

Industrial policy for defence: Lessons from history

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Overview

- Being underprepared for war is dangerous. The supply needs of defence and war require the help of industrial policy to bring about the changes in the structure of our economy that we need for the sake of security.
- The twentieth century has left us ten lessons for industrial policy for war. Industrial policy has two rationales. Fixed capital for defence will be underprovided without public funding ([Lesson 1](#)). Mobilization requires speed and will be slowed by numerous frictions in the absence of policy interventions ([Lesson 2](#)).
- Among further insights, most war plans were useless, but war planning was nonetheless essential: the productive aspect was the process, more than any paper plan that resulted ([Lesson 3](#)). Victory at any cost is a good slogan but, in a long war, costs mattered and it was important to mobilize efficiently ([Lesson 4](#)). Prices mattered too; the impulse to control prices could impede adaptation to changing shortages ([Lesson 5](#)). Autarky was a delusion: trying to achieve it would incur very high costs ([Lesson 6](#)). Once a war of attrition began, there was no technological escape from it based on miracle weapons ([Lesson 7](#)). Incompetence and self-dealing were luxury goods; only wealthy countries could afford to waste resources on incompetence or rent seeking ([Lesson 8](#)). Getting policy right was all very well, but GDP also mattered and could be the decisive factor ([Lesson 9](#)).
- History suggests a caution: war was not the only risk. Industrial policy for war could store up obstacles to postwar prosperity ([Lesson 10](#)). Still, that would come later; today's problem was – and is – to be ready for war if it should come tomorrow.

Keywords: attrition, autarky, defence, economic sustainability, friction, industrial policy, mobilization, planning, priorities, public/private partnership, war economy, world wars

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Introduction: Deter and defend

Industrial policy is “government action expected to increase a strategic business activity”; “strategic” means the government has decided it is more important than others (Fernandes and Reed, 2026: 1). Industrial policy for war means increasing the activities that sustain military deterrence and defence.¹ Industrial policy for war does not presume an intention to make war or commit acts of aggression. It does presume an intention to be ready for war and, if necessary, capable of waging war sustainably over a period of time. This has economic implications that make the case for industrial policy for war.

A good reason to be ready for war is the hope of deterring aggression, so that war preparations need never be put into action. As history shows, however, it is not enough to threaten an aggressor with severe consequences, without the capacity to act.

After World War I, most Europeans and Americans were war-weary and inclined to pacifism. Defence spending everywhere fell back to low levels. When dictators came to power in Russia, Italy, Germany, and Japan, they were able to suppress pacifist voices and incite militarism. By contrast, democratic governments were constrained by popular opinion. There was little public appetite for rearmament and mobilization of industry. While informed observers could see the threat of war returning long before the median voter, public discussion of war contingencies could be met by suspicion and hostility.

In the 1930s, popular reluctance to prepare for war in peacetime tied one hand of the democracies’ leaders in the League of Nations as they faced Axis aggression. When Japan invaded Manchuria, or when Italy invaded Ethiopia, they threatened sanctions but were unprepared to take military action if sanctions failed to work (Bertazzini, Elooranta, and Kuorelahti, 2026; Okazaki and Okubo, 2026). Seeing this, the Axis powers understood the hidden message: sanctions just signalled the military weakness of those who were trying to keep them in their place. This encouraged their war plans. The pattern was repeated more recently when Russia annexed Crimea and invaded Ukraine.

When deterrence failed, defence was the only option. Once war was imposed on them, British and American voters became ready to shoulder the burdens of a lengthy fight-back. It would have cost them far less if only the League of Nations could have deterred Axis aggression beforehand with a show of force. But until war came to their door, then as now, voters were reluctant to look ahead and internalize the predictable costs of the war that eventually transpired.

The French and British leaders of the 1930s are blamed today for appeasement, and they did fail to prevent war, but they did more to prepare for war than this would suggest. They understood that appeasement might fail and they looked for insurance. In

¹ In March 2025 Fernandes and Reed (2026: 2-3) surveyed World Bank economists working with national governments around the world on their clients’ interest in industrial policy. Only 3 per cent reported interest in industrial policy for national security, zero for supply chain resilience, and zero for geopolitical concerns. Reflecting this, discussion of industrial policy for national security and resilience occupies only five of the 276 pages of their report.

Britain the “Ten-Year Rule” (that no major war was to be expected within ten years) was abandoned in 1932. Air and naval rearmament began in earnest in 1935. By 1938, the European democracies had already committed a share of national resources to defence that was substantial by peacetime standards (Table 1). They still lagged Germany and Japan, and their preparations were too late to form a credible deterrent to Axis expansion. But they did contribute substantially to the readiness of the democracies for war in 1939.

Today, by contrast, most European countries have neglected their war readiness. If we set aside Ukraine, which is already fighting against Russian aggression, European democracies remain far short of the level of sacrifice for war readiness made by their counterparts before World War II. This is also shown in Table 1. When we are all threatened by an aggressive power, this neglect is dangerous. It undermines deterrence and can work to bring aggression forward.

Table 1: Military outlays in 1938 and 2025, per cent of national income: selected countries

Country	1938	2025
Japan	23.5	1.4
Germany	18.9	2.3
Russia/Soviet Union	9.9	*7.5
United Kingdom	7.4	2.4
Italy	6.4	1.9
United States	1.5	3.1
Ukraine	..	*40.0
China	..	*1.7

Notes: Countries are ranked in order of the share of military expenditures in 1938. Figures marked * are estimated.

Sources: 1938, Japan, defence outlays, per cent of gross domestic product, from Hara (1998: 257). Germany, military outlays, per cent of net national product at factor cost, from Abelshauser (1998: 138). Soviet Union, defence outlays, per cent of gross domestic product in 1937 factor costs, obtained by linear interpolation between figures for 1937 and 1940 from Bergson (1961: 237). United Kingdom, war outlays, percent of net national expenditure from Broadberry and Howlett (1998: 47). Italy, military outlays, per cent of gross domestic product, calculated from figures given by Zamagni for the financial year 1938/39 (1998: 198-199). United States, Army and Navy outlays, per cent of gross national product, from Rockoff (1998: 89). 2025, all figures, percent of gross domestic, product from Liang et al. (2026).

Ten lessons from history

If we should be more ready for war than we are, why does that need industrial policy? On the face of it, the structural changes demanded by war ought to come about without any special intervention. Public funding creates a market for weapons, military equipment, and all the other elements of a soldier’s kit. Why doesn’t the profit motive work to build the factories, hire the workers, and redirect the vast assortment of specialized components and materials into defence production, without the intervention of public policy to help things along?

