Scars of War: the Legacy of WWI Deaths on Civic Capital and Combat Motivation

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Abstract

How does the memory of lives lost in past wars shape communities and the next generation of soldiers? We use geolocated data on British servicemen to study the legacy of the Great War mortality shock on local communities and on the behaviour of soldiers in WW2. We find that fatalities in WWI increased both the number of deaths of the next generation in WW2 and the likelihood that these soldiers would receive military honours. To explain these findings, we report that WWI deaths promoted civic-oriented and cooperative behaviours in the inter-war period, as demonstrated by the creation of lasting war memorials, veterans' associations and charities, and by increases in voter participation. Overall, we present evidence that, for British servicemen, the legacy of the Great War endured and was amplified by civic capital and the remembrance of fallen soldiers.

Keywords: World War, Communities, Combat Motivation, Conflict

JEL classification: D74, D91, O15, Z10

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1. Introduction

The Great War of 1914-18 was one of the most deadly and costly events in human history, with fatalities of between 15 and 22 million (Showalter and Royde-Smith 2023). Britain alone suffered over seven hundred thousand deaths in this conflict. Memories of the war endured in media and political discourse, art and literature, the mass building of memorials, and the minds of millions of veterans. It was not long, however, before the Great War proved not to be "the war to end all wars", as in 1939 the next generation of Britons was being conscripted to war and urged to replicate the courage of their parents and grandparents.[1] To what degree did the legacy and memory of the First World War influence their behaviour during World War Two?

Understanding the drivers of soldier behaviour is challenging because combat represents a topical example of a collective action problem, whereby benefits from effort principally accrue to others – e.g., the nation – and costs fall squarely with those who fight and, particularly, those who die (Olson Jr, 1971; Campante and Yanagizawa-Drott, 2016). Yet, nations have been very successful at finding individuals willing to risk their lives in combat. Earlier studies have emphasised the role of contemporaneous factors driving the motivation of fighting men - for example, group loyalty (Costa and Kahn, 2003), identity (Barber IV and Miller, 2019), and reciprocity (Caprettini and Voth, 2023). However, the values that sustain the will to fight may also be shaped by *inter-generational* factors that work through the actions of previous generations and how these actions are remembered. These collective memories can be constructed, shared with others, and passed on to the next generation. They are important in the formation of group identity and, ultimately, in nation building (Halbwachs, 2020; Ochsner and Roesel, 2019).

This paper investigates these inter-temporal determinants of combat motivation by studying how the effort of British soldiers in WW2 was shaped by deaths of members of their community of origin during WWI. We hypothesise that the cultural transmission of civic capital – that is, *"those shared values and beliefs that help a group overcome the free rider problem in the pursuit of socially valuable activities"* (Guiso, Sapienza and Zingales, 2011) – connected the behaviour of soldiers fighting in the two wars. Our empirical work addresses three main questions: (i) was the conduct of soldiers in WW2 combat affected by community-level deaths in WWI?; (ii) were these effects mediated by changes in community-level stocks of civic capital? and (iii) was the inter-generational persistence of combat behaviour driven by family- or community-level transmission?

Our empirical approach exploits spatial variation in WWI mortality across local communities. To implement it, we gather detailed individual-level data covering over four million

[1]The memory of World War 1 is illustrated by The Times article of 11 Nov 1939 (Times, 1939), "In a remarkable degree, the present conflict is a continuation of the last... We cannot falter where they stood fast; we cannot grudge to give our little where they gave their all". Similarly, on the same day, the Daily Mail included Gerald Sanger's poem "Remembrance", which ends: "So in Remembrance, pledge that we will not cease; Our toil and travail till the deed is done; And we redeem our fallen comrade's glory."

British soldiers serving in either of the wars, combined with local characteristics of 14,000 parishes in England and Wales. Parishes are the principal administrative unit for church and civil purposes in the United Kingdom and constitute our main unit of analysis. We start by documenting a strong positive association between mortality at the parish level in WWI and WW2 that holds after conditioning on mobilisation, population and other covariates. Causal interpretation of this correlation relies on assuming that WWI deaths are (conditionally) uncorrelated to parish-level drivers of mortality in either war.[2] The unpredictable nature of warfare – i.e., the "fortunes of war" – suggest such an assumption may be non-perilous in some contexts. However, this assumption may be violated in the presence of persistent and unobservable determinants of combat behaviour.

To circumvent the possible endogeneity of war deaths, we devise an instrumental-variable strategy that instruments WWI deaths with predicted deaths at the parish-level, constructed using variation in the mortality of different battalions in which soldiers fought during the war. Soldiers were assigned to units of different riskiness, and this allocation largely determined their chances to survive and come back to their community. The organisation of the British army allowed recruits to have some degree of control over their assignment to specific regiments. However, assignment to battalions within regiments was arguably exogenous. We exploit this institutional feature in our empirical strategy. The validity of the instrument relies on assuming that conditional assignment to battalions was unrelated to parish-level characteristics that may drive mortality in war, such as socio-economic conditions, local norms, or persistent genetic traits. We will provide several pieces of evidence in support of this assumption, and show results are robust to alternative definitions of the instrument, estimation strategies, and sample selection.

Our main result is that parishes affected heavily by WWI mortality exhibit higher death figures in WW2, with elasticities estimated to lie in the range of 0.2-0.4. This result is robust to controlling for a variety of determinants of soldier mobilisation, socio-economic variables and fixed effects, and to instrumenting for WWI deaths. To investigate the mechanisms driving this result, we collect data on the construction of WWI war memorials, as well as several proxies for local civic capital such as the presence of branches of the British Legion (a veterans' association), mutuals or charities, or turnout in the subsequent national elections, and show that WWI mortality has a positive effect on all of these measures. Finally, we investigate the extent to which civic capital is the channel that links WWI mortality to changes in behaviour of soldiers in WW2 by implementing an IV mediation analysis using the method proposed by Dippel et al. (2019). Estimates indicate that a large fraction – about two-thirds – of the total effect is driven by the indirect effect of WWI deaths operating through civic capital, suggesting that civic capital is indeed a key channel through which past war deaths

[2]The exogeneity of war deaths is frequently invoked, for instance, in the literature studying the effect of wars on marriage markets – e.g., Abramitzky, Delavande and Vasconcelos (2011), Brainerd (2017) and Boehnke and Gay (2020). Studies relying on the exogeneity of war related destruction in other settings include, for example, Davis and Weinstein (2002), Dericks and Koster (2021), and Acemoglu et al. (2022).

shape the behaviour of the next generation of fighters.

In the second part of the analysis, we turn to soldier-level data to study whether the effect on WW2 mortality is indeed due to a change in soldiers' behaviour. Using information on all soldiers who were killed in WW2, we show that coming from a parish with higher WWI mortality increases the probability of being awarded an honour for bravery, such as the Victoria Cross or the Distinguished Service Order. Estimates are robust to controlling for age, rank, and regiment fixed effects, suggesting that selection of soldiers from different locations into riskier units or more favourable tasks is not driving these results.

We then explore the role of intergenerational transmission of values within British families. To this end, we link individualised data from the 1911 Census to soldiers serving in the two wars and provide evidence that the transmission of values through the community documented above is complemented by a direct channel that goes from father to son: children of soldiers who were killed in WWI are about 30% more likely to die in WW2 than those who did not lose their father. Instead, we find no effect of losing another male household member. This father-son effect co-exists with the community-level effect estimated using our parish-level measure of WWI mortality, lending support to the hypothesis that both "horizontal" and "vertical" transmission of values are important in this setting (Campante and Yanagizawa-Drott, 2016; Bisin and Verdier, 2001).

We perform additional analyses to rule out alternative channels. To start, show that our main effect is unlikely to be driven by WWI deaths fuelling higher mobilisation by showing that there is no detectable effect of WWI deaths on mobilisation during WW2, as measured in electoral records of 1945. We then regress a battery of economic and demographic outcomes measured in inter-war years on WWI deaths and show that there is no effect on these potential mediators, suggesting that the effect of WWI mortality on WW2 behaviour is not the result of changes in economic conditions or demographic factors at the local level.

Our results are robust to a variety of alternative specification checks and instrument choices. First, we show that estimating the model using death rates instead of log deaths yields very similar results. Recent work has cautioned about the perils of models in logarithms when the dependent variable can take value zero, hence we also demonstrate that our main results remain largely unaffected when dealing with this issue in different ways, including using Bellégo, Benatia and Pape (2022)'s iterative OLS estimator. In addition, we estimate the model again using an alternative instrument obtained after excluding Pals battalions – volunteer units that were raised locally in the early stages of the Great War – or using only late-war deaths (when the army was composed almost entirely of conscripts). We also evaluate the robustness of our findings when using an instrument that relies on variation between infantry regiments only. Reassuringly, in all of these exercises we obtain IV estimates that are very similar to our baseline results.

This paper contributes to a strand of quantitative studies in economics investigating individual behaviour in the military. Costa and Kahn (2003), study how company characteristics – in particular, socio-economic and cultural homogeneity – affected desertion in the US Civil

War. Closer to our study, Campante and Yanagizawa-Drott (2016) show that war service by parents increases the propensity to serve by their offspring using Census data on US men throughout the 20^{th} century. While we also study the transmission of attitudes towards military service across generations, we depart from this paper by i) looking specifically at community-transmission and, ii) shifting the focus from the effect on serving to studying the effect of war deaths on risk-taking behaviour and mortality, conditional on serving. This links our paper with Ager et al. (2022), who study how social image concerns motivated Luftwaffe pilots to take additional risks in WW2. As the authors show, this competition for honours led average pilots to die at a higher rate. Other studies look at other drivers of combat motivation such as propaganda (Barber IV and Miller, 2019) and religiosity (Beatton, Skali and Torgler, 2019). We study another possible channel, related to the commemoration of war losses and civic capital, on combat behaviour.

Our results relate to previous work on nation building. Alesina, Reich and Riboni (2020) present a theoretical description of the problem faced by modern states that need to mobilise soldiers when wars, traditionally fought by small, professional corps, started requiring mass conscription armies. One way to motivate war effort is to implement "positive nation-building" policies, to promote values of shared culture for which it is worth fighting. Depetris-Chauvin, Durante and Campante (2020) show that shared collective experiences induce individuals to identify less with their ethnic group and more with the nation as a whole.[3] We document that in our setting the commemoration of war losses may strengthen the survivors' sense of belonging to the community and foster the creation of civic capital. Our results thus accord with recent work finding that, in some settings, violence can lead to altruistic behaviour and higher social capital (Voors et al., 2012; Blattman, 2009).

Naturally, our paper is also connected to the literature studying the consequences of war.[4] Much work in this literature has focused on the local economic and demographic consequences of war-related destruction, (see for example Davis and Weinstein 2002; Brakman, Garretsen and Schramm 2004; Riaño and Valencia Caicedo 2020; Ciccone 2021). We relate the most to recent research studying how individual experiences of conflict shape social preferences and behaviour. War experience has been show to either foster pro-social behaviour and risk-taking attitudes (Voors et al., 2012), or, on the contrary, erode political trust and promote anti-social or even repugnant behaviours (Grosjean, 2014; Cage et al., 2020). We contribute to this line of work by documenting a strong inter-temporal transmission of war-related deaths via changes in the behaviour of soldiers in the battlefield.

Finally, we contribute to the literature studying how collective memory is formed and how it impacts behaviour by presenting evidence of long-lasting effects of the "scars of war"

[3]Other work has focused instead on the effects of *negative* historical events – such as the actions of occupying or belligerent states, or judicial rulings – on the formation of national identity (Dehdari and Gehring 2022, Dell and Querubin 2018, Casas, Curci and De Moragas 2020).

[4]The theoretical game theory literature on conflict has been an active area of enquiry for over half a century (see Kimbrough, Laughren and Sheremeta 2017 for a review). See also Sandler and Hartley (2007).

and the amplifying effect of making them more salient through commemoration. Fouka and Voth (2021) show that areas that suffered German reprisals during WW2, especially those recognised as "martyr towns", reduce purchases of German cars substantially during the Greek debt crisis, when memory of past wrongdoings was made salient again. Ochsner and Roesel (2019) show that Austrian villages pillaged by Turks over 500 years ago started showing more aversion to Muslims after populists brought it back to the public attention during their electoral campaign.

2. Background

In this section, we set out to describe how men were incorporated into the British Army and how the army was organised during WWI. We also provide historical context and discuss some of the key military engagements taking place in both wars. Finally, we describe the genesis of some of the customs and traditions of remembrance that developed following the war, many of which persist to this day. These institutional details will motivate our subsequent empirical analysis.

2.1. The British Armed Forces during WWI: Enlisting and Conscription

A total of 4.3 million men from England and Wales served with the British Army in the First World War (Winter, 1980), while an additional 200,000 served with the British Navy. Roughly half of these men served as volunteers, while the other half were conscripted. The size of the British military increased by over an order of magnitude during the course of the war, rising rapidly from the small regimental force of only 244,000 units in service at the onset of the war to a massive army at its dénouement.

The composition of the British forces also evolved markedly throughout the war. Before the conflict broke out, the army had been a small and mobile professional force designed to work in tandem with the dominant naval fleet to maintain an empire covering a quarter of the globe. Britain did not have conscription, and service was entirely voluntary. It was this professional army – the regulars – that provided the six divisions of the British Expeditionary Force that landed in France in the summer of 1914. By the end of that year, much of this initial force had been spent: one third of the men in the initial expedition had been killed and more were wounded or missing (Travers, 1994).

Anticipating high levels of attrition, the Secretary of State for War, Lord Kitchener, issued a call for volunteers immediately after the declaration of war with Germany. This call was initially very successful, with roughly 2.5 million men joining the army in 1914 and 1915 alone (Simkins, 2007). During the volunteering phase, doctors in charge of medical examinations were paid only for successful recruits, and nearly everyone passed the required medical tests (Winter, 1980). This resulted in thousands of men in poor physical condition being enlisted into the army in the early stages of the war. Some centralised efforts were made to prevent recruitment from key industries like mining and shipbuilding, but these restrictions were often ignored by local recruiters or circumvented by volunteers themselves.

The British War Office believed that morale and cohesion would benefit if men could volunteer and fight alongside their friends and peers. To this end, local committees were permitted to raise "Pals" battalions, i.e., units of volunteers from the same locality, occupation, or social club. Because Pals battalions were recruited locally, the creation of these units had the added benefit of relieving the strain on recruitment efforts by the War Office (Simkins, 1994).

In 1915, to further expand the army to match the demand from the war, the Government passed the National Registration Act. Following this Act, a Census was conducted and measures to stimulate recruitment were put in place. After disappointing results, the Military Service Act on January 1916 introduced conscription for all unmarried British males aged 19-41. Only a few months later, the age requirement was reduced to 18 and the exemption for married men was dropped. During conscription, the process of determining who was enlisted was tightened: medical examinations became more rigorous and men working in "reserved occupations" - those deemed vitally important to sustain the war effort or the operation of other essential sectors - were exempted from service.[5] The introduction of conscription in 1916 also led to the effective end of the practice of raising Pals battalions. Conscription would continue until the end of the war in November 1918.

2.2. Organisation of the British Army during WWI

Since the 19^{th} century – and to this day – the British Army has been organised into administrative units called regiments. Most infantry during WWI came from regiments with a regional identity and a specific recruitment area, such as the *Essex* or *Norfolk* regiments. Figure 1 shows a map of local regiments' recruitment areas in 1916, together with regimental headquarters. A man who wanted to enlist could, in principle, do so in any recruitment office across the country. However, the most common choice was to enlist at the local regimental depot. Appendix Figure D.3 shows that this was indeed the case, and that most regiments which had local recruiting areas were disproportionately manned by recruits from their own county.

Regiments are made up of fighting units called battalions, with each comprising roughly 1,000 soldiers, of which 35 were officers. Pre-war regiments usually had between 2 and 4 battalions but this number was expanded substantially when the war began. Therefore, most of the battalions that took part in the war were created in 1914 and then re-filled with new recruits as attrition took its toll on the army. While assignment of soldiers to regiments was often based on geographical proximity, allocation to battalions was mostly a mechanical process, unrelated to the characteristics of recruits. During Kitchener's call to arms, service battalions were formed simultaneously and each was filled with recruits as soon as they

[5]A list of reserved occupations was published in the Times on November 22, 1915. The list included occupations engaged in the production or transport of munitions, mining of coal and certain other minerals, the operation and maintenance of railways, agriculture, and food and clothing production. Besides occupational dispensations, conscientious objectors could be exempted from service on the grounds of political, religious, or moral beliefs at the discretion of a military tribunal.

Figure 1
British Army regiments' recruitment areas in WWI

Notes: Edited extract of a poster originally published by the Parliamentary Recruitment Committee, London, in 1915. Image from the Imperial War Museum archive. © IWM Art.IWM PST 11946. Enlarged section introduced by the authors. Note that not all regiments had a specific recruitment area. Some regiments such as the Royal Field Artillery, Royal Garrison Artillery or the Royal Rifle Corps recruited from all over the United Kingdom.

arrived, in lots of 100 soldiers, until all battalions' ranks were full. Reserve battalions – duplicates of the service battalions – were then formed using the same method (Simkins, 2007). Self-selection of men into units was made even more difficult in the second half of the war with the introduction of mass conscription. While there was an assignment system in place, historians have described how this was often overridden by the immediate needs of the battlefield. For example, Bet-El (2009) notes that in the vast majority of cases, *"military requirements were the only true measure, given the need to despatch most available men to the front, either in a fighting capacity or as auxiliaries"* .

