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Abstract

We review some “myths” of the Great War of 1914 to 1918: that the war broke out inadvertently, that the western front saw needless slaughter, that the Allies used the food weapon to strangle Germany, and that the peace treaty that ended the war caused the rise of Hitler and the still greater war that followed.

Keywords: economic mobilization, hyperinflation, interdependence, rational calculation, strategic interaction, reparations, war of attrition.

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Myths of the Great War

I love stories on the news about Vera Lynn, evacuees, rationing, all that fun stuff. But I don't mean to be rude, but just I don't want to hear more about the mud, the trenches, the barbed wire and the massive loss of life (respondent quoted by British Future 2013: 16).

In Bruce Bairnsfather's celebrated cartoon, two infantrymen of the Great War cower in a foxhole while shells fly overhead (Figure 1). One says to the other: "Well, if you knows of a better 'ole, go to it." Their passive misery captures much of how the Great War is remembered today.

Most wars are rich in tales of agency and decision. Yet many tales of the Great War are told otherwise. A dominant narrative of the Great War tells us that we were passive victims of an irrational disaster: Everything that happened was done to us; we scarcely know by whom.

Perceptions of the Great War continue to resonate in today's world of international politics and policy. Most obviously, does China's rise show a parallel with Germany's a century ago? Will China's rise, unlike Germany's, remain peaceful? The Financial Times journalist Gideon Rachman wrote last year:

The analogy [of China today] with Germany before the first world war is striking ... It is, at least, encouraging that the Chinese leadership has made an intense study of the rise of great powers over the ages – and is determined to avoid the mistakes of both Germany and Japan.”¹

The idea that China's leaders wish to avoid Germany's mistakes is encouraging, certainly.² But what are the “mistakes,” exactly, that they will now seek to avoid? The world can hardly be reassured if we ourselves, social scientists and historians, remain uncertain what mistakes were made and even whether they were mistakes in the first place.

¹ “The shadow of 1914 falls over the Pacific,” Financial Times, February 4, 2013.

² While much attention has been focused on China's rise and the German parallel, less has been given to Russia's decline, which in some ways resembles that of the Austro-Hungarian Empire and has no less disturbing implications: two sprawling, multi-national empires, struggling to manage a fall from past greatness, rising ethnic tensions, and external rivals competing for influence in bordering states.

The myths of the Great War challenge the skills of both historians and economists. Historians face the challenge of preserving and extending the record and contesting its interpretation – especially when reasonable people differ over the meaning. If anything challenges the economist, it is surely persistence in behaviour that is both costly and apparently futile or self-defeating.

Closer study of the historical record of the Great War reveals a story full of foresight, intention, calculation, and causation. Some consequences that are commonly thought to have been unintended were considered beforehand and fully discounted; others were not consequences at all.

Myth #1. An inadvertent war

Interviewed earlier this year at Davos, Japanese premier Shinzo Abe likened China and Japan today to Britain and Germany in 1913.³ He commented on the similarity of their rivalry. He noted that they shared a strong trading relationship and that a century ago this had not prevented strategic tensions leading to the outbreak of conflict. Today, he concluded, any “inadvertent” conflict would be a disaster.

Historians and politicians have focused on moral responsibility for the war. Whom should we blame? In 1918 Lloyd George demanded “Trial of the Kaiser” (Purcell 2006: 75). By 1920 he had changed his mind. In a later memoir (Lloyd George 1938: 32) he wrote:

The nations slithered over the brink into the boiling cauldron of war without any trace of apprehension or dismay.

The allocation of moral blame for the Great War is still debated. A recent survey of ten professional historians (BBC 2014) placed Germany first in line with 9 votes (out of 10), but with many also-rans: Austria-Hungary (7 votes), Russia and Serbia (3 each), and Britain and France (2 each). Two of the ten gave equal weight to *all* the belligerents.

From a social-science perspective the underlying issue is less moral than empirical: Was the Great War truly an “inadvertent” conflict, one that started when no one was looking? When the actors decided on war, to what extent did they calculate their actions and intend the results? The

³ “Davos leaders: Shinzo Abe on WW1 parallels, economics and women at work,” *Financial Times*, January 22, 2014. Subsequently the Chinese foreign minister Wang Yi was reported as rejecting the parallel on the following grounds: “1. The parallel is a misleading one. Military conflict is now unthinkable. 2. Japan caused the second world war. This is unambiguous.” “Davos: China rejects Abe’s WW1 analogy,” *Financial Times*, January 24, 2014.

economist's standard model of strategic interaction demands evidence of individual agency (rather than of unconscious collective drives), of unbiased "rational" expectations, and of backward induction of one's own best choice based on the expected best choice of the adversary.

It is a myth that such calculations were absent from the decision for war. On the contrary the record shows that the war was brought about very largely by design, and among those that designed it there was realistic foresight of the scale, scope, character, duration, and even outcome of the war.

Several versions of the Great War deny or qualify agency. These are traditional stories of nationalism, imperialism, and coordination failure. According to them, national leaders were trapped into actions they did not intend by commercial interests, the demands of the mob, and alliance commitments. In fact the historical record has left clear evidence of agency and intention.

In every country the decision for war was made by a handful – literally – of people at the apex of each political system (Hamilton and Herwig 2004: 238-241). Their councils were "saturated with agency" (Clark 2013: xxvii). The cliques themselves were not united, so that there were also waverers in every country including the German, Austrian, and Russian emperors, the German premier Bethmann Holweg, and the British finance minister (later premier) Lloyd George. At crucial moments, however, those that favoured war were able to sway the others.

An implication is that the war was not inevitable. Minor variations in the course of events and the personalities involved might have had different outcomes. The Sarajevo assassination killed a voice for peace in Vienna and also made it more difficult for similar voices to be heard (Fromkin 2007: 154). In the powerful words of Margaret MacMillan (2013: 605): "There are always choices."

No one was swayed by commercial interests, which were against the war in all countries (Hamilton and Herwig 2004: 241-248), or by public opinion more widely, which was taken by surprise (Ferguson 1999: 174-2011). Public opinion was considered, only to bolster the legitimacy of the actions the actors had decided to take anyway. In Germany, for example, Moltke (cited by MacMillan 2013: 480) wrote to Bethmann Holweg after the so-called "imperial war council" of December 1912 that "we can ... face even the most difficult tasks with confidence, if we manage to formulate the *casus belli* in such a way that the nation will take up arms unitedly and enthusiastically." No one was trapped into war by alliance commitments. Instead, they considered carefully whether or not to honour them, or even went beyond them. Thus in its "blank cheque" to Austria, Germany went far beyond its alliance obligation. Italy, in contrast, went to war in 1915 against its former allies. Nor were they trapped into

war by the pressure of mobilization timetables; in both Berlin and St Petersburg, the war advocates exploited the timetables to force the waverers to commit to war (e.g. Herwig 1977: 25).

What ruled the calculation in every country was the national interest as they perceived it. But on what was the “national interest” based? As everywhere, on shared beliefs and values.⁴ These began with national identity, in which the well-being of the nation was commonly identified with persistence of the ruling order. They extended to shared values of power, status, honour, and influence, and then to shared beliefs about the forces underlying the distribution of power in the world. Strikingly, the decision makers in every country were subscribers to a virtual world where the zero-sum game of power was being played out, not the positive-sum game of commerce and development.

There is clear evidence that some of the actors had a specific intent to bring about a war. Two things muddy the water. One is the efforts made later to destroy the evidence and distort the record (Herwig 1987). Another is that those that intended war did not have the same war in mind, although they still understood the wider conflict that could follow (Fromkin 2007). In Vienna chief of the general staff Hötendorf and foreign minister Berchtold intended war with Serbia in order to assert the integrity of the Austro-Hungarian Empire, knowing that the Russians might intervene and so widen the conflict. In Berlin chief of the general staff Moltke and war minister Falkenhayn planned war with Russia before the Russian rearmament would be completed, knowing that this would also entail war with France. To bring war about, they also encouraged each other: when the Germans encouraged the Austrians to make war on Serbia in July 1914 among them were those that expected this would provide the best opportunity to attack France and Russia (Hamilton and Herwig 2004; Fromkin 2007). Similarly, the Russians and French egged each other on, although the Russians had their eyes on Austria and the French on Germany (McMeekin 2013: 54).

Is it true that everyone expected a short war? According to a Financial Times Editorial for New Year’s Day, 2014:

⁴ On the “national interest” see Hamilton and Herwig (2004: 239). A much praised history by Christopher Clark, *The Sleepwalkers* (2013: 560), also comments on the idea of shared political culture: “we should [not] minimize the belligerence and imperialist paranoia of the Austrian and German policy-makers ... But the Germans were not the only imperialists and not the only ones to succumb to paranoia. The crisis that bought war in 1914 was the fruit of a shared political culture.” Use of terms such as “belligerence” and “paranoia” conveys Clark’s agenda, more moral than investigative.

