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Abstract

On 23 June 2016, the electorate of the United Kingdom voted to leave the European Union. Britain's relationship with the European project has a long history, and deep historical factors may have played a role in shaping the outcome of the referendum. I show that past civilian experience and collective memory of war is one such factor. Combining geo-referenced data on bombing during the Second World War and district-level results of the EU Referendum, I show that districts with a greater number of bombing events exhibited higher Leave vote shares. This pattern is robust to controlling for other salient predictors of support for Leave and to using technical details of *Luftwaffe* technology to instrument for bombing. Collective memory is an important moderator; bombing predicts Leave vote shares only in districts where war graves and memorials from the Second World War are most prevalent. The same is not the case for war graves or memorials from other wars. Lastly, evidence from individual-level surveys suggests that Second World War-rooted Leave rhetoric was effective in swaying voters in high bombing intensity areas.

Keywords: Brexit, populism, war, collective memory
JEL Codes: D72, N44, Z13

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1 Introduction

In political rhetoric, the past is "not even past".[1] Using the power of salient historical events, politicians mobilise history to justify policy stances, create political identities and shape narratives. The fraught debates around Brexit provide a case in point: a month before the EU Referendum in the summer of 2016, then-figurehead of the Leave campaign Boris Johnson made headlines by likening the European Union to a superstate allegedly not unlike the one Adolf Hitler had attempted to architect in the 1940s. By tapping into the collective memory of the Second World War, Johnson's statement is one which seeks to exploit a resonance between past events and Leave talking points about sovereignty and autonomy.

In this paper, I empirically document a link between the bombing of Britain during the Second World War and patterns of Leave voting in the 2016 EU Referendum. These periods of intense bombing – most famously of London during the *Blitz*, but also of other urban, suburban and rural areas – were traumatic events that directly exposed civilians to the realities of war and entered into British collective memory and self-understanding in the post-war period. My central argument is that such events, when kept "alive" via commemorative practices, constitute a reservoir of analogies that can be tapped into and activated by political actors.

I proceed in a number of steps, mustering various novel data and employing a variety of empirical strategies. As a starting point, in a cross-sectional analysis of district-level voting, I find evidence of a strong positive correlation between Second World War bombing and Leave vote shares. This correlation is robust to the inclusion of a wide range of covariates which plausibly correlate both with bombing and support for Leave, including globalisation exposure (Colantone and Stanig, 2018), austerity (Fetzer, 2019) and the set of best predictors of Becker, Fetzer and Novy (2017).[2] The most conservative specifications suggest that moving a district from the ninety-fifth to the fifth percentile in the distribution of bombing intensity would be sufficient to move it from the mean Leave vote share to a Remain majority.

Results from this exploration of conditional correlations are further substantiated in an instrumental variables design which exploits technical details of the radio technology employed by the Nazi *Luftwaffe* to conduct its bombing raids. Because the majority of bombing took place during the night to minimise the risk of interception, radio beams were used to guide

[1] The full phrase – "The past is never dead. It's not even past." – is from William Faulkner's 1951 novel *Requiem for a Nun*.

[2] This "best predictor subset" includes measures of EU exposure, public services, demography, education, (un)employment and wages. I describe it in fuller detail as I introduce it in my empirical analysis in Section 4.

bombers to their targets. The transmitters of these beams were constructed in the territories occupied by Nazi Germany, with local topography determining their locations in ways that appear to have been orthogonal to the characteristics of potential targets in Britain. Proximity to these transmitters was, however, a strong predictor of the intensity of bombing experienced by a given British locality.[3] Two-stage least squares results obtained from using variation in bombing deriving only from districts' proximity to radio transmitters corroborate the central result that districts which were more intensively bombed exhibited higher Leave vote shares in 2016.

To unpack the channels underpinning the long-run relationship between Second World War bombing and voting in the EU Referendum, I provide evidence of the importance of both collective memory and activation. For the former, I show that the main result is moderated by commemoration of the Second World War. The positive correlation between bombing and Leave voting is much stronger in districts where war graves and memorials of the Second World War are particularly prevalent. For the latter, I use Boris Johnson's "superstate" statement in May 2016 as a case study to employ a difference-in-difference strategy on individual survey data. The design exploits variation over time (before and after the statement was first covered in *The Telegraph*) and across space (by comparing respondents from districts of different bombing intensity) to show that, after Johnson's statement, respondents in high-bombing areas became differentially likely to express pro-Leave voting intentions.

Together, my findings speak to three broad literatures. First, I provide a novel perspective on Brexit which fuses insights from disciplines which typically have not been in conversation on this topic. Qualitative studies have documented various ways in which Britain's past has given rise to identities that became salient during the Leave campaign (Bonacchi, Altaweel and Krzyzanska, 2018; Brophy, 2018; Franklin, 2019; Gardner, 2017; Stratton, 2019). Similar historical perspectives are typically absent from quantitative studies of the EU Referendum, which consider proximate determinants in time-frames of weeks, months and years in the lead-up to the vote.[4]

[3] In Section 4, I provide much more detail on the instrumentation strategy, including a defence of key identifying assumptions.

[4] I summarise the key findings of this literature in more detail in Section 2 below. Work in this space has either broadly identified key sets of predictors of Leave (Goodwin and Heath, 2016; Becker, Fetzer and Novy, 2017; Clarke, Goodwin and Whiteley, 2017; Arnorsson and Zoega, 2018; Alabrese, Becker, Fetzer and Novy, 2019) or zoomed in on specific factors, like globalisation and economic insecurity (Colantone and Stanig, 2018; Liberini, Oswald, Proto and Redoano, 2019), austerity and worsening public services (Fetzer, 2019; Fetzer, Sen and Souza, 2023), terrorism (Bove, Efthyvoulou and Pickard, 2022) and the impact of traditional and social media (De Luca, Huning and Santos Moneiro, 2021; Foos and Bischof, 2022).

Second, I show that the effects of war are long-lasting and that its impact are socio-political as well as physical. Specifically in the context of bombing, existing work has studied the important effects of bombing on economic development and economic geography (Bosker, Brakman, Garretsen and Schramm, 2007; Davis and Weinstein, 2002; Disney, Kirchmaier, Machin and Villa, 2026; Elster, Zussman and Zussman, 2017, 2019; Fetzer, 2023; Koster, van Ommeren and Rietveld, 2012; Miguel and Roland, 2011; Redding and Sturm, 2024; Riaño and Valencia Caicedo, 2024; Waldinger, 2016). A smaller but vibrant sub-literature has examined the short- and long-run effects of bombing on political behaviour and preferences (Adena, Enikolopov, Petrova and Voth, 2020; Berman, Brey and Laurent-Lucchetti, 2023; Elster, 2019; Grosjean, 2014; Heldring, Robinson and Whitfill, 2022). Here, Heldring, Robinson and Whitfill (2022) is particularly relevant, given the shared empirical setting. Interestingly, Heldring, Robinson and Whitfill (2022) find that the bombing of Britain reconfigured the social contract and shifted preferences in favour of redistribution in the immediate post-war period, as reflected in higher Labour vote shares and lower inequality. Together, our findings suggest that the long-run effects of historical events are shifting and contingent.

Third, and related, my findings resonate with a growing recent literature that has brought concepts of collective memory to the quantitative social sciences. Classic contributions in this domain date to the writings of Halbwachs (1992). Work in economics and political science has used these frameworks to study the socio-political effects of commemorative symbols (Carozzi, Pinchbeck and Repetto, forthcoming; De Juan, Haass, Koos, Riaz and Tichelbaecker, 2024; Rahnama, 2025; Taylor, 2025; Turkoglu, Ditlmann and Firestone, 2023), the role of the family for the transmission of memory (Brey, Haddad and Kattan, 2025; Dinas, Fouka and Schläpfer, 2021; Gharibyan, 2024) and the use of history by politicians (Belmonte and Rochlitz, 2019; Cantoni, Hagemeister and Westcott, 2020; Fouka and Voth, 2023; Ochsner and Roesel, 2024; Andrews-Lee and Liu, 2021; Elçi, 2022; Müller and Proksch, 2024; Ghidoni and Schindler, 2026). My argument that the long-run link between Second World War bombing and the EU Referendum is not immutable, but rather is underpinned by commemorative practices and activated by political actors, is one which fuses many of the insights from this literature within a single setting.

The paper proceeds as follows. In Section 2, I provide further institutional and historical background, including detail on the EU Referendum in 2016, on wartime Britain and on the Second World War in collective memory. Section 3 describes my data sources. Section 4 docu-

ments the long-run relationship between bombing and Leave vote shares, providing both correlational evidence and evidence from an instrumental variables design using details of *Luftwaffe* bombing technology to isolate plausibly random variation in bombing in a first stage. Section 5 unpacks channels of persistence and activation. In Section 6, I offer some concluding remarks.

2 Institutional and Historical Background

2.1 Brexit

The Brexit vote in the summer of 2016 was a watershed moment in recent political history. While a surprising outcome to many commentators at the time, the roots of the referendum result (and of the fact that a referendum was held in the first place) run deep. As noted by Becker, Fetzer and Novy (2017), the "United Kingdom's relationship with the European Union has always been a very special one." O'Rourke (2019) traces out this relationship starting over one hundred years before the date of the referendum itself. In a more immediate sense, the lead-up to the referendum can be understood as reflecting the political economy of growing Europscepticism within the electorate (reflected in the rise of the UK Independence Party, UKIP) and within the ruling Conservative Party itself.