Fighting units deployed in the field were usually divisions (about 20,000 men or 12 battalions). Divisions were typically composed of battalions from different regiments, so that in practice soldiers often fought alongside men from very different origins.[6] These institutional

[6]For example, the First Infantry Division, who fought in France, comprised three brigades, each made of four battalions. However, its exact composition changed over time and, by the time the war ended, as many as 30

features will directly inform the empirical strategy that will be discussed in Section 4.1.

2.3. *Main Battles of WWI*

Most of the fighting force of the British Army during WWI was committed on the Western Front.[7] It was also on this front where the vast majority of British deaths took place. Figure 2 is built using data from the Commonwealth War Graves Commission and illustrates the timing of death of British soldiers throughout the war.

After an initial phase during 1914 in which the French Army and the British Expeditionary Force succeeded in halting the German invasion of Flanders and France, the war began to be fought on rather static fronts. The trenches that have come to epitomise the fighting during this period provided substantial defensive advantages which turned the war in the west into an artillery-heavy war of attrition. The most costly battles in the first two years of the war in terms of casualties were fought in Ypres and especially in Aubers Ridge, which caused a total of over 11,000 fatalities.

By far the most dramatic and bloodiest engagement of the British Army during the First World War was the one fought over the Somme river in France between July and November 1916. Over 3 million men from the British, French and German armies participated in the battle, and a third of them were wounded or killed. In the first day alone, over 19,000 British soldiers were killed, making it the worst day in the history of the British Army (McCartney, 2017). By the end of the battle, Britain alone had suffered 420,000 casualties, of which roughly 100,000 were fatalities.

In the following months and throughout 1917, the British continued assisting the French offensive at Arras, which proved to be particularly costly. Later in the same year, the town of Cambrai – then an important German supply point – was attacked. After a successful first day for the British, a powerful German counter-attack caused once again a large number of casualties.

In 1918, the German Supreme High Command launched a series of attacks over the whole Western Front in an attempt to defeat the Allies before the United States could deploy their resources completely. After an initial success – though at the cost of heavy losses – the German advance was contained. In July, the arrival of the American Army gave the Allies the numerical advantage they needed to counter-attack, regaining all lost ground. This battle caused the German line to collapse and essentially ended the hopes of victory for the German Army, which sued for peace just a few months later.

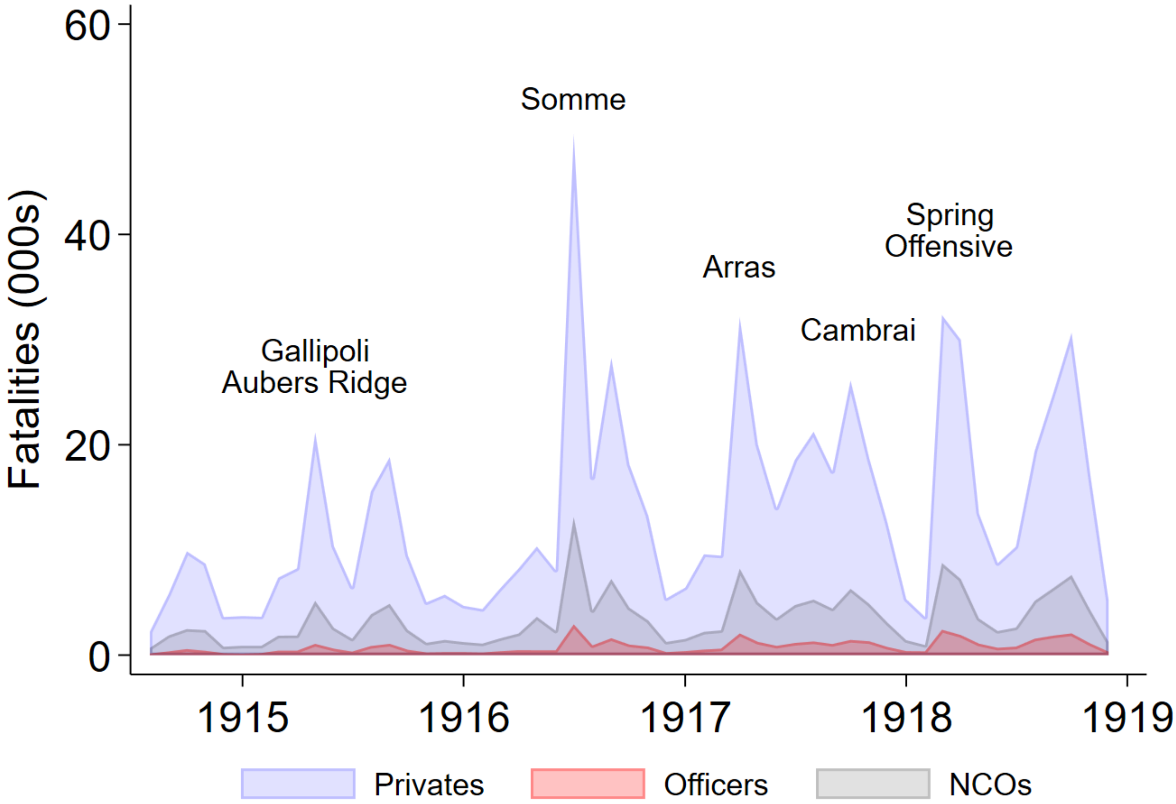
2.4. *WWI Remembrance*

Fighting in WWI ceased on 11 November 1918 and in June 1919 the Great War was officially concluded. The end of the war naturally led to a profound reflection on the fallen

battalions coming from 21 different regiments had served in it (James, 2012).

[7] According to Travers (1994), on the 1^{st} of November of 1918, three quarters of the British army (excluding colonial troops) was deployed in France.

Figure 2
Timeline of WWI Deaths of British Service Personnel



Notes: Number of British Army and British Navy fatalities in each month during WWI. Overlaid text indicates the name of five key battles: Aubers Ridge, on May 9, 1915. Somme, started in July of 1916. Arras, started in April of 1917. Cambrai, started in November of 1917. Spring Offensive, which began in March of 1918. Source: authors' elaboration based on Commonwealth War Graves Commission data.

and a desire to acknowledge their sacrifice, manifested in the subsequent adoption of numerous traditions and customs of public and private remembrance. Britain commemorated Armistice Day on 11 November 1919 by observing a two-minute silence with bowed heads to reflect on the fallen, and on the same day in 1921, 9 million remembrance poppies – artificial silk flowers that could pinned on a lapel – were sold to raise funds for disabled ex-soldiers. "Battlefield pilgrimages" to sites in Northern France and Belgium by both bereaved family members and tourists became commonplace (Lloyd, 2014), and the unknown serviceman entombed in Westminster Abbey in 1920 was visited by more than a million people in the first week alone. These rituals were sustained throughout inter-war Britain and remain closely observed today. For example, members of the royal family place wreaths on the Cenotaph in London and the public wear artificial red paper poppies on Remembrance Sunday (the second Sunday of November),[8] and the Remembrance Trail around the Somme battlefield

[8]According to the British Legion, some 40 million poppies where distributed by 40,000 volunteers in 2022.

receives some 200,000 visitors each year.

A widespread form of commemoration that will be important in our empirical analysis is embodied in the thousands of war memorials scattered through many of the country's cities, towns and villages. These memorials were typically built in remembrance of war dead from each location. In most cases, the creation of WWI memorials was funded locally, through voluntary donations and money-raising activities organised by local parish committees (King, 2014). It is estimated that as many as 50,000 WWI war-related memorials of one type or another were built in England and Wales, although a large proportion of this total are memorials to individuals e.g. gravestones. Around 1 in 10 of these memorials have subsequently been added to the National Heritage List as Listed Buildings, indicating they are legally preserved because of their special architectural or historical interest. Because building memorials that are worthy of being listed was only possible where donations were sufficiently large, they arguably represent a good measure of a high level of local civic capital, i.e., "values and beliefs that help a group overcome the free rider problem in the pursuit of socially valuable activities" (Guiso, Sapienza and Zingales, 2011).

2.5. British Armed Forces in WW2

In Spring 1939, the British government began preparations for a possible war against Nazi Germany. The May 1939 Military Training Act introduced limited conscription for single men aged between 20 and 22 so that when war was declared on September 3 there were some 259,000 men in the the Regular British Army (Danchev, 1994). As had happened in the Great War, the army would grow by more than an order of magnitude by the end of WW2.

The National Service (Armed Forces) Act was passed immediately after war was declared and required all males aged between 18 and 41 to register for conscription. Registration began in October 1939 and men were then conscripted by age cohort, starting with the youngest from January 1940. In December 1941 the call-up age was increased to 50. Relative to the army that had taken part in the Great War, the British Army during WW2 was disproportionately, and indeed almost wholly, manned by conscripts.

Those medically unfit were exempted and conscientious objectors could also seek an exemption before a tribunal. Anticipating a long war from the outset, the government had detailed plans to balance manpower across the armed forces and industry, which again relied on reservation by occupation. This was in place until 1942 when scarcity of resources necessitated moving to a system of individual deferment. At the start of WW2, the assignment of men to roles in the services was *ad hoc*, being largely determined by a recruiting officer's recommendation and the War Office's requirements (Crang, 1999). Men were routinely assigned to unsuitable roles. This problem was widely acknowledged and as the war wore on more systematic assessment and allocation systems were introduced.

According to the Commonwealth War Graves Commission, over 380,000 soldiers died fighting with Britain during WW2. Heavy fighting took place in many different fronts:

France, the North of Africa, South East Asia, Germany. British armies suffered defeat after defeat between 1939 and 1942, before turning the tide of war to victory in 1945.[9] The navy and, in particular, the air force played a more prominent role than in WWI. Yet the army continued to absorb the lion's share of the materiel and human resources of the British effort. It also endured the majority of the British deaths suffered during the war. The time-line of deaths during the 1939-1945 period can be found in Appendix Figure D.4.

3. Data and Descriptives

3.1. Data

In order to estimate the impact of the deaths in the Great War on civic capital in the inter-war period and outcomes in WW2, we assemble a database combining information for individual service personnel from both wars with harmonised data at the level of 1911 parishes. We use these sources to create our two main estimation datasets: one at the parish level, using 1911 historical parishes as the underlying unit of observation; and another, at the level of individual WW2 soldiers.

Data Sources

Data on British service personnel killed in both wars is obtained from the Commonwealth War Graves Commission (CWGC). The CWGC is an intergovernmental organisation dedicated to marking, recording and maintaining the graves, memorials and memories of the men and women of the Commonwealth forces who died in both World Wars. Open data from this organisation contains individualised information on names, time of death, rank, regiment, honours (e.g., medals) and – for a large sub-sample – age at the time of death and a string from which we can extract the location of origin of dead soldiers. For those dying during WWI, data on locations is augmented using information on residence from Forces War Records (FWR), a military genealogy specialist website.

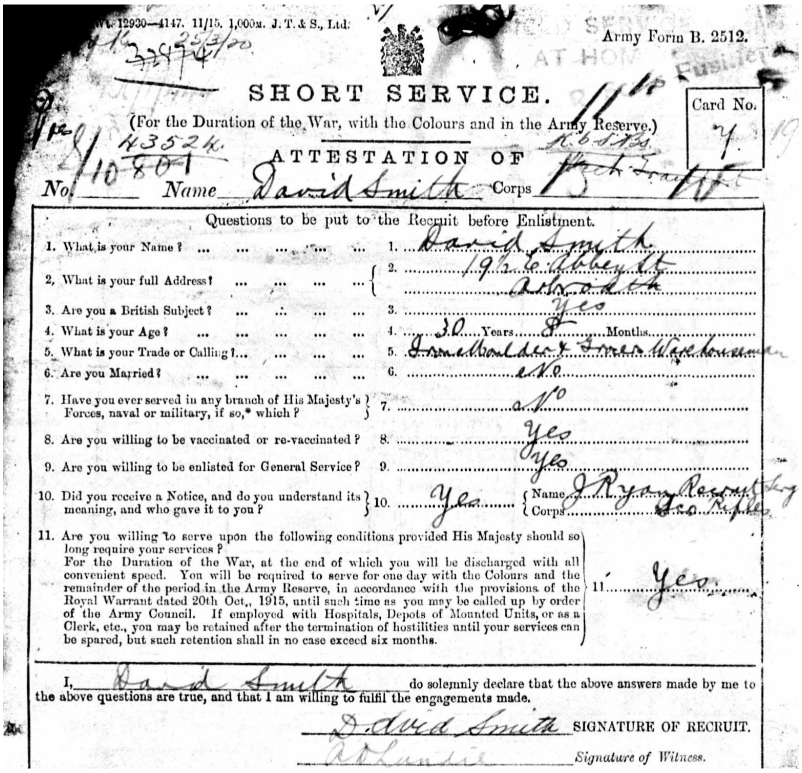
Data on 4,072,035 war records of soldiers mobilised during WWI is obtained from FamilySearch, a non-for-profit organisation which offers on-line access to large genealogical datasets. FamilySearch draws its information from the British Army Service Records for 1914 to 1918. These records contain information on enrolled soldiers including names, place of residence, birthplace, age at the time of enlistment, year and unit in which the soldier was enlisted. An example of one of these records can be found in Figure 3.[10] The FamilySearch source allows

[9]The 2^{nd} Battle of El Alamein in 1942 is widely regarded as the turning point of the war in the west. Prime Minister Winston Churchill would later quip "Before Alamein we never had a victory. After Alamein we never has a defeat." (D'Este, 1994)

[10]Digitised versions of these records can be consulted at www.ancestry.co.uk. The FamilySearch collection, which includes the extracted data, is called "United Kingdom, World War I Service Records, 1914-1920". The original sources of this information are the "Burnt documents" (record code WO 363) and the "Unburnt collection" (record code WO 364), which are kept in the National Archives at Kew in London. The Burnt Documents are roughly 2.5 million records on WWI soldiers which survived the fire resulting from an incendiary bomb hitting the War Office Record Store in 1940. The Unburnt Collection is made of soldier information obtained from pension claims. This collection was stored separately in 1942 and, therefore, did not suffer the fate of many of the Burnt Documents.

us to measure WWI mobilisation at the parish level, which can readily be aggregated to other geographies. The information on soldiers' regiment and battalion of service will be used to construct our instrument (see section 4.1). When cleaning and processing this information, we use as reference the Table of Organisation of each regiment as detailed in James (2012).

FIGURE 3
BRITISH ARMY WWI SERVICE RECORD - EXAMPLE


Army Form B. 2512.

SHORT SERVICE.

(For the Duration of the War, with the Colours and in the Army Reserve.)

Card No. 4.

ATTESTATION OF

No. 10801 Name David Smith Corps

Questions to be put to the Recruit before Enlistment.

1. What is your Name? ... 1. David Smith
2. What is your full Address? ... 2. 19½ E. Abbey St Arbroath
3. Are you a British Subject? ... 3. Yes
4. What is your Age? ... 4. 30 Years 8 Months
5. What is your Trade or Calling? ... 5.
6. Are you Married? ... 6. No
7. Have you ever served in any branch of His Majesty's Forces, naval or military, if so,* which? 7. No
8. Are you willing to be vaccinated or re-vaccinated? 8. Yes
9. Are you willing to be enlisted for General Service? 9. Yes
10. Did you receive a Notice, and do you understand its meaning, and who gave it to you? 10. Yes {Name J Ryan Recruiting {Corps
11. Are you willing to serve upon the following conditions provided His Majesty should so long require your services? For the Duration of the War, at the end of which you will be discharged with all convenient speed. You will be required to serve for one day with the Colours and the remainder of the period in the Army Reserve, in accordance with the provisions of the Royal Warrant dated 20th Oct., 1915, until such time as you may be called up by order of the Army Council. If employed with Hospitals, Depots of Mounted Units, or as a Clerk, etc., you may be retained after the termination of hostilities until your services can be spared, but such retention shall in no case exceed six months. 11. Yes

I, David Smith do solemnly declare that the above answers made by me to the above questions are true, and that I am willing to fulfil the engagements made.

David Smith SIGNATURE OF RECRUIT.

Signature of Witness.

Source: British Army World War 1 Service Records, 1914-1920. Accessed at Ancestry.co.uk on February 2, 2021.

Individual-level information on the English and Welsh population before the war is obtained from the 1911 Census of population.[11] We use this data both at the individual level in Section 5.2 and to construct aggregates at the parish level. From this source, we obtain information on the occupational composition of the workforce and several income proxies including the number of servants and the number of rooms per household. We obtain other 1911 aggregate information, as well as digital maps for parishes, districts and constituencies from "A Vision of Britain through Time" (VoB), an online library of spatial data created by the Geography Department at the University of Portsmouth.

Finally, we use data from other sources to obtain spatially disaggregated proxies for civic capital. Data on war memorials built both before and after the Great War are obtained from the Imperial War Museum memorial registry and complemented with information on Listed memorials from Historic England and the Welsh equivalent, CADW. Information on regis-

[11]The dataset originates from the Integrated Census Microdata project (Schürer and Higgs, 2014), and is distributed by IPUMS (Minnesota Population Center, 2019).

tered charities and their location is obtained from the Charity Commission for England and Wales. Data on mutual societies – a type of enterprise that can be likened to a cooperative – is obtained from the Financial Conduct Authority. Data on branches of the British Legion – a veteran's association set up after WWI – is contained in the Charity Commission data but is incomplete in terms of branch addresses so we supplement this using location information obtained from the website of the Royal British Legion and other online directories.

