The Pity of Peace:

Germany's Economy at War, 1914-1918 and Beyond

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1. Introduction

The economic history of Germany's Great War appears intellectually unexciting. It is the story of a failed *blitz* campaign and a subsequent war of attrition. It is the chronicle of disappointed expectations, painful adjustment, and of quixotic efforts to ignore reality. It is the account of an insufficient resource base, and probably of misallocation and disingenuous economic planning. And last, it is the story of a half-constitutional yet undemocratic system in denial of defeat, unable to compromise, unable to make peace, finally drawing the whole of society into the abyss of its own political and military collapse.

A tragedy foretold: in the winter of 1914, the *Kaiser's* military commander in chief, Erich von Falkenhayn, informed his government that Germany's war effort had failed, that its military machinery lay in pieces, and that the only way out of the deadlock would be through diplomatic channels, see Mommsen [2001, p. 47]. Whatever the changing fate of Germany's armies on the battlefield after that date, events in the end proved Falkenhayn right. Hardach [1973] and Ferguson [1998] have taken this point to the extreme. They argued that contrary to conventional wisdom and popular myths, the economics of World War I explain little, if anything that goes beyond the military facts of late 1914.

This survey chapter on the German economy at war is about these seemingly residual economics of World War I on the German side. Analysis of even the most basic facts and figures is considerably more difficult than in the case of Britain or the United

States. While contemporary statistics were more than incomplete, statistical compilations by later scholars have mostly evaded World War I. Analysis of the few data that do exist reveals that the German war economy was probably robust but nevertheless suffered severe reductions of output and productivity. Still, the German war economy appears to have been less unstable than previously thought. While previous research has found evidence of large-scale redistribution of income and of heavily inflationary war finance, closer examination of the data gives a more balanced impression of the German economy – seemingly adding to the lack of excitement.

However, analysis cannot stop there. Scholars and politicians since Rosa Luxemburg [1913] and Vladimir Ilyitch Lenin (1915) have argued that imperialist rivalry, driven by the alleged dysfunctions of 19th century capitalism, was at the root of World War I. Whatever the truth of this claim, the apparent military failure of German maritime imperialism deeply affected the political discourse of Germany's political right during the war. While Anglo-Saxon writing about World War I often takes the 19th century as its reference point, post-war historians in Germany have interpreted World War I largely by its implications for World War II. In a hugely influential study, Fritz Fischer [1967] noticed an abrupt swing in Germany's imperial ambitions towards Eastern Europe during World War I. Although not quite accepted as the official doctrine, internal memoranda at the top level now suggested the formation of a continental empire. Their analysis consisted in a highly explosive cocktail of Malthusianism, Darwinian concepts of racism, and of mistaken conclusions from Germany's faltering war effort. This paper will follow a German tradition to argue that herein lies the true significance of Germany's war economy of World War I. Misapplied economic analysis combined with a surprising overestimation of economic warfare to generate a new

blend of German imperialism, which foreshadowed Germany's second war from 1939 on.

The remaining sections of this chapter will be organised as follows. The next section looks into output, capital, and labour during the war. Section 3 analyses the distribution of incomes in the German economy and their potential for social conflict as one possible reason for Germany's collapse. Section 4 turns to external economic warfare, notably the allied blockade and Germany's *U-Boot* campaigns. Section 5 looks into the proportions of Germany's food problem. Section 6 reviews war finance as a possible check to German efficiency during the war. Section 7 takes the analysis to the political discourse at the time. The redirection of Germany's imperialist thrust towards Eastern Europe and the failures of its war economy turn out to be two sides of the same medal. This establishes a line of continuity that leads directly to the economic aims of Nazi Germany during World War II. Section 8 concludes.

2. A *Real Bad* Business Cycle

What does a war shock do to economic behaviour? The war-related resource drain on national product operates very much like a major productivity shock, which exogenously reduces incomes and living standards. For consumers, this generates a strong incentive to smooth out the shock over time, be it through the depletion of stocks or through borrowing. In addition, the shock induces a real business cycle: faced with the very low returns from going to work, consumers value their free time higher and decide to work less to ride out the shock. In a great war where emotions fly high, this effect gets even more pronounced: volunteers on either side of the front leave their

workplaces in droves to enlist in their armies. Volunteers to the combatant armies prefer spending their time in the trenches killing each other to going to the factory in the morning. This generates a bad real business cycle, from which the participating economies take time to recover.

World War I indeed dealt a severe and persistent blow to Germany's output, labour input and productivity. Mobilisation in the summer of 1914 reduced the workforce, and the sudden shift away from civilian to military uses of national product induced considerable unemployment for a while. In the aggregate, output suffered a persistent decline that was not to be reversed until well into the hyperinflation of 1920-23. Table 1 shows estimates of national income between 1913 and 1928.