In 2015, therefore, then-PM David Cameron pledged a consultative referendum on continued EU membership, which was held the following year. The arguments made by proponents of Leave often centred on ideas of autonomy and sovereignty, including tensions on immigration and lawmaking which were seen to be incompatible with continued EU membership. At a grassroots level, the movement was populist and drew on elements of nativism and anti-establishment ideas (Inglehart and Norris, 2016; Arnorsson and Zoega, 2018).

Vast literatures spanning multiple disciplines have since sought to make sense of the outcome of the referendum.[5] One set of papers seek to broadly characterise salient predictors of the propensity to vote Leave, either by comparing across districts (Goodwin and Heath, 2016; Becker, Fetzer and Novy, 2017) or across individuals (Clarke, Goodwin and Whiteley, 2017; Arnorsson and Zoega, 2018; Alabrese, Becker, Fetzer and Novy, 2019). Among these contributions, there are several noteworthy regularities: support for Leave was stronger among older and less-educated groups of lower socio-economic standing.

[5]Unsurprisingly, there are also vast literatures seeking to document the impact of the Brexit referendum on various outcomes. To name a few, these find effects on aggregate UK GDP (Bloom, Bunn, Mizen, Smietanka and Thwaites, 2025), regional inequality within the UK (Alabrese, Edenhofer, Fetzer and Wang, 2026) and global repercussions of Brexit uncertainty (Hassan, Hollander, Lent and Tahoun, 2024).

Other work has narrowed in on more specific predictors of Leave, including globalisation and economic insecurity (Colantone and Stanig, 2018; Liberini, Oswald, Proto and Redoano, 2019), austerity and worsening public services (Fetzer, 2019; Fetzer, Sen and Souza, 2023), terrorism (Bove, Efthyvoulou and Pickard, 2022) and the impact of traditional and social media (De Luca, Huning and Santos Moneiro, 2021; Foos and Bischof, 2022).

The role of the past, in particular our collective understanding of history and how this shapes political attitudes, has received much less attention in the quantitative social science literatures on Brexit. Qualitative studies across a range of fields – including cultural anthropology and social archaeology – have, however, noted that the past may have played a role in shaping politically salient identities that were brought to the fore in the run-up to the EU Referendum (Bonacchi, Altaweel and Krzyzanska, 2018; Brophy, 2018; Franklin, 2019; Gardner, 2017; Stratton, 2019). In this paper, I seek to bridge these approaches to understanding Brexit, taking the experience and collective memory of the *Blitz* as a testing ground.

2.2 The Blitz

The Second World War began on 1 September 1939 with the invasion and conquest of Poland by Nazi Germany and the Soviet Union. Britain's formal involvement in the conflict began not long after, with a declaration of war on Nazi Germany, together with France, on 3 September. What followed was a prolonged "Phoney War", with little to no actual fighting well into 1940. Matters changed in the spring of 1940, with the successive Nazi invasions and conquests of Denmark, Norway, the Low Countries and France. By May 1940, the enemy was, so to speak, on Britain's doorstep, culminating in the evacuation of Dunkirk in June 1940.

During the Battle of Britain, which began in July 1940, the Royal Air Force withstood sustained efforts by the German *Luftwaffe* to achieve air superiority and a rapid British surrender. In this phase of the war, German attacks focussed largely on military targets, aircraft production and shipping in the English Channel. Despite suffering heavy losses, British Fighter Command were able to secure a decisive defensive victory. Civilian losses were relatively minimal and significant strategic damage was largely avoided.

As German High Command came to the realisation that swift surrender was unlikely to be achieved, the *Luftwaffe* increasingly switched to active targeting of industrial and civilian objectives, with the aim of dealing economic damage and undermining civilian morale. This phase of the war, which began on 7 September 1940 with the sustained large-scale bombing of

London over some 57 days, became known as the *Blitz*.

While attacks initially focussed on London, other parts of Britain soon became targets of *Luftwaffe* bombing. Industrial centres (like Coventry and Birmingham) and shipping towns (like Liverpool and Hull) were also heavily raided. As wartime diarist Anthony Heap sarcastically remarked:

> *"There is this to be said for the Germans' particular tactics. They do spread the blitz fairly over the country and give the provinces their due share instead of concentrating solely on London as they did at first."* (from the diaries of Anthony Heap, quoted in Gardiner (2010, p. 331))

Interestingly, many rural and suburban regions of Britain also witnessed instances of heavy bombing. Partly, this can be explained by the imprecision of aerial bombing during the Second World War, which as a rule took place at night to avoid easy interception by anti-aircraft defences and fighter planes. As described in further detail below, advanced radar technology was developed by the *Luftwaffe* to facilitate nighttime bombing. Even so, some imprecision remained as bombers often veered off course during runs conducted in bad weather. In some cases, low fuel reserves necessitated the bombing of the next best target to permit a return to base. The result was an inherent randomness – both perceived and real – in exposure to bombing.[6]

2.3 The Second World War in Collective Memory

The Second World War strongly shaped British self-understanding and has lived on in popular culture and collective memory, thereby perpetuating what Calder (1992) has acerbically termed the "myth" of the *Blitz*. Phrases like "standing alone" and the (possibly apocryphal) "keep calm and carry on", which encapsulated British wartime resilience in the face of initially overwhelming odds, are examples of this.

Of course, the effects of the *Blitz*, in terms of loss of life, physical destruction and psychological trauma were immense and very much real.[7] Even so, this is still consistent with

[6] As Harrisson (1976) notes: "The erratic patterns of the German blitzes... seems in retrospect to be nearly senseless. The sequences show no logic, no discernible theory of what such attacks ... were supposed to achieve; nor any reason why one place was left alone, while another was given serial assault, though still never with any consistency" (Harrisson, 1976, p. 144).

[7] Overy (2013) notes that while "[b]ombing was a brief, if dangerous, operation for the bomber crew, ... it was a profound social fact for the victims who lived more permanently with its consequences" (Overy, 2013, p. 127) and that the "longer-term effects on civilians have been little studied in comparison with the post-war psychological damage done to soldiers as a result of the stresses of combat" (Overy, 2013, p. 640).

"myth-making" around the collective civilian experience of the *Blitz* which selectively recalls strong social cohesion in the face of external threat. Post-war memory, commemoration and understanding of the *Blitz* is therefore shifting and adaptable, in line with frameworks of collective memory first conceptualised by Halbwachs (1992).[8]

As argued by Stratton (2019), the "language of leaving" was no exception, with politicians readily drawing on wartime analogy in the run-up to the EU Referendum. Johnson's comparison of the EU to a Hitlerian "superstate" is one such example.[9] As reflected by its use in political narratives and in contradistinction to other parts of Europe, the legacy of the Second World War in the United Kingdom has not been support for European integration (O'Rourke, 2019). It seems plausible, therefore, that the localities within Britain where civilians were most intensely exposed to the war may be more susceptible to such narratives. As the rest of this paper seeks to show, this appears to have manifested in stronger support for Leave in such localities, with collective memory, commemoration and activation of salient history as important mechanisms.

3 Data and Descriptive Statistics

I combine data from multiple sources, which I now describe in turn.

3.1 EU Referendum: Votes and Predictors

The proximate source of data on voting outcomes in the 2016 EU Referendum is from the district-level analysis of Becker, Fetzer and Novy (2017). I report the spatial distribution of Leave vote shares across British districts in Figure 1. The figure demonstrates the (by now familiar) geographic patterns of the referendum, with support for Leave particularly high in the East of England. Districts in London, Scotland and parts of the South East (such as Oxford and Brighton) exhibit vote shares on the other end of the distribution. Summary statistics are reported in Panel A of Appendix Table A1.

The same dataset additionally includes a rich set of potential predictors of the outcome

[8] In particular, he writes that "the various groups that compose society are capable at every moment of reconstructing their past. But, as we have seen, they most frequently distort that past in the act of reconstructing it... Only those recollections subsist that in every period society, working within its present-day frameworks, can reconstruct" (Halbwachs, 1992, pp. 182-3, 189).

[9] In 2017, David Davis, then Secretary of State for Exiting the European Union, drew similar parallels when discussing the immensity of leaving the EU: "Our civil service can cope with World War II. It can easily cope with this." (Civil Service World, 19 Jan 2017, `link`). Similar wartime language and points of reference also arise at a more grassroots level. In explaining his decision to vote Leave, an anonymous attendee at a Second World War event at the Biggin Hill Memorial Museum said that "we would like to stand alone again. We've always been an island nation" (Christian Science Monitor, 11 April 2019, `link`).

of the referendum, which Becker, Fetzer and Novy (2017) use to construct a "best predictor subset" for explaining support for Leave. I include these as controls in some specifications, and report summary statistics for these variables in Panel D of Appendix Table A1. In the same Panel, I report summary statistics for a measure of globalisation exposure, taken from Colantone and Stanig (2018).

I turn to individual-level data for parts of my analysis. For this, I draw on waves 7 and 8 of the *British Election Study* (Fieldhouse, Green, Evans, Mellon, Prosser and Bailey, 2022), which were collected between 14 April 2016 and 22 June 2016 (in the months immediately before the EU Referendum). These data contain a range of information about respondents' socio-economic characteristics and their political attitudes. I use, in particular, respondents' vote intention in the then-imminent EU Referendum. Panel E of Appendix Table A1 reports summary statistics for these data.