In 1914 some European politicians and generals, their outlook shaped by the limited wars that had unified Germany and Italy half a century earlier, harboured this illusion.⁵

But it was not, in the main, “politicians and generals” that suffered from the illusion. It was mainly the ordinary uninformed citizens that expected a short war. The “short war” illusion arose from the warnings of Bloch (1899) and Angell (1910) about the destructive force of modern warfare and the dependence of prosperity on economic interdependence. The military had heard the warning and had discounted it (Macmillan 2013: 305-306). In reality the idea of a short war was not so much a shared illusion as a shared hope: starting from Schlieffen, everyone hoped the war could be short.

Military planners also realistically evaluated the likelihood that such hopes would fail. Schlieffen’s staff warned that quick victory might well be replaced by “a tedious and bloody crawling forward step-by-step” (Clark 2013: 561). Updating German war plans in 1905 and 1906, Moltke himself envisaged one possible outcome as “a people’s war, one which would not be concluded in a single battle” but a “murderous European war,” a “general European massacre, at whose horror one could only shudder,” a “long and protracted struggle” that would continue until “the peoples’ energy had been entirely broken”; if victorious, Germany would still be “exhausted in the extreme” (Herwig 2002: 688-692). Preparing for war, German administrators planned how to feed the population under blockade (Lee 1975). Moltke himself explained that respecting Dutch neutrality would provide Germany’s “wind pipe,” or neutral channel to overseas trade (Herwig 2002: 689). These considerations made sense only in the expectation of a protracted war in which national resources would be mobilized and brought to bear.

Across the Channel in August 1914, while others expected a short war, war secretary Kitchener thought “if things go wrong the war might last two or three years at least” (cited by French 1988: 387). Prime minister Asquith anticipated “Armageddon.” French and Russian generals looked forward to the “extinction of civilization” (Clark 2013: 561).

In strategic interaction, the principle of backward induction requires each player to work out the best choice from predicting their adversaries’ likely responses. To what extent did the Great Powers do this in 1914? Within the governing cliques of the Great Powers, each had reasonable understanding of the others’ war plans, based on open signals and confirmed by covert intelligence (Macmillan 2013: 314-352). That is, each

⁵ “Reflections on the Great War,” *Financial Times*, January 1, 2014.

government shared a broad understanding that, if Austria attacked Serbia, Russia would probably mobilize against Austria and Germany; Germany would probably attack France as well as Russia; and Britain would probably come in on the side of France (Herwig 2002). Austrian foreign minister Berchtold promoted aggression “even though our operations against Serbia should bring about the great war.” From Berlin, Wilhelm II told Vienna to count on “Germany’s full support”; he wrote that Germany fully expected war with Russia and for years had made all preparations with this in mind.

Each country’s likely reaction was not known with certainty, and there are well known moments when they were misread. But the theory of deterrence (Schelling 1966 92-125) does not require certainty; indeed, deterrence is thought to be more effective when each side retains some discretion. Of course, leaving the adversary in a state of uncertainty is not the same thing as being uncertain oneself, and the latter condition reflected the influence of the waverers.

To what extent were the war makers simply over-optimistic? In this context, over-optimism would have a specific meaning: that the sum of probabilities of expected victory among the great powers would exceed one. Evidence of over-optimism is strikingly absent among those that brought the war about in Berlin and Vienna. Possibly there was over-optimism in St Petersburg: both Russians and Germans overestimated how quickly Russia might become stronger than Germany. In the present, however, both German and Austrian leaders had clear premonitions of defeat (Berghahn 1973; 2013; Ferguson 1999: 13; 2005: 19). As war began, German war minister Falkenhayn put it: “Even if we go under as a result of this, it still was beautiful.” In Vienna Hötendorf told his mistress: “It will be a hopeless struggle, but ... such an ancient monarchy and such an ancient army cannot perish ingloriously.” The Austrian Kaiser Franz Joseph wrote: “If we must go under, we better go under decently” (from Herwig 1997: 11, 22, 37).

Far from optimism, their attitude is better described as *rational pessimism*: they did not expect victory, but they did view the expected payoff from remaining at peace as inferior to that from war. Thus Moltke told Hötendorff on 12 May 1914: “To wait any longer means a diminishing of our chances” (from Herwig 1997: 51). Bethmann Holweg to Kurt Riezler, 7 July 1914: “Russia’s military power growing fast ... Austria grows ever weaker ... The future belongs to Russia, which grows and grows into an ever greater weight pressing down on our chest” (from Erdmann 1972: 181-93).

Could the Great War have been avoided? The case continues to be made that avoidance of war in such circumstances can be achieved by

mediation and accommodation. Gideon Rachman, for example, has contrasted “Munich” and “Sarajevo”:

If leaders warn against “another Munich”, they are almost always advocating a tough response to aggression – usually military action. If they speak of “Sarajevo”, however, they are warning against a drift to war.⁶

From the perspective of managing China’s rise, Rachman continued:

This year’s centenary of the outbreak of the first world war could do the world a great service by persuading modern politicians to spend more time thinking about Sarajevo, and less time worrying about Munich.

But this assumes the Great War was the “inadvertent” conflict of legend. In fact there was no drift, no lack of foresight, communication, realism, or calculation. There was no lack of mediation. In the July crisis the British government made repeated offers to mediate, but in Berlin these were seen as a complication, and German responses were designed only to avoid public blame for the onset of war when it came.

Rather, war came in 1914, unlike in previous crises, because in that moment the great powers did not deter each other. From this perspective the reality of 1914 looks not unlike 1939, when only a credible deterrent might have stopped Hitler in his tracks. As Margaret Macmillan (2013: 503-4) has shown, the Victorians understood deterrence perfectly well. War broke out in August 1914 because, in that moment unlike all the preceding moments, the Austrian and German governments were insufficiently deterred. There was an added problem in 1914, because rational pessimism changes the balance of fear: there is no value in waiting and no merit in avoiding risky actions if you fear the future more than you fear your enemies. This is a problem that we may face again today with declining regimes in Moscow and Pyongyang.

In 1914 there was also a deeper cause of war. This was the confinement of decision making to secretive councils where the national interest was understood on the basis of military beliefs and values. In business and society, no one wanted war. As Max Warburg told the Kaiser: “Germany becomes stronger with every year of peace. We can only gather rewards by biding our time” (from Herwig 2011: 13).

⁶ “Time to think more about Sarajevo, less about Munich,” *Financial Times*, January 6, 2014. See also Skidelsky (2003).

Empirically, open political systems that aggregate widely held social preferences and exercise civilian control over military authority appear to engage in warfare more reluctantly and so more selectively than their authoritarian counterparts (Levy 1988). There can be adverse side effects; for example, democracies might be inhibited from undertaking decisive military action that would deter aggression by others. Thus a world where democracies and non-democracies coexist is not necessarily more peaceful. It seems beyond dispute, nonetheless, that if German and Austrian councils had given due weight to middle and working class opinions in 1914 there would have been no Great War.

Myth #2. Needless slaughter

The Great War took place in an era of mass armies. This era began in the 1860s, when the railway technology first enabled the assembly and deployment of multi-million armies (Onorato et al 2012), and ended in the 1970s when battlefield nuclear weapons and cruise missiles deprived the same mass armies of their viability.

Angell and Bloch warned that warfare in the age of mass armies would be militarily horrendous and economically and socially unbearable. In this they were partially correct: the wars were certainly horrible, but European societies proved all too capable of carrying unprecedented war mobilizations for years at a time.

The focal point of the Great War was conflict between Germany and Russia, triggered by the gradual disintegration of the Austrian and Ottoman Empires. In fact, this was the point of the war: Germany went to war in the West, only in order to secure the conditions of victory in the East. In this sense there is an exact parallel between the two World Wars.

The two wars differ, however, in where the outcome was decided. In the Second World War, the Eastern front was decisive: this is where the main forces were concentrated and the main battles were fought. In the first World War, in contrast, the decisive engagements took place on the Western front. In fact, Germany won in the East, and was then defeated in the West.

In the West, the decisive conflict took the form of a war of attrition. The original German war plan was for an offensive across Belgium and France, ending in destruction of the French army within six weeks. Although the French Army suffered its worst losses of the war, it did not collapse, dug in, and was quickly buttressed by a small British expeditionary force.