Geo-locating soldiers

Our empirical analysis relies on exploiting variation in the location of origin of mobilised and killed service personnel. This requires adequately geolocating soldiers based on information on their place of birth and of residence contained in the data sources described above. The procedure used for geolocation is described in detail in Appendix A.

The CWGC data on those killed during WWI includes information on 796,601 soldiers.[12] Information for residence or birthplace (or both) of the remaining serviceman are obtained from either the birthplace and residence fields from FWR or the "additional information" string included in the CWGC source. We are able to locate over 74% of WWI dead in terms of birthplace or residence (or both), for a total of 588,224 soldiers.

The FamilySearch data on mobilised men and women includes information on residence and/or birthplace for most records. The geolocation process yields 2.6 million servicemen assigned to their parish of origin – amounting to 66% of all records if we exclude those corresponding to soldiers from Scotland/Ireland and other countries outside of the British Isles.

The CWGC dataset on soldiers killed in WW2 has information on 441,110 deaths (of which 67,591 were civilians) during 1939-1945. For about 344,000 of them (79% of total), some additional information is provided in the form of a short text that very often includes the location of origin. Using this information, we are able to geolocate about 245,000 or 56% of all records to a parish in England and Wales.[13]

The geolocation process will yield a good quality match between locations of origin and parishes when the origin location reported by either the servicemen or the registrar coincides with the parish name. This is not uncommon, as parish names correspond quite closely to the names of the locations they encompass. However, there will be cases in which the conventional name of a location does not correspond to any parish name, or it corresponds to the name of a parish that occupies a fraction of the area that is typically denoted with that name.[14] It is for this reason that for 11 locations we group parishes to a unit which

[12]This number is in line with the 702,410 born in the British Isles and killed in the war, as reported by the British government (BWO, 1922). The discrepancy between these two figures emerges because the CWGC data occasionally includes data on men from British dominions and Commonwealth countries participating in the war effort.

[13]Given that we do not geolocate soldiers born in Ireland, Scotland, or abroad, this means that we geolocate the majority of soldiers with information (76%).

[14]For example it is almost certain that in most cases, soldiers that reported their location as "London" were referring to the London conurbation, and not to the relatively small parish within the conurbation that is called "City of London".

encompasses the parishes in the town or city under consideration.

In Appendix A, we discuss details of the geolocation procedure and provide descriptive figures to validate the resulting spatial data on mobilisation in WWI and deaths in both wars.

Data Assembly

Our main analysis is based on a 1911 parish-level dataset covering England and Wales. We take 1911 as our reference year because it is the last Census year before the onset of the Great War in 1914. Parishes are administrative units corresponding to the lowest level of local government in the United Kingdom.[15] We drop from this sample all parishes that had zero population in 1911 – usually parcels of empty land in remote rural areas – and 9 additional parishes that have repeated names. After applying these restrictions and grouping parishes as described in the previous section, our final dataset encompasses 14,504 parishes, of which 13,408 are in England and 1,096 are in Wales.

We occasionally use information at other levels of aggregation (e.g., the much larger districts). In order to aggregate observations or impute information across geographies corresponding to different periods, we use a spatial matching procedure based on the assumption of uniform population distribution within small spatial units.[16] We will also use information at the level of individual soldiers killed in WW2 based on the CWGC source.

3.2. Descriptives

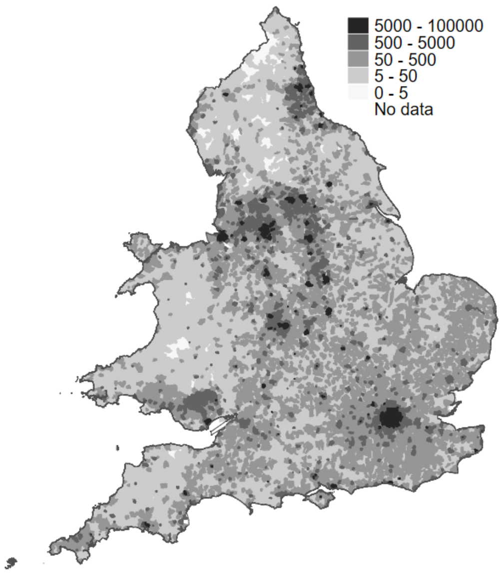
The panels in Figure 4 represent 1911 parishes and shows the level of spatial variation that we use in the analysis. Panel A is provided for reference and plots population densities, with darker colours corresponding to denser parishes. We can observe the high density agglomeration of London to the south east, the populous areas around Liverpool and Manchester near the west coast north of Wales and the city of Newcastle in the north east. The geolocation process described in the previous section allows us to represent aggregate mobilisation and death rates at the level of these geographies. The British Army at its maximum strength counted approximately 3,820,000 soldiers in 1918. As illustrated in Panel B of Figure 4 all regions of Britain contributed with recruits, with mobilisation rates – the ratio of enlisted men over population – above 10% in some locations. Differences in WWI death rates across parishes are represented in Panel C. Substantial spatial variation can also be observed in WW2 death rates, illustrated in Panel D.

Our parish-level dataset includes parish characteristics from the 1911 Census, the number of soldiers coming from each parish and killed in each war, as well as the number of

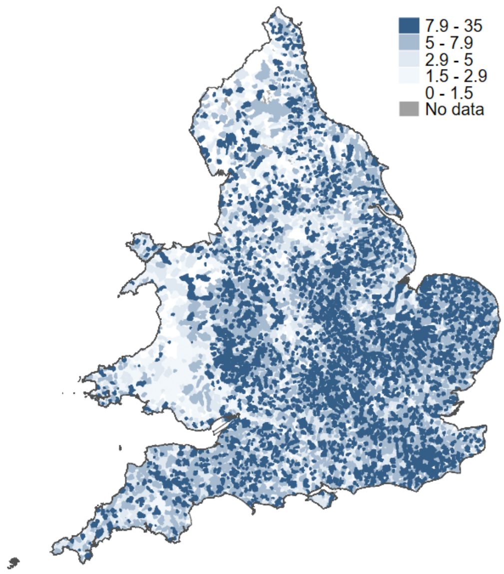
[15]Civil parishes evolved from ecclesiastical parishes during the 19th century. By 1880, civil parishes had no religious or ecclesiastical duties. In 1911, the territories of England and Wales were divided into 14,664 parishes, of which 13,404 in England and 1,260 in Wales.

[16]This allows re-aggregating information or imputing across periods when boundaries overlap. Because parishes are relatively small (10 sq. km on average), and boundaries are often quite stable, we expect the measurement error induced by making this assumption to be limited.

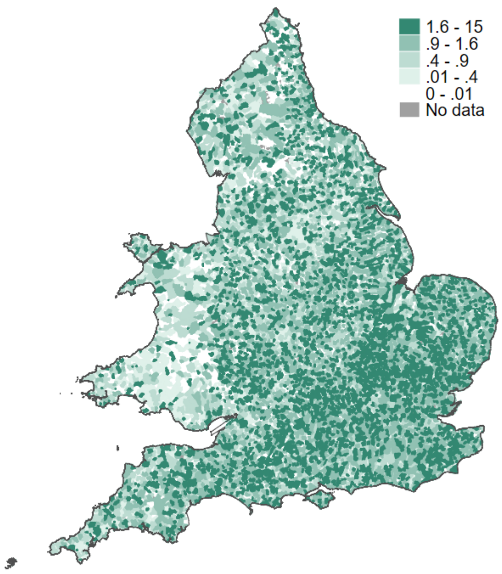
Figure 4
Density, Mobilisation and War Deaths



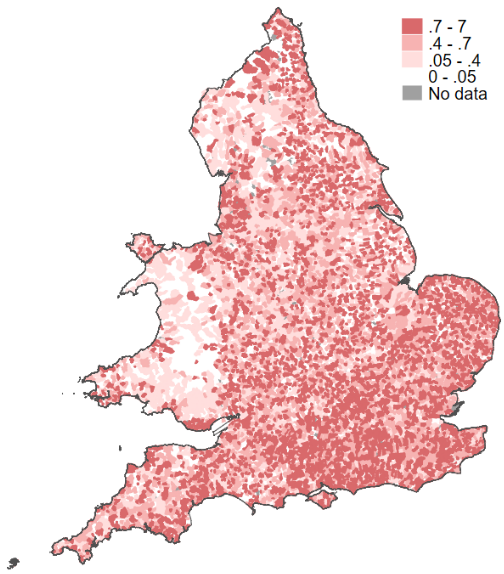
(A) Population Density (pop./km^2)



(B) Mobilisation per capita in WWI (%)



(C) Deaths per capita in WWI (%)



(D) Deaths per capita in WW2 (%)

Notes: Historical parishes in England and Wales. Panel A shows population density, measured as 1911 population per squared kilometre. Panel B shows mobilisation per capita (in percentage points), measured as number of mobilised soldiers from each parish over population. Panels C and D show similar figures for the number of soldiers killed in WWI and WW2, respectively.

mobilised soldiers during WWI. Descriptive statistics for this dataset can be found in Panel A of Table 1. The average parish had a population of about 2,500 in 1911 and an area of 10.6 square kilometres. The average number of WWI mobilised servicemen taking part in WWI was 73, which puts the average mobilisation rate (defined as mobilised over total 1911 population) at roughly 5%. The average death rate was around 0.9% in WWI and just about 0.5% in WW2. A quarter of parishes had a WWI memorial that would later be added to the Heritage List built within their boundaries after the war.

Our second dataset is constructed using CWGC data on servicemen who died in WW2. The average age at death was 27, and the average soldier died about three years from the time in which they first enlisted. Roughly half of servicemen who died in the War were privates. Only a small fraction of men – about 3% – received any gallantry honour, such as a medal, in WW2.[17]

TABLE 1
DESCRIPTIVE STATISTICS

	Mean	Std. dev.	Min	Max
A. Parish-level data				
Population 1911	2,478.72	39517.60	3	4521685
Area (sq. km)	10.60	11.49	0	314
Mobilisation WW1	73.33	217.72	0	2480
Mobilisation Rate WW1 (%)	5.25	4.70	0	34
Number WW1 Dead	39.68	793.02	0	87547
Death Rate WW1 (%)	0.88	1.00	0	7
Listed WW1 Memorial Dummy	0.23	0.42	0	1
Death Rate WW2 (%)	0.49	0.77	0	8
Observations	14504			
B. WW2 Soldier-level data				
Age of Soldier at Death	27.36	7.83	14	91
Received honours (dummy)	0.03	0.17	0	1
Days in war (from enlisted)	1,155.63	564.74	0	2311
Private (dummy)	0.49	0.50	0	1
Mobilisation Rate WW1 in origin parish (%)	9.95	10.73	0	66
Death Rate WW1 in origin parish (%)	1.93	1.89	0	11
Memorial in origin parish (dummy)	0.73	0.44	0	1
Observations	367827			

Notes: Panel A provides descriptives for the parish-level dataset. Panel B provides descriptives for the soldier-level dataset of all English and Welsh WW2 fatalities.

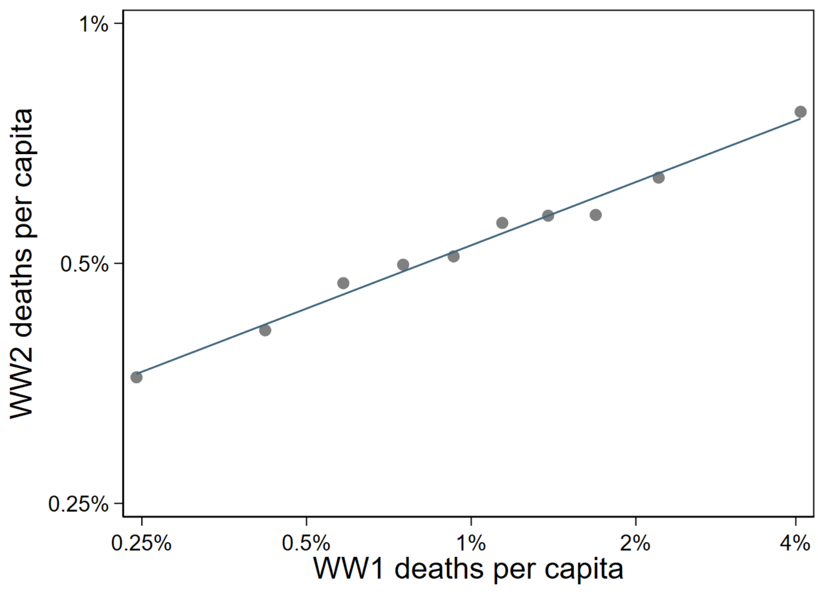
[17]Examples of honours that appear in the data are the Victoria Cross (the highest honour awarded to fighting servicemen), the George Cross (its equivalent for non-combat acts), Distinguished Service Order, the Military Cross, Distinguished Flying Cross (for the Royal Air Force), and being “mentioned in despatches”.

4. The Legacy of WWI Deaths on British Communities

Our empirical analysis is concerned with understanding the effects of soldier deaths in WWI. We start at the community level by studying how WWI mortality affects mortality in WW2 and the accumulation of local civic capital in the inter-war period. Then, we turn to individual-level data to investigate how exposure to WWI deaths, both at the community level and household level, translates into changes in soldiers' behaviour in WW2. We use parishes as our community-level unit of analysis throughout, for two reasons. First, parishes are a well-defined geography for which we can obtain accurate measures of demographic and economic conditions, as well as proxies for civic capital (see Section 3). Second, due to their administrative functions in this period (e.g., welfare administration through the Poor Law) and their small size, parishes arguably represent a good approximation to tightly connected functional local communities that share the same public services, places of worship, and entertainment.

The main result of our empirical analysis is illustrated graphically in Figure 5. This binned scatter plot depicts the cross-sectional relationship between the percentage of deaths per capita in both World Wars at the parish level. The positive relationship indicates communities which lost many of their inhabitants to the fighting in WWI also suffered more deaths in WW2. This correlation is strong, as WWI deaths explain between 5 and 10 percent of the total variance in WW2 deaths.

FIGURE 5
DEATH RATES IN WWI AND WW2



Notes: Binned scatter plot (log scale) of the death rate in WWI, defined as the number of service personnel killed in the war divided by 1911 population at the parish level, and the death rate in WW2, defined as WW2 deaths over 1931 population (last available figure).

However suggestive, the correlation shown in Figure 5 may not reflect a causal relationship. A number of different community-level confounders can simultaneously affect both variables via, e.g., their effect on mobilisation, the demographic composition of the mobilised servicemen, or persistent economic conditions. In the next section, we discuss how we can exploit additional information on these communities, together with data on the organisational structure of the British Army, to devise a empirical strategy that allows us to identify causal effects. We then use this strategy to investigate the consequences of WWI deaths both on deaths during WW2 and on community-level civic capital formation in the inter-war period.

4.1. Empirical Strategy

To study the community-level effect of WWI servicemen deaths on WW2 deaths we begin by estimating the following equation:

$$Log(\mathrm{d}_i^{WW2}) = \gamma_0 + \beta Log(\mathrm{d}_i^{WWI}) + \gamma' X_i + \mathbb{FE} + e_i, \tag{1}$$

where d_i^{WW2} is the number of servicemen from parish i who died in WW2, d_i^{WWI} is the number of servicemen from parish i who died in WWI, X_i is a vector of controls, and $\mathbb{FE}$ refers to different sets of fixed effects as described below.[18] The parameter of interest is β, which captures the (conditional) elasticity of deaths in WW2 to deaths in WWI. We estimate the model by OLS and then move on to an instrumental variable (IV) strategy, based on instrumenting WWI deaths with deaths predicted using variation in the riskiness of different battalions.

The vector of controls X includes (log) population of the parish in 1911 in all specifications. In this way we ensure that the identification of β does not come from cross-sectional differences in parish size. In most specifications, we also include variables related to mobilisation in WWI or its determinants.[19] Finally, we consider an expanded set of controls that includes proxies for local economic conditions.[20]

In order to account for persistence in the identity of the regiments to which local populations are mobilised we occasionally include two different sets of fixed effects. First, we control for the historic county of each parish. The boundaries of the 52 historic counties in England and Wales often coincide with the boundaries of the recruitment areas (see Figure 1). Therefore, accounting for between-county variation should absorb a large part of the differences in the determinants of mobilisation and mortality across the regiments into which men served. Second, we control directly for dummies corresponding to the regiments to which soldiers were mobilised from each parish. That is, we include a dummy for each

[18]Throughout this section we consider models in logarithms for reasons that will be clear shortly. We provide results for models in death rates – defined as the number of deaths over total population – in Section 7.

[19]These include the total number of men mobilised in WWI, obtained from aggregating data from FamilySearch. From the 1911 census, we also obtain the share of men of military age, the share employed in military/defence, the male ratio, the share of married men, and the share of workers in what would become reserved occupations during WWI.

[20]These are the share of workers in white collar occupations from the 1911 census, the average rooms per person for residents in the parish, the local unemployment rate, the share of households with no servant, the share with 1 servant, and log population density as a proxy for urbanisation.

one of the WWI British Army regiments, that will take value 1 if the parish had any men mobilised into the regiment in question.[21]

Causal interpretation of the resulting OLS estimates requires assuming that, controlling for our set of controls and fixed effects, the number of deaths in WWI is exogenous in equation 1. A similar assumption is commonly made in a variety of recent papers that use soldier deaths as a source of exogenous variation – see, e.g,. Abramitzky, Delavande and Vasconcelos (2011), Brainerd (2017), Boehnke and Gay (2020), Acemoglu et al. (2022).[22] The unpredictable nature of warfare – i.e., the "fortunes of war" – justifies the validity of this assumption in some contexts.