3.2 Bombing Events during the Second World War

I construct measures of districts' exposure to bombing during the Second World War using data from War, State and Society (2020), a large collection of archival material from British wartime intelligence sources. In particular, the *Bombing Britain* dataset contains collates data from daily reports to the Ministry of Home Security and details over 32,000 bombing events.

The key information contained in these data is the location of each bombing event, which I use to assign each event to a district in the EU Referendum data.[10] This is done primarily via a merge using the Office for National Statistics (2019) *Index of Place Names*. For the subset of events where such a merge is not possible – for instance when the bombing location is listed as between two settlements – the match is done via manual georeferencing.

Figure 2 reports a range of descriptive information derived from the bombing data. The timeline in Panel (a) demonstrates that the majority of bombing took place in 1940-41 during the *Blitz*. But bombing continued throughout the war, with an especially pronounced uptick in 1944 during the so-called *"Baby" Blitz*. In Panel (b), I report a histogram of bombing across the cross-section of districts. The count of bombing events has been transformed using an inverse hyperbolic sine (IHS) transformation to allow for zero bombing in one district and to account for

[10] Other information about each event include the precise date and time of bombing and the number of injuries and fatalities. I do not directly use this information in my main analysis, but in additional checks I use bombing dates to conduct analyses for subsets of bombing periods and injury and fatality numbers to conduct analyses for subsets of events with human loss of life or injury.

a minority of districts which experienced exceptionally heavy bombing. The map in Panel (c) shows that while bombing was particularly concentrated in London and industrial centres like Coventry, Birmingham and Liverpool, bombs fell virtually throughout Britain.

In an instrumental variables strategy – described in more detail below – I use details of radio technology used by the *Luftwaffe* during the Battle of the Beams to isolate exogenous variation in bombing. To do so, I measure the distance of each district to key transmitters in territory occupied by Nazi Germany. The locations of these transmitters are digitised from Price (1977). Summary statistics for all variables related to the bombing of Britain during the Second World War are reported in Panel B of Appendix Table A1.

3.3 War Graves and Memorials

To explore the role of memory, memorialisation and commemoration in creating a link between the events of the Second World War and political attitudes decades later, I create measures of the prevalence of war graves and memorials in each district. Data on war graves are digitised from the online database of the Commonwealth War Graves Commission (2020), which details the location of each cemetery in Britain containing at least one war grave (along with the war in which the commemorated soldier fell). From these data, I construct a variable for the total number of dead interred in each district, for each of the world wars.

Information on war memorials is derived from Carozzi, Pinchbeck and Repetto (forthcoming), who in turn identify these memorials using the register of the Imperial War Museum and the National Heritage List. Like Carozzi, Pinchbeck and Repetto (forthcoming), I restrict attention to "listed" memorials, which are protected for their historical significance (and therefore more likely to capture locally salient and visible commemoration of a specific war). Again, I construct measures separately for the number of memorials commemorating the Second World War and other wars. Data on both war graves and memorials have been collated at the level of districts, and Panel C of Appendix Table A1 reports summary statistics for the resulting variables.

4 Empirical Evidence

I now provide empirical evidence of the relationship between bombing during the Second World War and support for Leave in the 2016 EU Referendum. I begin by estimating (conditional)

correlations, before turning to an instrumental variables approach isolating plausibly exogenous variation in bombing.

4.1 Correlational Evidence

To give a first sense of the relationship between wartime bombing and Leave voting, Figure 3 presents a range of correlational evidence. Panels (a) and (b) report gridmaps of Britain, where each square represents one district.[11] Each gridmap reports quintiles of the distribution of Leave voting and bombing, respectively, where each variable has been residualised using the logarithm of electorate size and eleven broad region fixed effects.[12] Darker colours represent higher quintiles of the respective distributions. Panel (c) represents, in a binned scatter plot, the corresponding conditional correlation. As can be seen, districts that saw more bombing during the Second World War tend to exhibit higher Leave vote shares in 2016.[13]

To estimate this relationship slightly more formally, I turn to variants of the following simple OLS specification:

$$\text{Leave}_i = \alpha_r + \beta \, \text{Bombing Events}_i + \text{X}_i'\gamma + \epsilon_i \tag{1}$$

where, for districts i, Leave vote shares (Leave_i) are regressed on the inverse hyperbolic sine of the number of bombing events (Bombing Events_i), conditional on region fixed effects (α_r) and a vector of control variables (X_i).

I report estimates of equation 1, with increasingly rich sets of control variables, in Table 1. The most parsimonious specification in column 1 includes only region fixed effects and a control for electorate size; it thus corresponds to the relationship reported in the binned scatter plot in Figure 3. The estimate of β is positive and statistically significant, indicating that more wartime bombing is associated with higher support for Leave. Is the effect economically meaningful? A back-of-the-envelope calculation suggests that moving a district from the ninetieth to the tenth percentile of the distribution of bombing would reduce the Leave share by approximately 3.5 percentage points. This is enough to move a district from the average Leave share in the sample

[11] Note that these are not gridcells of latitude and longitude, but a reshaping of districts into equally-sized squares. This is to permit a visual analysis that gives each district equal visual "weight", undistorted by the differential geographical areas of districts.

[12] These regions include Scotland, Wales and nine regions in England (East, East Midlands, London, North East, North West, South East, South West, West Midlands, Yorkshire and the Humber).

[13] In Appendix Figure A1, I show that very similar results are obtained when restricting attention only to events with fatalities or with injuries.

to a Remain majority.

Now, one might reasonably worry that there are confounders which have been omitted from this parsimonious specification. That is, characteristics of districts which made them prone to bombing during the Second World War may also have been important for determining support for Leave. In the remaining columns of Table 1, I therefore control for candidates for such variables. I begin with two factors which have received considerable attention in the literature trying to make sense of Brexit: austerity (Fetzer, 2019) and the "China shock" (Colantone and Stanig, 2018). Controlling for these factors in fact tends to strengthen the relationship from column 1.

One can make the specification richer still. In column 4, I do so by including the entire "best predictor" subset of variables from the comprehensive analysis of Becker, Fetzer and Novy (2017). This set of variables are those which best explain variation in Leave vote shares subject to an information criterion, and span measures of (i) EU exposure, (ii) public service provision and austerity, (iii) demography and education and (iv) economic structure, wages and unemployment.[14] Including this fuller set of covariates attenuates the coefficient from column 1 by about half, which is unsurprising if one suspects a "selection" into bombing which also correlates with determinants of Leave. The estimated β remains positive and statistically significant.

The same back-of-the-envelope calculation as above suggests that it would be necessary to move a district from the ninety-fifth to the fifth percentile of the bombing distribution to move it from the mean Leave share to a Remain majority. This is a non-trivial counterfactual. For this reason, I do not claim that wartime bombing explains the outcome of the EU Referendum. Rather, my findings should be viewed as an "existence" result, in that it is possible for past events to have long-lasting repercussions for political outcomes decades later.[15] I now turn

[14]The full set of variables is as follows: the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015).

[15]The 1975 referendum on continued membership of the European Economic Community presents an interesting counterpoint to these findings. As shown in Appendix Table A2, the correlation found between bombing and Leave in 2016 was not at all present in 1975. This provides an interesting nuance to my findings: the long shadow of history in shaping political preferences appears contingent. Below, I will return to this line of reasoning with analysis suggestive of the importance of political actors tapping into and "activating" the past in their rhetoric

to an instrumental variables strategy to further substantiate these findings, and then present evidence to unpack the mechanisms behind the long shadow cast by past exposure to war.

4.2 Instrumental Variables Using *Luftwaffe* Bombing Technology

Despite the rich set of controls included in the conditional correlations reported above, and despite the often erratic nature of *Luftwaffe* bombing, some problematic non-randomness in bombing exposure may still remain. I therefore turn to an instrumental variables strategy, which exploits the fact that the majority of strategic bombing of Britain took place at night and therefore required particular technological innovations, to isolate variation in bombing which is plausibly random.

In particular, the *Knickebein* system of radio transmitters allowed for *Luftwaffe* bombers to be guided to their targets without having to rely on celestial navigation or observing targets on the ground. Figure 4 illustrates how the system worked. Suppose a bomber begins a run over London from an airfield near Mont Violette in occupied France. It would follow a beam sent from a transmitter at Mont Violette in the direction of its target.[16] The novelty of the *Knickebein* system (which gave the system its name, meaning "crooked leg") was the sending of a second signal from a different transmitter, for instance from Julianadorp. When the two beams crossed – over London – the bomber crew knew the target had been reached and the bombing run could commence.

These details of *Luftwaffe* bombing technology are econometrically useful, for two reasons. First, as bombers had to follow a beam from a departure airfield on the European mainland and as spending more time over British soil increased the risk of interception, proximity to a *Knickebein* transmitter was a strong predictor of the intensity of bombing in Britain. This is demonstrated in Figure 5, a binned scatter plot correlating a district's distance to the nearest transmitter and the intensity of bombing experienced. The relationship is strongly negative, as expected. Table 2 shows that this relationship holds when comparing districts within the same region and when controlling for latitude and longitude. As an instrument, then, distance to transmitters exhibits a strong first stage.

Second, the placement of transmitters was dictated by topographical characteristics of oc-

(Ochsner and Roesel, 2024).