Industrial policy for war has twin motivations. There are well understood obstacles to building the tangible fixed capital that can equip the armed forces for war. Industrial policy has been wielded to secure the cooperation of the industries supplying war

goods in overcoming the obstacles (Lesson 1). The other is that the transition to war is unusually vulnerable to disruption and disorder. Industrial policy has proved effective in smoothing the transition by creating a form of intangible capital in advance: the contingency plans and protocols that can coordinate industrial mobilization and protect the economy's supply chains if war should come (Lesson 2).

Economists usually motivate industrial policy for economic development in terms of some market failure that requires correction. The home economy might have some latent comparative advantage, for example, an export industry that has been suppressed by under-provision of skills or a blockage of market access. Industrial policy can support the industry, allowing it to flourish as it should.

Industrial policy for war is different. Supply chains are of concern for war readiness because they are exposed, not to foreign competition (a market activity), but to foreign disruption (by military means). Thus, industrial policy for war does not care about comparative advantage. It cares about building fighting power on a sustainable basis while meeting society's needs to the extent that the situation allows. It follows that the test of industrial policy is not whether it promotes national prosperity and welfare, but whether it protects the nation against hostile threats or acts.

Despite these important differences, industrial policy for war is like industrial policy for development in two respects. One is selectivity: it promotes some activities, but this must be at the expense of others. Another is territoriality: where production takes place matters for national security as much as it does for national economic development.

Lesson 1. Fixed capital for defence needs public funding

Building industrial capacity for defence is risky because it may be used only for a short time or never used. For that reason, private firms have often been rationally reluctant to engage with defence-related projects. Overcoming that reluctance is a proper task of industrial policy for war. It usually requires the government to socialize the risks through some form of co-financing or public/private partnership (Rogerson, 1994).

War reconfigures the economy's need for fixed capital. Structures and equipment that supply civilian goods must be converted or rebuilt to supply weapons and military equipment and the associated raw materials and specialized components. The problem for investors is uncertainty. War is not a permanent state – it can last for years, but it can also be over in months or even a week. For today's capital projects to be profitable, they must be assured of demands that are pitched years into the future. But future demands for war goods depend entirely on how the government expects the geopolitical situation to evolve, which can change overnight. If the situation were to suddenly change for the better, the capacities built to meet today's defence needs could be redundant tomorrow. Because of this, in a *laissez-faire* economy, private corporations

would have little private incentive to bear the costs of investing today in the capacities the government desires for security or resilience tomorrow.

Various solutions were found in the two world wars, ranging from “shadow” factories (in the UK) and “government owned, privately operated” facilities (in the USA) to public enterprise (not only in the Soviet Union but also in Germany in the form of the Reichswerke Hermann Göring). A modern equivalent to these is capacity contracts under which the government pays defence contractors and subcontractors a retention fee to maintain surplus capacities for mass production over and above the level required for peacetime use (Carril, 2026).

Failure to grasp the nettle at the right time had serious consequences for Germany in World War I. From the first months of World War I, it was apparent that the capacity of Germany’s armament industries was insufficient. But “the prospect of converting to war production for a short war was not regarded as a profitable venture” (Feldman, 1966: 56; see also Jopp, 2018). Germany’s military leaders took two years to acknowledge the problem. In August 1916 they launched the Hindenburg Programme, a plan for new factories that would double the output of explosives and some armaments and treble the output of others by May 1917. The plan was overambitious, however, given Germany’s aggregate constraints, and too late, given the stage of the war. With other current claims on resources, the available labour, coal, steel, and means of transport were not enough to complete the programme on time. It increased the burden of consumption sacrifices without increasing German fighting power as intended, because some projects that were begun could not be completed in time to avoid defeat (Feldman, 1966: 273).

Lesson 2. The enemy of mobilization is friction

War sets everything in motion, a process that we call mobilization. Mobilization has a natural enemy, friction. Clausewitz imagined friction as all the little things that go wrong for the army when war is translated from a paper plan to reality (Clausewitz, 1968: 1967). In the economy, friction covers multiple failures of adaptation, foresight, and coordination. Therefore, overcoming friction is also a proper rationale for industrial policy.

In industrial mobilization, friction has several aspects.

- Material friction is reflected in the costs of abruptly shifting resources into new uses in ways that violate peacetime norms and contracts.
- Psychological friction arises from fear, mistrust, division, loss, and fatigue induced by the unfamiliar setting of war.
- Overshooting friction arises from uncoordinated decisions. When structural alterations are sudden, large, and many, those at a distance from the first-order changes may be unable to predict when and where they will ultimately be needed. As World War I showed, the armed forces may suddenly expand beyond the limit that the economy can support. In the economy, labour and capital may end up in the wrong

place, increasing imbalances. The time horizon may not be long enough for correction.

- Political friction arises when surging demand for war goods combines with short-run supply constraints to give rise to large changes in relative prices and wages. Temporary war profits plus government underwriting might or might not suffice to draw additional capital into war production within the time horizon allowed by the enemy. While workers were putting on uniform to risk their lives in battle, it was socially unacceptable for private defence firms to make riskless profits. Suspicions of war profiteering in many countries were deeply divisive during World War I and after (in the case of Germany see Kocka, 1984: 26-29 and, in contrast, Jopp, 2018).
- External friction can be induced by the defection of foreign trading partners and by hostile acts of psychological and economic warfare, ranging from divisive rumours to sabotage, blockade, and bombardment.

The frictions of war mobilization were a surprise for the great powers as they went to war in 1914. They all sent their armies into war with combat stocks intended to last a few weeks or months. First to be depleted were stocks of ammunition, used up at much higher rates than expected, far outpacing the capacity of industry to replace them. After that, everyone needed much larger armies, which required more of everything, so the scope of shortages rapidly extended from ammunition to guns, explosives, horses, uniforms, medical supplies, food rations, and so on. This succinct summary of what happened in the summer of 1917 as the United States entered the war simply repeats what happened everywhere in Europe in the autumn of 1914:

Manufacturers, under a cross-fire of conflicting demands, attempted to please too many procuring agencies, at home and abroad, and became hopelessly overloaded. Promises were given which were impossible of fulfillment. Some of the prime contractors sublet the major portion of their contracts. In reality they became a secondary line of governmental procuring agencies, extending the confusion (quoted by Smith, 1991: 33).