Britain went to war with a strategy of attrition, which required the immediate raising of a mass army. At first there was no intention to send the new army into battle on the Western front to kill and be killed;

Kitchener planned to wait, perhaps until 1917, while the French and the Russians wore the Germans down, and then intervene with “the last million men” that would decide the war (French 1982; Bourne 2005: 129).

As things turned out, however, before 1914 was over the British Army was fully engaged. The first, second, and third millions went to war long before 1917. Once the front line of trenches and dugouts settled into place, attrition became the norm. Attrition is an ugly word, designed to conceal the attempt to exchange wounds and deaths with the adversary at a favourable rate. Generals on both sides accepted casualties on a scale unthinkable by modern standards in the hope that the enemy’s loss would be greater. On an average day of a war that lasted more than four years, more than 6,000 soldiers died of all nationalities, including 2½ thousand of the Central Powers and 3½ thousand of the Allies (from Uralanis 1971: 209). Britain’s worst day was the first on the Somme, 1 July 1916, with 20,000 killed and missing.

Attrition was a reality; was it pointless? That idea was founded on two rates of exchange: lives for lives, and lives for territory. Lives for territory: In most battles on the western front until 1918 only a few yards changed hands for thousands or tens of thousands of casualties.⁷ Lives for lives: When the Allied armies traded with the enemy, they consistently came off worse. Figure 2 reports British and German casualties in the British sector as monthly averages. It separates the 16 months from Neuve Chapelle to before the Somme, and the 29 months from the Somme to the Armistice. Two things are clear. First British losses rose greatly with the forces deployed. Second, British losses consistently exceeded those of the adversary in the same sector: by nearly two to one in the first period and still by 1.5 to one in the second. (The time profile of French losses is something of a mystery – to me, at least – and are a gap in this paper.)

At that rate, the Allied policy of attrition was irrational. When Falkenhayn launched the battle of Verdun in February 1916, he expected

⁷ What a difference a few yards make! On an average day of World War II the Red Army alone suffered 5,000 deaths in combat or behind the front line (from figures reported by Barber and Harrison 2006: 225). The defeat of Hitler’s Wehrmacht still took almost four years, so that average day came around 1,416 times. Yet Stalin’s generals are mostly remembered as heroes, not donkeys. One reason may be that their men took Vasilevskii, Zhukov, and Kon’ev more than 2,000 kilometres from Stalingrad to Berlin. But an emphasis on movement is to mistake the purpose of combat. Its purpose is not to take territory or even to achieve local breakthroughs but to destroy the enemy’s fighting power. The fact is that fewer lives were spent in the destruction of Germany’s fighting power in World War I than in World War II.

to lose two of his own men for five French soldiers. He would drain France of blood (Herwig 1997: 182). Germany, not Britain, would have the last million.

Did the Allied generals see this? The British commanders' alleged failure to learn is embodied in Alan Clark's (1961) invented epithet: "Lions led by donkeys." Niall Ferguson (1998: 242-281) has also maintained that, given their great advantage over the Central Powers in economic capability, the Allies' failure to win the war more quickly must be explained by disorganization and incompetence: an "advantage squandered."

In fact, commanders on both sides made repeated efforts to escape the logic of attrition. The problem was that every effort seemed to come to nothing. In the category of efforts intended to save lives on the Western front fell the artillery preparations with which Allied commanders preceded major attacks (ineffective more often than not), Churchill's attack on the underbelly of the Central Powers via the Dardanelles (a costly failure), the Allied blockade of Germany (slow acting at best), and German submarine attacks on Allied and neutral shipping (arguably ineffective and certainly counter-productive in bringing America into the war).

If these escapes from attrition led nowhere, it was also dangerous to retreat into passivity. This was the insight of the sociologist Tony Ashworth (1980: 204-226). Left alone, he observed, the soldiers on both sides of the trenches lapsed into "live and let live". Between the great offensives, the commanders could choose to let their men to keep their heads down, or keep them on the alert by means of regular raids across the front line to gather intelligence and take prisoners. Raiding was costly, and increased casualties on both sides, and so stimulated hostile feeling; passivity emphasized the adversaries' shared interest in keeping violence at the level of harmless ritual. Ashworth concluded that the British preference for frequent raiding may explain why the British did not suffer the mutinies that spread through the French army in 1917.

Beyond the tragic loss of life, attrition had a further consequence: it interacted with the rapid expansion of the armies on both sides to lock them into a vicious circle of declining quality. But this was more important for the British than for others.

At the outbreak of war, the British sent a small, well-trained, and experienced army to France. Within a few weeks the survivors had been decimated by losses from their own ranks, and further diluted by the much larger numbers of fresh recruits. The number of survivors from each attack was critically important because the task of further learning and improvement fell to them (Griffith 1996: 3; Corrigan 2003: 274-276). As Figure 3 illustrates, in seven months from Mons to Neuve Chapelle (in

February 1915) the monthly survival probability of British officers and men was more than 90 percent; but in the rapidly growing British army the monthly average share of those that had survived at least one month in France was little more than 60 percent.

The figure plots these two statistics, the survival rates and survivor shares, through the war for the British and German armies. The Germany army was affected by the same logic, but to a much smaller degree, because it entered the war on the Western front already at one third of its wartime maximum, rather than zero in the British case. As can be seen, in every period the British army was disadvantaged. The men's survival rate was lower, and the survivor share was lower. For both armies the gap between the survival and the survivor share tended to close as the size of the army in the field stabilized, but the gap was initially far wider for the British army, and it closed in the final period of the war only at the expense of a declining survival rate.

Based on manpower alone, a strategy of attrition was self-defeating: the Allies could have expected to lose the war. Kitchener's last million (men) turned out to come from America, which no one anticipated in 1914. During the war, however, the solution to attrition presented itself, and the Allies were better able to grasp this solution than the Central Powers. The solution on the Western front would be broken not by manpower but by firepower. Additional firepower was supplied by the Allied economies, which were incomparably richer than those of the Central Powers. First to grasp this was Lloyd George, who echoed Kitchener in 1915 by claiming that Britain would raise the "last million" (pounds) that would win the war (Macdonald 2006: 403).

The balance of economic advantage is easily illustrated. Figure 4 offers a gross comparison of the Allied advantage in prewar GDP and population, and in men mobilized in wartime. It is a snapshot, rather than a moving picture, so it rolls up Russian and American resources into a single number, ignoring the fact that Russia was dropping out as America came in. Still, these were the resources available. Allied GDP was more than three times that of the Central Powers; population more than twice; men mobilized more than one and a half times. Figure 5 shows a similar comparison limited specifically to war production. In tanks (especially), airplanes, machine guns and rifles, the Allies comfortably outproduced the Central Powers; only in artillery did they fall short.

It was in the economic dimension of attrition that the stalemate was broken, leading to Allied victory. Their economic advantage allowed the Allies to compensate for heavy casualties by superior accumulation and diversification of firepower (Prior and Wilson 1992; Strachan 2003). Allied artillery bombardments became effective against opposing trenches when intensified above a calculable threshold. Allied

infantrymen were re-equipped with offensive weapons such as rifle grenades, trench mortars, and portable machine guns, and were supported by growing numbers of airplanes and tanks. Taken together these allowed the infantry to return to the principles of fire-and-movement. What made this possible was the vast dimensions of the Allied production mobilization; and also American reinforcement in 1917 which added a million men (but with little experience), and some elements of firepower (but with little heavy artillery) (War Office 1922: 628).

A vital feature of resource mobilization for the Great War is that it took time on both sides. The importance of time is easily illustrated. Think of the war in two halves, separated in the middle of 1916. This appears natural from a British perspective, because the battle of the Somme, which opened on 1 July 1916, became the iconic engagement of the British Army in the Great War, based on its terrible casualties and minimal gains.

Griffith (1994) called the war after the Somme the “larger second half of the war.”⁸ A surprising aspect is by just how much it was larger than the first half in every dimension. In Figure 2 and 3 we saw already how the numbers of soldiers mounted through the war, so that casualties of the second half in the British sector outweighed those of the first half by an order of magnitude. In the second half of the war the Somme was no longer an exceptional engagement. Using two separate estimates (one official, the other by Griffith), Figure 6 illustrates how the number of division-level battles involving British forces rose rapidly, month after month from 1915 through 1916 and 1917 to the end of the war. By the end of the war, moreover, the resources being deployed in every battle exceeded those of earlier battles by large multiples. This was enabled, in turn, by very large increases in combat stocks. At the time of the Somme offensive, on 9 July 1916, the British Army held more than 6.5 million shells in France and a further 1.1 million at home. By the time of the 1918 spring offensive, on 9 February, the equivalent numbers were 16.5 million and 11.3 million (War Office 1922: 481).