However, it is reasonable to worry about the presence of unobservable drivers of combat motivation that influence behaviour in both Wars. To tackle this identification problem, we instrument actual WWI deaths in each parish with a measure of predicted deaths based on the assignment of servicemen to different battalions.

The construction of this instrument relies on information on WWI fatalities to estimate the death rate in each battalion j, denoted $\hat{\delta}_j$. We also compute α_{ij} – the fraction of soldiers from a parish i mobilised in each battalion j – and the mobilisation rate from each parish, m_i. These three components are then used to calculate a parish-level prediction of the expected number of WWI deaths that can be used to instrument for the actual number of deaths.

Formally, we instrument $Log(\mathrm{d}_i^{WWI})$ with

$$z_i = Log\left(m_i \sum_{j=1}^{J} \alpha_{ij}\hat{\delta}_j\right),$$

where $\hat{\delta}_j = \frac{d_j - d_{ij}}{m_j - m_{ij}}$ is battalion j's leave-out-mean death rate. The choice of this particular form for the instrument is motivated by an analytic decomposition of the number of WWI deaths (shown in Appendix B) that shows that the instrument is unaffected by parish-level idiosyncratic determinants of war deaths, such as persistent differences in values or attitudes towards risk.

Yet, through its reliance on α_{ij}, z_i may be affected by endogenous selection of soldiers to different fighting units. This would happen if, for instance, men from a parish are systematically sorted into more dangerous units in both wars. As argued in Section 2, selection of men into fighting units may well have taken place at the regiment level, but assignment to battalions within a regiment should have been non-systematic. This fact provides us with two different strategies to deal with potential selection issues. First, we include regiment mobilisation fixed effects to account for the regiments in which men from a parish are mobilised in. Second, we construct a variable z_i^r which mimics z_i but only uses regiment-level

[21]We cluster standard errors at the historic county level throughout. Alternatives including clustering at the district level – there are 1828 of them – yield very similar results.

[22]Previous work has also treated war destruction in the form of bombings as plausibly exogenous (see e.g., Davis and Weinstein 2002, Dericks and Koster 2021).

variation in death rates and unit composition. This variable is then included as a control in our IV specifications, so that our instrument only relies on the variation in deaths at the battalion level that remains after controlling for regiment-level mortality. Identification of the causal effect of interest hence relies on assuming that, once conditioning for selection into regiments, assignment to different battalions is unrelated to other parish-level determinants of WW2 mortality.

We provide two sets of results on the validity of our proposed instrument. First-stage estimates of the effect of z_i on $Log(\mathrm{d}_i^{WWI})$ under different sets of controls are reported in Appendix Table D.1. Predicted deaths obtained from battalion-level mortality are strongly and positively correlated with actual deaths. Formal tests of the relevance condition indicate that the instrument is strong, with F-statistics above 20 in all specifications.

In Figure 6, we report a series of balancing checks obtained by regressing different parish characteristics on the instrument z. All specifications include, alongside the instrument, the logarithms of 1911 population and WWI mobilisation, as well as historic county and regiment mobilisation fixed effects. The first estimate from the top corresponds to the (standardised) first-stage coefficient which, as expected, is positive and significant. All other coefficients are close to 0, and statistically insignificant at conventional levels, indicating that the instrument is not correlated with observable characteristics that could affect deaths in WW2. The validity of our proposed IV strategy then relies on this lack of correlation holding also for unobservable factors that could affect death rates in both wars.

4.2. Results: Legacy Effect of WWI Deaths on Deaths in WW2

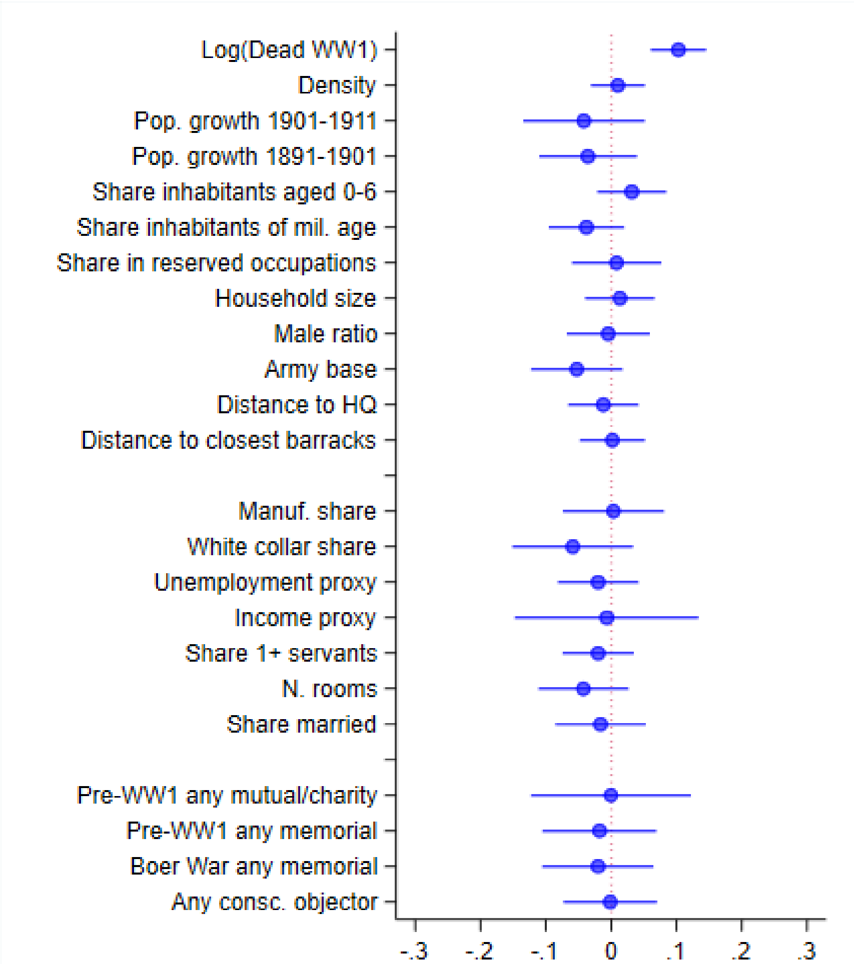
Ordinary Least Squares estimates of the effect of WWI deaths on WW2 mortality – coefficient β in equation 1 – are reported in Table 2. Each column corresponds to a different set of controls and fixed effects as indicated in the table foot. A 1% increase in the deaths in WWI is associated to an increase in the deaths in WW2 of about 0.16-0.22%. This effect is sizeable, indicating there is a strong impact of deaths taking place in a community during WWI on WW2 combat outcomes. Adding socio-economic controls (col. 3), county fixed effects (col. 4) and regiment mobilisation fixed effects (col. 5) has modest impact on point estimates.

In Table 3, we report IV estimates obtained using predicted deaths as an instrument for observed deaths in WWI. The resulting elasticities vary between 0.41 and 0.49 depending on the specification. In columns 3 and 4 we control, respectively, for regiment mobilisation fixed effects and for z^r – predicted deaths based on *regiment*-level death rates. The fact that point estimates are largely unaffected by the inclusion of these controls suggests that endogenous selection of soldiers into regiments is of little consequence for our findings.

Overall, instrumental variable estimates are in line with OLS results but larger in magnitude. Part of this difference may be attributable to the presence of measurement error in our WWI deaths measure, due for example to misreporting of the place of origin in military records and possible geo-coding errors. Additionally, IV estimates are local in that they identify the treatment effect only for the group of compliers (Imbens and Angrist, 1994). These

Figure 6

Instrumental Variable Balancing Checks



Notes: Reduced-form OLS estimates of a regression of instrument z_i on different variables, together with 95% confidence intervals. All outcomes have been standardised to have mean zero and unit standard deviation. The first coefficient shows the first-stage, that is the regression coefficient of the effect of the instrument on the (standardised) instrumented variable, $Log(\mathbf{d}_i^{WWI})$. All specifications control for logged 1911 population, WWI mobilisation, regiment mobilisation and county fixed effects. Standard errors clustered at the historic county level.

may differ from the average parish in the sample, so that heterogeneity in effects across parishes could also explain part of the discrepancy between both types of estimates. Taken together, however, both OLS and IV results provide evidence that a large legacy effect of WWI deaths on combat outcomes in WW2 exists.

We interpret these findings as evidence that soldiers from parishes that had experienced more deaths during WWI had higher combat motivation during WW2. A large set of recent work in economics has used death as a proxy for combat motivation (see e.g., Ager et al. 2022, Beatton, Skali and Torgler 2019, Rozenas, Talibova and Zhukov 2022). The rationale is that deaths in combat are shaped, at least in part, by a willingness to assume risks by the soldier. In Section 5, we will use individual-level data to provide additional evidence linking the legacy of WWI deaths with servicemen motivation by studying their impact on honours

TABLE 2

EFFECT OF WWI DEATHS ON WW2 DEATHS – OLS ESTIMATES

	(1) $Log(d^{WW2})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$	(5) $Log(d^{WW2})$
$Log(d^{WW1})$	0.223***	0.185***	0.184***	0.182***	0.163***
	(0.015)	(0.018)	(0.018)	(0.017)	(0.018)
Obs.	6305	6305	6305	6305	6305
R2	0.68	0.68	0.69	0.70	0.71
Mobil. controls	N	Y	Y	Y	Y
Econ. controls	N	N	Y	Y	Y
County FE	N	N	N	Y	Y
Regiment mob. FE	N	N	N	N	Y

Notes: OLS estimation results of the effect of WWI deaths on WW2 deaths at the parish level. All specifications control for the logarithm of 1911 parish population. Different additional sets of controls and fixed effects are used in each column (see text for details). Standard errors clustered at the historic county level in parentheses.

TABLE 3

IV RESULTS – EFFECT OF WWI DEATHS ON WW2 DEATHS

	(1) $Log(d^{WW2})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$
$Log(d^{WW1})$	0.415***	0.492***	0.495**	0.447**
	(0.131)	(0.142)	(0.229)	(0.190)
First stage F-stat	44.7	56.6	21.1	31.2
Obs.	5434	5434	5434	5346
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	N	Y	Y	Y
Regiment mob. FE	N	N	Y	N
Regiment instr.	N	N	N	Y

Notes: IV estimation results of the effect of WWI deaths on WW2 deaths at the parish level. All specifications control for the logarithm of 1911 parish population. Different sets of controls and fixed effects are used in each column. In column 3 we include regiment mobilisation fixed effects whereas in column 4 we control for our measure of predicted deaths constructed using regiment-level mortality, z^r. Standard errors clustered at the historic county level in parentheses.

received for bravery in combat.

4.3. Results: Legacy Effect of WWI Deaths on Commemoration and Civic Capital

We hypothesise that the causal link between localised war deaths in WWI and WW2 reflects social and cultural dynamics. In particular, we propose that the actions of community members in WWI and the way in which those actions are remembered foster the creation of civic capital, those shared values that encourage cooperation and socially valuable behaviour. Civic capital matters for combat behaviour of subsequent generations because it prompts individuals to assume individual costs for collective gain, overcoming the collective action problems that are so pervasive in war.[23] In this section, we provide estimates showing that WWI deaths affected a community's civic capital by studying the response of measurable aspects of remembrance and local measures of civic capital in the inter-war period.

We look at three different outcomes. We begin by studying whether the number of WWI deaths affected the presence of memorials commemorating WWI soldiers in a community. We restrict our attention to listed memorials, i.e., buildings or structures that must be legally preserved because of their historical or architectural significance. The funding to create these memorials was often raised locally, so listed memorials will be present in communities that spent substantial time and effort on their design and construction.

Next, we use information on charities and mutual societies, or mutuals, to create indirect proxies of local civic capital. Mutuals are co-operative organisations that are owned and democratically controlled by their members and usually aim to benefit those members or the local community. Charities are typically institutions with philanthropic aims involving members of the community as providers of funding or management services. Finally, we create a third outcome using information on all branches of the British Legion. The Legion was the largest veteran's association created after WWI. To this day, it still leads the annual poppy appeal taking place in Britain during the fall and several other remembrance initiatives (see Section 2).

To study the impact of WWI deaths on the presence of listed memorials, charities, and Legion branches we use a similar strategy to that employed in the previous section. We estimate a modified version of equation 1, in which the dependent variable is replaced with a dummy taking value 1 if a parish contains one of these attributes. We alternatively estimate a Poisson model using the count of memorials, parishes or branches as the outcome. Controls and fixed effects included in these specifications coincide with those discussed in Section 4.1.

Estimates for these exercises are reported in Table 4. Across specifications, we find positive and significant effects of WWI deaths on our proxies for civic capital formation. Column 1 coefficients in Panel A indicate that doubling the number of deaths will, on average, increase the probability of having a listed memorial in the parish by 3 percentage points, roughly 9% of the associated baseline probability. The effects in column 2 indicate that doubling deaths increases the probability of having a British Legion branch by 1.7 percentage points. Finally, we also find statistically significant effects of similar magnitudes on the presence of charities and mutuals in the parish. Poisson regression results for the corresponding count variables

[23] Civic capital can accumulate through cultural transmission of civic values and beliefs to children, formal or informal education, and through socialisation and social pressure (Guiso, Sapienza and Zingales, 2011). In our setting all three mechanisms may be at play: families hailing from parishes that suffer more losses are more likely to be bereaved or otherwise exposed to local sacrifice thereby socialising them to selfless behaviour; children from these same areas may in turn be more exposed and receptive to the transmission of civic values from a range of possible sources including surviving and remembered parents and family members, community participants and leaders, and local educators.

are very similar and reported in Panel B.

Taken together, our findings display a large and positive impact of WWI mortality on all our measures of civic capital.[24] This is evidence that WWI deaths indeed caused a strong reaction at the community level through commemoration and the accumulation of civic capital. Growing up in these communities may have then been an important factor driving soldiers' behaviour in the battlefield during WW2, increasing the willingness of men from these communities to assume individual risks for collective goals.

TABLE 4
EFFECT OF WWI DEATHS ON MEMORIALS AND CIVIC CAPITAL MEASURES

	(1) Memorials	(2) Legions	(3) Mutuals/Char.
A. LPM (dummy outcome)			
$Log(d^{WW1})$	0.030***	0.017***	0.032***
	(0.007)	(0.005)	(0.008)
Mean of dep.var.	0.39	0.16	0.92
Obs.	8266	8266	8266
B. Poisson (count outcome)			
$Log(d^{WW1})$	0.028***	0.016*	0.157***
	(0.009)	(0.009)	(0.024)
Mean of dep.var.	0.39	0.16	0.92
Obs.	8266	8113	8266
Mobil. controls	Y	Y	Y
Econ. controls	Y	Y	Y
County FE	Y	Y	Y
Regiment mob. FE	Y	Y	Y

Notes: Effect of WWI deaths on the listed memorials built (column 1), British Legion branches (column 2) and charities and mutuals established (column 3). Panel A presents estimates for linear probability models where the outcomes are dummies taking value 1 if the corresponding institution is present in the parish. Panel B shows average marginal effects from a Poisson model estimated using the corresponding count variables instead. Full controls and fixed effects are included in all specifications. Standard errors clustered at the historic county level in parentheses.

4.4. Results: The Effect of Civic Capital on WW2 Deaths

In the previous sections we showed that communities with high WWI mortality are more likely to commemorate deaths, accumulate more civic capital and, ultimately, have high mortality in WW2. These results indicate that changes in shared values might indeed be a channel through which WWI mortality affects the behaviour of soldiers in WW2.

However suggestive, the aforementioned results are not enough to establish the existence of such a link. Formally, denoting WWI deaths as a "treatment" variable T, WW2 deaths as the outcome Y, and the instrument as Z, we can think of civic capital as a "mediator" M.

[24]Instrumental variable estimates of these effects also yield positive and significant effects in the linear probability model.

WWI deaths T can affect WW2 deaths both directly ($T \rightarrow Y$) and indirectly through civic capital ($T \rightarrow M \rightarrow Y$), which is for this reason called a mediator.

In this section we seek to understand whether civic capital can explain part of the total effect of WWI deaths on WW2 deaths. To identify separately the direct and indirect effect, we follow Dippel et al. (2019) and Dippel, Ferrara and Heblich (2020), who show that identification of both effects with a single instrument is possible under an additional assumption. This assumption amounts to requiring that T can be endogenous in a regression of Y on T, but this endogeneity cannot arise from unobserved factors that affect both T and Y. It must come only from factors that affect both T and M.

In our setting, this assumption allows for the existence of parish-level unobservables that determine both WWI deaths and civic capital. One such instance arises, for example, if soldiers from poorer communities are in worse health conditions and die more often and, at the same time, these communities have higher civic capital. However, conditional on civic capital (and its unobserved determinants), WWI deaths are required to be exogenous in a regression of WW2 deaths on both WWI deaths and civic capital.

Table 5 reports IV results obtained by applying this method.[25] Estimates suggest that the total effect of WWI deaths on WW2 deaths (also estimated above with our baseline IV model) is driven in part – roughly one-third – by a direct effect of WWI mortality, and in part by an indirect effect of these deaths that goes through the accumulation of civic capital. Although estimates of both effects are, in some specifications, imprecise, overall the results strongly indicate that a significant part of the effect of WWI mortality is due to civic capital, supporting our hypothesis.[26]

4.5. Results: Effects of WWI Deaths on Electoral Turnout

An alternative measure of civic capital widely used in the empirical literature is electoral turnout (Putnam, 2001; Guiso, Sapienza and Zingales, 2011). To test for the effect of WWI deaths on this outcome, we assembled data for turnout in national elections in the period 1911-1935 at the electoral constituency level. With this data at hand we estimate:

$$\text{Turnout}_c^t = \gamma_0 + \beta Log(\text{d}_c^{WWI}) + \gamma_1 \text{Turnout}_c^{1911} + \gamma_2' X_c + \gamma_3' \text{MSh}_c + \varepsilon_c \qquad (2)$$

where Turnout_c^t is the turnout rate recorded in constituency c in the general election taking place in year t, $Log(\text{d}_c^{WWI})$ is the logarithm of the number of WWI deaths of servicemen from c. This variable, as well as the control variables included in X_c, is obtained from aggregating parish-level data to constituencies. MSh_c is a vector of shares of mobilised men in

[25] Implementation is carried out in in Stata using the command *ivmediate*. See Dippel, Ferrara and Heblich (2020).