As the war industries descended into chaos, surges of army recruitment drew workers away from industry and agriculture. Skilled machine builders and coal miners were typically first in line to respond to the call to arms: this further undermined war production.

Meanwhile, shortages extended beyond direct demands for munitions and other war goods to “war materials”, a concept that came into common use in 1915 to cover metals, chemicals, fuels, and fibres. There was a competitive scramble for resources, with public money borrowed or printed to throw at one shortage after another, leading to sharply rising prices and costs. To suppress both inflation and non-war uses of scarce resources, governments stepped in to control war materials and enforce wartime priorities.

The first such intervention came as early as August 1914, when the Prussian War Ministry established a War Materials Department (KRA), headed by Walther Rathenau, then a director of AEG. The KRA was authorized to monopolize the supply of materi-

als important to the war effort and ration them exclusively to firms supplying fighting power. These functions were exercised by specialized subsidiary bodies formed under the KRA by personnel drawn from the main companies in the market – a form of public/private partnership (Feldman, 1966: 45-50).

Shortages were not limited to munitions and war materials. Eventually, excess demand overtook the available supplies of foodstuffs, capital goods (machinery and construction materials), and labour (for fighting services, war production, and capital construction). For the first time in history, it turned out to be easy to assemble an army too large to be fed, clothed, fuelled, and equipped by a fully employed economy.

All these frictions pushed governments not to leave wartime structural transformation to unregulated markets. Instead, they learned to plan the transition to a war economy beforehand, and in wartime to manage the economy by imposing a state monopoly of war-related commodities, to be rationed to industrial users and household consumers at fixed prices on the basis of wartime necessity. For this reason, the language of industrial policy for war has more often been of quantities, targets, priorities, and deadlines than of cost-benefit ratios or discounted present values.²

Lesson 3. Plans are useless, planning is essential

Most war plans have been wrong in the sense that the scenarios on which they were based turned out to be misconceived. Nonetheless, the planning process was valuable (an insight widely attributed to Dwight Eisenhower, the Allied Supreme Commander on D-Day, later US President). This was because planning for war disseminated the underlying habits and practices of thinking through the various contingencies of the economy's transition to war.

The mismatch of plans to realities is easy to illustrate. The naval confrontation with Britain that dominated German strategy over the two decades up to 1912 was not the war that Germany actually fought in 1914. The land invasion that Germany launched against France and Belgium did not allow the British to follow their own war plan, which was to blockade Germany's overseas trade, leaving the French and Russian armies to fight Germany on land. Instead, Britain had to intervene in the war on the continent within weeks as the German Army swept towards the Marne.

Two decades later, the Axis leaders had grand designs to avoid a repetition of the stalemate that ended 1914, but they pursued their objectives opportunistically. From one year to the next, they had no idea which countries each of them would attack or try to occupy. While Stalin underestimated Hitler's capacity for deception, Hitler underestimated the Soviet capacity for resistance. The Axis leaders all underestimated the powers of resistance of the democracies and the wealth that would eventually be deployed against them.

² The measures discussed here bear only passing resemblance to the instruments of industrial policy for national security and resilience identified by Fernandes and Reed (2026: 205-209): dispersing production to protect against domestic shocks; diversifying imports away from unreliable suppliers; helping exporters adapt to foreign shocks.

In economics, the failure of the Axis powers' war plans is exemplified by their common strategy of "feeding the war by war" – in other words, to channel aggression towards the territories that could supply them with the resources that were most needed. For Germany this meant the wheatfields of Ukraine and the oilfields beyond the Caucasus. For Japan, at first, it meant expansion beyond Korea and Manchuria to Siberia. Japanese ambitions, halted by bruising encounters with the Red Army in border conflicts in 1938 and 1939, turned to South-East Asia in 1941. Apart from oil and bauxite, the region offered a relatively poor match to Japanese wartime requirements (Huff, 2020: 14-17). Japan needed food, yet Indonesia, Malaya, and the Philippines were also food-importers. As for Germany, it was largely by accident and good luck that Hitler found himself in occupation of France in 1940. French resources turned out to be far better matched and more accessible to the German war economy than those of Russia or Ukraine (Klemann and Kudryashov, 2012: 75-117). Yet France too was a food-importing nation, while far less food was available from the East than Hitler expected. While most war plans were based on misconceived war scenarios, experience suggests that the process of war planning is essential.

In all countries, planning for World War II began from the study of World War I. In the 1920s, the US General Staff struggled with the realization that military mobilization was a complex process, not an event. The day was gone when "a million men would spring to arms" (attributed to William Jennings Bryan by Smith, 1991: 37). The million men would do no more than form an unarmed rabble while disrupting industry and transport. Rather, the mobilization of personnel ought to be coordinated with the acquisition of their clothing, equipment, accommodation, and means of transportation, and the need to identify and set aside the floor space, machinery, and labour to produce the complementary goods and services, distributed over many locations and phased over many periods in a plan that would eventually cover much of the economy.

The plan that emerged pivoted around "M Day", the day on which two things would come together: for the military, orders for general mobilization, and for the supply branches of the economy, funding for war production. But its accompanying schedules were designed to begin long before M Day and to continue long after (Smith, 1991: 115-122).

During the 1930s the plan for M Day went through many revisions. American rearmament lacked any sense of urgency, however, until the Fall of France in June 1940, which marked a clear turn towards largescale rearmament. But America was not yet at war, and it was thought undesirable to declare M Day at that time. So economic mobilization went ahead without the plan being announced. America entered the war eighteen months later, in December 1941, following Japan's attack on Pearl Harbor and Germany's war declaration, but by then it was too late to announce M Day, because the moment had already passed.

In other words, the identification of contingencies, resources, locations, and time-scales helped people in public agencies and private corporations to understand how their roles and duties were likely to change in the transition to war. As a result, plan-

ning for M Day did its job without M Day ever being declared: it reduced the costs of transition to war, and especially the psychological and overshooting frictions.

Other countries also studied the economic problems that arose in the course of World War I. The disintegration of the internal market for food had been decisive in the failure of the Russian war effort. In the 1920s, Stalin became fixated on ensuring the “stability of the rear” in general and the distribution of food products in particular, control of which should be established before war returned (Harrison, 2017). German studies conducted in the 1930s focused on the wartime control of war materials, shortages of which, it was believed, had been instrumental in the failure of civilian morale in 1918 (Schermer, 2024). To avoid the missteps of 1914 and their lasting consequences, British civil servants studied the record of the war economy and compiled detailed blueprints for all sectors of economic activity (Broadberry, 2018; Broadberry and Howlett, 2016).