[16]The transmitters used so-called Lorenz beams (see Appendix Figure A2) which would transmit two sets of signals. When both signals were picked up by the receiver, the pilot would know they were on course. If only one of the signals was received, the pilot could deduce whether they were off course to the left or right.

cupied territories, as they had to be placed on sufficiently high ground such that signals could be beamed over Britain. This implies that their strategic placement vis-à-vis characteristics of British localities was limited. The set of balance checks reported in Figure 6 support this interpretation. Distance to *Knickebein* transmitters does not correlate with interwar demographic or socio-economic characteristics. This is evidence in favour of the assumption of instrument exogeneity.

With this instrument in hand, then, I proceed to estimate 2SLS regressions with a first stage given by:

$$\text{Bombing Events}_i = \delta_r + \zeta \, \text{Distance to Transmitters}_i + \mathrm{X}_i'\eta + \nu_i \tag{2}$$

which isolates variation in bombing deriving only from variation in distance to transmitters. As before, this is done in the presence of region fixed effects (δ_r) and potentially a vector of controls (X_i). Results from the corresponding second stages are reported in Table 3, beginning with a parsimonious specification in column 1 and then gradually introducing richer sets of controls.[17] Throughout, findings from the 2SLS regressions support those from their OLS counterparts: more intense wartime bombing in a district results in higher Leave vote shares.

In several specifications, 2SLS estimates are substantially larger than their OLS analogues. This may plausibly be the case due to attenuation bias in OLS estimates (as reporting of bombing events in wartime may be subject to some error). It may also be the case that the LATE being estimated using my instrument is larger than the ATE (as places bombed solely due to their relative proximity to transmitters may respond more strongly than places which reasonably may have expected to be bombed under any scenario). With the inclusion of the richest set of controls in column 5, however, 2SLS estimates are reasonably similar to those from the OLS estimation.

4.3 Robustness Checks

I now describe, in turn, a range of checks to probe the robustness of the results presented above.

Area-weighted bombing measures. In my main specifications, the explanatory variable of interest is the IHS transformation of the count of bombing events. One could, reasonably, instead use an area-weighted measure to capture bombing intensity. I do this for my main OLS

[17] Reduced-form estimates are reported in Appendix Table A3.

and IV specifications and report the findings in Appendix Table A4. Conclusions are identical to those arrived at above.

Region leave-one-out exercises. Are any particular regions driving my findings? To explore this, I conduct "leave-one-out" exercises where I re-estimate my main OLS and IV specifications multiple times, excluding each region in turn from the estimation sample. Appendix Figure A3, which reports the results, shows that all coefficients from this procedure are statistically identical to those form the baseline. It therefore appears that no single region is driving the main effect.

District type leave-one-out exercises. Rather than regional heterogeneity, it may be that there are differences in the estimated effects by type of district. In the dataset, these are classified into four categories: unitary authorities, London boroughs, and metropolitan and non-metropolitan districts. As reported in Appendix Figure A4, results are largely stable across district types. Excluding non-metropolitan districts results in a larger coefficient, albeit one that is only marginally statistically different to the baseline (and only in the OLS).

Standard errors. It may be that errors are correlated across space. In Appendix Figure A5, I re-estimate my main OLS and IV specifications with alternative standard error structures. These include clustering at the level of 1×1-degree grid cells and Conley (1999) standard errors with various distance cutoffs. Across specifications, the estimated coefficients remain statistically significant.

Different sub-periods of bombing. Are results driven by particular phases in the bombing of Britain? Specifically, does bombing during the main *Blitz* or during the later *"Baby" Blitz* seem to affect Leave voting differently? Using information on the timing of bombing events in the *Bombing Britain* dataset, I am able to determine if each event falls within these two main periods or outside of them. Re-estimating my main OLS and IV regressions while restricting attention to subsets of bombing events does not give rise to any noteworthy heterogeneity by timing, as reported in Appendix Figure A6. Intuitively, perhaps, bombing casts a similar shadow irrespective of when it occurred within the framework of the broader war.

5 Channels: Persistence and Activation

In this section, I provide evidence on the channels through which the long-run relationship between wartime bombing and Leave voting arises, highlighting the importance of collective

memory and activation of historic grievances in populist rhetoric.

5.1 Explaining Persistence: War Graves, Memorials and Collective Memory

One potential channel linking the historical experience of wartime bombing to modern political views and voting behaviour is via the physical commemoration of the conflict and its victims. Such commemoration can take several forms, and here I focus on the prevalence of war graves of fallen soldiers and historically significant listed memorials. Both are permanent physical manifestations which can plausibly sustain horizontal transmission of collective memory within a locality. The memorials in particular take prominent physical positions within the local community, in town squares and the like.

I proceed in steps to empirically document that local commemoration and collective memory appears to play a role in explaining the patterns uncovered in the previous section. The key hypothesis I would like to test is whether the relationship between bombing and Leave vote shares appears stronger in districts with a high prevalence of war graves and memorials. To rule out that any such patterns are simply driven by some underlying latent propensity to commemorate (which may in turn correlate with other factors determining support for Leave), it will additionally be important to show that such heterogeneities are present only for the specific conflict under consideration – the Second World War – and not other conflicts.

In Table 4, I present evidence which is consistent with these hypotheses. The table reports four pairs of columns which together provide evidence for the set of heterogeneities (and non-heterogeneities) just described. Columns 1 to 4 consider war graves, and columns 1 to 2 narrow down the focus to those graves commemorating soldiers fallen during the Second World War. In districts with a high prevalence of such war graves, the strong positive correlation between bombing and Leave obtains. The same is not true for districts with a low prevalence. Focussing instead on war graves of those fallen during the First World War (columns 3 to 4), there is no evidence of a similar heterogeneity. Rather, the relationship between bombing and Leave is remarkably similar between high- and low-prevalence districts.

The same patterns emerge when considering memorials (columns 5 to 8). Performing similar splits of districts (into high and low prevalence of listed memorials, separately for the Second World War and other wars) yield results very similar to those for war graves. The strongest associations between bombing and Leave arise precisely where the Second World War is commemorated most strongly. Together, these results suggest an important role for collective

memory, sustained via physical commemorative objects, in creating long-run links between past events and present-day political behaviour.

5.2 Activation: Populist Rhetoric Drawing on History

Physical commemoration can sustain collective memory within communities, but may require the active linking of historical events to current political discourse in order to "activate history" (Ochsner and Roesel, 2024). In the context of the Brexit referendum, Boris Johnson's likening of the European Union to a Hitlerian superstate in an interview with *The Telegraph* around a month before the EU Referendum may have served as such an activation.

To explore whether Johnson's statement moved the dial, I turn to individual-level survey data on voting intentions in the EU Referendum. These come from the *British Election Study* (Fieldhouse, Green, Evans, Mellon, Prosser and Bailey, 2022). As the data include information on the date respondents were interviewed, I can construct a repeated daily cross-section of responses. Further, using information on respondents' district of residence, I can bring in the data used above on the intensity of wartime bombing in the residents' location.

The resulting data structure allows me to estimate a triple-difference specification of the following form:

$$\begin{aligned}\text{Leave}_{jit} = \quad & \beta_1 \text{ Pro-Johnson}_j + \beta_2 \text{ Pro-Johnson}_j \times \text{Bombing Events}_i + \beta_3 \text{ Pro-Johnson}_j \times \text{Post}_t \\ & + \beta_4 \text{ Pro-Johnson}_j \times \text{Post}_t \times \text{Bombing Events}_i + \text{X}_j'\gamma + \Omega_{it} + \epsilon_{jit}\end{aligned} \tag{3}$$

As before, subscript i denotes districts. Additionally, j denotes individuals and t denotes calendar days. Leave_{jit} is an indicator for whether the respondent intends to vote Leave (multiplied by 100 for ease of interpretation), the vector X_j includes individual controls (fixed effects for age group and level of education) and Ω_{it} denotes district-by-day fixed effects.

The main regressor of interest is the triple interaction $\text{Pro-Johnson}_j \times \text{Bombing Events}_i \times \text{Post}_t$, which allows me to test whether individuals who could be receptive of Johnson's rhetoric ("Pro- Johnson_j") are more likely to express an intention to vote Leave after his superstate statement ("Post_t"), and particularly so in districts where bombing was intense ("Bombing Events_i"). The reasoning behind the inclusion of an indicator for whether respondents like Johnson is two-fold. First, it focuses attention on those respondents most likely to read about, and take

seriously, his claims in the interview with *The Telegraph*. Second, it permits the inclusion of district-by-day fixed effects, which stringently partial out any cross-sectional and temporal differences – idiosyncratic district-specific shifts in opinion – affecting equally all respondents in a given place at a given point in time.

Figure 7 provides a descriptive look at the patterns in the data. Here, the solid line traces out the average percentage point difference in respondents' intention to vote Leave, relative to the date of Johnson's interview with *The Telegraph*, specifically for pro-Johnson respondents in high-bombing intensity districts. The dashed line traces out the averages for all other subsets of respondents. This evidence is suggestive of a largely stable evolution of voting intentions before the superstate statement (barring a temporary blip two weeks or so before). Average voting intentions across all groups are on the whole very similar three weeks before compared to the day of the statement itself.

In the days after Johnson's superstate statement, however, trends between the two sets of respondents begin to diverge. In particular, pro-Johnson respondents in high-bombing districts are, almost immediately, around 10 percentage points more likely to state that they intend to vote Leave, with no similar jump for other respondents. Three to five weeks later, immediately before the referendum (Johnson gave the interview on 15 May 2016 and the EU Referendum took place on 23 June 2016), the differences between the two groups remain strikingly large.