[26] It is legitimate to ask what is the direct effect capturing in this setting. One possibility is that civic capital is imprecisely measured by our proxy variable, and the direct effect captures the part of the correlation between WWI and WW2 deaths that we are unable to explain using this proxy.

TABLE 5
IV RESULTS – EFFECTS OF WWI DEATHS ON WW2 DEATHS WITH CIVIC CAPITAL AS MEDIATOR

	(1) $Log(d^{WW2})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$
total effect	0.462***	0.528***	0.506**	0.461***
	(0.150)	(0.118)	(0.212)	(0.178)
direct effect	0.136***	0.119***	0.103***	0.119***
	(0.034)	(0.019)	(0.037)	(0.024)
indirect effect	0.332	0.414***	0.406	0.342*
	(0.227)	(0.141)	(0.292)	(0.183)
Obs.	5433	5433	5433	5345
F-stat $Log(d^{WW1})$ on Z	43.53	53.65	21.96	30.83
F-stat M on $Z\|Log(d^{WW1})$	24.85	22.15	4.43	15.94
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	N	Y	Y	Y
Regiment mob. FE	N	N	Y	N
Regiment instr.	N	N	N	Y

Notes: Mediation IV results of the effect of parish-level WWI deaths on WW2 deaths using an index of civic capital as mediator M. This index is constructed as the first principal component of the number of listed WWI memorials, of branches of the British Legion, and of charities and mutuals registered in the parish in the inter-war period. Controls and fixed effects are included as specified in each column. Standard errors clustered at the historic county level in parentheses.

each regiment.[27] Finally, Turnout_c^{1911} is the turnout in constituency c in the 1911 general election.

Estimates of β for different general elections are reported in Table 6. Panel A corresponds to estimates obtained without controlling for 1911 turnout and Panel B corresponds to estimates obtained after controlling for 1911 turnout. Results reported in column 1 of Panel A show that WWI deaths are uncorrelated with election turnout in 1911. Estimates in other columns indicate a positive effect of WWI deaths on turnout in the inter-war period. We can observe these positive effects are robust to controlling for election turnout in 1911 in panel B. These estimates again provide evidence that deaths during the Great War resulted in an increase in civic capital in affected communities.

5. Individual-Level Analyses: War Honours & Inter-generational Transmission

5.1. WWI Parish Deaths and WW2 Honours

In the previous section, we showed that parishes hit harder by the WWI mortality shock are more active commemorating the dead and have higher levels of civic capital. To further

[27]Unlike the parish-level analysis, here we use shares rather than dummies for each regiment because dummies would be 1 for most constituencies.

TABLE 6
EFFECT ON ELECTION TURNOUT

	(1) 1911	(2) 1922	(3) 1929	(4) 1935
A. Baseline				
$Log(d^{WW1})$	-0.002	0.024	0.046**	0.039**
	(0.031)	(0.022)	(0.022)	(0.018)
Mean of dep.var.	0.86	0.74	0.78	0.73
Obs.	496	460	496	471
B. Conditional on 1911 turnout				
$Log(d^{WW1})$		0.029	0.047***	0.041***
		(0.023)	(0.015)	(0.014)
Mean of dep.var.		0.74	0.78	0.73
Obs.		453	488	464
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	Y	Y	Y	Y
Regiment mob. shares	Y	Y	Y	Y

Notes: OLS estimation results of the effect of WWI deaths on national election turnout at the constituency level. Full controls and fixed effects are included in all specifications. Panel B additionally conditions on 1911 turnout. Standard errors clustered at the historic county level in parentheses.

investigate how exposure to WWI mortality leads to higher mortality in the subsequent conflict, we turn to the soldier-level dataset, with comprehensive information on all servicemen who were killed in WW2, including whether they were awarded a medal for bravery.

An ideal thought experiment would be to have WW2 soldiers that are comparable with respect to rank, socio-economic background, experience, who serve in the same unit, but come from communities that were randomly exposed to differently WWI mortality shocks. Any difference in the probability of dying in battle or in their combat behaviour could then be attributed to the impact of exposure to local mortality and, potentially, to its commemoration. While implementing this experiment in practice is infeasible, it serves as a useful reference to guide our analysis in the following.

The main limitation of this dataset is that, despite its richness in terms of soldier characteristics, it only contains information on service personnel who died during the war, hence it is unsuited to study the probability of dying in WW2. However, while all soldiers in the dataset eventually died, not all of them did so in the same circumstances. Specifically, we can use information on the honours awarded during service to construct a measure of effort and bravery in battle. To implement this idea in practice, we regress an indicator for having been awarded an honour during service or posthumously on the WWI mortality shock, a set of controls and fixed effects as follows:

$$\text{Pr(Honour)}_{is} = \alpha + \beta Log(\mathbf{d}_i^{WWI}) + \gamma' X_i + \mathbb{FE} + e_{is}, \tag{3}$$

where s indexes soldiers and i parishes. X_{is} is a vector that includes parish-level mobilisation and socio-economic controls as before. In addition, we also incrementally include fixed effects for age in 1939 (with catch-all indicators for individuals under 10 and above 65), rank, and regiment. If soldiers coming from localities that were disproportionately affected by WWI fight more bravely, we should observe a positive effect of deaths in WWI on the probability of being awarded an honour.

TABLE 7
OLS ESTIMATES – EFFECT OF WWI DEATHS ON WW2 HONOURS

	(1)	(2)	(3)	(4)
A. Outcome: Pr(honours)				
$Log(d^{WW1})$	0.004***	0.004***	0.003***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Mean of dep.var.	0.029	0.029	0.030	0.030
Obs.	218912	218912	204786	204786
B. Outcome: N. honours				
$Log(d^{WW1})$	0.004***	0.005***	0.004***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Mean of dep.var.	0.032	0.032	0.032	0.032
Obs.	218912	218912	204786	204786
Mobil. controls	Y	Y	Y	Y
Econ. controls	N	Y	Y	Y
Age FE	N	N	Y	Y
Rank FE	N	N	N	Y
Regiment FE	N	N	Y	Y

Notes: Soldier-level OLS estimation results of the effect of WWI deaths on the probability of receiving one or more WW2 honours (Panel A) or the number of honours received (Panel B). Different sets of controls are used in each column (see text for details). Age fixed effects are dummies for age in 1939 (with catch-all dummies for individuals below 10 and above 65). Rank fixed effects are dummies for each rank. Regiment fixed effects are dummies for serving in a given regiment. Standard errors clustered at the parish level in parentheses.

OLS results in Table 7 suggest that this is indeed the case.[28] WWI deaths are positively related to the probability of receiving an honour with estimates significant at conventional levels in all specifications. These effects are also not negligible: a soldier coming from a parish with 1% more deaths in WWI has a 0.2-0.4% higher probability of being awarded a medal, a 6-13% increase over the baseline probability in the estimation sample (3%). Estimation results using the number of honours received as outcomes are very similar and reported in panel B.[29]

[28]Estimation results from models akin to this linear probability model, such as Probit or Logit, yield very similar results, hence are not reported for brevity.

[29]Because the dependent variable in this case is a count variable which often takes value zero, a Poisson regression model might be preferable. Results from such a model are very similar and reported in Appendix's

Importantly, results hold even when controlling for age, rank, and regiment fixed effects. In column 4, the most demanding specification, we are effectively comparing servicemen born in the same year, who served in the same regiment with the same rank, but come from parishes with different WWI death rates. Because soldiers had some discretion over which regiment to enlist in, it is important to control for fixed effects at this level to purge all factors determining the regiment each soldier is assigned to. This is particularly important if we believe that, for instance, recruits from poorer localities are disproportionately more likely to be sent to more dangerous battlefields, while well-off recruits are reserved for non-combat units or deployed far from the front.[30] Reassuringly, using only within-regiment variation does not alter the main conclusion of this analysis, with the coefficient being slightly lower in magnitude but still precisely estimated.

In sum, results in this section suggest that WW2 soldiers coming from areas that suffered more losses in the Great War may take greater risks and fight more bravely, as reflected in the higher propensity to be awarded a medal for their courage.

5.2. Household-Level Effects and Intergenerational Transmission of Values

So far, we have focused on the effects on combat motivation of an aggregate mortality shock, and how its commemoration can affect the civic capital of the whole community. Of course, however, the experience of war varies across individual households. The loss of a father, husband, brother, friend, could have had profound emotional and economic consequences on those who survived at home. Consequently, war can affect individuals belonging to the same community differently, depending on who they lost, which may in turn shape their sense of belonging to their community and country, and their willingness to fight for them.

The set of values and beliefs that a person carries are affected in part by those held by the community she belongs to ("oblique" or "horizontal" transmission), and those passed along by her close family ("vertical transmission", using the terminology by Bisin and Verdier 2001). In a related paper, Campante and Yanagizawa-Drott (2016) show that war service by parents in the US increases the propensity to serve by their offspring throughout the 20^{th} century, and present evidence suggesting father-son and community transmission of war service may be substitutes.

One may then ask whether these insights on volunteering carry over to our setting and if they translate into changes in actual behaviour in battle. Our setting and data are suitable to try to shed some light on this hypothesis. To circumvent the fact that the UK authorities do not release information on WW2 service personnel, we resort to using information from matching the 1911 Census to WWI and WW2 military records. We construct a dataset starting from the 3.4 million male children that were aged 0 to 8 in the 1911 Census. We can

Table D.2.

[30] Notice that regiments did not necessarily constitute independent fighting units. For example, machine gun regiments were split over different divisions according to need. However, conditioning on the regiment mitigates concerns about selection into riskier and more dangerous units being related to parish-level characteristics.

then determine who, among those children, died in the war by matching them to our dataset of WW2 deaths. Finally, we use the 1911 Census information to identify their fathers and other household members and match them to WWI deaths. All matches are performed using the automated matching algorithm developed by Abramitzky, Boustan and Eriksson (2012) (henceforth ABE).[31]

Using this approach, we link 28,500 of the children to a deceased WW2 soldier. We also identify that some 20,000 of the boys in the 1911 dataset lost their father and another 94,000 lost a different co-habiting household member in WWI. We then use this dataset to run a series of individual-level regressions of the following form:

$$Pr(D_{ic}^{WW2}) \times 100 = \alpha + \lambda_1 D_c^{Father} + \lambda_2 D_c^{Other} + \beta Log(\mathrm{d}_i^{WWI}) + \gamma' X_{ic} + \mathbb{FE} + e_{ic}$$

where c indexes children aged 0-8 in 1911 and i parishes. $Pr(D_{ic}^{WW2})$ is an indicator for whether the child died in WW2, which we multiply by 100 for presentational reasons. D_c^{Father} and D_c^{Other} are indicators for whether the father or another household member co-habiting with the child in 1911 died in WWI. The variable d_i^{WWI} and the fixed effects are the same as above, while X_{ic} includes the same parish-level mobilisation and socio-economic controls as before, plus child-level characteristics (categorical variables for age and father's occupation in 1911). Standard errors are clustered at the historic county level.

Findings are tabulated in Table 8. We first test in column 1 whether the number of WWI dead in the parish of residence affects the probability of dying in WW2 when conditioning on county fixed effects. Consistent with previous results, we obtain a positive coefficient that suggests a 10% increase in the number of WWI dead increases the probability of dying in WW2 by around 0.02%.[32] We next evaluate in column 2 if the loss of a co-habiting household member in WWI leads to a greater likelihood of a child dying in WW2, finding a large and highly significant impact of the loss of the father but no significant impact of losing another household member. The magnitude of the father effect is large and amounts to an increment in the probability of dying in WW2 of 30% over the baseline. The coefficient on the parish-level WWI deaths are essentially unchanged by adding these two indicators, suggesting that community-wide and household-level transmission mechanisms operate side-by-side in this context. In the final two columns we add district-level fixed effects in an attempt to absorb more local variation, obtaining similar and slightly more precise estimates for the community-level coefficient.

These results suggest that vertical and horizontal transmission of values could be cultural complements, rather than substitutes, as instead suggested by Bisin and Verdier (2001)

[31] We use the ABE matching code from `https://ranabr.people.stanford.edu/historical-record-linking`, last accessed 21 February 2023. Our matching variables include place of birth or residence, forename and surname, age, and father's initial. See Appendix C for details.

[32] This coefficient is much smaller than our parish-level estimates because here we include *all* male children aged 0-8 in 1911 in estimation. Although a large fraction of them did not fight in WW2, they will still appear as survivors in our estimation, likely attenuating our estimates.

Table 8
OLS results – Effects of WWI Deaths on WW2 Deaths of 1911 Census Children

	(1)	(2)	(3)	(4)
$Log(d^{WW1})$	0.018*	0.017*	0.032***	0.031***
	(0.010)	(0.010)	(0.011)	(0.011)
Father died		0.244***		0.238***
		(0.069)		(0.070)
Oth.HH died		0.005		0.022
		(0.037)		(0.032)
Mean of dep.var.	0.79	0.79	0.79	0.79
Obs.	3029875	3029875	3029875	3029875
R2	0.003	0.003	0.004	0.004
Full Parish controls	Y	Y	Y	Y
Individual controls	Y	Y	Y	Y
County FE	Y	Y	N	N
District FE	N	N	Y	Y

Notes: OLS estimation results of the effect of parish-level WWI deaths and household deaths on the probability of dying in WW2 for male children aged 0 to 8 in 1911. Individual-level regressions. All regressions include economic and mobilisation controls at the parish level. Individual controls are fixed effects for age in 1911 and father's occupation. Standard errors clustered at the county level in parentheses.

and Campante and Yanagizawa-Drott (2016). In their framework, substitutability derives from the observation that parents living in an environment where their values are also shared strongly by the community do not need to invest in direct transmission by trying to inculcate their children with their values.

This mechanism is entirely reasonable and our results do not stand necessarily in contrast with it. To start, the way cultural traits are transmitted in our setting is necessarily different, because some of the most important individuals that are meant to be transmitting those values – fathers and members of the community – lose their lives in the war. As such, the values that are passed over are likely to be different from those typically associated with serving, such as helping individuals to mature or work as a team (Campante and Yanagizawa-Drott, 2016). Rather, it is plausible that losing someone close evokes feelings of sorrow, remembrance and eventually celebration among members of the community. These cultural traits may then lay the foundation for building a communal stock of civic capital. In this respect, losing one's father could well have a similar – though perhaps stronger – effect as losing other members of the community, making horizontal and vertical transmission complements rather than substitutes.

6. Alternative Mechanisms

Our main hypothesis is that local deaths during WWI motivated men to exert more combat effort in WW2 because they fostered the accumulation of civic capital in grieving communities during the inter-war period. However, there are other possible mechanisms that may also, at least in part, explain our findings for WW2 outcomes. We discuss three of them in the following.

6.1. WW2 Mobilisation

Legacy effects of WWI deaths on WW2 outcomes could be explained via a response through increased mobilisation: if WWI deaths generate more mobilisation during WW2, then this would mechanically lead to more deaths in that conflict. The plausibility of this channel is somewhat constrained by the fact that mobilisation in WW2 was obtained via mass conscription. Any effects on mobilisation would have to operate via differences in the proportion of ineligible men across locations, or in attempts at draft evasion. However, because the effect of mobilisation on deaths is expected to be large and mechanical – more men go to war, more of them die – it is possible that this limited variation in mobilisation is nonetheless important.

To evaluate whether this is the case, we use data on the number of mobilised servicemen aggregated at the level of 1945 electoral constituencies. These figures are obtained from electoral data and consist of the number of servicemen registered to vote in the general election that took place in December 1945.[33] We thus estimate the following regression relating mobilisation in 1945 to WWI deaths:

$$Log(m_c^{1945}) = \alpha + \mu Log(\mathrm{d}_c^{WWI}) + \gamma_1' X_c + \gamma_2 Log(\text{electors}_c^{1945}) + e_c, \tag{4}$$

where c indexes constituencies. Controls in X_c refer to the same set of controls in our parish-level analysis, now aggregated at the constituency level. Regiment-specific mobilisation shares are also included in some specifications. Variable $Log(\text{electors}_c^{1945})$ is the log number of eligible voters in constituency c. Columns 1 through 4 of Table 9 reports OLS estimates of μ for different sets of controls. We find insignificant coefficients across columns, with all point estimates indicating very small and sometimes negative elasticities. For comparison purposes, we report the effect of deaths across wars at this level of aggregation in column 5. The associated elasticity is at least 10 times larger in absolute value than all the point estimates for the mobilisation outcome. This leads us to conclude there was no discernible effect of WWI deaths on WW2 mobilisation.

6.2. Local Economic and Demographic Impacts

The toll of WWI deaths in a community could influence the combat behaviour in WW2 through its impact on local economic conditions, by changing incentives and constraints faced by potential recruits. For example, the locations most affected by war mortality may become relatively more impoverished, leading to worse employment prospects for individuals and

[33]The use of more aggregated data is made necessary by the fact that, as discussed earlier, individual military records for WW2 are still closed to the public at the time of writing.