A benefit of the frequent rehearsals of one scenario after another was to speed the process of industrial mobilization when war became a reality. This was not the case in all countries, however. Strangely, Germany and Italy were exceptions – something that must be explained otherwise (Lesson 8).

Lesson 4. In a long war, costs matter

In May 1940, “Victory at all costs” was what the British wanted to hear from their new prime minister Winston Churchill. His words conveyed a message of unyielding resistance – of fighting power backed by commitment and determination. But fighting power must also be backed by resources. In a long war, when the costs of warfare have depleted all the resources available, commitment and determination fade away. Anything that adds to the costs of warfare – unnecessary frictions, private motivations, and mistakes that subtract from the war effort – can bring forward the moment of exhaustion. Therefore, costs matter. It becomes important to find the least-cost path through war preparation and mobilization.

It was the high marginal costs of war mobilization that brought Germany to defeat in 1918. These are exemplified in the food market, where the background to the war is significant. Even before the war, German households faced higher food costs than in Britain. Despite the growth of industry and towns, thirty years of tariff protection had kept Germany nearly self-sufficient in food. On the eve of war, Germany imported only about one fifth of food calories, compared with Britain’s two-thirds. This seemed to give Germany the advantage. But protection had kept German agriculture in the hands of less efficient, less commercialized farmers (Broadberry and Vonyo, 2026). Because of the higher food costs that resulted, German households consumed substantially fewer calories and proteins than in Britain.

As of 1914, Germany’s war plan was to attack Russia, a main supplier of imported food. Another important trading partner was Britain; if Britain entered the war, it was expected to impose a blockade on German ports. Cut off from food imports, it was thought, Germany would still feed itself with a little belt-tightening (Lee, 1975). If

war broke out and lasted long enough to interrupt international trade, it was widely predicted that British consumers would starve while Germans would fill their stomachs with potatoes.

Two factors confounded this expectation. One was Germany's war mobilization, which stripped agriculture of young men, horses, machinery, and fertilizers, precipitating a severe decline of wartime harvests. Another factor was the less commercialized nature of German farmers, who responded to wartime shortages of the manufactures for which they were willing to trade food by returning to subsistence (Broadberry and Vonyo, 2026).

The outcome was a severe decline of food availability from which the urban population suffered most acutely. The real costs of feeding Berliners from farms in Brandenburg were much higher than of feeding Londoners to a higher nutritional standard from farms in America and Australia, despite the Germany Navy's best efforts to sink Atlantic shipping.

Germany did not fail for want of effort or sacrifice. The German economy was more highly mobilized (measured in Table 2 by the share of GDP devoted to the war effort) than that of any other power.

Table 2: Peak war outlays in two World Wars, per cent of national income: selected countries

Country	World War I		World War II	
	Per cent	Peak year	Per cent	Peak year
United States	16.6	1918	37.3	1944
Russia/USSR	..	..	61.0	1942, 1943
Germany	59.0	1917	70.0	1943
United Kingdom	37.1	1916-1917	55.3	1943
France	53.5	1918	..	..
Japan	..	..	76.0	1944
Austria-Hungary	30.2	*1914/15	..	..
Italy	..	..	22.8	*1940/41

Notes: Countries are ranked in order of diminishing size of the economy, shown in Table 3. In Austria-Hungary and Italy the share of war outlays declined continuously after 1914/15 and 1940/41 respectively. Figures marked * are estimated.

Sources: World War I: all figures from Broadberry and Harrison (2005: 15), except Austria-Hungary from Schulze (2005: 84). World War II: as for 1938 in Table 1, except Soviet Union from Harrison (1996: 110).

Eventually, Germany was exhausted by the combined costs of supplying the battlefield and feeding its own people under blockade. This was the largely intended outcome of the Allied strategy of wearing Germany down from two sides. On one side the pressure of the battlefield forced Germany to mobilize ever more resources into its army. On the other side the pressure of blockade forced Germany to depend increasingly on its domestic resources, which proved inadequate in quantity and quality.

In wars of attrition, the costs of mobilization were as important as battlefield victories. A victory that accelerated attrition and the depletion of resources could prove fatal. In World War II, German fighting power was exhausted by the costs of defending the territorial gains of 1940 to 1942. In World War I, German fighting power collapsed only months after the supreme efforts that bought its greatest victories on the Western front.

One could say that Germany brought its defeat forward by trying too hard. Protracted war is like a marathon: trying too little and trying too hard both end in defeat.

Lesson 5. Prices matter too

In World War I the German government's first intervention in the food market was to cap the prices of bread and potatoes. The intention was to help low-income households retain access to basic foodstuffs. At first, however, meat prices remained unregulated. Among the unintended consequences, German farmers responded to changing incentives by feeding scarce but underpriced cereals and potatoes to scarcity-priced livestock. In early 1915, to stop the diversion of cereals from food to animal fodder, the government ordered the killing of five million pigs. There was a temporary glut of meat, followed by a shortage. Next, the pig slaughter caused a loss of animal fertilizer to the arable sector, but chemical fertilizers could not make up the deficit because of the war demand for nitrates. After that, less meat was available than before, but cereal marketings did not recover as hoped (Frizzera, 2025: 93-94).

Price signals convey important information in wartime as in peacetime. They tell us how relative scarcities are changing. They also prompt us to adapt to sudden shortages in the ways that suit us best. The rising price of a commodity tells us to cut back on usage and find cheaper substitutes. It also incentivizes those who can bring more to market to do so, which can offset the shortfall.

In a war setting, the value of these adaptive responses is clear: they explain how people and societies can survive the wrenching changes imposed on them by hostile action (Broadberry and Harrison, 2026: 16-17). Then, as now, both sides typically underestimated the extent to which firms and households could survive supply disruptions by substituting towards alternative commodities and suppliers. Adaptive responses such as substitution suggest how Britain survived the attempt to blockade its imports in two world wars, and how on both occasions Germany sustained its war effort despite naval blockade and aerial bombardment for as long as it did (Broadberry and Vonyo, 2026; Harrison and Voth, 2026).