Behind this lay the expansion of production, illustrated in Figure 7. In the 30 months from the Somme to the end of 1918, British industry produced more than twice as many rifles, more than 5 times the number of shells, 9 times the number of machine guns and aircraft, and 33 times the number of tanks compared with the similar period up to the Somme.

⁸ Griffith also noted an “early-war bias” in history and literature, based on the time of “amateurism, blundering, and fumbling” when most of the serious fighting was left to the French, and most of the poetry was written (and perhaps the poets were able to write it because the British sector was quiet most of the time).

Not surprisingly, there was an answering mobilization on the German side, most notably the “Hindenburg plan” of war-industry construction adopted in August 1916; the best account in English, almost half a century old, is still that of Feldman (1966). Our quantitative picture of the German industrial mobilization over time remains lamentably incomplete, however. Figure 8 infers from somewhat incomplete evidence that the monthly rate of explosive powder production in Germany between the Somme and the Armistice was most likely around three times the monthly rate of the period before July 1916 (the horizontal axis of this figure is scaled to match that of Figure 7). Another focus of the Hindenburg plan was on artillery. It is known that over the war period as a whole Germany alone outproduced the Allies in guns (including both Russia and the USA), but we lack the timing of this achievement. Other data reported in the figure put Germany’s submarine construction after the Somme at around twice the rate beforehand. These numbers, while not spectacular, are evidence of German success to compare with that of the Allies.

Three things clearly undermine the German economic record, however. First, the German production programme clearly neglected the airplanes and tanks that could give supporting cover to the attacking infantry and would prove decisive in 1918.

Second, under the Hindenburg plan huge efforts went into building new explosive and gun factories, and these took the German economy into the realm of excessive mobilization. By the middle of 1917, wrote German interior minister Karl Helfferich (cited by Feldman 1966: 273), there were:

everywhere half-finished and finished factories that cannot produce because there is no coal and there are no workers available. Coal and iron were expended for these constructions, and the result is that munitions production would be greater today if no monster programme had been set up but rather production had been demanded according to the capacities of those factories already existing.

Third, the industrial mobilization precipitated the disintegration of the German economy, the collapse of living standards, and an urban famine, the causes of which we will consider further below. As a result Germany could not reap the dividend from the collapse of the Eastern front. By 1918 more than 2 million men available for military service were being held back from the front to work in Germany, alongside thousands of soldiers returned from the front (Bessel 1988: 24-25). By this point the Germany Army had too many guns for the men available to fight, and still not enough food (Herwig 1997: 264, 410). On one hand “the new artillery,

trench mortars, and machine guns rusted on loading docks.” On the other hand, the troops were afflicted by “hunger and thirst,” which drove them through the year’s spring offensive: as they advanced they quickly exhausted their own supplies, which they made up by looting the abundance that they found in Allied stockpiles, but the search for food and wine slowed the advance.

In short attrition worked, not in the generals’ understanding of it, which was indeed narrow-minded and pre-modern (Offer 1989: 352), but in Lloyd George’s concept: When the financial and industrial strength of the central powers was finally exhausted, the Allies still had the last million.

Should the Allied victory have come sooner? Ferguson (1998) argued that, given their material advantage, the Allies should have won in two years. Evidently “the Germans were significantly better at mobilizing their economy for war than the Western powers.” The Allied advantage, he concluded, was squandered.

There is some merit in this line of thinking. The British army of 1914 had to face a new problem – but the problem should not have been thought of as completely new because it had been encountered before in the American Civil War and the Boer War. Could the Allied economic mobilization have benefited by learning from these earlier experiences of mass warfare? Yes (according to Trebilcock 1975). There is clear evidence that the Allied commanders’ learning from experience was slow and unaccountably erratic; should they have been quicker to learn how to use their material advantage without wasteful losses? Again, yes (according to Prior and Wilson 1992; see also Griffith 1994: 192-200). It seems the British Army, at least, lacked the analytical capability to learn systematically from experience. The German Army was a more innovative and effective combat organization. It is true that the British Army, the only one not to be broken by its own offensives, was transformed by 1918, but the transformation could have been quicker and many lives would then have been saved.

It is unreasonable to conclude, however, that the German economy was better organized. On the contrary, the German generals that ran the domestic war effort from 1916 made some terrible mistakes. They ended up with war factories they could not supply or operate, and soldiers and civilians they could not feed. Lacking the advantage of material superiority, these were mistakes they could not afford.

In a paper summarizing our joint work on the subject, however, Broadberry and Harrison (2005b) concluded: “Total war takes time.” Learning from defeat, building and training armies, equipping the army with new weapons, and equipping industry to supply the weapons: these things all took years. Both sides mobilized, but neither side fully

anticipated the additional efforts that would be required to match the other's mobilization. The war eventually drained economies of resources in reverse order of their strength, so Russia first, then Austria and Germany. There was also error and wastage. Clausewitz (1968: 167) would have recognized these as no more than the "friction" that makes war "a resistant medium for every activity." Those who decide over war and peace must anticipate the tragedies, crimes, and mistakes that go with war and also serve, incidentally, to prolong it.

Why, exactly, was the war so bloody? The mass killing of soldiers in the Great War is sometimes ascribed to the advantage of the defenders. At first, attacking infantry could not suppress machine guns and barbed wire. Heavy artillery could do this, but how to do it was poorly understood. The result was a static war in which territory rarely changed hands. The entrenched armies exchanged terrible casualties whenever they left the relative safety (Strachan 2003) of the trenches and dugouts.

This situation began to change late in the war. In 1917/18 the offensive began to regain the advantage. Attacking infantry acquired more versatile weapons and more intensive support. The result was that warfare became mobile again, and once again territory changed hands first this way, then that. As fighting moved into the open, however, casualties rose.

In the next war it was easier to attack than defend. From the start, infantry everywhere engaged in fire-and-movement, supported by aircraft and tanks. The result was mobile warfare on a global scale. It is notable that military casualties of World War II tragically exceeded those of World War I by a large margin. The conclusion is inescapable that mass killing did not arise from being immobilized in trenches or from unimaginative military leaders too stupid to think their way around the obstacles. The casualties that arose when warfare became mobile were even higher. Mass killing was the result of warfare in the era of mass armies, not from the particular form it took in the Great War.

To conclude, in the Great War, despite material advantage, the Allies could not escape the war of attrition. Attrition meant slaughter. Some of this slaughter was the kind of pointless, wasteful killing that happens in every war. The rest of it was the killing demanded by mass warfare. Attrition was not only slaughter, however. There was an economic dimension as well as the military one. It was the combined attrition in both dimensions that defeated the Central Powers.

Myth #3. The food weapon

Food was an essential element of two world wars (Collingham 2011). Moreover, food security was a core element of German war preparations

(Lee 1975). Despite such preparations, many believed, Germany was strangled by the British (later Allied) blockade. The food weapon appeared to have been decisive: Germany was starved into submission.

This belief has historic significance. After the war it helped to sustain the notion (attributed to Germany's wartime leaders Hindenburg and Ludendorff) that Germany remained unbeaten militarily; the army was betrayed when the home front folded. The memory of the blockade also ran deep in the national socialists' project to restructure Europe in Germany's interest by force, as when Hitler (cited by Collingham 2011: 37) remarked in 1939: "I need the Ukraine, so that no one is able to starve us again, like in the last war."

The idea that Germany was starved into defeat is highly plausible, although it would have astonished prewar observers. At the outbreak of war Germany imported 20-25 percent of calories for human consumption; for Britain the equivalent number was 60 percent. It was natural for Angell and Bloch to suppose that in wartime British consumers would suffer first.

In prewar 1913, as Figure 9 suggests, the average British and German diets were quite comparable. In the outcome British food supplies were constrained and their average composition deteriorated somewhat. As the same figure shows, however, the decline of food availability to Germans was much more severe.

In Britain sugar was rationed from the end of 1917 and various meats and fats during 1918. The access of low-income families to food improved somewhat, so there was a degree of equalization (Gazeley and Newall 2013); this seems more likely attributable to the high demand for all kinds of labour than to rationing itself. In Germany price ceilings and rationing were introduced in 1916 for bread and flour, meat, fats, and oil. Food rationing supplied only 50-60 percent of required calories, so everyone had to go to unofficial sources to survive. In this setting the wealthy had the advantage. Based on average height of soldiers born before and during World War I, the war saw both an average decline and an increase in inequality (Blum 2013). Excess mortality among German civilians is estimated at around 750,000, most likely because of hunger and hunger-related disease (Davis and Engerman 2006: 204).