TABLE 9

OLS RESULTS – EFFECT OF WWI DEATHS ON WW2 MOBILISATION

	(1) $Log(m^{1945})$	(2) $Log(m^{1945})$	(3) $Log(m^{1945})$	(4) $Log(m^{1945})$	(5) $Log(d^{WW2})$
$Log(d^{WW1})$	0.003	-0.006	-0.011	-0.034	0.384***
	(0.027)	(0.019)	(0.011)	(0.028)	(0.105)
Mean of dep.var.	8.43	8.43	8.43	8.43	6.26
Obs.	504	504	504	504	504
R2	0.80	0.88	0.94	0.97	0.83
Mobil. controls	N	Y	Y	Y	Y
Econ. controls	N	Y	Y	Y	Y
County FE	N	N	Y	Y	Y
Regiment mob. shares	N	N	N	Y	Y

Notes: OLS results, from equation 4, of the effect of WWI deaths on WW2 mobilisation at the constituency level (columns 1-4) and WW2 deaths, for comparison (column 5). Different sets of controls and fixed effects are used in each column (see text for details). Standard errors clustered at the historic county level in parentheses.

weaker incentives to invest in education. This could, in turn, lower the opportunity cost of taking risky actions later in life. Conversely, the labour supply shock of WWI could result in a tighter labour market and improved employment conditions which could also influence combat behaviour. Finally, demographic factors might also play a role, through the effect of WWI deaths shocks on available populations, local marriage markets and fertility decisions (see, for instance, Abramitzky, Delavande and Vasconcelos 2011; Brainerd 2017).

To test for the effects of the war on local economic and demographic conditions, we use district-level data to estimate the following specification:

$$y_d^t = \pi Log(\mathbf{d}_d^{WWI}) + \gamma' X_d + \mathbb{FE} + \varepsilon_d, \tag{5}$$

where y_d^t is an outcome measuring the economic or demographic conditions in district d, either in the early 1920s or in 1931.[34] The vector of controls X_d contains the same covariates as in our baseline parish-level specification (aggregated at the district-level), including WWI mobilisation and other variables measured in 1911. All specifications include county and regiment mobilisation fixed effects.

Columns 1 through 3 of Table D.3 (in the Appendix) show our findings for economic outcomes. Panel A presents results for outcomes recorded in the early 1920s while Panel B shows results for outcomes recorded in 1931. The first measure of local economic conditions is a proxy for the unemployment rate, calculated as the number of individuals not in employment or employed in unclassified occupations as a percentage of population of employment

[34]This analysis is conducted at the district level because economic variables are not currently available at the level of parishes. Individual-level data for the inter-war year censuses is still not publicly available at the time of writing. Early 1920s outcomes are measured in 1921 except for data on births which is only available for 1922.

age. Results in column 1 show negative and insignificant coefficients in both periods. Our second economic outcome of interest is the infant mortality rate. Estimates for this outcome are reported in column 2 and are again statistically insignificant in both panels. In column 3, the outcome is the percentage of births that are to unmarried parents. This is another proxy for local incomes and is a variable that has been shown to correlate with parental investment in many contexts (see e.g., Greenwood, Guner and Vandenbroucke 2017). Once again, we find a insignificant effects of WWI deaths on this outcome in the early 1920s and 1931.

Columns 4 and 5 look at demographic outcomes. In column 4 we estimate the effects on the population growth rate (in percentage points) relative to 1911. Results are small in magnitude and not significantly different to zero, probably because of population re-adjustment across districts taking place in the years after WWI. In column 5, we look at the share of population between 15 and 64, and again find no significant effects of WWI deaths.

One possible concern with these results is that they refer to specific points in time and these particular years may not be representative of the whole inter-war period. In addition, controlling for 1911 variables may be insufficient to deal with the potential endogeneity of deaths in equation 5. To address this point, we use two outcomes for which annual data is available throughout the pre-WWI and inter-war period, infant mortality and births outside of wedlock, in an event-study design to generate point estimates for each year. This allows us to control for district fixed effects and yields estimates of the slope between the logarithm of WWI deaths and the outcome for every year.[35] Resulting estimates are plotted in Appendix Figure D.5. In both cases, we find no evidence of an effect of the WWI shock on the outcomes in the pre-WWI or inter-war periods. In summary, although we are limited by imperfect data, we find little support for the idea that the WWI mortality shock significantly affects local economic or demographic conditions in a way that could explain our main findings.

6.3. *Other Mortality Shocks: The Case of the Spanish Flu Epidemic*

One possibility is that the observed effect on WW2 deaths is simply a result of a generic mortality shock, of which WWI deaths are simply an example. Other types of local mortality shocks may affect behaviour in future conflicts through channels such as civic capital accumulation or turnover in local population irrespective of their origin. Under this interpretation, our main results would not be a consequence of localised *war* deaths and their remembrance, but simply a direct effect of the deaths themselves. To test this hypothesis, we use data on an alternative mortality shock that took place across the country in the late

[35] Specifically, we estimate:

$$y_d^t = \sum_{\substack{k=1911 \\ k\neq 1913}}^{1938} \Big((\pi_k Log(\mathbf{d}_d^{WWI}) + \gamma_k Log(\mathbf{m}_d^{WWI})) \times \mathbb{1}\{k=t\} \Big) + \alpha_d + \delta_t + \varepsilon$$

where $Log(\mathbf{m}_d^{WWI})$ is the log of mobilisation in district d during WWI, α_d is district fixed effect and δ_t is a time effect. The object of interest is the sequence of estimates of π_ks.

1910s: the Spanish flu epidemic.

In Appendix Table D.4 we provide a series of estimates obtained using data on Spanish flu deaths at the district level.[36] In column 1, we show that WWI deaths were conditionally uncorrelated with the deaths from the Spanish flu. This is perhaps not surprising as the epidemic quickly spread through the United Kingdom in 1918, so that its incidence was unaffected by people returning (or not returning) from the war. Column 2 is included for comparison purposes and indicates that we still find an effect of WWI deaths on deaths in WW2 for the selected sample of districts. In columns 3 and 4, we show that the number of deaths from the 1918-19 epidemic had no effect on deaths during WW2. Finally, in column 4 we show that controlling for the number of flu deaths has no impact on the effect of WWI deaths.

Taken together, these results show that the mortality shock deriving from the flu epidemic had no impact on deaths during WW2. It also complements our results regarding the impact of deaths on economic conditions as flu deaths were concentrated in high poverty areas.

7. Robustness Checks

7.1. Alternative Definitions of the Instrument

In this section, we explore the robustness of our main results to alternative definitions of the instrument. In particular, we try to address concerns about its exogeneity with respect to parish-level factors that affect WWI mortality.

One possible issue with our instrument is that it is built using data on professional soldiers, volunteers, and conscripts. Differences in voluntary enlistment in the army could be related to systematic differences across locations, such as poor local economic conditions or lack of job prospects (see, e.g., Humphreys and Weinstein 2008). These factors could persist to WW2 and induce omitted variable bias in estimation.[37]

In an attempt to rule out this possibility, we first re-construct our instrument after excluding soldiers who served in one of the Pals battalions.[38] As discussed in Section 2, these battalions were formed with men who came from the same community or workplace and who volunteered to serve together. Excluding these units from the calculation of our instrument should mitigate concerns around the spatially concentrated deaths of volunteers associated to the battalions. Results using this alternative definition are reported in Table 10 and are very similar to the baseline estimates reported in Section 4.

[36] Data on flu deaths for 1918-1919 are obtained from Registrar-General (1920). Disaggregated data is only available for London boroughs, districts designated as County Boroughs (typically large towns and cities), and other districts with populations greater than 20,000, so the sample here is restricted to 268 districts.

[37] The mobilisation data does not allow us to precisely distinguish between volunteers and conscripts, so we cannot control for differential types of mobilisation in Equation 1.

[38] We identify a total of 221 battalions that were made of Pals at some point during the War in our data using information from James (2012) and Becke (1938). These battalions contributed to about 9% of all fatalities in WWI.

Another approach to limit the influence of WWI volunteers is to build our instrument using WWI deaths that occurred in 1917 and 1918 alone. At that stage of the conflict, most of the volunteer army of 1914-1915 had been put out of action. Mass conscription had been in place since 1916. Hence, it is reasonable to assume that the vast majority of those who died towards the end of the War were conscripts. Because conscription left limited room for individual choice over when and where to enlist, using only deaths later in the War in the construction of the instrument helps mitigate the potential confounding effect of persistent differences in the propensity to volunteer. IV results are reported in Table D.5 in the Appendix. As expected, the first stage remains strong, with F-statistics above 30 in all specifications. At the same time, the magnitudes of IV estimates are very similar to the baseline results.

TABLE 10

ROBUSTNESS: REMOVING PALS BATTALIONS – EFFECT OF WWI DEATHS ON WW2 DEATHS

	(1) $Log(d^{WW2})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$
$Log(d^{WW1})$	0.501***	0.545***	0.546**	0.511***
	(0.123)	(0.137)	(0.218)	(0.185)
First stage F-stat	43.1	53.5	21.0	30.9
Obs.	5303	5303	5303	5228
R2	0.68	0.63	0.64	0.64
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	N	Y	Y	Y
Regiment mob. FE	N	N	Y	N
Regiment instr.	N	N	N	Y

Notes: IV estimation results of the effect of WWI deaths on WW2 deaths, using only soldiers not belonging to Pals battalions to construct $Log(d^{WWI})$, its instrument, and mobilisation. Different sets of controls and fixed effects are used in each column (see text for details). Standard errors clustered at the county level in parentheses.

Another possible reason for concern arises if soldiers were able to self-select into less risky units. As argued in Section 2, recruits in general could not choose which battalion to serve in. Yet it is possible soldiers sorted into units based on their individual characteristics because of recruitment needs, connections and other factors. For instance, more skilled soldiers may be spared from serving with infantry and may instead be assigned to – typically less risky – support units. If this were the case, certain communities may experience greater losses in both wars for reasons unrelated to combat motivation.

In the main analysis, we address this selection problem by controlling for regiment-level mobilisation in different ways. As an alternative solution, we here re-calculate our instrument using exclusively information on soldiers who served in infantry regiments units. In this way, we ensure that we are only using variation in death rates across units within the infantry to identify our effect of interest.[39] Appendix Table D.6 provides results using this variable. The restriction to infantry does not weaken the predictive power of our instrument, which remains strongly correlated with our measure of WWI mortality, whose definition is unchanged and includes soldiers from all regiments. Second-stage estimates are also very similar in magnitude to those in the baseline, and precisely estimated across specifications.

7.2. Other Specifications

We can also test the robustness of the main results to choices of functional form or estimation method. In this section, we show that the main results described above hold under different alternatives to the main specification in equation 1.

We start by considering two different strategies to deal with the problem that the logarithmic specification used in our main analysis requires dropping parishes with zero deaths in either WWI or WW2. In Table 11, we report results from estimating our baseline model adding a positive constant to the number of WWI and WW2 deaths to all observations before taking logarithms. In column 1, we report the baseline OLS and IV results as reference, whereas in columns 2-5 we vary the choice of constant. Reassuringly, these transformations do not alter the sign of our estimates, although magnitudes are somewhat larger.

TABLE 11
ROBUSTNESS: DEALING WITH THE LOG OF ZERO – EFFECT OF WWI DEATHS ON WW2 DEATHS

	(1) no const.	(2) c = 0.5	(3) c = 1	(4) c = 1.5	(5) c = 2
A. OLS					
$Log(d^{WW1})$	0.163***	0.213***	0.239***	0.257***	0.271***
	(0.018)	(0.019)	(0.020)	(0.020)	(0.020)
Obs.	6305	14504	14504	14504	14504
R2	0.71	0.66	0.68	0.68	0.69
B. IV					
$Log(d^{WW1})$	0.495**	0.580***	0.652***	0.703***	0.739***
	(0.229)	(0.214)	(0.177)	(0.154)	(0.137)
Obs.	5434	14504	14504	14504	14504

Notes: OLS (panel A) and IV (panel B) estimation results of the effect of WWI deaths on WW2 deaths at the parish level. In column 1 we report the baseline estimates from the model in logarithms, where parishes with zero reported WWI or WW2 deaths are dropped. In columns 2-5 we estimate our baseline model adding a constant c to the number of dead before taking logarithms for both the outcome (the number of WW2 dead), the variable of interest (the number of WWI dead), and (in panel B) the instrument. Full sets of controls and fixed effects included in all specifications. Standard errors clustered at the historic county level in parentheses.

Recent work on the issue of zeroes in models with logarithms has shown that this rather

[39] A similar argument motivates the choice by Acemoglu et al. (2022) to use only foot soldiers casualties in measure the War mortality shock in the context of Italy.

common practice of adding a fixed constant before taking logarithms may lead to biased estimates. Bellégo, Benatia and Pape (2022) suggest an alternative approach, based on an iterative OLS procedure (iOLS), that by adding an observation-specific scalar to the variables before taking logarithms should yield unbiased estimates. In Table D.7 in the Appendix, we implement the iOLS estimator on our data, showing results for different choices of the hyper-parameter δ. We also report the value of their proposed test statistic, λ. Following the authors' recommendations, one should prefer choices of δ for which λ is close to 1.[40]

Except for very low levels of the parameter δ, we observe that point estimates using iOLS are very similar to those obtained using standard OLS in Table 2. Notice that the value of λ becomes closer to 1 the larger δ is, suggesting that large values of δ are indeed to be preferred. In sum, these results show that the sample selection due to the presence of zeros in our logged variables does not appear to affect our main estimates, neither in magnitude nor in precision.

As a final exercise, in Appendix's Table D.8 we estimate the baseline OLS model using death rates instead of levels as measures of WWI and WW2 mortality. Results are very similar to those from the baseline model in logarithms – though coefficients are of slightly smaller magnitude – reassuring us about the robustness of the results to model specification.[41]

8. Conclusions

In the summer of 1914, the European powers embarked in what would become one of the most lethal wars in human history. Only 25 years later, with the memories of the Great War still fresh in people's minds, the continent was drawn into a new, tragic conflict. We use new data at the parish level and geolocated military records for both wars to show that local deaths from a community during WWI affected the number of soldiers killed from that community in WW2, as well as the likelihood that they were awarded military honours for their actions. We provide evidence in favour of the existence of a channel from WWI deaths to WW2 combat motivation that operates via the accumulation of local civic capital: the memory and commemoration of fallen soldiers and their courage at the community-level changes soldiers' subjective value of individual sacrifice and induces them to take additional risks in combat.

Our results inform the understanding of the determinants of combat motivation and emphasise the role of common memories as a key factor both for nation-building and to generate the conditions that allow states to raise and motivate an army. This literature has typically focused on the incentives and actions of governments or military hierarchies, for instance in organising propaganda and recruitment campaigns, forced conscription, and other deliberate efforts to create national identity. We provide evidence on the importance of the history

[40] We specify the option *nonparametric* in implementing the iOLS_delta_test command in Stata 17, which uses the kNN estimator to estimate the conditional probability function of observing a zero in the data.

[41] Unfortunately, when moving to the analysis in levels to using death rates, the instrument loses some predictive power and the first-stage is weak, which renders an IV strategy unfeasible in this context.

and memory of previous conflicts in shaping the actions of those who fight.

The importance of past conflicts in shaping a nation's determination in the face of war is eloquently portrayed in the following speech by Queen Mother Elizabeth, broadcast on Armistice Day of 1939, months after the beginning of WW2: "For 20 years, we have kept this day of remembrance as one consecrated to the memory of past and never to be forgotten sacrifice. And now, the peace, which that sacrifice made possible, has been broken, and once again we have been forced into war. (...) We have all a part to play, and I know you will not fail in yours. Remembering always the greater your courage and devotion, the sooner shall we see again in our midst the happy ordered life for which we long."

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Appendix

A. Geolocation Details and Validation

In this Appendix, we provide further details of the geolocation procedures used to assign soldiers in the CWGC and FamilySearch datasets to their parish of origin. We also produce a series of figures that serve as validation for the resulting parish-level aggregates in WWI mobilisation and soldiers killed in both wars.

The original CWGC data on soldiers killed during WWI includes 796,601 records. Given that our analysis will focus on England and Wales only, we remove 75,000 Scottish servicemen from the sample. Geolocation proceeds by combining a) direct string matches with parish names based on data from FWR on historic county and location of birthplace/residence, b) string matching based on the CWGC additional information field, and c) latitudes and longitudes obtained from a batch geolocating service to which we input the FWR locations.For the batch geolocation process, we use a service provided by the company OpenCageGeo, which is based on OpenStreetMap and is available across platforms. In order to validate the geolocation process used by this source, we randomly selected 800 individual servicemen and validated the imputed locations by hand. Only 9 observations in this sample were incorrectly imputed and 6 of these 9 were imputed to nearby areas. Hence, we conclude that the geolocation process based in this method is reliable for our purposes, resulting in a limited amount of measurement error.

The data on parish of origin (birthplace or residence) of mobilised men in WWI – obtained from FamilySearch – has a slightly different structure and, therefore, we use a different procedure than the one used for CWGC/FWR data.[42] To match the FamilySearch records to an individual parish we combine: a) a direct string match with parish names for records that have both an historic county and a location, b) direct string matching with parish names for records that only include no county information (only match to parishes with unique names), c) hand matching of a fraction of remaining records carried out by identifying locations via GoogleMaps.