When governments succumb to popular demands and administrative convenience to fix prices, the adaptive capacity is weakened or lost. Instead, unintended consequences multiply. Goods that are valuable to the war effort, but scarce and underpriced, are hoarded. Black markets spring up that recycle them to unauthorized buyers. From a consumer perspective, this might mitigate the loss of welfare. But, from a public perspective, the resources are being diverted from the war effort.

The country that prepared most thoroughly for war was the Soviet Union (Harrison, 2020). This was reflected not only in rearmament itself, but also in Soviet industrial policy. The government assumed all the risks of investment in capital projects, including fixed capacities for defence (Lesson 1) by socializing almost all industrial profits and losses. It did everything possible to minimize friction in the transition to war (Lesson 2). This included forcing the defence industry into the

age of mass production and interchangeable parts and building surplus capacities for mass production ahead of demand in all the main branches of defence industry and war materials to militarizing the conditions of employment and controlling job turnover and migration throughout the economy and cascading mobilization plans and practice mobilizations down to every workplace (Harrison, 2000; Harrison, 2008).

The rationing of scarce resources at “fixed” (in reality, sticky) prices was an essential mechanism of the Soviet command economy. This made it slow and sometimes unable to respond to changing relative scarcities. Soviet firms and households were often passive when supplies and demands changed, unless the government issued an emergency decree to force adaptation. Although the Soviet economy survived four years of total war, it failed to adapt to longer-run changes in the world economy such as the rise of services and information sharing technologies.

Lesson 6. Autarky is a delusion

Making the domestic economy independent of foreign supplies seemed like a sensible route to achieving economic security. In practice, the pursuit of autarky added to the costs of mobilization. The countries that practiced interdependence and resource sharing with allies and neutral trading partners found a more efficient recipe for an economically resilient war effort.

At the outbreak of World War I, German leaders believed that their relative self-sufficiency in food was a strength. In fact it turned out to be a weakness. German food was made costly by thirty years of tariff protection. German consumers entered the war with a peacetime diet that was already inferior to that of British consumers. They could ill afford the inevitable deterioration as the war blocked imports and stripped import-substituting factors of production from farming.

After World War I, the Axis powers prepared to face sanctions and blockade in a future war. They pursued import substitution to reduce dependence on imported foodstuffs, iron ore, coal, oil, and rubber under various slogans – in Italy “autarchia”, Germany’s Four-Year Plan, and the Japan-Manchuria-Northern China bloc. Such measures cut back on imports that were regarded as less essential or could more easily be produced at home. Judged by its diminishing trade ratios, the economy seemed more resilient to an attack on trade. While trade declined in absolute value, residual imports were increasingly limited to those foreign goods that a country could absolutely not do without, which were therefore of rising marginal value.

Of all countries, the Soviet Union seemed best insulated against a wartime interruption of trade. By the late 1930s, foreign trade had been driven down to less than one per cent of Soviet GDP. Yet the result was to make the tiny quantum of imports that remained extraordinarily valuable. The scarcest and most valuable resource in the entire Soviet dictatorship was Stalin’s attention. The allocation of a few dollars to imports

became of such importance that Stalin himself had consider and approve the detail of every purchase (Davies et al., 2018: 126).

For the Soviet Union, the price of autarky was also paid in technologies that were forgotten in the process of communist modernization. Stalin thought he was living in the age of machine-building. He did not see that this was already the age of the telephone and radio. When war came, Soviet industry could supply its own tanks and guns, but the United States had to supply the Red Army with more than 35,000 radio transceivers and a million miles of field telegraph cable (Jones, 1969: 284, 287).

Protected against foreign competition, onshore supply chains that satisfied the requirements of autarky in the moment were monopolized and inflexible. In the 1930s, National Socialist policies tried to control the supply and demand for food using the same coercive controls and price caps as in Germany in World I. Even before war broke out, food market integration began to break down, disrupting the apparently simple process of getting food from farms to workers' households. Urban living standards and health indicators stagnated or declined (Baten and Wagner, 2002). Even before war broke out, the slow depletion of civilian reserves had already begun.

For Germany, coal was abundant and natural deposits of oil were lacking. Oil was seen as a critical national priority, so the Four-Year Plan sponsored a major investment in the distillation of oil from coal. But synthetic oil was astonishingly costly: by the middle of the war, it is estimated, half a million workers were employed in synthetic oil at just one tenth of the output per worker in the US industry (Schermer, 2024: 13). And despite all that effort, oil was still so critically short in 1942 that the German Army's priority became a drive to the Caucasian oil fields via Stalingrad, not the capture of Leningrad and Moscow.

In two world wars, with an economy far more exposed to external disruption, the British government pursued a strategy of external interdependence, relying on trading partners and allies for "essential" resources such as food and oil (Toprani, 2019). The result was a more prosperous economy with higher living standards and more flexible supply networks. The British economy proved better able to adapt to wartime conditions and wage war with lower costs, helping it to outlast its adversaries (Broadberry and Vonyo, 2026; Harrison and Voth, 2026).

In fact, as the historian David Edgerton (2015: 128) pointed out, World War II "was not fought by autarkic nations, but by much larger entities". Germany and Japan drew separately on the resources each could squeeze out of occupied Europe and occupied East and Southeast Asia; as already mentioned (Lesson 3) they called this "feeding the war by war". By contrast, the Allies coordinated the resources of a giant bloc formed by the United States, the Soviet Union, and the British Empire under the heading of "mutual aid". This was a far more successful formula.

Lesson 7. There is no technological escape from attrition

Could technological advantage yield a quick victory in war? Israel's Six-Day War of 1967 is sometimes taken as an example (according to "legend": see Pollack, 2005). Whether true or not, hindsight suggests the conflict was really just one episode in a much longer war of attrition between Israel and its neighbours.

In both world wars the aggressors were first movers, relying on speed and shock. Unable to respond in kind, the resisters could only respond by choosing attritional war. The war of attrition was terrible, and in every country the leaders dreamed of finding a miraculous way out. But there was no escape from attrition, however desirable that seemed. While it could be said that the Allies' increasing technological advantage was a factor in the outcome of two world wars, it did not put a stop to attrition. Rather, it brought forward the completion of attrition. It completed the exhaustion of the adversary's military, economic, and psychological resources.

Two world wars saw continual innovation in military technologies. Most progress was incremental. The driver of competition was experience on the battlefield, fed back to manufacturers and designers. The guns, tanks, ships, and planes that were coming on line as the war broke out were tried on the battlefield. If not proven worthless and abandoned, they were continually improved in the light of experience. With each round of improvement, attrition intensified on both sides. If technological advantage was ever decisive, it emerged at the end of both wars, not at the beginning.