Two factors confound this story. One is simple: Germany went to war with its principal trading partners. Angell and Bloch had argued forcefully that great powers heavily dependent on trade should not attack the sources of their own prosperity. But this is exactly what Germany did (and Shinzo Abe was right to note the fact). The German economy was much more interlinked with its future adversaries than its future allies. In 1913, Britain, France, Italy, and Russia accounted for 36 percent of

prewar German trade (Gartzke and Lupu 2012: 131).⁹ The same figure for Austria-Hungary, Bulgaria, and the Ottoman Empire was only 12 percent. Britain alone accounted for a bigger share of Germany's trade than the latter combined. Russia was a major source of German food and animal fodder. From this perspective, Alan Kramer (2013) has pointed out, much of the "blockade" was no more than an Allied decision not to trade with the enemy. No blockade was necessary to interrupt trade across no man's land.

Germany's loss of trade, however, was not the only supply shock. Prewar plans for wartime autarky assumed that German farmers would have to farm more intensively to feed the nation (Lee 1975), but the war mobilization stripped German farms of young men, horses, and chemicals. Further shocks came from farmers' incentives. At the same time that battlefronts and blockades cut off food imports across open borders, war mobilization restricted the domestic supply of manufactured goods to the rural market. Although food prices soared, farmers retreated to the inside option of self-sufficiency. When civilian officials stepped in to control prices, the attraction of the inside option only increased.

In his economic history of the war Gerd Hardach (1987: 34) asked how economic warfare interacted with Germany's economic mobilization. He conjectured that:

"The tremendous economic decline of the Central Powers between 1914 and 1918 was caused less by the blockade than by the excessive demands made on their economies by the war."

Hardach did not suggest how to implement this comparison, but there is a simple way to consider its possible validity in the German market for food calories. Start from the fact that before the war Germany imported up to one quarter of calories for human consumption. Note that there were two welfare losses, one arising from the trade shock affecting the quarter that was imported and the other arising from the mobilization shock affecting the three quarters produced at home. Is it reasonable to suppose that the loss from the shock affecting the one quarter was smaller than the shock affecting the three quarters?

Figure 10 separates the wartime increases in the price of calories that are attributable to the curtailment of foreign trade and to the internal mobilization. The resulting welfare losses correspond to two triangles. While the height of each triangle cannot be ascertained, its base is known. The welfare loss from the blockade (ABC) was proportional to prewar

⁹ Ferguson (1998: 253) gives a higher figure for the share of Germany's prewar imports from wartime adversaries: 48 per cent.

trade, whereas the loss from mobilization (OCD) was proportional to prewar consumption. Since trade in calories was at most one quarter of prewar consumption, and not all trade was cut off, it follows that the welfare loss from mobilization was likely to have exceeded the loss from the blockade by a multiple.¹⁰

We do not count the welfare loss arising from price ceilings and rationing on the grounds that these were largely ineffective. On the evidence of Blum (2013) they redistributed welfare adversely, but are best ignored for present purposes.

Finally, it is worth noting, the blockade of Germany continued through the armistice to Germany's acceptance of the Treaty of Versailles in June 1919 and, extended to the Baltic, became even tighter. With the fighting over and German soil under German control, trade sanctions were now the Allies' only coercive lever to ensure that Germany came to terms. The postwar blockade was bitterly unpopular in Germany and its continuation became a source of lasting resentment. Yet, as Offer (1989: 388-391) reports, prices did not rise and rations did not fall. The most obvious explanation is that the end of military mobilization allowed some dishoarding.

It was both plausible and convenient for politicians of the war period and later to blame German's wartime economic difficulties on the Allied blockade. This must be largely a myth. The blockade was not the only factor in the disruption of German trade. The disruption of trade was not the only factor that disrupted the German internal market for food. Arguably, the military mobilization of agricultural resources into war, and the economic mobilization of industry, had a larger disruptive effect than the shock from foreign trade.

Myth #4. Folly at Versailles

The Treaty of Versailles of 1919 and the Reparations Commission that it established imposed heavy burdens on Germany. Having witnessed the negotiations Keynes (1920) strongly criticized the process on two grounds: it violated the terms of the Armistice (which limited German reparations to making good civilian damages arising from the war) and the resulting burden on the German economy was intolerable and would be counterproductive.

Keynes may well have been right; the reparations burden was evidently intolerable since successive German governments did not tolerate it. But what in fact were the consequences?

¹⁰ This line of argument has a precedent in Williamson (1968: 21-23).

Many serious consequences have been ascribed to the indemnity imposed on Germany in 1921. According to the financier and philanthropist George Soros (2014), for example, to the French “insistence on reparations led to the rise of Hitler.” There are present-day implications for, Soros continues, “Angela Merkel’s [similar] policies are giving rise to extremist movements in the rest of Europe.”

The German hyperinflation of 1923 has also been attributed to reparations. According to Brookings vice-president (formerly a Turkish government minister and UN administrator) Kemal Derviş (2014), “had Germany’s hyperinflation of the 1920’s – a direct result of the war – been avoided, Hitler may well never have risen to power.”

The burden of German reparations determined in 1921 was certainly heavy and probably unwisely so. The evidence is plain to see in the better outcome of 1945, when the victors based retribution on evidence of personal culpability, not collective responsibility. Still, the mistakes of 1919 to 1921 should be kept in perspective.

In 1921 the Reparations Commission issued A, B, and C bonds, of which the C bonds were designed symbolically to appease various Allied constituencies; only the A and B bonds were held to be within Germany’s ability to pay. The A and B bonds together have been valued at about one year’s prewar German GDP (Ritschl 2005: 68-70). This was comparable to the French indemnities of 1815 and 1871 (White 2001). Taking into account Germany’s Treaty losses of territory and capacity, and adding non-reparations obligations to the Allies, Webb (1986) estimates the current burden at around 10 percent of Germany’s postwar GDP. Alternatively, Ritschl adds the A and B bonds to Germany’s existing public debt to find a total of around 1.5 times Germany’s GDP, which looks heavy but not overwhelming when compared with the sovereign debt liabilities of France and the United Kingdom in 1921 (2.6 and 1.5 times GDP respectively).¹¹

Germany’s centre-left government did not want to pay reparations out of taxes. The problem was not the burden of attempted compliance; the problem was that Germany did not comply. The clash with the Allies led, in early 1923, to the French occupation of the Ruhr in an attempt to extract reparations in kind by compulsion. The German government wrote another blank cheque, this time to fund the efforts of the local population to frustrate collection. As Webb (1986) has described, the anticipation of unbounded future fiscal deficits triggered hyperinflation.

¹¹ Data by Carmen M. Reinhart and Kenneth S. Rogoff at <http://www.reinhartandrogoff.com/data/> (accessed 23 February 2014).

Notably, however, there cannot have been any unique channel from German reparations to hyperinflation because the hyperinflation of the time was not unique to Germany. As Keynes (1920: 223) presciently remarked, “The inflationism of the currency systems of Europe has proceeded to extraordinary lengths. The various belligerent Governments, unable, or too timid or too short-sighted to secure from loans or taxes the resources they required, have printed notes for the balance.” Hyperinflation was a regional phenomenon, spreading beyond Germany through Russia, Poland, the Baltic, Austria, and Hungary (Bresciani-Turroni 1937; Dornbusch 1991; Harrison and Markevich forthcoming). Throughout central and eastern Europe, fragile governments presiding over newly constituted nations spent beyond their means, and compliant central bankers monetized the resulting debts.

To generalize, every case of hyperinflationary meltdown of that time began from a civil war of attrition (in the game-theory political-economy sense of Alesina and Drazen 1991) among domestic interests that prefer to postpone stabilization in the hope of shifting the burdens of stabilization disproportionately onto others. The only aspect unique to Germany was the foreign dimension: as external bondholders the Allies had a hand in the German game.

The story that links reparations to hyperinflation does not flow, therefore, from the consequences of Germany’s meeting an intolerable obligation; rather, all the effort on the German side went into avoidance (Marks 1978). A new war of attrition followed between the German and Allied governments, and the hyperinflation was a predictable consequence, triggered when holders of Mark-denominated government liabilities began to anticipate unbounded future government deficits.

After stabilization came the first of many reschedulings. There was also a peace dividend. Hantke and Spoerer (2010) note something that Keynes and others entirely neglected: the Treaty provisions that limited German interwar rearmament gave Germany fiscal breathing space. Restrictions on the size and equipment of Germany’s armed forces reduced the burden of military spending. In equilibrium they probably reduced military spending across Europe. To estimate the peace dividend requires a counterfactual hypothesis which is not straightforward, but in Hantke and Spoerer’s most conservative scenario it was large enough to cover at least 90 per cent of the reparations actually paid in the years from 1924 to 1929.