Table 5 documents the same result more formally, in the fully-fledged triple-difference specification outlined in equation 3.[18] This allows for a more stringent absorption of variation in the propensity to support Leave deriving from differences across districts (with the inclusion of district-by-day fixed effects) and from individual characteristics (with the inclusion of individual controls). It is even possible to include a three-way fixed effect allowing the pro-Johnson effect to vary flexibly by district-day (column 2).

The main takeaway from these results is that in high-bombing districts, pro-Johnson respondents became about 2.2-2.4 percentage points more likely to report that they intend to vote Leave following his statement drawing parallels between Hitler's war of aggression and the supposed ambitions of the EU. This suggests that political rhetoric drawing on history can resonate in powerful ways in places where that history may be particularly salient.

[18]Here, I report robust standard errors. Results with standard errors two-way clustered by district and calendar day are reported in Appendix Table A5.

6 Conclusion

On 23 June 2016, the UK electorate voted to leave the EU. In this paper, I trace out a link between the outcome of the Referendum and civilian conflict exposure during the Second World War, three-quarters of a century earlier. With a combination of correlational and instrumental-variables evidence, I document a robust positive relationship between wartime bombing intensity and the propensity to vote Leave. Importantly, this is a pattern which is highly contingent on commemorative practices, which keep alive the collective memory of the conflict within localities. It is this collective memory which political actors in turn can tap into to activate politically salient histories, as exemplified by Boris Johnson's likening of the EU to a Hitlerian "superstate".

These findings have a number of implications of general interest. First, the political effects of war are long-lasting and persist well beyond physical recovery and rebuilding. Second, politicians malleably use history in their rhetoric, such that the same historical event can have different effects depending on the context in which it is being invoked. Third, in explaining events like Brexit, it becomes essential to examine the collectively remembered past, which undergirds and lends credibility to prevailing political narratives.

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Tables

Table 1: Correlational evidence

	Dependent variable: Leave vote share			
	(1)	(2)	(3)	(4)
IHS(no. bombing events)	1.052**	1.319***	1.599***	0.557***
	(0.526)	(0.440)	(0.548)	(0.213)
Observations	380	378	375	366
Outcome mean	53.14	53.16	53.24	53.23
Adjusted R^2	0.437	0.547	0.455	0.899
Additional controls		Austerity	Globalisation	Best subset

Note: OLS regressions of the form $\text{Leave}_i = \alpha_r + \beta\,\text{Bombing Events}_i + \text{X}_i'\gamma + \epsilon_i$. Regressions in all columns control for the logarithm of electorate size and 11 region fixed effects. Additional controls included in columns as indicated: total austerity from Fetzer (2019); globalisation exposure from Colantone and Stanig (2018); the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 2: First stage – bombing events and the distance to *Knickebein* transmitters

	Dependent variable: IHS(no. bombing events)			
	(1)	(2)	(3)	(4)
ln(dist. to transmitter)	-1.673***	-2.048***	-2.116***	-1.531***
	(0.095)	(0.219)	(0.241)	(0.316)
Observations	380	380	380	380
Outcome mean	4.427	4.427	4.427	4.427
Additional controls		Region FE	Lat. & Lon.	Both

Note: First-stage regressions of the form Bombing Events$_i = \delta_r + \zeta$Distance to Transmitters$_i + \mathrm{X}_i'\eta + \nu_i$. Controls included in columns as indicated. Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 3: Instrumental variables results

	Dependent variable: Leave vote share				
	(1)	(2)	(3)	(4)	(5)
IHS(no. bombing events)	5.398***	5.963***	3.137***	5.497***	0.785**
	(1.017)	(1.796)	(0.726)	(0.989)	(0.367)
Observations	380	380	378	375	366
Outcome mean	53.14	53.14	53.16	53.24	53.23
Additional controls		Lat. & Lon.	Austerity	Globalis.	Best subset
K-P F-Stat	69.71	28.28	109.1	70.98	124.9

Note: IV regressions of the form $\text{Leave}_i = \alpha_r + \beta \text{Bombing Events}_i + \text{X}_i'\gamma + \epsilon_i$, where the corresponding first-stage regression is $\text{Bombing Events}_i = \delta_r + \zeta \text{ Distance to Transmitters}_i + \text{X}_i'\eta + \nu_i$. Regressions in all columns control for the logarithm of electorate size and 11 region fixed effects. Additional controls included in columns as indicated: latitude and longitude, total austerity from Fetzer (2019); globalisation exposure from Colantone and Stanig (2018); the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 4: Collective memory – war graves and memorials

	Dependent variable: Leave vote share							
	War graves				Memorials			
	WWII		WWI		WWII		Non-WWII	
	low	high	low	high	low	high	low	high
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IHS(no. bombing events)	0.776	2.135**	1.415*	1.461*	0.816	1.971**	1.227**	1.701*
	(0.754)	(0.845)	(0.795)	(0.849)	(0.813)	(0.816)	(0.598)	(0.971)
Observations	169	156	169	156	146	180	152	174
Outcome mean	54.83	54.07	56.05	52.82	54.92	54.16	57.91	51.52
Adjusted R^2	0.514	0.303	0.202	0.454	0.377	0.324	0.217	0.417

Note: OLS regressions of the form $\text{Leave}_i = \alpha_r + \beta\,\text{Bombing Events}_i + \text{X}_i'\gamma + \epsilon_i$, estimated in different subsamples as indicated in column headings. Sample splits along "low" and "high" levels of war graves and memorials are done by way of a median split, where "high" is defined as above the median of the given variable. Regressions in all columns control for the logarithm of electorate size and 11 region fixed effects. Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

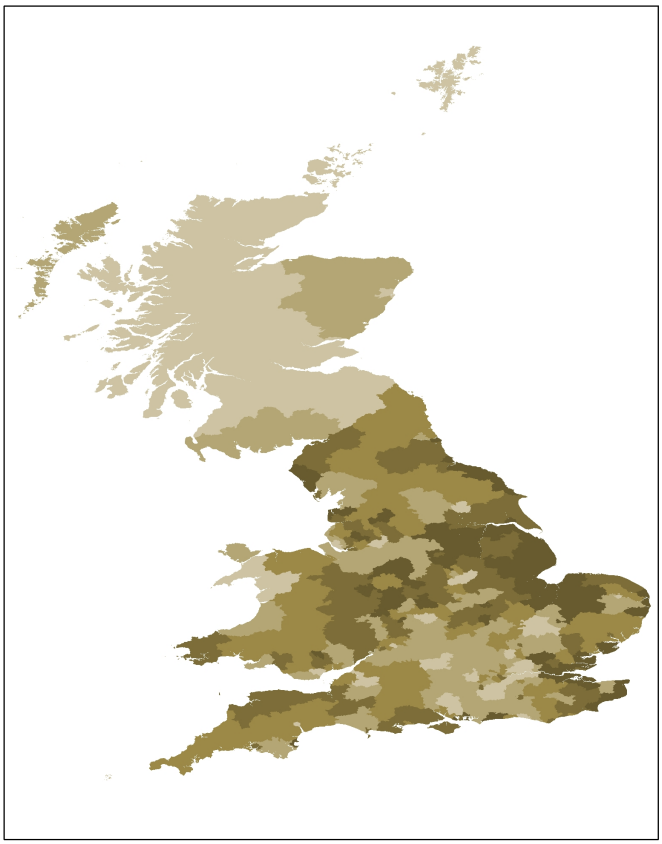
Table 5: Activation – Boris Johnson's "superstate" statement and voting intentions

	Dependent variable: intention to vote Leave	
	(1)	(2)
Pro-Johnson	27.766***	
	(3.689)	
Pro-Johnson × IHS(no. bombing events)	0.246	
	(0.760)	
Pro-Johnson × Post-statement	-1.139	
	(5.274)	
Pro-Johnson × Post-statement × IHS(no. bombing events)	2.437**	2.254**
	(1.085)	(1.110)
Observations	26027	26011
Outcome mean	49.46	49.44
Adjusted R^2	0.383	0.392
District-by-day FE	Y	Y
Individual controls	Y	Y
Like Johnson FE by district and day		Y

Note: OLS regressions of the form $\text{Leave}_{jit} = \beta_1 \text{Pro-Johnson}_j + \beta_2 \text{Pro-Johnson}_j \times \text{Bombing Events}_i + \beta_3 \text{Pro-Johnson}_j \times \text{Post-statement}_t + \beta_4 \text{Pro-Johnson}_j \times \text{Post-statement}_t \times \text{Bombing Events}_i + \text{X}'_{jit}\gamma + \Omega_{it} + \epsilon_{jit}$. An observation is of an individual j, residing in district i, responding to the survey on day t. All specifications control for district-by-day fixed effects Ω_{it}. Individual controls include age group indicators and years of education. Robust standard errors reported in parentheses. Regressions are weighted using *British Election Study* Wave 7 survey weights. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Figures

Figure 1: Leave vote shares in the 2016 EU Referendum



Note: Map showing the spatial distribution of Leave vote shares across local authority districts in quintiles (darker shades indicate higher Leave vote shares). Data from Becker, Fetzer and Novy (2017).