In World War II, unable to hope for quantitative superiority, Germany and Japan relied heavily on the quality of troops and training. In equipment, Germany aimed for "qualitative superiority", understood as keeping one step ahead of the adversary (Milward, 1965: 101-102). Because the adversary could copy any particularly advantageous innovation, there was no point aiming to leap ahead by more than a few months, but a lead of a few months could be sustained.

This policy presented German military and industrial leaders with a difficult trade-off. How was it possible to continuously modify weapons and equipment without losing the cost advantage of standardized products and long production runs?

From time to time a new technology seemed to present a miraculous way out of the war of attrition. In World War I it was poison gas and submarines. In the first years of World War II the long-range bomber was expected to be a miracle weapon; later it was V weapons and the atomic bomb. Each was expected to bring the killing to a stop.

Some options yielded more than others. The long-range bomber was not a miracle weapon that cut short the war of attrition; rather, it contributed usefully, but expensively, to the Allied attrition of the Axis war efforts. On the German side, disappointed by early results of bombing Britain, Hitler turned away from the idea of a strategic air offensive just as the Allies resolved to intensify it (Overy, 1980).

Later in the war, Hitler scaled down atomic research while the United States was pouring two billion dollars into the Manhattan Project. In Germany's case the decision was sensible: even America could not build a usable atomic bomb before the end of the war in Europe.

As the war turned against him, Hitler committed funding to the V weapons programme on a scale equivalent (relative to the size of the German economy) to America's atomic bomb. The V weapons programme aimed to restore Germany's advantage by destroying the Allies' civilian morale. Because it did not do this, its most likely achievement was to increase the costs of German resistance and accelerate Germany's defeat.

Did the atomic bomb provide an alternative to attrition? Most likely it traded the lives of a few hundred thousand Japanese civilians for similar numbers of American troops and Allied prisoners of war who were saved by Japan's surrender. But this was a very close result. In August and September 1945, even after two of its cities were levelled, Japan teetered on the edge of civil war, with surrender on one side, and a fight to the last man or woman standing on the other (Pacific War Research Society (PWRS), 1980). The atomic bomb was just one factor that swayed the balance towards surrender.

In 1945, the atomic bomb was an American monopoly. By the 1950s, the Soviet Union was also a nuclear power. In the stalemate that followed, Western leaders came to see the atomic bomb as a deterrent, not an instrument of attritional war. Yet from the Soviet perspective this was not clearcut. To the contrary, Soviet military doctrine pursued ideas of nuclear warfighting and victory in nuclear war (Pipes, 1977).

Today's experience is showing us a war of attrition unfolding in Ukraine under a nuclear umbrella. Despite Russian threats, nuclear deterrence has not stopped the losses of blood and treasure on either side.

Lesson 8. Incompetence and self-dealing are luxury goods

Steven Davis (2026) asks us to recognize that industrial policy will be implemented by "the government we have", not the rational, public-spirited technocrat that we may wish for. Effective industrial policy (in fact, any policy) requires impartial, competent administration. The design of industrial policy mattered little if implementation was in the hands of inept or self-serving officials. As it turned out, incompetence and self-dealing were luxury goods. Large, wealthy economies could afford them. Smaller, poorer countries could not.

Effective administration is impartial: it stands above private interest. But effective administration must also be competent.³ Competence is a mix of knowledge and experience: knowledge of social conditions, of economic processes, and of emerging tech-

³ Juhász, Lane, and Rodrik (2024) offer a sociological explanation of impartiality and competence. In their terms, the kind of state that is best placed to implement an effective industrial policy is "autonomous" (not swayed by special interests) and at the same time "embedded" (capable of two-way communication with society). Translated into these terms, the problem discussed in the text is how to be embedded while retaining autonomy.

nologies, combined with experience of negotiating with all sections of society from business interests and labour representatives to technologists, communicators, and soldiers. Competent impartiality is the key to effective implementation of industrial policy. To combine competence with impartiality is not an impossible dream. The combination is difficult, however. This is because the requisite knowledge and experience for competence cannot be acquired in isolation from society. The person who seeks competence must have engaged in social and economic life. In the process they risk becoming attached or obligated to one or another private interest, so that they lose impartiality.

Failures of both impartiality and competence have abounded in wartime economic policies. Their malign effects extended beyond the costs of inefficient allocation to the erosion of popular trust in leaders and mass disillusionment with the national cause, which multiplied the friction costs of mobilization.

The first modern war economy illustrates the scope for failures of competence and impartiality. In Germany the military leaders set national priorities for the procurement of weapons and equipment. The agency responsible for implementing these priorities was the KRA, a public-private agency dominated by representatives of major firms, which rationed war materials to the firms in each industry. On one side were generals who barked orders and expected everyone else to fall into line. On the other side were industrialists who believed they had a right to negotiate the terms of their cooperation with the war effort. The generals were impartial and the industrialists were competent, but the blend was unsuccessful (a leitmotiv of Armeson (1964) and Feldman (1966)).

The same failure can be observed in Germany's arrangements for the distribution of foodstuffs, which were rationed to civilians in towns by local stakeholder committees. In the absence of competent impartiality, food distribution became an arena for greed, evasion, and rent-seeking. Food inequality increased (Hardach, 1987: 117-120; Blum, 2013).

Germany's military leaders were ignorant of the needs of a modern industrial economy (Armeson, 1964: 10). The need for government funding to support capital expansion of the munitions industries was not recognized for two years. Succeeding to the supreme army command in the summer of 1916, Hindenburg and Ludendorff correctly diagnosed the need for more fixed capital, but their plans reflected an obsession with guns and explosives, neglecting emerging technologies such as armoured vehicles and planes. As well as being late, the Hindenburg programme was over-ambitious; it tied up coal, steel, and labour in new projects some of which remained unfinished while Germany's war effort reached the point of exhaustion.

Hindenburg and Ludendorff also recognized the need to mobilize labour and coordinate the requirements of front-line service with war work in factories and on farms, but their authoritarian approach was entirely unsuited to negotiating a sensible scheme with labour leaders and their parliamentary representatives (Armeson, 1964: 68-77; Feldman, 1966: 247-249).