If the economic implications of the Treaty have been oversold, the same is true of its political consequences. The electoral history of the Weimar Republic may conveniently be broken into three phases: 1919 to 1924 (with four parliamentary elections), a period that included the

imposition of the Treaty of Versailles, the announcement of reparations, the hyperinflation, and the first rescheduling of reparations under the Dawes Plan; 1925 to 1929 (including the election of May 1928), a period of stability that ended with the Great Depression and another rescheduling of reparations under the Young Plan; and 1930 to 1933 (with four more elections) ending in the Hitler dictatorship.

Figure 11 shows the evolving pattern of proportional representation in the German parliament. In the first phase the parties of the centre and left lost support dramatically, their vote share falling by 30 percent between February 1919 and June 1920. The votes were picked up on both far left and right by parties opposed to the new republic, some because they wanted the monarchy back, others because they supported Soviet revolution. As yet, neither the Treaty nor the reparations were known quantities. In the May 1924 elections, in the wake of the hyperinflation, the national socialists put in a first showing, winning nearly 7 per cent of the seats. But at the same support for the centre-left was recovering. At the second 1924 election the extremists' vote collapsed and that of the centre-left was further consolidated.

In May 1928, three and a half years later, despite a background of continued agitation on the reparations issue, the grip of the centre-left was still stronger; the communists gained little ground and support for the national socialists remained below 3 percent.

It was not until the hammer blow of the Great Depression that conditions were laid for violent polarization and the breakthrough of the radical right to national significance and power (Van Riel and Schram 1993; King et al. 2008).

In other words, from the Dawes Plan to the Great Depression the German electorate showed a substantial and growing majority for constitutional rule by the "Weimar parties." Were it not for the Great Depression, Hitler and his infamous co-conspirators would have lived to the 1960s and died in obscurity in their beds.

In setting out to punish Germany for the war the authors of the Treaty of Versailles lacked wisdom and enlightened self-interest. Contemporary critics of the Treaty in Germany and abroad made the most of this. But it is wrong to look here for the causes of the Hitler dictatorship and World War II. It was in the middle of defeat that the German high command launched the Fatherland Party demanding peace with annexations East and West (Howard 2002: 98), but it was still September 1918, before the Armistice and long before the Peace. And it was in the expectation of an early victory that Bethmann Holweg proposed the "September programme" to restructure Europe as a German empire (Hastings 2013: 100), in September 1914 when the war going well, not 1919 when Germany had been saddled with "war guilt" and reparations, and not

1924 when hyperinflation had done its worst. It was the end of the war, not the terms of the peace, that Germany's far right would not accept.

The most that can be said against the Treaty of Versailles is that it did not help. It was bad diplomacy and, given what diplomacy is supposed to achieve, that is bad enough.

Concluding remarks

We have reviewed four widespread narratives of the Great War. Each is at the crossroads of economics, politics, and strategy. Myths are not necessarily baseless, and we have tried to distinguish truthful elements, but their part in the overall story was often relatively small.

According to one myth the Great War was an inadvertent conflict; it transpired without intention or calculation. In fact, the decisions that led to the Great War were calculated with considerable foresight of the wider costs and consequences. The spirit of those that started the war is usefully defined as "rational pessimism."

Another myth considers that most fighting on the Western front took the form of needless attrition. There was attrition, and this was a deliberate strategy on both sides. From the Allied standpoint this looks scarcely rational because the rate of exchange of casualties was always adverse. The missing dimension was economic: the "last million" was measured in firepower as well as manpower. The Allies outproduced the Central Powers in firepower (and everything else) and this was the basis of victory. But there was no escape from attrition, and no other way of winning the war but by the sacrifice of millions of lives.

A myth of historic significance is that the Allies used food as a weapon to starve Germany out of the war. While German civilians suffered greatly, in part because of the Allied blockade hurt, it seems likely that German actions hurt more. These included the decision to attack Germany's main trading partners, the impact of Germany's economic mobilization on the internal food market, and the overblown scale of the Hindenburg plan.

A final myth is that the Treaty of Versailles, which concluded World War I, laid the foundations for World War II. Many aspects of the Treaty of Versailles would seem to fail the test of enlightened self-interest on the Allied side. Despite this, the electoral impact of the Treaty, the reparations, and the hyperinflation of 1923 were short lived. In the mid-1920s and as late as the Reichstag elections of 1928, German society was set on a course to political moderation and stability.

The Great Depression, which struck Germany in 1929, then brought back to life the dark forces of radical nationalism that led to World War II. These forces were engendered long before World War I. Let loose by the war, they were caged by the German defeat and Weimar democracy put

them into a coma. The Treaty of Versailles, foolish or not, set the terms of the peace. They stirred, but slept on. It was the Great Depression that reawakened them so that they sprang back to life.

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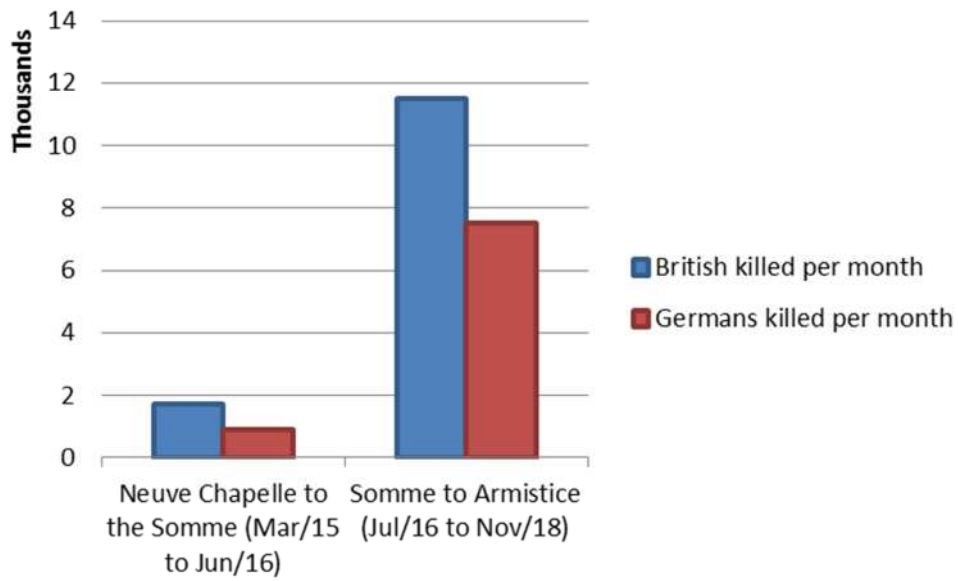
Figures

Figure 1. "Well, if you knows of a better 'ole, go to it."



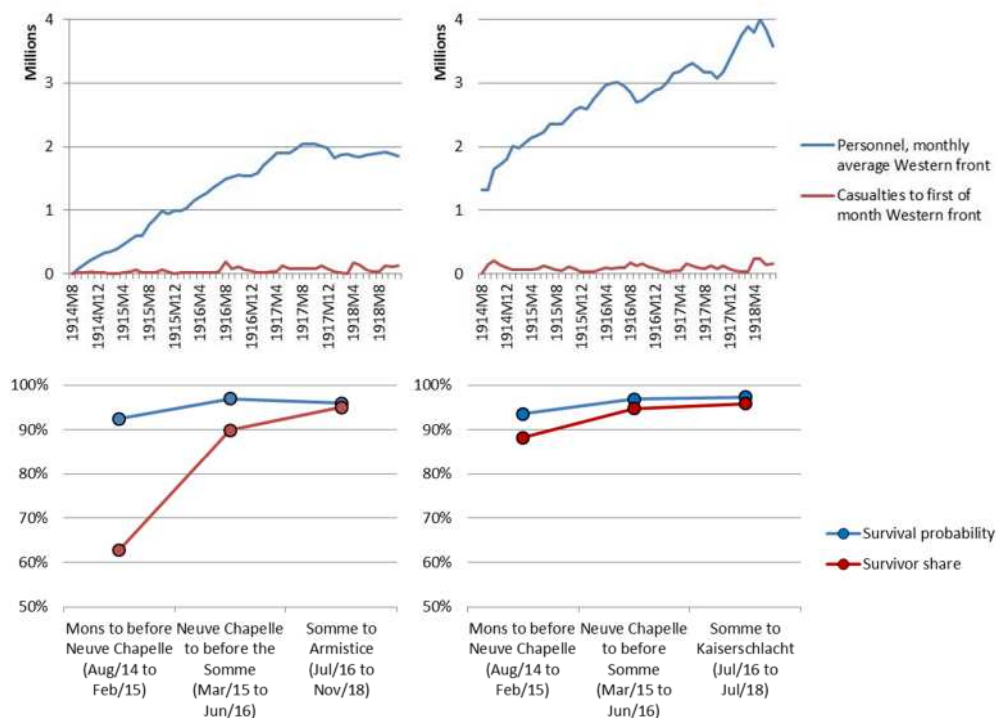
Source: Bairnsfather (1917). Thanks to Major and Mrs Holt, Bairnsfather's biographers, for permission to reproduce this image.