In order to validate the WWI mobilisation figures derived from FamilySearch – and the associated geolocation process – we first investigate the relationship between mobilisation and 1911 population figures from the Census. The associated binned scatter plot of both variables in log scale is depicted in panel A of Figure A.1. We can observe a clear positive relationship, which is what we would expect given the nature of the mobilisation process. The associated univariate regression yield a fairly high R-squared of 65% and a slope coefficient of 0.92.

We can jointly validate the parish-level mobilisation and deaths figures by looking at the relationship between mobilisation rates and death rates (i.e., the relationship between

[42] For example, the batch geocoding procedure that we used and validated when using FWR data on locations for killed soldiers yields very poor results when used with the FamilySearch strings.

both mobilisation and deaths divided by population). The associated binned scatter plot (in log scale) is provided in Panel B of Figure A.1. Again we find a positive and almost linear relationship, in line with expectations. The associated univariate regression yields an R-squared of 27% and a slope coefficient of 0.5, indicating that there was a clear relationship between mobilisation and deaths – as expected – but that there was substantial unexplained variation in deaths after accounting for differences in mobilisation and population.

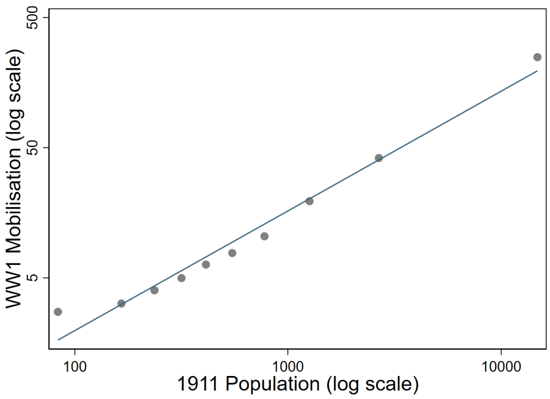
To validate the geolocation procedure for deaths we can show two figures for death rates at the parish level constructed using two different sources for the underlying location of origin data: the information coming from the `additionalinformation` string in the CWGC data and the information on location of origin provided in the FWR records (either birthplace or residence). The corresponding binned scatter plot is illustrated in Panel C of Figure A.1. Again, we find a clearly positive and close to linear relationship between dead rates from both sources. The associated univariate regression yields and R-squared of 38% and a slope coefficient of 0.68.

Finally, we can complete the validation of the geolocation procedure for our data on deaths by using comparing the death rates obtained using the FWR data on location of origin using either birthplace or residence. We expect that both sources would yield very similar figures for deaths because most people reside in the same parish in which they were born. The associated binned scatter plot is provided in Panel D of Figure A.1 and again shows a clearly positive and linear relationship. The associated univariate regression yields an R-squared of 66% and a slope coefficient of 0.84.

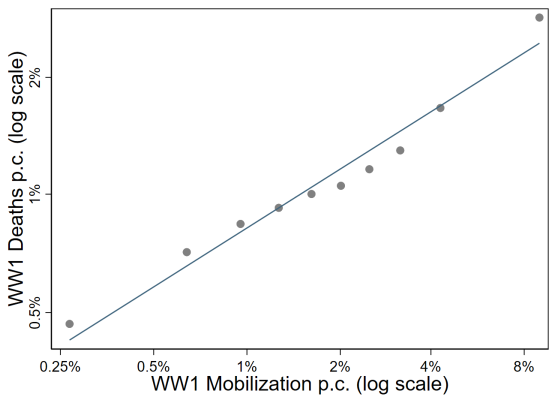
We can further validate the baseline measure of WWI deaths used in the paper with one constructed using the number of dead commemorated in local memorials. As discussed in Section 2, memorials often include a list of names of the servicemen from the specific location that lost their lives in the war. We aggregate these figures at the parish level and investigate the correlation between the parish-level death rate thus constructed and the death rate constructed using our main measure. Results of these comparisons for both WWI and WW2 are illustrated in panels A and B of Figure A.2. The depicted relationships are positive and close to linear. The associated univariate regressions yield elasticities of over 0.2, significant at all conventional levels.

Figure A.1

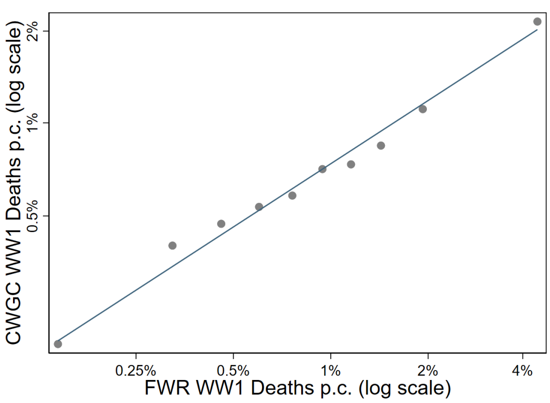
Validation: Mobilisation and Death Rates



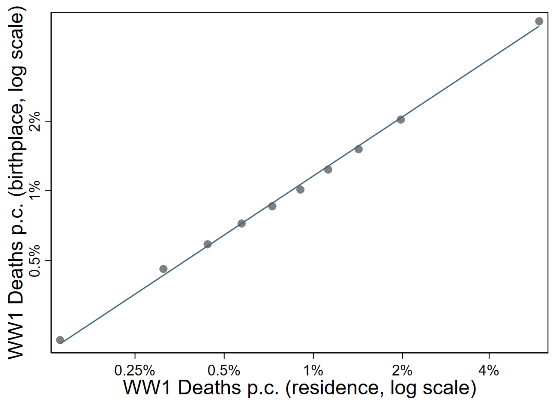
(A) Mobilisation Rate & Population



(B) Mobilisation Rates and Dead Rates WWI



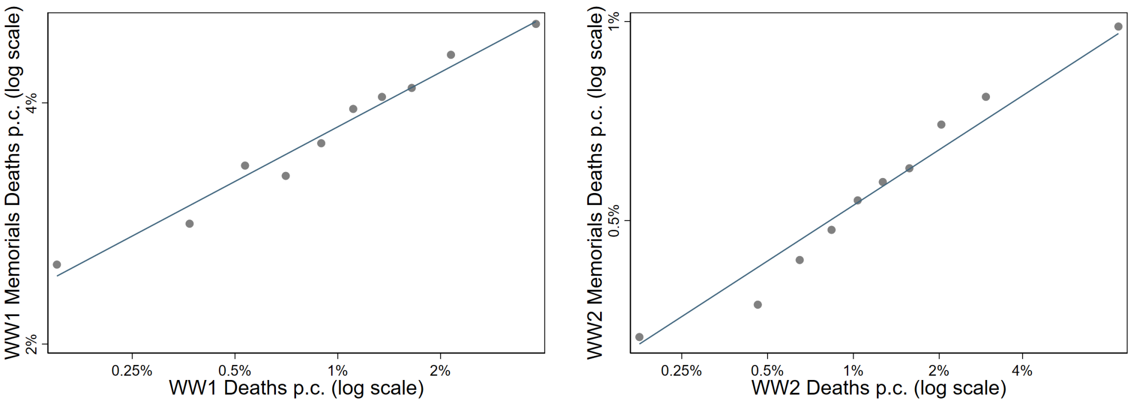
(C) Dead Rate WWI – CWGC & FWR



(D) Death Rate WWI – Birth & Residence

Notes: **Panel A**: binned scatter plot of the relationship between parish-level WWI mobilisation and 1911 population, both in logs. Fitted line corresponds to OLS estimates using the underlying data. **Panel B**: binned scatter plot of the relationship between log death rates for WWI calculated from the CWGC source in the horizontal axis and from log mobilisation rates at the parish level. **Panel C**: binned scatter plot of the relationship between log death rates at the parish level calculated using FWR and CWGC information. **Panel D**: binned scatter plot of the relationship between death rates at the parish level calculated using FWR information based on birthplace data and residence data.

Figure A.2
Validation: Death rates WWI and WW2



(a) WWI Dead Rates: Memorials & CWGC (b) WW2 Dead Rates: Memorials & CWGC

Notes: **Panel A**: binned scatter plot of the relationship between WWI death rates from memorials (vertical axis) and from the CWGC data (horizontal axis). Fitted line correspond to OLS estimates using the underlying data. **Panel B**: binned scatter plot of the relationship between WW2 death rates from memorials (vertical axis) and from the CWGC data (horizontal axis). Fitted line corresponds estimated via OLS.

B. Derivation of the instrument

We index regiments by $j = 1, ..., J$. Each regiment is divided into smaller battalions, indexed by $b = 1, ..., B_j$. The number of deaths in a parish i can be expressed as either the sum over all regiments or as the sum over all battalions.

Regiment-level derivations

Start by decomposing WWI deaths by summing over regiments j:

$$d_i^{WWI} = \sum_{j=1}^{J} d_{ij}^{WWI}.$$

Deaths at the regiment level can be decomposed as:

$$d_{ij} = \underbrace{\frac{m_{ij}}{m_i}}_{\alpha_{ij}} m_i \frac{d_{ij}}{m_{ij}} = \alpha_{ij} m_i \frac{d_{ij}}{m_{ij}} = \alpha_{ij} m_i \left[\underbrace{\frac{d_j}{m_j}}_{\delta_j} + \underbrace{\left(\frac{d_{ij}}{m_{ij}} - \frac{d_j}{m_j} \right)}_{\xi_{ij}} \right]$$
$$\implies d_{ij} = \alpha_{ij} m_i [\delta_j + \xi_{ij}].$$

Hence, the number of deaths from parish i can be decomposed as the sum of a "predictable" part, due the mortality of regiments, and an "idiosyncratic" part:

$$d_i^{WWI} = \underbrace{m_i \sum_{j=1}^{J} \alpha_{ij} \delta_j}_{predictable} + \underbrace{m_i \sum_{j=1}^{J} \alpha_{ij} \xi_{ij}}_{idiosyncratic}, \tag{B.1}$$

where:

- m_i – N. mobilised soldiers
- α_{ij} – Fraction of soldiers from i assigned to j
- δ_j – Regiment j death rate
- ξ_{ij} – Parish-specific deviations from mean death rate.

Equation B.1 motivates our choice of instrument. We instrument for the number of deaths using its part that is predictable by using regiment-level mortality. These are the deaths that each parish is expected to suffer given the proportion of men who go to each regiment and the corresponding regiment-level mortality. The instrument is unaffected by parish-level idiosyncratic differences in death rates, hence the corresponding IV estimates should be free of the bias generated, for instance, by persistent parish-level characteristics that correlate with death rates in the two wars, such as income, risk attitudes, etc.

As discussed in the paper, however, this instrument does not solve the issue of endogeneous sorting in more or less risky regiments. The reason is that it is constructed using α_{ij}, the fraction of men from parish i fighting in regiment j, which can be endogenous. To mitigate concerns about the endogeneity of the α_{ij}, in the paper we will control for regiment-level mortality and use instead, mortality at the battalion-level, which is more disaggregated. The instrument relies on the fact that battalion-level deaths, once controlling for regiment-level mortality, are orthogonal to parish-level confounders. More precisely, we assume that battalion-level deviations from regiment-level mortalities are uncorrelated to the characteristics of the parish of birth of soldiers. To provide formal background for this choice of instrument, in the following we proceed to decompose the number of deaths using battalion-level death rates.

Battalion-level derivations

An alternative derivation can be obtained by using battalions instead of regiments as units. Start by decomposing deaths by summing over battalions b:

$$d_i^{WWI} = \sum_{j=1}^{J} \sum_{b=1}^{B_j} d_{ijb}.$$

The number of deaths from parish i who fought in battalion b in regiment j can be written as

$$\begin{aligned} d_{ijb} &= m_i \frac{m_{ijb}}{m_i} \frac{d_{ijb}}{m_{ijb}} = m_i \alpha_{ijb} \frac{d_{ijb}}{m_{ijb}} \\ &= m_i \alpha_{ijb} \left[\frac{d_{jb}}{m_{jb}} + \left(\frac{d_{ijb}}{m_{ijb}} - \frac{d_{jb}}{m_{jb}} \right) \right] \\ &= m_i \alpha_{ijb} \left[\delta_{jb} + \xi_{ijb} \right], \end{aligned}$$

where:

- m_i – N. mobilised soldiers
- α_{ijb} – Fraction of soldiers from i assigned to batallion b in regiment j.
- δ_{jb} – Battalion b-specific death rate.
- ξ_{ijb} – Parish-specific deviations from mean battalion death rate.

Hence, the number of deaths from parish i can be decomposed, as before, as the sum of two parts, now depending on battalion-, rather than regiment-level death rates:

$$d_i^{WWI} = m_i \sum_{j=1}^{J} \sum_{b=1}^{B_j} \alpha_{ijb} \delta_{jb} + m_i \sum_{j=1}^{J} \sum_{b=1}^{B_j} \alpha_{ijb} \xi_{ijb}. \tag{B.2}$$

This result shows that an improvement over the instrument that uses only regiment-level information is possible if data on a more disaggregated level, such as the battalion, are available. The decomposition in equation B.2 suggests that one can instrument $Log(\mathbf{d}_i^{WWI})$ using $z_i = Log(m_i \sum_{j=1}^{J} \sum_{b=1}^{B_j} \alpha_{ij} \delta_{jb})$, controlling for $z_i^r = Log(m_i \sum_{j=1}^{J} \alpha_{ij} \delta_j)$. This approach uses only variation in deaths due to battalion-level shocks, after controlling for regiment-level mortality. This is desirable because it allows to effectively control for selection into regiments.

C. Details on merging the 1911 Census data with military records

As described in the main text of the paper, we exploit that we can access the full 1911 Census including names and addresses and unique individual and household identifiers to estimate how WWI deaths within households affect the behaviour of men in WW2. The basic idea is that we take all male children in the 1911 Census aged 0-8 (so aged 28 to 36 at the start of WW2), then link these children to WW2 deaths. We separately link WWI deaths to all the men in the 1911 Census that could have fought in WWI. We then combine this second merge with the children dataset to identify which children had fathers and other household members that died in WWI.

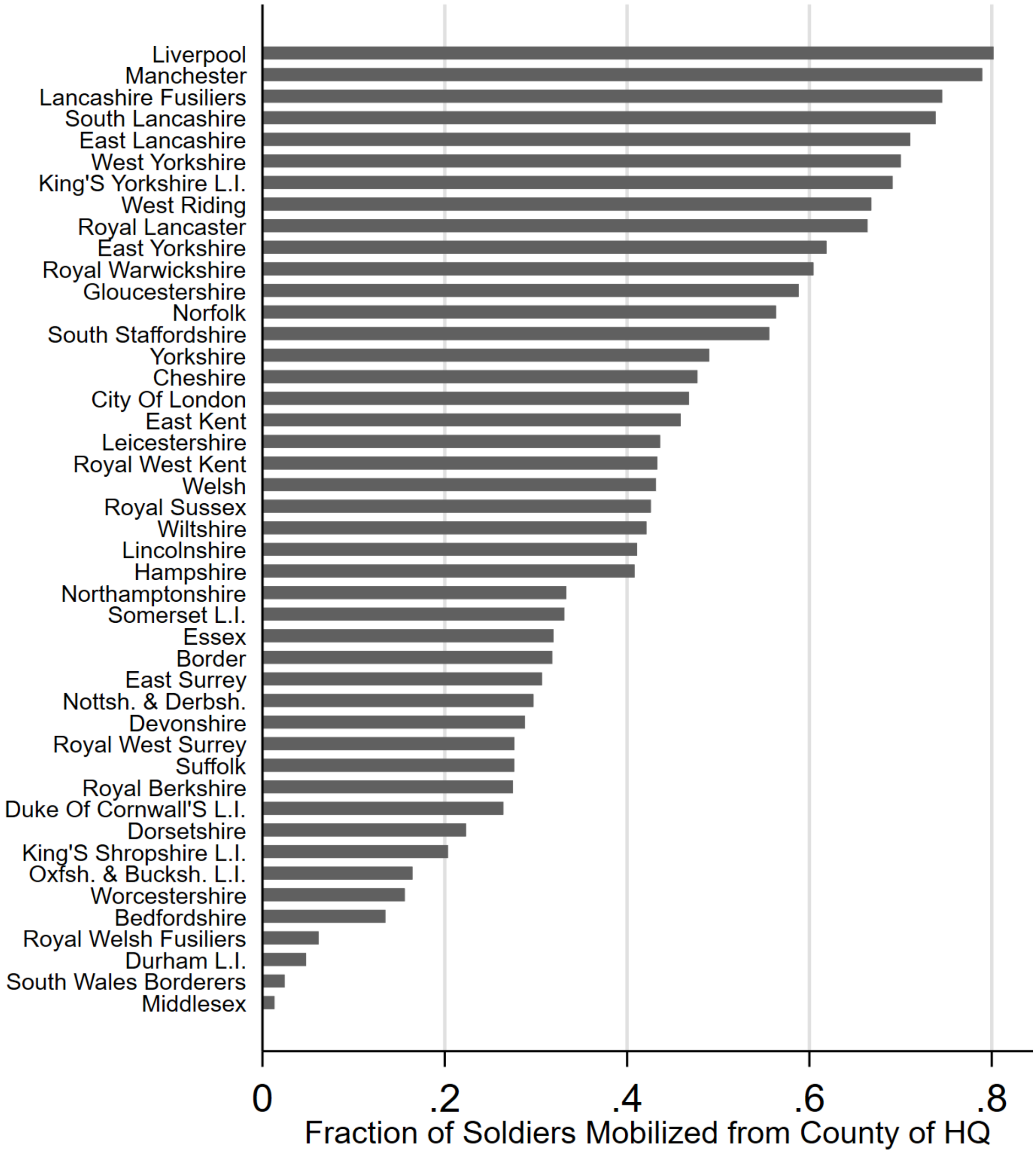
In more detail, we conduct this exercise by the following steps. First, we correct some minor 1911 Census parish errors using a file issued by IPUMS in Dec 2020. We then create two files from the 1911 Census that will be matched to the war dead. The first file, which will be linked to WWI dead, comprises men aged between 10 and 50 in 1911 (and hence between 17 and 57 by the end of WWI). These are potential fathers and cohabiting household members of children in 1911. The second file, which will be linked to WW2 dead, is a file of male children aged between 0 and 8 in 1911 which includes the forenames of the boys, the forenames of their cohabiting father, and a household identifier.