Figure 2: The bombing of Britain during the Second World War

(a) Timeline

(b) Histogram

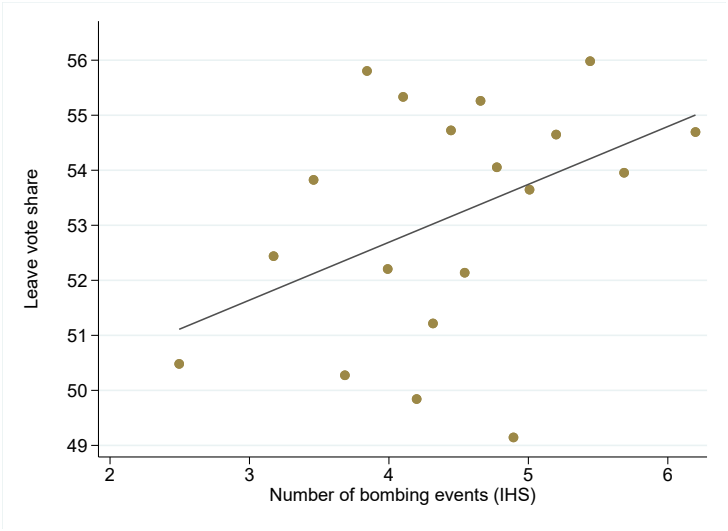
(c) Spatial distribution

Note: Top left: timeline of British bombing events during the Second World War. Top right: histogram of bombing events across local authority districts. Bottom: map showing spatial distribution of bombing events. Data from War, State and Society (2020).

Figure 3: Correlational evidence

(a) Gridmap of Leave quintiles

(b) Gridmap of bombing quintiles



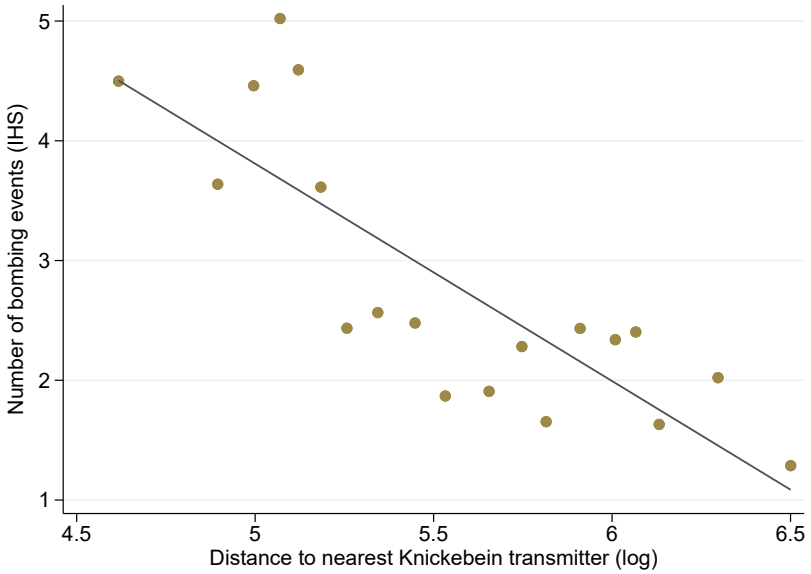
(c) Conditional correlation: Leave vote shares and bombing

Note: Top: gridmaps showing Leave vote share quintiles (left) and bombing event quintiles (right), residualised using the logarithm of electorate size and 11 region fixed effects. Each pixel represents one local authority district. Bottom: binned scatter plot showing the conditional correlation between Leave vote shares and the number of bombing events (transformed using the inverse hyperbolic sine), controlling for the logarithm of electorate size and 11 region fixed effects.

Figure 4: *Knickebein* transmitters and *Luftwaffe* bombing

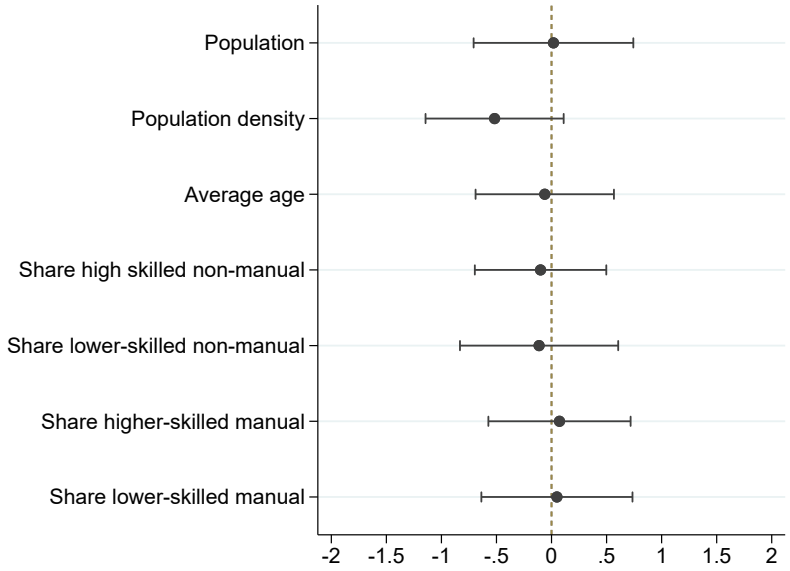
Note: Map showing the *Knickebein* transmitters used for *Luftwaffe* bombing runs over Britain during the Second World War. Digitised from Price (1977).

Figure 5: First stage – bombing events and the distance to *Knickebein* transmitters



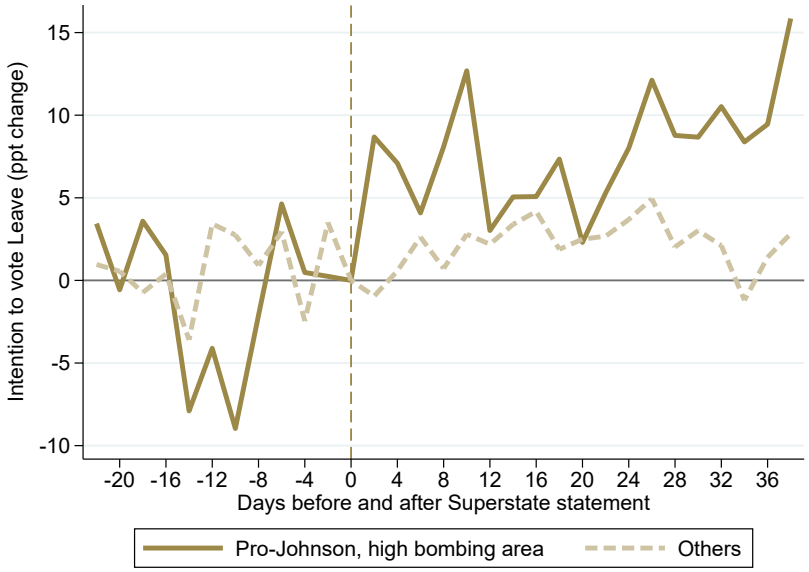
Note: Binned scatter plots showing the conditional correlation between the number of bombing events (transformed using the inverse hyperbolic sine) and the logarithm of the distance to the nearest *Knickebein* transmitter, controlling for the logarithm of electorate size and 11 region fixed effects.

Figure 6: Balance check – distance to *Knickebein* transmitters and interwar outcomes



Note: OLS regressions of the form Interwar Outcome$_i = \omega_r + \phi$Distance to Transmitters$_i + \mathrm{X}_i'\xi + v_i$. Registration sub-districts are the unit of observation. Demographic and socio-economic data are from Reid (2020) and spatial boundaries used to calculate distances to transmitters are from Southall, Burton, Greogry and Aucott (2025). All regressions control for latitude and longitude and regression county fixed effects. All variables have been standardised to have mean 0 and standard deviation 1 for ease of comparability between coefficients. 90 percent confidence intervals shown.

Figure 7: Activation – Boris Johnson's "superstate" statement and voting intentions



Note: Mean EU Referendum voting intentions by subgroups over time (before and after Boris Johnson's "superstate" statement). Groups are defined according to whether or not respondents claim to like Boris Johnson and whether or not they reside in a high-bombing intensity district. Both series are normalised with respect to the day of the statement and expressed as percentage point deviations from this normalisation.