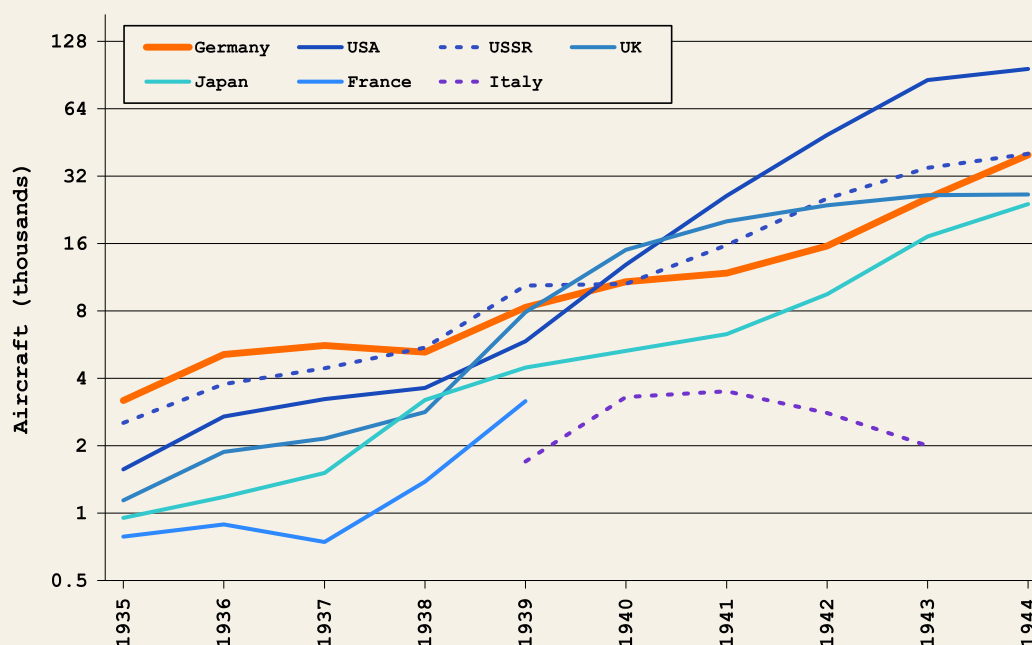
More case studies of low-quality administration are found in German and Italian aircraft production in World War II. Figure 1 shows the evolution of aircraft production

among the great powers from 1935 to 1944. Aircraft were the most complex, rapidly evolving machines of the period, and during the war they represented at least one third and up to one half of the value of all munitions produced by every major power.

At the beginning, Germany was the world leader in aircraft production, followed closely by the Soviet Union. The mystery of [Figure 1](#) is how Germany, where Hitler was planning his wars for a decade ahead, fell so far behind up to 1942 (a long running debate is summarized by Overy, 2020; see also Harrison, 2000). The poor performance was not for want of resources, which were provided abundantly. Nor was it for want of pressure from the top: Hitler was often frustrated by the poor performance of the war industries. Under the direction of his crony, Hermann Göring, however, aircraft production was disorganized. A military quest for ever higher quality and frequent modifications was permitted to prevent the industry from realizing the economies of longer runs. Steps were taken to rationalize procurement in 1942, but the production surge of 1943 and 1944 was too little too late.

Between the wars, Italy acquired the reputation of a pioneer in aviation technology. The industry was managed personally by Mussolini as Italy's "first pilot". Despite this (or because of it), wartime aircraft production was disastrous, facing shortages of all kinds, limited by small scale and short production runs, and declining continuously from 1941.

Figure 1: Aircraft production, 1935-1944 (thousands): selected countries



Sources: USA from Modley (1945: 8). Germany from Overy (1980: 15) and USSBS (1945: 277). Soviet Union from Harrison (1985: 250). UK from Overy (1980: 15) and CSO (1995: 170). Japan from Overy (1980: 15) and Hara (1998: 248). Italy (military aircraft) from Zamagni (1998: 196).

Policy errors and self-dealing could be found in all economies in all the wars of the twentieth century. Error correction was quicker and easier in a country such as Britain that already had long-standing traditions of government by consent, subject to public accountability. However, it would go too far to claim that poorly implemented industrial mobilization caused Germany or Italy to lose the war. A greater problem for Germany and its partners in both world wars was that they faced an economically superior coalition. The Allies could misspend money and divert resources away from the war effort and still count on victory. They could afford policy failures in a way that their adversaries could not (Lesson 9).

Lesson 9. GDP is back

Recent years have seen a sustained critique of the idea of GDP (gross domestic product) because it does not capture various aspects of welfare and sustainability. This misses the point of GDP. Its present form was developed in the 1940s, an era of geopolitical rivalry and great-power wars. GDP was highly relevant to that era. The wars of the period forced each country to throw everything it could produce into armed conflict. GDP set the upper limit on the resources available for fighting power. Today, geopolitical rivalry is back – and so is GDP.

It is easy to think of industrial policy for war as making all the difference to the outcome of armed conflict. In fact this was the case only under special circumstances – when the two sides were evenly balanced in total resources. Consider two societies at war. The United States mobilized nearly 40 per cent of its GDP into World War II ([Table 2](#) above). There were many frictions: America made many mistakes and threw much good money after bad. Japan mobilized 75 per cent of its GDP into the same war. Whatever mistakes the government made, soldiers and civilians alike showed extraordinary inventiveness and endurance, contributing to lower friction. If other things were equal, Japan should have won.

But other things were not equal. The prewar GDP of the United States was nearly five times that of Japan ([Table 3](#)). The effect of Japan's greater mobilization was to reduce the American material superiority from fivefold to threefold. America was going to win its war against Japan, regardless of Japan's advantage in the intensity of its war mobilization. World War II was a marathon. Japan's more intensive mobilization at first delayed its defeat but finally brought it forward.

For a case where industrial policy mattered, perhaps decisively, consider the war between Germany and the Soviet Union. Here, relative GDP was not really a factor. Measured by GDP, their prewar economies were of similar size. (It is true that the Soviet population was more than twice that of Germany, but this just meant that Soviet agriculture employed many times the number of workers to produce an inferior national diet. If anything, the advantage was to Germany.) But it turned out that the Soviet Union's industrial policy was more effective than Germany's. By forcing a transition to standardised production and interchangeable parts on both Soviet industry and the Red Army before war broke out, Soviet leaders created a capacity to

Table 3. Real gross domestic product of 1913 and 1938 in international dollars and 1990 prices (billions): selected countries

Country	1913	1938
United States	511.6	800.3
Russia/USSR	257.7	359.0
Germany	244.3	351.4
United Kingdom	226.4	284.2
France	138.7	185.6
Japan	..	169.4
Austria-Hungary	100.5	..
Italy	91.3	140.8
Ottoman Empire	25.3	..