We then prepare the war dead data for both WWI and WW2 for the ABE merge. There are 796,601 WWI dead in our data, of which some 380,000 are potentially matchable as age, forename, and surname fields are non-missing. There are 436,696 WW2 dead in our data. We only attempt to match the 85,000 or so that are aged between 0 and 8 in 1911. We next run merges using the ABE algorithm. For matching WWI soldiers to 1911 Census men we use three matching strategies (i) surname, forename, birthyear and birthplace; (ii) surname, forename, birthyear and parish of residence; (iii) surname, forename and birthyear. For matching WWI soldiers to 1911 Census men we also use three matching strategies (i) surname, forename, birthyear, and father's forename initial; (ii) surname, forename, county of residence and birthyear; (iii) surname, forename and birthyear. In each case we use the default ABE parameters, NYSIIS standardised names, and allow the option to use standard nicknames. Note that the ABE matching procedure only considers records to be matched when matches are unique, hence we will only identify a subset of the true matches between the war dead and 1911 Census participants.

In the final step we combine the 1911 Census with the outputs of the ABE merges. We first take all boys aged 0 to 8 in the 1911 Census and we use the ABE WW2 merge to create an indicator variable for those which died in WW2 (we code non-matched children as 0). This provides our dependent variable. We then use the ABE WWI merge to create an indicator for children whose father died in WWI (we code non-matched fathers as 0). Finally, we link in the ABE WW2 merge into our dataset for a second time but now merging on the household identifier rather than the person identifier. By doing so we can then create an indicator for a household member other than a father died in WWI (we code non-matched households as 0).

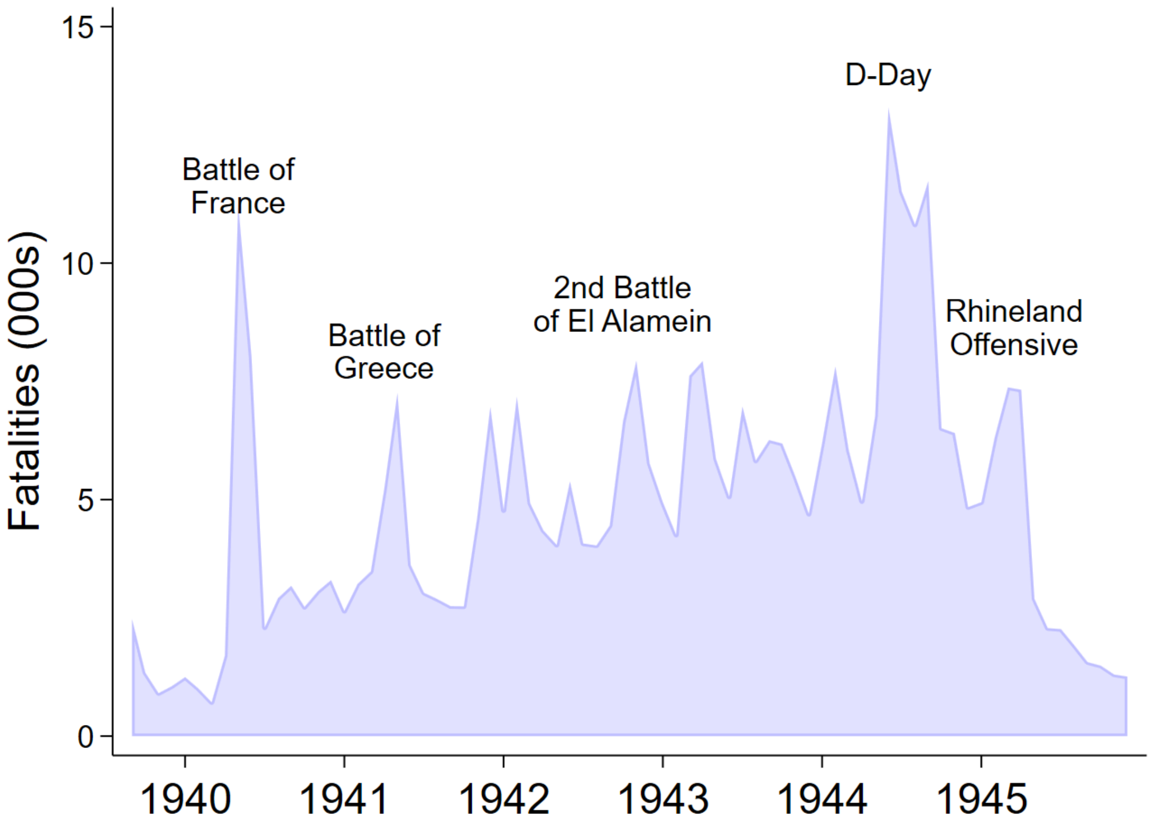
D. Additional Figures and Tables

Figure D.3
WWI Regiments and Localised Recruiting



Notes: Horizontal axis represents the fraction of soldiers who served in a given regiment whose parish of origin is in the same county as the regiment's headquarters. Regiments organised in the vertical axis correspond to the 45 regiments in the British Army that had pre-specified recruiting areas.

Figure D.4
Timeline of WW2 Deaths of British Servicemen



Notes: Number of British Army, Navy and Air Force servicemen fatalities in each month during WW2. Overlaid text indicates the name of five key battles: Battle of France (May 1940), Battle of Greece (April 1941), 2nd Battle of El Alamein (October 1942), D-Day (June 1944), and Rhineland Offensive (February 1945). Source: Own elaboration based on Commonwealth War Grave Commission data.

TABLE D.1
FIRST-STAGE RESULTS

	(1) $Log(d^{WW1})$	(2) $Log(d^{WW1})$	(3) $Log(d^{WW1})$	(4) $Log(d^{WW1})$
z	0.165***	0.160***	0.110***	0.145***
	(0.025)	(0.021)	(0.024)	(0.026)
F-stat	44.7	56.6	21.1	31.2
Obs.	5434	5434	5434	5346
R2	0.80	0.81	0.82	0.81
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	N	Y	Y	Y
Regiment mob. FE	N	N	Y	N
Regiment instr.	N	N	N	Y

Notes: First-stage OLS estimates of the effect of the instrument on WWI deaths at the parish level. All specifications control for 1911 population. Different sets of controls and fixed effects are used in each column (see text for details). Standard errors clustered at the historic county level in parentheses.

TABLE D.2
POISSON REGRESSION RESULTS – EFFECT OF WWI DEATHS ON WW2 HONOURS

	(1)	(2)	(3)	(4)	(5)
Outcome: N. honours					
$Log(d^{WW1})$	0.140***	0.158***	0.158***	0.122***	0.071***
	(0.037)	(0.032)	(0.032)	(0.028)	(0.023)
Mean of dep.var.	0.032	0.032	0.032	0.033	0.033
Obs.	218912	218912	218912	202773	202773
Mobil. controls	Y	Y	Y	Y	Y
Econ. controls	N	Y	Y	Y	Y
Age FE	N	N	N	Y	Y
Rank FE	N	N	N	N	Y
Regiment FE	N	N	N	Y	Y

Notes: Soldier-level Poisson regression estimation results of the effect of WWI deaths on the number of honours received. Standard errors clustered at the parish level in parentheses.

TABLE D.3
EFFECT OF WWI DEATHS ON INTER-WAR OUTCOMES

	(1) Unemployment	(2) Infant Death	(3) Unmarried	(4) Pop.Growth	(5) Working Age
A. 1921/1922					
$Log(d^{WW1})$	-0.044	0.110	0.096	-1.348	-0.098
	(0.052)	(0.085)	(0.116)	(0.878)	(0.098)
Mean dep.var.	5.24	2.53	2.24	9.24	65.60
Observations	1694	1691	1691	1694	1694
B. 1931					
$Log(d^{WW1})$	-0.824	-0.011	-0.015	3.375	-0.101
	(0.496)	(0.135)	(0.123)	(2.873)	(0.084)
Mean dep.var.	10.68	5.80	4.74	22.22	67.85
Observations	1695	1695	1695	1695	1695
Mobil. controls	Y	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y

Notes: OLS estimation results of the effect of WWI deaths on inter-war economic and demographic outcomes (in rates in percentage points) at the district level. Controls and fixed effects included as indicated in the table foot. Standard errors clustered at the historic county level in parentheses.

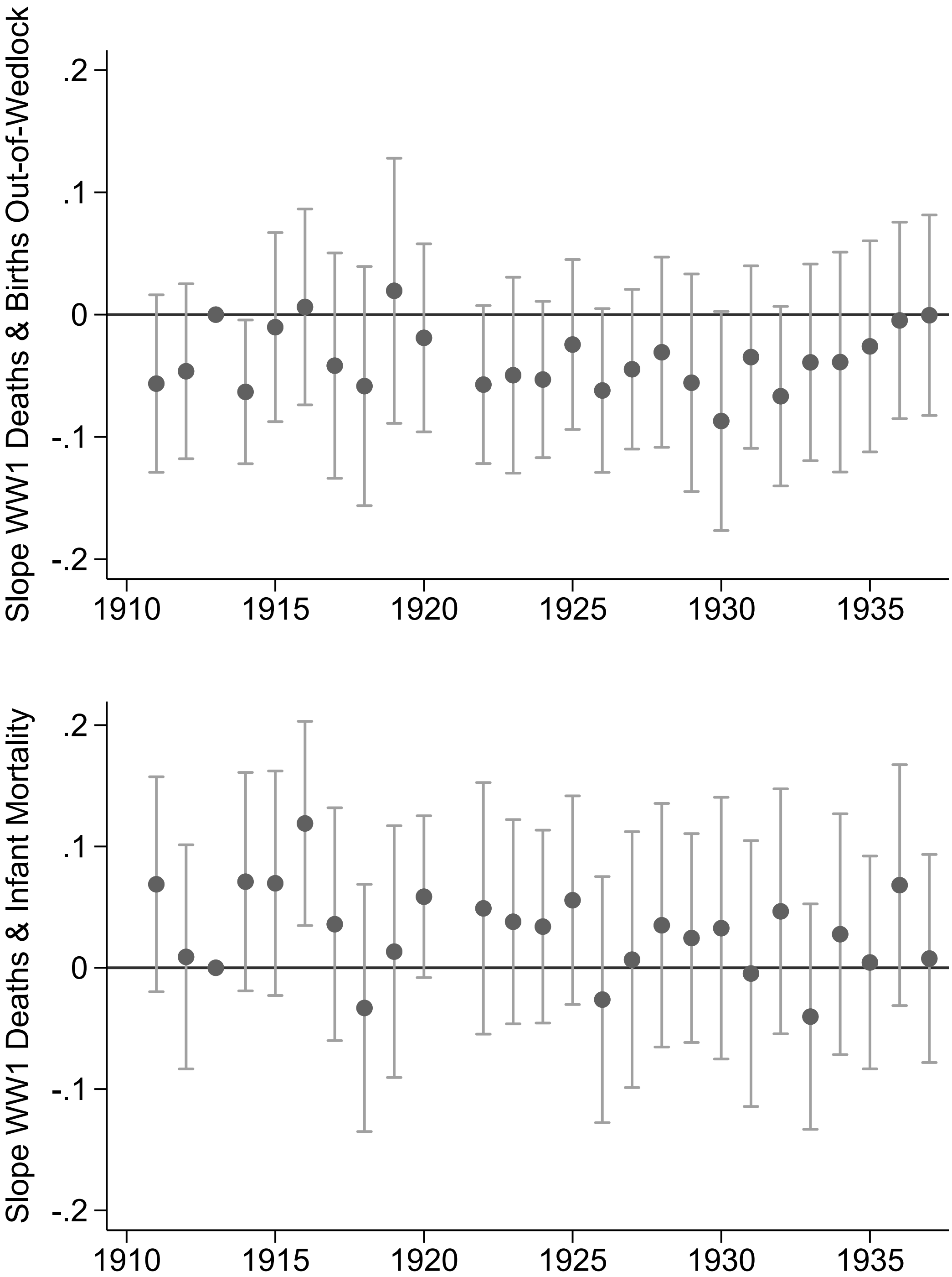
TABLE D.4
1918 FLU

	(1) $Log(d^{Flu})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$
$Log(d^{WW1})$	0.039	0.412***		0.410***
	(0.070)	(0.131)		(0.136)
$Log(d^{Flu})$			0.104	0.059
			(0.289)	(0.275)
Mean of dep.var.	5.40	5.44	5.44	5.44
Obs.	260	260	260	260
R2	0.97	0.89	0.89	0.89
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	Y	Y	Y	Y

Notes: District-level OLS regression estimation results on 1918 flu deaths. Controls and fixed effects included as indicated in the table foot. Standard errors clustered at the historic county level in parentheses.

Figure D.5

Event-Study Graphs: WWI Deaths and Pre- and Inter-War Economic Outcomes



Notes: Each point is an estimate for yearly interactions of the (log) number of WWI deaths on the outcome. All specifications include district fixed effects, year effects and interactions between year dummies and the log of WWI mobilisation (see footnote 35 for details). Standard errors clustered at the historic county level in parentheses. No data is available for 1921

Table D.5

Robustness: IV using 1917-1918 Deaths – Effect of WWI deaths on WW2 Deaths

	(1) $Log(d^{WW2})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$
$Log(d^{WW1})$	0.441***	0.553***	0.612***	0.532***
	(0.114)	(0.118)	(0.171)	(0.139)
First stage F-stat	55.9	66.0	29.0	43.9
Obs.	5028	5028	5028	4998
R2	0.69	0.63	0.63	0.64
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	N	Y	Y	Y
Regiment mob. FE	N	N	Y	N
Regiment instr.	N	N	N	Y

Notes: IV estimation results of the effect of WWI deaths on WW2 deaths, using only deaths in 1917-1918 to construct the instrument. Different sets of controls and fixed effects are used in each column (see text for details). Standard errors clustered at the historic county level.

Table D.6

Robustness: IV using Infantry Regiments – Effect of WWI Deaths on WW2 Deaths

	(1) $Log(d^{WW2})$	(2) $Log(d^{WW2})$	(3) $Log(d^{WW2})$	(4) $Log(d^{WW2})$
$Log(d^{WW1})$	0.429***	0.488***	0.515**	0.472**
	(0.125)	(0.129)	(0.247)	(0.220)
First stage F-stat	40.4	47.7	14.4	22.9
Obs.	5287	5287	5287	5209
R2	0.69	0.64	0.64	0.64
Mobil. controls	Y	Y	Y	Y
Econ. controls	Y	Y	Y	Y
County FE	N	Y	Y	Y
Regiment mob. FE	N	N	Y	N
Regiment instr.	N	N	N	Y

Notes: IV estimation results of the effect of WWI deaths on WW2 deaths. Instrument and mobilisation variables built using only soldiers from infantry regiments. Different sets of controls and fixed effects are used in each column (see text for details). Standard errors clustered at the historic county level.

Table D.7
OLS results – effect of WWI deaths on WW2 honours - iOLS estimator

	(1) δ = 0.1	(2) δ = 1	(3) δ = 2	(4) δ = 10	(5) δ = 100
$Log(d^{WW1})$	0.093**	0.149***	0.167***	0.205***	0.241***
	(0.044)	(0.039)	(0.039)	(0.041)	(0.046)
Obs.	14504	14504	14504	14504	14504
λ stat.	1.026	1.023	1.018	0.999	0.966

Notes: iOLS estimation results of the effect of WWI deaths on WW2 deaths at the parish level. Different sets of controls are used in each column (see text for details). Full controls, county fixed effects, and the (log) number of predicted deaths at the parish level constructed using regiment-level death rates are included. Standard errors clustered at the county level.

Table D.8
Robustness – OLS estimates of the effect of WWI deaths on WW2 deaths – using rates

	(1) $D.\ rate^{WW2}$	(2) $D.\ rate^{WW2}$	(3) $D.\ rate^{WW2}$	(4) $D.\ rate^{WW2}$	(5) $D.\ rate^{WW2}$
$Dead\ rate^{WW1}$	0.108***	0.091***	0.089***	0.086***	0.087***
	(0.012)	(0.011)	(0.011)	(0.010)	(0.011)
Obs.	14128	14128	14128	14128	14108
R2	0.02	0.05	0.05	0.08	0.08
Mobil. controls	N	Y	Y	Y	Y
Econ. controls	N	N	Y	Y	Y
County FE	N	N	N	Y	Y
Regiment	N	N	N	N	Y

Notes: OLS estimation results of the effect of WWI death rate (number of dead in a given parish over 1911 population) on the WW2 death rate (number of dead over 1931 population, the last available figure from Census data). Different sets of controls and fixed effects are used in each column (see text for details). In column 5 we control for our measure of predicted death rate, defined as the number of dead in a given parish (predicted using regiment-level mortality) divided by population. Standard errors clustered at the historic county level in parentheses.