(Table 1 about here)

As can be seen, results differ widely. Henning's rather favourable index of national income is derived from output estimates, however without making its method of calculation explicit. It must be regarded as a mere guess, albeit one that has been highly influential. On the other end of the scale is Roesler's rather pessimistic estimate, which he derives from extrapolating industrial production onto the aggregate economy. The indices of Graham and of Maddison [1991] include agriculture along with industry, while the index of Witt works from deflated income tax data. Maddison's index is spliced to a highly optimistic estimate of output in 1925 by Hoffmann [1965]; hence its upward deviation from most of the other estimates after 1918. The last two columns in Table I represent two estimates of national product of Ritschl and Spoerer [1997], which combine the data employed by Graham and by Maddison with informa-

tion on output in transport and services and two different weighing schemes for sectoral value added in 1913.

It is noteworthy that most series in Table 1 show a decline in output or income during the war. Also, the income data produced by Witt appear to fit very well in the general picture drawn by the revised Maddison estimates of Ritschl and Spoerer [1997]. Maddison's own series is the apparent exception. Maddison's index is based on the same data on industrial and agricultural output as the estimates of Graham and of Ritschl and Spoerer. As the data employed in these indices show that output in both sectors fell, Maddison's index implicitly assumes that output in transport and services grew fast enough to overcompensate the decline in the other sectors. The series of Ritschl and Spoerer are merely the result of replacing this assumption with more conservative estimates of output in services.

Indeed, output in industry and agriculture dropped by more than most of the aggregate estimates in Table 1. Table 2 gathers the information and provides a rough breakdown.

(Table 2 about here)

The output of armament-related industries declined until 1915 and then recovered from 1916 on, when control over the economy was tightened and new armament programmes were implemented, see Roth [1997]. However, this increase came at a cost: output dried up in the other industries. Surprisingly, it also decreased in agriculture where additional output was needed the most.

Employment appears to have broadly matched the path of output in the various sectors of the German economy. The total workforce in industry dropped by roughly ten percent (Table 3).

(Table 3 about here)

As would be expected, male labour input fell sharply, while female labour input increased, though not by the same number. At the same time, a pronounced sectoral shift into armament and away from peacetime industries took place. Given that the average workweek was extended, the data in Table 3 must underestimate employment. Reliable information on the number of hours worked per week during the war is apparently not to be had. Bry [1960, Table A.43] estimates the spread between hourly and weekly wages to have increased by 12 percent. Thus it is possible that total hours in industry increased slightly, despite the fall in the number of persons employed. Bry's estimate is probably a lower bound for the increase in industrial labour time, as work on Sunday was reintroduced and shift lengths were often extended aggressively. Table 4 attempts a rough guess of labour productivity in German industry in 1918 as compared to 1913.

(Table 4 about here)

The results of the rough guess in Table 4 look rather devastating. Productivity per person employed seems to have fallen between 20 and 30 percent, depending on the various different industry groups. The aggregate industry estimate (column I) even puts the overall decrease at over one third.

Unfortunately, the industry classifications underlying the data in Tables 2 and 3 do not match each other exactly, see Kocka [1978, p. 13]. As a result, the estimates of sectoral productivity changes are inconsistent with the calculated industry aggregate. To produce a coherent estimate, column V gives an employment-weighed estimate of aggregate industrial productivity. This measure shows industrial productivity decline to be lower than the aggregate (in column I) would suggest, but still puts the cumulative productivity decrease per person at 22%.

The decline in industrial productivity looks even more pronounced if allowance is made for an overall increase in hours by 20% as in columns VI-X of Table 4. The hourly productivity decline measured in this way lies somewhere between one third and over 40%. An employment-weighed average (column X) suggests that industry-wide productivity per person-hour declined by 35 %.

One possible reason why productivity suffered suggests itself from looking deeper into the industry structure of output. While output in war-related industries such as non-ferrous metals increased, it decreased sharply in everything not related to the war. We also find a remarkable stagnation and eventual collapse of output in iron and steel, despite its strategic importance. The enormous disproportions in sectoral output imply that capital utilisation rates must have been suboptimal in most industries, driving down aggregate labour productivity.

(Table 5 about here)

Reliable employment data for the aggregate economy seem hard to come by. As a rough consistency check for the above productivity estimates, the national product and income data from Table 1 are therefore calculated into total population (Table 6). This measure is biased to the extent that expansion of employment, in particular of female labour force participation, failed to compensate for the men drafted to the military.