Appendix: Additional Tables and Figures

Table A1: Summary statistics

	Obs.	Mean	St. Dev.	Min.	Max.
Panel A. EU Referendum					
Percent Leave	380	53.14	10.42	21.38	75.56
Panel B. Bombing during WWII					
Number of bombing events	380	86.45	111.18	0	623
Number of bombing events with injuries	380	26.61	49.54	0	357
Number of deadly bombing events	380	19.61	44.66	0	331
Distance to nearest transmitter (km)	380	294.20	150.04	70	741
Panel C. War Graves and Memorials					
War graves, total interred WWII	380	479.76	2094.37	0	23936
War graves, total interred WWI	380	350.30	1088.68	0	12165
War memorials, number commemorating WWII	326	13.78	13.85	0	99
War memorials, number commemorating other wars only	326	15.82	16.47	0	102
Panel D. Controls					
Initial EU accession migrant resident share (2001)	380	0.00	0.00	0.00	0.02
Initial EU 15 migrant resident share (2001)	380	0.01	0.01	0.00	0.11
Total economy EU dependence (2010)	380	0.10	0.03	0.03	0.15
1975 referendum Leave share	380	31.35	5.25	23.33	58.32
Share of residents commuting to London (2011)	376	0.02	0.04	0.00	0.25
Owned (outright + mortgage) share (2001)	380	0.70	0.10	0.27	0.88
Council rented share (2001)	380	0.12	0.08	0.00	0.42
Total fiscal cuts (2010-2015)	379	447.85	121.77	177.00	914.00
Share of suspected cancer patient treated within 62 Days (2015)	379	82.71	7.72	33.30	100.00
Share of res. pop. no qualifications (2001)	380	0.35	0.07	0.13	0.53
Share of res. pop. no qualifications growth (2001-2011)	380	-0.04	0.02	-0.09	0.07
Share of res. pop. qualification 4+ (2001)	380	0.19	0.07	0.08	0.60
Retail employment share (2001)	380	0.17	0.02	0.05	0.24
Retail employment share change (2001-2011)	380	-0.01	0.01	-0.04	0.03
Construction employment share change (2001-2011)	380	0.01	0.01	-0.01	0.04
Finance employment share (2001)	380	0.04	0.03	0.01	0.18
Median hourly pay change (2005-2015)	380	0.24	0.09	-0.09	0.66
Interquartile pay range (2005)	371	9.93	3.03	5.26	35.07
Unemployment rate (2015)	377	5.26	2.11	1.60	12.10
Globalisation shock	375	0.34	0.13	0.06	0.75
Panel E. Individual-Level Variables					
Intending to vote Leave	26027	0.49	0.50	0	1
Likes Boris Johnson	26027	0.44	0.50	0	1
Age	26027	51.68	16.28	18	97
No formal qualification	26027	0.13	0.33	0	1
GCSE qualification	26027	0.22	0.41	0	1
A-Level qualification	26027	0.22	0.41	0	1
University qualification	26027	0.44	0.50	0	1

Note: Summary statistics for key variables. See Section 3 for details and sources.

Table A2: "Falsification check" – votes in the 1975 referendum

	Dependent variable: Leave vote share			
	(1)	(2)	(3)	(4)
IHS(no. bombing events)	-0.041	-0.022	0.084	-0.249
	(0.221)	(0.223)	(0.258)	(0.263)
Observations	380	378	375	366
Outcome mean	31.35	31.32	31.24	31.46
Adjusted R^2	0.614	0.636	0.597	0.685
Additional controls		Austerity	Globalisation	Best subset

Note: OLS regressions of the form $\text{Leave}_i = \alpha_r + \beta\,\text{Bombing Events}_i + \text{X}_i'\gamma + \epsilon_i$. Regressions in all columns control for the logarithm of electorate size and 11 region fixed effects. Additional controls included in columns as indicated: total austerity from Fetzer (2019); globalisation exposure from Colantone and Stanig (2018); the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). Excluded from the best predictor subset is the Leave vote share in the 1975 referendum. Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A3: Reduced form

	Dependent variable: Leave vote share				
	(1)	(2)	(3)	(4)	(5)
ln(dist. to transmitter)	-10.781***	-10.961***	-7.114***	-10.983***	-1.932**
	(1.758)	(2.785)	(1.742)	(1.764)	(0.899)
Observations	380	380	378	375	366
Outcome mean	53.14	53.14	53.16	53.24	53.23
Additional controls		Lat. & Lon.	Austerity	Globalisation	Best subset

Note: IV regressions of the form $\text{Leave}_i = \alpha_r + \beta \text{Bombing Events}_i + \text{X}_i'\gamma + \epsilon_i$, where the corresponding first-stage regression is $\text{Bombing Events}_i = \delta_r + \zeta \text{ Distance to Transmitters}_i + \text{X}_i'\eta + \nu_i$. Regressions in all columns control for the logarithm of electorate size and 11 region fixed effects. Additional controls included in columns as indicated: latitude and longitude, total austerity from Fetzer (2019); globalisation exposure from Colantone and Stanig (2018); the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A4: Robustness to bombing per land area

	Dependent variable: Leave vote share	
	OLS	IV
	(1)	(2)
IHS(no. bombing events per km squared)	1.955***	2.702**
	(0.671)	(1.240)
Observations	366	366
Outcome mean	53.23	53.23
Adjusted R^2	0.900	
K-P F-Stat		78.73

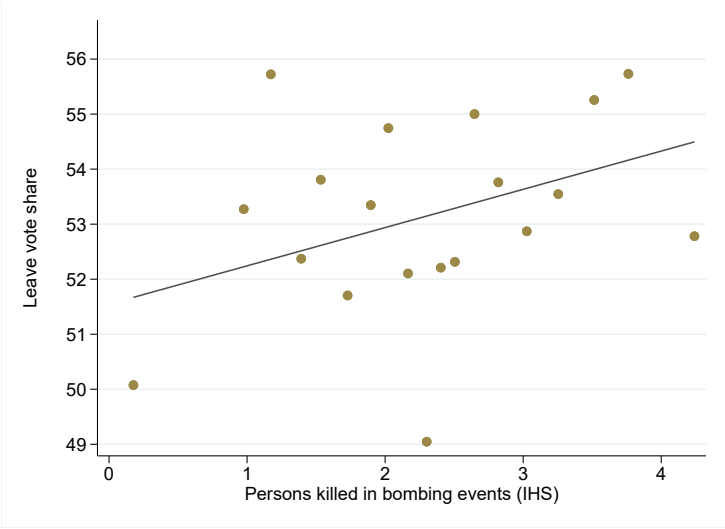
Note: OLS and IV regressions of the form $\text{Leave}_i = \alpha_r + \beta$ Bombing Events per Land $\text{Area}_i + \text{X}_i'\gamma + \epsilon_i$, where the corresponding first-stage regression is Bombing Events per Land $\text{Area}_i = \delta_r + \zeta$ Distance to $\text{Transmitters}_i + \text{X}_i'\eta + \nu_i$. Regressions in all columns control for the logarithm of electorate size, 11 region fixed effects and the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A5: Activation – robustness to two-way clustering standard errors

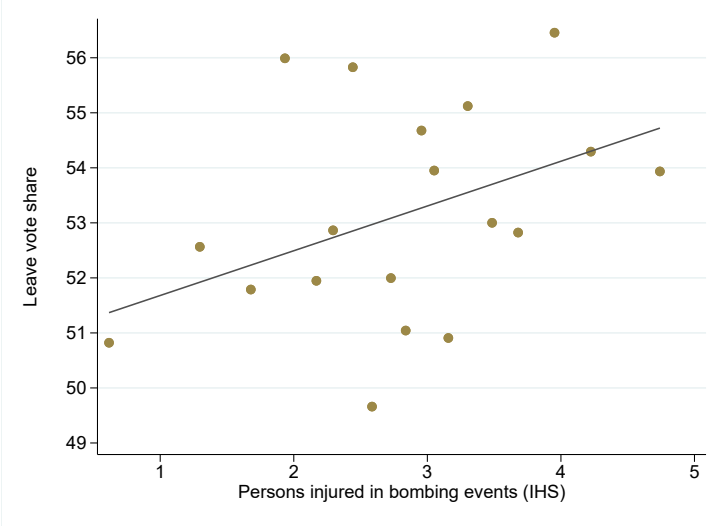
	Dependent variable: intention to vote Leave	
	(1)	(2)
Pro-Johnson	27.766***	
	(4.112)	
Pro-Johnson × IHS(no. bombing events)	0.246	
	(0.854)	
Pro-Johnson × Post-statement	-1.139	
	(5.903)	
Pro-Johnson × Post-statement × IHS(no. bombing events)	2.437*	2.254*
	(1.226)	(1.268)
Observations	26027	26011
Outcome mean	49.46	49.44
Adjusted R^2	0.383	0.378
District-by-day FE	Y	Y
Individual controls	Y	Y
Like Johnson FE by district and day		Y

Note: OLS regressions of the form $\text{Leave}_{jit} = \beta_1 \text{Pro-Johnson}_j + \beta_2 \text{Pro-Johnson}_j \times \text{Bombing Events}_i + \beta_3 \text{Pro-Johnson}_j \times \text{Post-statement}_t + \beta_4 \text{Pro-Johnson}_j \times \text{Post-statement}_t \times \text{Bombing Events}_i + \text{X}'_{jit}\gamma + \Omega_{it} + \epsilon_{jit}$. An observation is of an individual j, residing in district i, responding to the survey on day t. All specifications control for district-by-day fixed effects Ω_{it}. Individual controls include age group indicators and years of education. Regressions are weighted using *British Election Study* Wave 7 survey weights. Robust standard errors, two-way clustered by district and day, reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Figure A1: Correlational evidence using subsets of bombing events



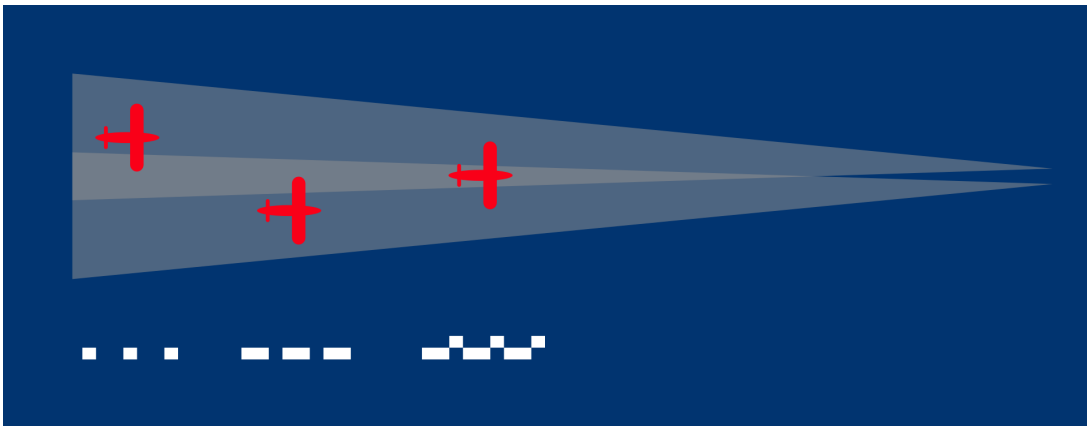
(a) Conditional correlation: Leave vote shares and deadly bombing