Notes: Countries are ranked in declining order of the size of GDP. Allowing for one missing data point in 1913 and two that had disappeared by 1938, the rank order is unchanged across the two years shown.

Sources: Figures for 1913 from Broadberry and Harrison (2005: 7, 10), and for 1938 from Harrison (1998: 3, 7).

outproduce Germany in most categories of weapons and military equipment. In this respect, the military and industrial specialists in Stalin's circle turned out to be more impartial and more competent than Hitler's favourites.

In both wars the combined GDP of the Allied coalition exceeded that of its adversaries several times over. This was ultimately decisive. But again, GDP does not explain everything. What made GDP decisive in two world wars was the total commitment of the powers on each side to wage war to final victory or defeat.

The advantages of a larger GDP evaporate only when commitment is not symmetrical. This was the case in the Vietnam War. The US economy dwarfed that of North Vietnam, but the North Vietnamese communist leaders saw the Vietnam War as existential. They were determined to fight at all costs. South Vietnamese leaders were not. Nor were American leaders. Eventually, the Americans were willing to cut their losses and leave South Vietnam to its fate. Thus, the Vietnam war tested each side in two dimensions: GDP and commitment. Commitment, not GDP, tipped the balance.

Both GDP and commitment are factors in Russia's war against Ukraine, but their relative weight is not yet decided. Russia's GDP is five times that of Ukraine on its own. Ukraine's superior economic mobilization (Table 2 above) cannot fully make up for its lack of size. But the GDP of Ukraine combined with its friends is many times that of Russia. Russia has no real friends, but it has partners of convenience. Is Russia prepared to fight at all costs? How far will its partners go to help it? Are Europeans willing to cut their losses and leave Ukraine to its fate? Again commitment is being tested as well as GDP.

Alliances embody both mutual commitments and combined GDPs. The North Atlantic alliance is being severely tested by internal critics and external adversaries. But the advantages of mutual reliance within NATO to all its members over going it alone are simply enormous. It is not accidental that the alliance retains solid support among voters on both sides of the Atlantic (Campbell and Doshi, 2026).

Lesson 10. War is not the only risk

War preparations aimed to manage the risk of a sudden war ending in defeat. But war itself was not the only risk. Industrial policy for war also presented long-term risks to society. The problem is that industrial policies are “hard to kill” (Davis, 2026).

What are the long-term risks of industrial policy for war? Selective intervention for the public good is at the core of industrial policy. But the capacity to intervene selectively can and will be misused. Because industrial policy designates winners and losers, it creates vested interests. Those interests extend to keeping supportive policies in being long after they cease to serve the public good.

British experience is a cautionary tale. In World War I, the Ministry of Munitions became an effective coordinator of economic mobilization. The relationships forged then between government and industry fostered anti-competitive practices that persisted through the interwar period, were strengthened again in World War II, and served to weaken product market competition thereafter. However, the policies were popular at first, not only with the incumbent firms that profited directly, but also with the electorate. As a result, the new Labour government of 1945 was mandated to bring into public ownership industries such as coal and steel that in wartime had merely been state controlled. This preserved inefficient management and labour practices and put a brake on economic growth for thirty years (Broadberry and Howlett, 2016).

In World War I, food rationing was neither long-lived nor extensive. In World War II it was practiced much more comprehensively. While petty evasion was common, rationing was widely accepted as a way to protect the access to foodstuffs of working households. In 1945, the incoming Labour government was elected, in part, on a promise to maintain food rationing indefinitely.

It was not inevitable that war policies would persist long after the war. In the United States they were rapidly unwound. In Britain, food rationing did eventually become unpopular, and the last vestiges were eliminated within a decade of the war's end. But state intervention in industry proved much more durable. Privatization of state-owned industries and an effective competition policy had to wait for the 1980s and Margaret Thatcher.

In 1961, Dwight Eisenhower, who had led the Allied armies in World War II, and occupied the White House since 1953, worried that war mobilization followed by the permanent nuclear standoff with the Soviet Union had given rise to a “military-industrial complex”. By this he meant a web of mutual payoffs among political, military, and business leaders that would keep the United States overspending on defence and over-prepared for war.

In hindsight, the military-industrial complex was not a permanent phenomenon. In the United States the share of GDP devoted to defence fell steadily from the 1950s through the early 1980s. With the end of the Cold War it fell again (Table 1 above). By the twenty-first century, most Western economies spent more on health than on defence.

If a military-industrial complex emerged and persisted anywhere during the twentieth century, it was in the Soviet Union. There, under a blanket of secrecy, military leaders used up an increasing share of GDP on defence outlays without having to account to society for their privileged access to resources. This is where industrial policy for war was hardest to kill. The collapse of communism seemed to drive a stake through its heart, but thirty years later Russia's military-industrial complex still lives and breathes.

Today, Western economies must again get used to spending more on defence and war readiness. The first problem is to deter aggression. The risks of embedding rent-seeking military-industrial interests are real, but hypothetical, compared to the immediate risks and costs of renewed warfare among the great powers.

Conclusion

For thirty years I taught the economics of the two World Wars. Every year I told my students that this was a historical project. Study of the two world wars could help us understand the origins of today's world in very general terms, but it did not have any further practical uses, which economists often call "policy implications." This was because of nuclear weapons. By creating the new danger of instant annihilation, their spread would prevent any repetition of the protracted mass wars fought by the great powers in the first half of the twentieth century.

It now seems that I was wrong: I had made the mistake of thinking that a technical advance could put an end to attritional war (Lesson 7).

To many, today's world shows important similarities to the world of the 1930s. Abroad, rising powers are intent on revising borders and spheres of influence. At home, there is growing extremism of the right and left. The 1930s were followed by the 1940s. Peace was broken by small wars and then a great war. In hindsight the world's descent into mass warfare came to seem inevitable.

But there are also differences. What we have today is a far better world than that of the 1930s – richer, fairer, and freer. It is true that peace is threatened, as then, by geopolitical rivalries and extremism. But there is no inevitability that today's threats and small wars must lead to a great war. What is necessary to uphold peace is for us to be willing and able to deter aggression – something that was not done sufficiently in the 1930s. To achieve this broad purpose requires a series of practical steps. Identifying the steps and getting them in the right order turns out to be where history is useful after all.

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