parties are compared, and negative posts drew more engagement on both sides. Whatever per-post advantage the Leave side had is partly associated with its themes (immigration and the “take back control” frame), its calls to action and the style of Leave.EU, and not with a greater share

of negative posts. The data are not a clean experiment, and I have been explicit about which comparisons they can bear. In keeping with the first paper in this series on Britain First (Hotham 2026), and with the party-level work in my thesis (Hotham 2021), the evidence is consistent with a platform on which negative content draws more engagement whichever side posts it.

Data and code availability. The coded post-level dataset (post identifiers, dates, formats, codes and engagement counts, without message text), the validation sample’s labels and the analysis code are available from the author on request. The codebook is in Appendix B. The CrowdTangle exports are subject to the terms under which they were obtained.

References

- Angelopoulos, A. N., Bates, S., Fannjiang, C., Jordan, M. I., and Zrnic, T. (2023). Prediction-powered inference. *Science*, 382(6671):669–674.
- Benjamini, Y. and Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society: Series B*, 57(1):289–300.
- Berger, J. and Milkman, K. L. (2012). What makes online content viral? *Journal of Marketing Research*, 49(2):192–205.
- Brady, W. J., Wills, J. A., Jost, J. T., Tucker, J. A., and Van Bavel, J. J. (2017). Emotion shapes the diffusion of moralized content in social networks. *Proceedings of the National Academy of Sciences*, 114(28):7313–7318.
- Cliff, N. (1993). Dominance statistics: Ordinal analyses to answer ordinal questions. *Psychological Bulletin*, 114(3):494–509.
- Goodwin, M. J. and Heath, O. (2016). The 2016 referendum, Brexit and the left behind: An aggregate-level analysis of the result. *The Political Quarterly*, 87(3):323–332.
- Hobolt, S. B. (2016). The Brexit vote: A divided nation, a divided continent. *Journal of European Public Policy*, 23(9):1259–1277.
- Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, 6(2):65–70.
- Hotham, T. (2021). *How Do Political Parties Use Facebook and What Does It Offer to Their Campaigns*. PhD thesis, University of Bath.
- Hotham, T. (2026). What went viral on Britain First’s Facebook page? Outrage, questions and the cost of mobilisation, 2013–2018. Preprint, Zenodo, October 2026.
- Howard, P. N. and Kollanyi, B. (2016). Bots, #Strongerin, and #Brexit: Computational propaganda during the UK–EU referendum. arXiv:1606.06356.
- Hutto, C. J. and Gilbert, E. (2014). VADER: A parsimonious rule-based model for sentiment analysis of social media text. In *Proceedings of the Eighth International AAAI Conference on Weblogs and Social Media*.

- Koenker, R. and Bassett, G. (1978). Regression quantiles. *Econometrica*, 46(1):33–50.
- Lau, R. R. and Rovner, I. B. (2009). Negative campaigning. *Annual Review of Political Science*, 12:285–306.
- Monroe, B. L., Colaresi, M. P., and Quinn, K. M. (2008). Fightin’ words: Lexical feature selection and evaluation for identifying the content of political conflict. *Political Analysis*, 16(4):372–403.
- Rathje, S., Van Bavel, J. J., and van der Linden, S. (2021). Out-group animosity drives engagement on social media. *Proceedings of the National Academy of Sciences*, 118(26):e2024292118.
- Santos Silva, J. M. C. and Tenreiro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4):641–658.
- Soroka, S., Fournier, P., and Nir, L. (2019). Cross-national evidence of a negativity bias in psychophysiological reactions to news. *Proceedings of the National Academy of Sciences*, 116(38):18888–18892.
- Usherwood, S. and Wright, K. A. M. (2017). Sticks and stones: Comparing Twitter campaigning strategies in the EU referendum. *British Journal of Politics and International Relations*, 19(2).
- Vasilopoulou, S. (2016). UK Euroscepticism and the Brexit referendum. *The Political Quarterly*, 87(2):219–227.

Table 9. Leave-aligned versus Remain-aligned pages: sequential controls (campaigns, leaders and parties with known audience).

Specification	Leave premium	95% CI	<i>p</i>	Posts
raw	+1084%	262 to 3766	<.001	5,364
+tier	+1462%	397 to 4804	<.001	5,364
+audience	+308%	104 to 718	<.001	5,364
+format	+308%	141 to 590	<.001	5,364
+tone	+305%	141 to 582	<.001	5,364
+topics	+202%	84 to 396	<.001	5,364

Posts from 24 pages, week fixed effects, standard errors clustered by page. Controls are added cumulatively: tier, log followers, format, tone (composite negativity), and topics. Only five Leave pages have known audiences, and Stronger In is excluded.

Table 10. Robustness of the negativity premium, by side.

Sample	Leave	Remain
Excluding MP tier	+22% (2,160)	+49% (4,503)
Excluding SNP family	+15% (3,773)	+43% (5,022)
Excluding Northern Irish and Irish pages	+16% (3,660)	+44% (10,918)
Excluding campaign pages	+12% (2,295)	+43% (11,161)
Pages above 100,000 followers	+23% (2,111)	+46% (1,912)
Excluding first week	+15% (3,735)	+41% (11,661)
Last six weeks	+27% (1,735)	+44% (3,946)
Before last six weeks	+6% (2,038)	+40% (7,777)
Poisson PML (raw counts)	+15%	+4%

Posts in parentheses. All OLS specifications include page and week fixed effects and format controls; the Poisson model includes page fixed effects and format controls.

A Appendix

B Codebook for the validation sample

Each post was coded 1 or 0 on each of five codes, from its message text and image text alone.

Negative. The main thrust of the post is to attack, blame, accuse, mock or sneer at a person, party, institution or the other side; to warn of harm, loss or threat; or to express anger, outrage or distress. Sarcasm and accusations of lying count. A negative word in a neutral or celebratory post does not count. A positive appeal to vote does not count even when it mentions risk in passing. News of a tragedy counts when the post expresses distress or condemnation, and the code is not applied to a post that only reports a fact. A neutral reference to a political opponent does not count.

Immigration. The post is about immigration, migration, refugees or border control, whether for or against.

Identity and sovereignty. The post appeals to British sovereignty, control, independence, democracy as self-rule, or national identity (“take back control”, “our country back”, “Independence Day”). Scottish, Welsh and Irish independence and identity do not count.

Cooperation. The post appeals to cooperation, partnership, solidarity, shared European or international action, or unity.

Call to action. The post contains a direct request to the reader to do something: vote, share, like, watch, read, join, sign, register, donate, or come along.

Provenance and AI use

Note added in 2026 to version 2 of this preprint. The rest of the paper is unchanged from version 1.

The data were collected with Netvizz and CrowdTangle during my doctoral research. This paper builds on my doctoral thesis (Hotham 2021). The analysis and writing were completed in 2026.

The analysis code and drafts of the text were prepared with the assistance of an AI system (Claude, by Anthropic), which was also used to review drafts. I checked the analysis and the text and take responsibility for both.

References for this note

Hotham, T. (2021). *How Do Political Parties Use Facebook and What Does It Offer to Their Campaigns*. PhD thesis, University of Bath.