(b) Conditional correlation: Leave vote shares and bombing with injuries

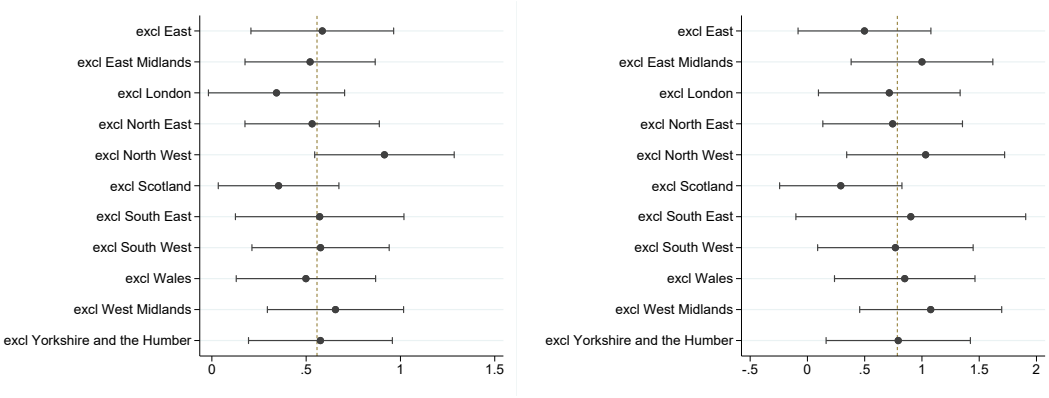
Note: Binned scatter plots showing the conditional correlation between Leave vote shares and the number of bombing events (transformed using the inverse hyperbolic sine), controlling for the logarithm of electorate size and 11 region fixed effects. Top: using only deadly bombing events; bottom: using only events with any injuries.

Figure A2: The Lorenz beam



Note: Diagram showing the intuition behind the Lorenz beam used in the *Knickebein* transmitter system. Source: `https://en.wikipedia.org/wiki/Lorenz_beam#/media/File:Lorenz_beam.svg`.

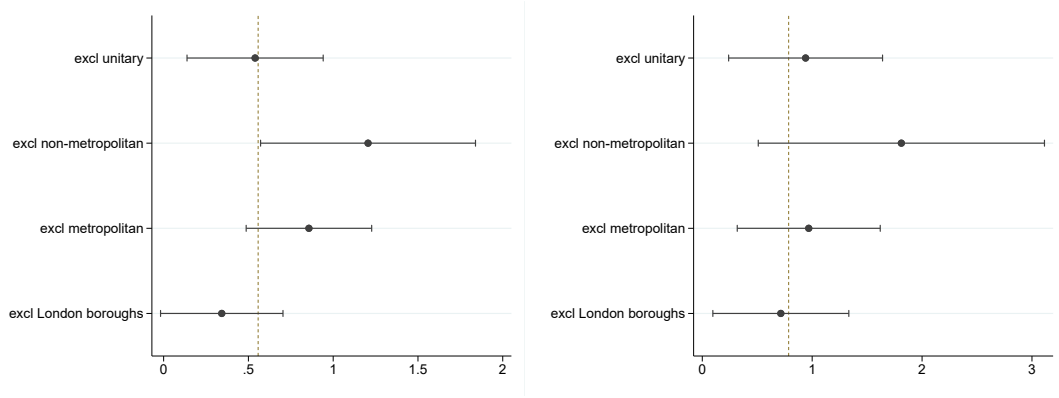
Figure A3: Robustness to excluding regions in turn



(a) OLS (b) IV

Note: Robustness exercise leaving out each region in turn. Each graph presents various coefficient estimates where the region indicated on the vertical access is excluded. The corresponding baseline estimates are indicated by vertical dashed lines. All regressions control for the logarithm of electorate size, region fixed effects and the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). 90 percent confidence intervals shown.

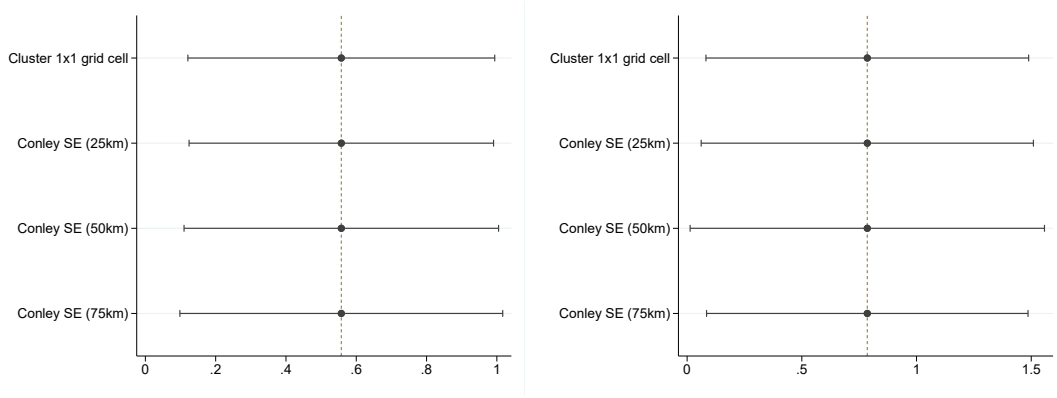
Figure A4: Robustness to excluding district types in turn



(a) OLS (b) IV

Note: Robustness exercise leaving out each type of district in turn. Each graph presents various coefficient estimates where the district type indicated on the vertical access is excluded. The corresponding baseline estimates are indicated by vertical dashed lines. All regressions control for the logarithm of electorate size, region fixed effects and the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). 90 percent confidence intervals shown.

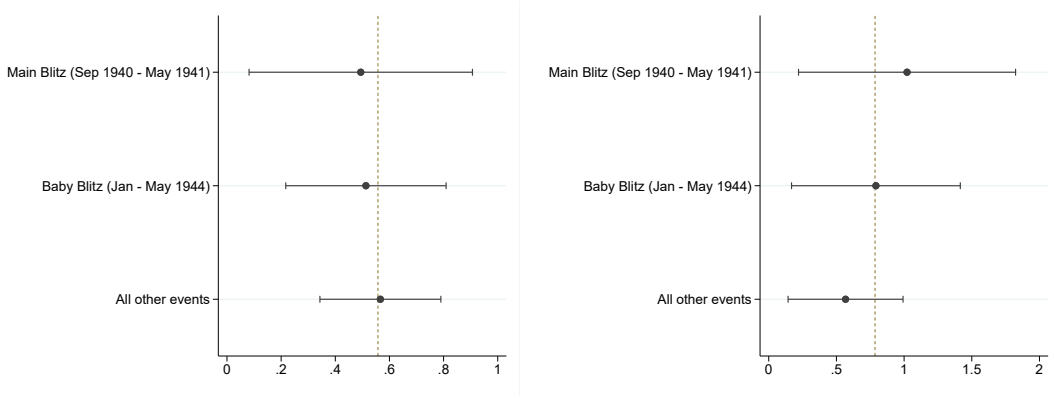
Figure A5: Robustness to different standard error structures



(a) OLS (b) IV

Note: Robustness exercise using different standard error structures. Each graph presents various coefficient estimates where standard errors are estimated using the method indicated on the vertical axis. The corresponding baseline estimates are indicated by vertical dashed lines. All regressions control for the logarithm of electorate size, region fixed effects and the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). 90 percent confidence intervals shown.

Figure A6: Robustness to different sub-periods of bombing



(a) OLS (b) IV

Note: Robustness exercise focusing in turn on different sub-periods of bombing. Each graph presents various coefficient estimates where regressions include only bombing from the sub-period indicated on the vertical axis. The corresponding baseline estimates are indicated by vertical dashed lines. All regressions control for the logarithm of electorate size, region fixed effects and the best predictor subset from Becker et al. (2017), including the share of initial EU accession migrant residents (2001), the share of initial EU 15 migrant residents (2001), total EU-dependence of local economy (2010), the 1975 referendum Leave share, the share of residents commuting to London (2011), the share of residents who own their property (outright and mortgage) (2001), the share of residents in council housing (2001), total fiscal cuts (2010-15), the share of suspected cancer patient treated within 62 days (2015), the share of resident population with no qualifications (2001), the growth of the share of resident population with no qualifications (2001-11), the share of resident population with qualification 4+ (2001), share of retail employment (2001), the growth of the share of retail employment (2001-11), the growth of the share of construction employment (2001-11), share of finance employment (2001), the change in median hourly pay (2005-15), the interquartile pay range (2005) and the unemployment rate (2015). 90 percent confidence intervals shown.