Figure 2. British and German military deaths on the Western front, British sector, monthly average, before and after the Somme



Source: Calculated from War Office (1922: 358-362).

Figure 3. Total British and German military personnel and monthly casualties, survival probabilities, and survivor shares on the Western front



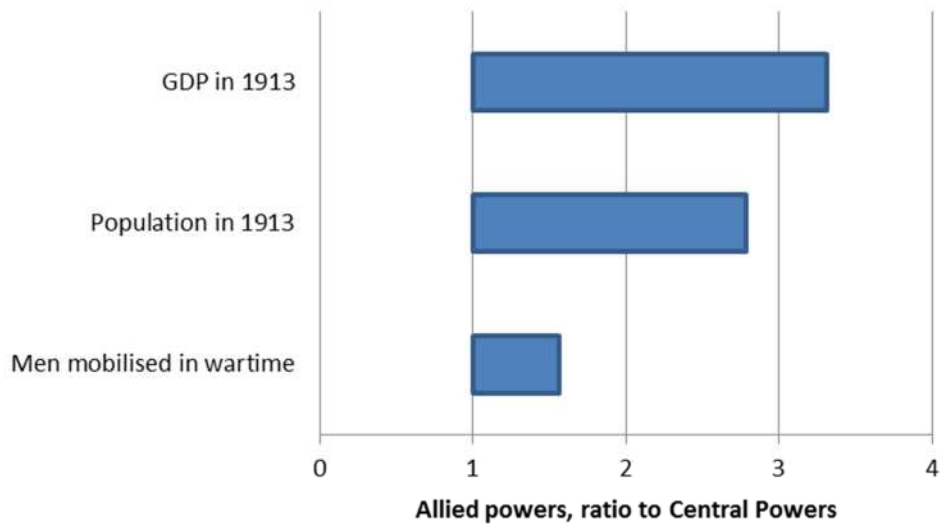
Sources: British data are from War Office (1922, pp. 64(iii) and 253-271); German data are from McRandle and Quirk (2006, pp. 682-685 and 696-696). All figures relate to the first of the month. Numbers of British officers and other ranks present on the first of September through November 1914 are found by linear interpolation on the figure for 1 December 1914 and zero for 1 August; the same procedure is used for 1 May and 1 July 1916. German numbers for 1 August 1914 are found by backward extrapolation from September and October.

For both armies, casualties are killed, died, wounded and sick, missing, and prisoners.

The *survival probability* is the ratio of the actual number present on the first of the current month to the gross number, where the latter is defined as the number present on the first of the previous month plus casualties over the month. A simplifying assumption is that men arriving at the front within a given month did not become casualties until the next month or later.

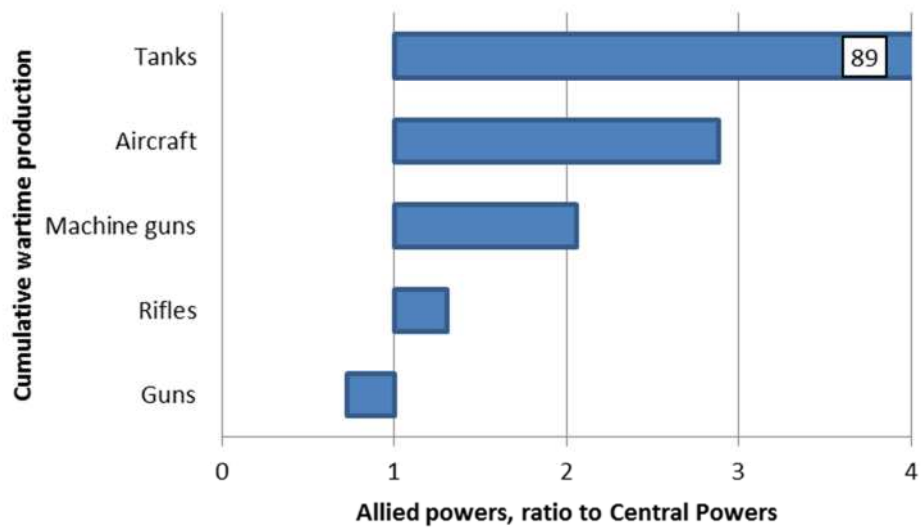
The *survivor share* is the ratio of the actual number present on the first of the previous month to the gross number on the first of the current month, using the same definition of gross number and the same assumption as for survival probabilities.

Figure 4. The Allied material advantage: Prewar GDP and population and wartime military mobilization



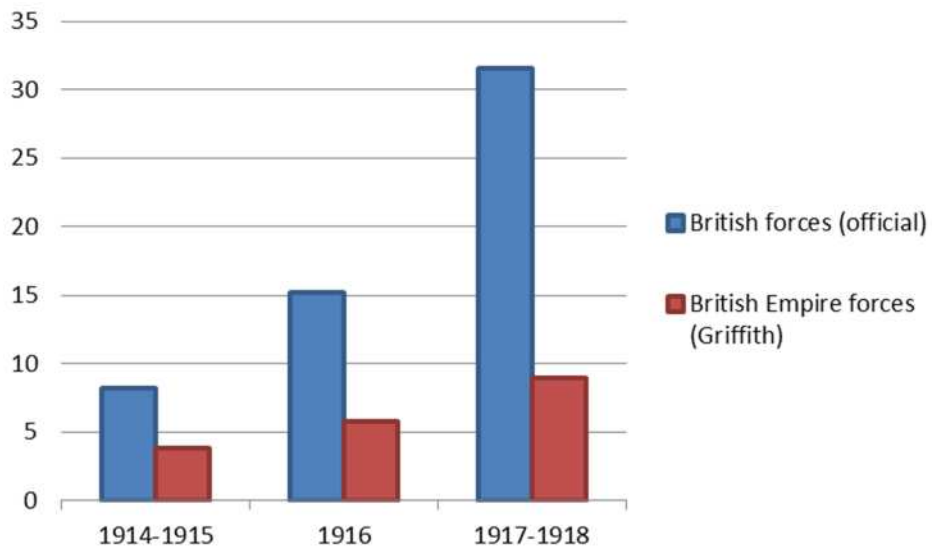
Sources: Prewar GDPs and populations from Broadberry and Harrison (2005, pp. 7-8 and 10); men mobilized from Uralnis (1971: 209).

Figure 5. The Allied material advantage: cumulative wartime production



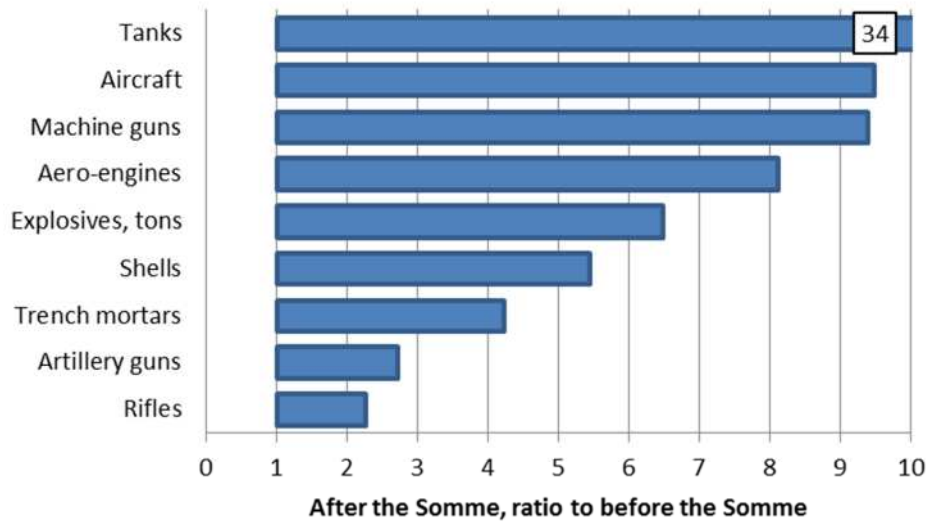
Sources: War production from Adelman (1988: 45), except UK from Broadberry and Howlett (2005: 212) and Austria-Hungary from Schulze (2005: 88).

Figure 6. Number of divisional battles on fought by British and Empire forces on the Western front



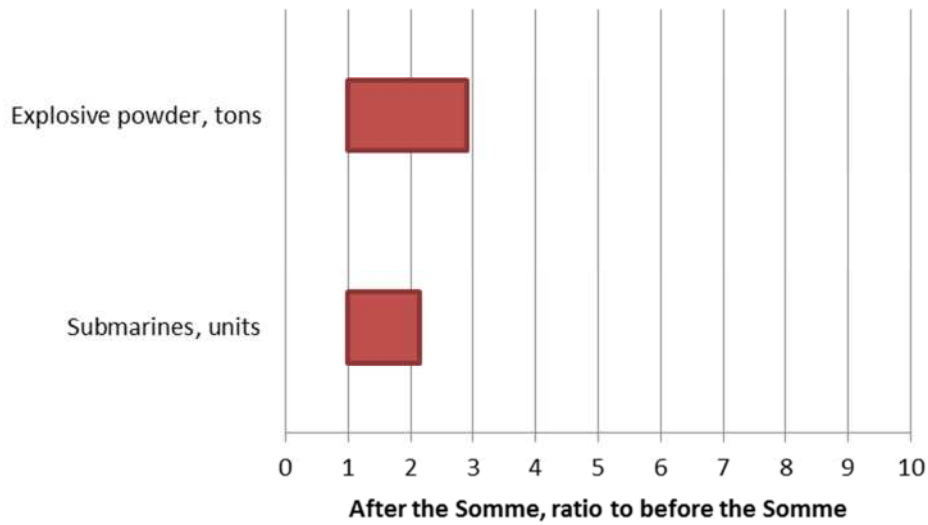
Source: Totals are given by Griffith (1994: 18). Monthly averages are calculated from the totals. Griffith describes the official figures (covering British forces only) as "more exhaustive (or pedantic, if you will)."

Figure 7. British war production after the Somme, monthly average, ratio to before the Somme



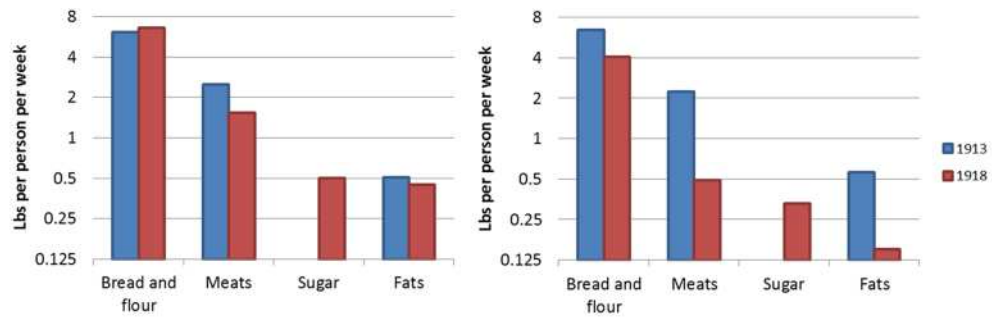
Source: Annual data from Broadberry and Howlett (2005: 212). Figures for 1916 are distributed equally between the first and second halves of the year.

Figure 8. German war production after the Somme, monthly average, ratio to before the Somme



Sources: Explosive powder: Feldman (1966: 152-3, 268, 272, 494) gives figures for December 1915 (4,000 tons), July 1916 (6,000 tons), February 1917 (6,400 tons), April 1917 (8,000 tons), May 1917 (9,200 tons), and April 1918 (12,000 tons). I assume that these figures were selected because they are salient, and I interpolate linearly between them. I take 1,000 tons as the monthly figure for August 1914, and I assume that a monthly output of 12,000 tons (the target of the Hindenburg plan) was maintained through November 1918. Submarines: Davis and Engerman (2006: 232-233).

Figure 9. British and German food consumption, pounds per head per week, 1913 and 1918



Source: Davis and Engerman (2006: 210).

Figure 10. The Hardach conjecture: The German market for calories

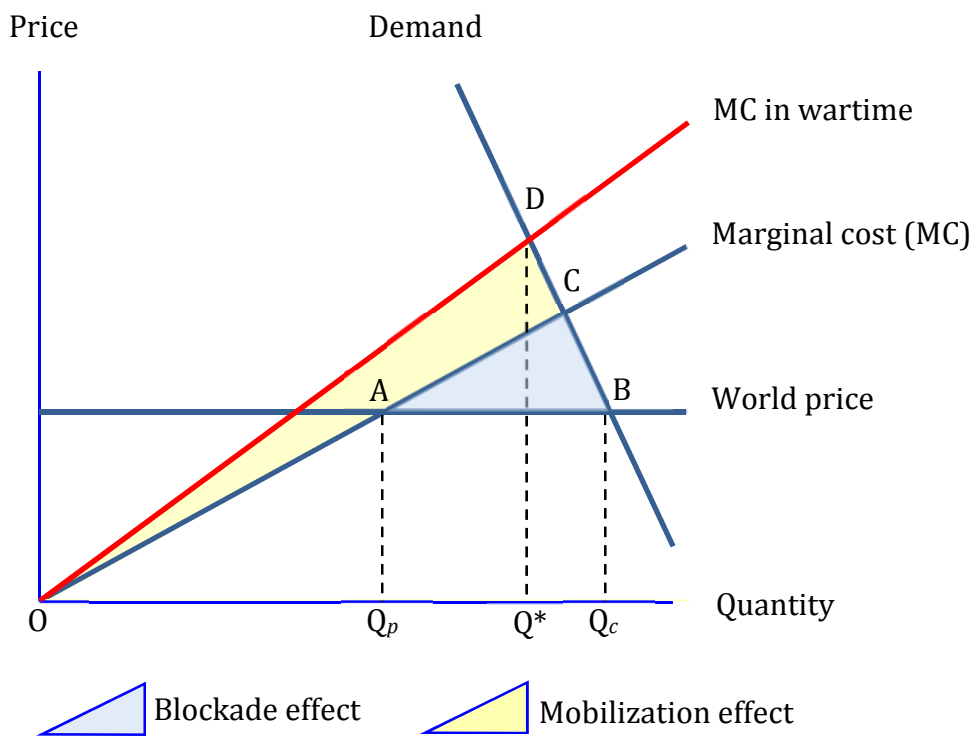
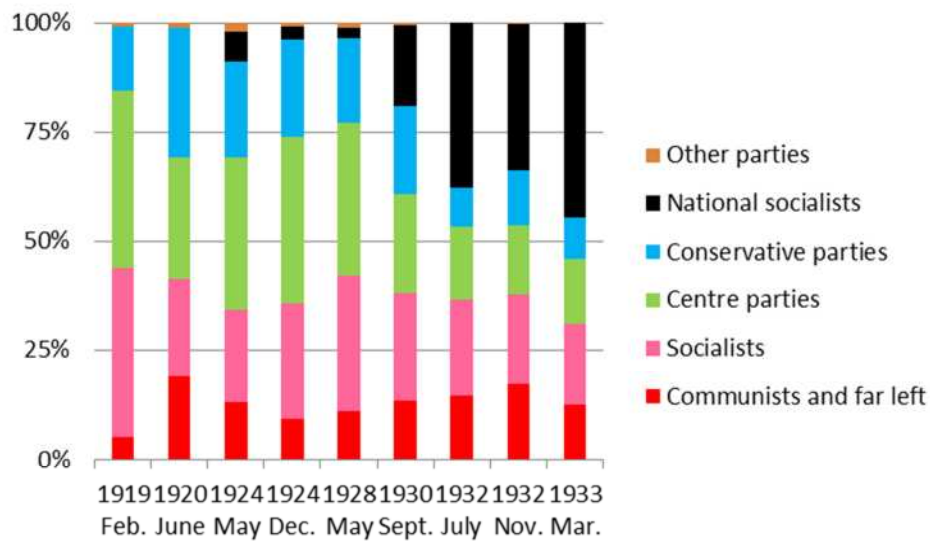


Figure 11. Elections to the Reichstag, February 1919 to March 1933



Sources: 1920 to 1933 (Berghahn 1982: 284-285), supplemented by figures for February 1919 from “German Federal Election, 1919” at http://en.wikipedia.org/wiki/German_federal_election_1919 (accessed 23 February 2014). The German People’s Party (DVP) under Stresemann is allocated to the centre from 1923 to 1929, and to the conservative parties otherwise.