(Table 6 about here)

The aggregate picture looks somewhat more favourable than the industry data suggest. It also adds temporal structure to the productivity decline: except for the estimate in column III, all series would place the largest part of the decrease in income per capita near the beginning of the war. After that, productivity appears to have resisted quite well until it declined again in the military and political collapse of late 1918. Still, the cumulative decline in output per capita of the German population is around 20% even in Maddison's optimistic estimate. Contrast this with Feinstein [1972]'s compromise estimate of British national product per capita [Broadberry and Howlett, Table 3, in this volume]: on the other side of the channel, per-capita product increased throughout the war without interruption, to peak in 1918 with a plus of 11% over 1913. Evidently, the economy was not just a side show to World War I.

3. The Not-So-Yellow Submarines: On Economic Warfare

German naval strategy in World War I rested largely on not using her navy. Two unintended naval battles had proven the superiority of Britain's fleet and quenched Ger-

many's appetite for more of the same, see Hardach [1973, p. 21f.]. As things stood, the German navy was strong enough to defend its coastline and ports but failed to present the fundamental risk to Britain's war strategy that Germany's strategists had dreamt of before the war, see Ferguson [1998, p. 83 ff.]. Consequently, Germany had no direct military means at her disposal against the allied blockade, in spite of most heavy investment into its fleet before the war. Retaliation thus seemed to be the only way out.

Information on the German balance of payments during World War I is sparse. The only extant series seem to be in Kleine-Natrop (1922) who may have worked from internal files, Hardach [1973, p. 42]. Table 7 reproduces these figures in current and gold values and calculates implicit price deflators and terms of trade indices.

(Table 7)

Even in current prices, Germany's external trade dropped significantly after 1914. Not unlike Germany's autarky policies of the 1930s, war affected exports even more than imports, which implied foreign exchange shortage on top of the trade reduction as such, Ritschl [2001]. In real terms, German imports during the war remained at 40-60% below their peacetime levels, while exports fell even further. A look at the implied import prices and terms of trade in the table suggests that the gold values might still overstate German imports: import and export prices are shown to have increased by roughly the same percentage, and Germany's terms of trade would even have increased slightly. This seems somewhat unrealistic. Again, the comparison with Britain is revealing: while British import prices are reported to have increased by a cumula-

tive 125% over the war years (Broadberry and Howlett, p. 16), import values grew by 89% (ibid., Table 11), which would leave a real decline of no more 16%. If we apply the same 125% increase to German import prices (i.e., a factor of 2.25 instead of 1.69), Germany's imports in 1918 would be an estimated 3.16 instead of 4.2 bn marks. This would imply a cumulative decline of 71% instead of the 61% implicit in Table 7. Whatever the true figure, it seems evident that the blockade managed to inflict far greater damage on the German war economy than the not-so-yellow submarines did to England.

Table 8 relates trade to national income. Relative autarky should be reflected in a decline in the ratio of imports to output.

(Table 8 about here)

This decline evidently came in two phases. If we are to believe in the data, really strong cuts into Germany's trade came only beginning in 1917. In fact, the previous decline does not exceed Germany's self-inflicted exclusion from foreign trade during the 1930s. There can be little doubt, though, that Britain's policies of intensified blockade beginning in 1916 must have an impact on the German economy that was absent in the early years of the war.

Still, the trade balance provides only an incomplete account of Germany's access to and use of foreign resources. Employment of prisoners of war and of foreign contracted workers increased to sizeable proportions during the war (Table 9).

(Table 9)

Even the use of forced labour was attempted: in October, 1916, Germany began deporting Belgian workers at rates of 2000 per week and more, transferring them in freight trains to camps in Germany, see Hardach [1973, p. 76f.]. There is even a history of Jewish forced labour during World War I, deported to Germany from Poland, Elsner and Lehmann [1988]. Under the pressure of international protests, deportations stopped in February 1917 and most (but not all) workers were repatriated.

4. Too Much Distribution? Wages and Social Conflict

Domestic labour market policy at the beginning of the war was remarkably disoriented, as their main task was first seen in fighting unemployment. Job agencies were established in August, 1914. In December, central government asked municipalities to draw up welfare schemes for the unemployed and promised subsidies. Attempts to subject industrial relations to martial law initially failed, except for Prussia's state-owned arms factories. Labour regulation was only tightened in the Patriotic Labour Service Act (*Vaterlaendisches Hilfsdienstgesetz*) of late 1916. Social historians have often interpreted this act as a backlash against the interests of organised labour. Indeed, under the new act the mobility of labour was restricted, and a compulsory labour service established for all males aged between 17 and 60 years. On the other hand, the implementation of the act brought increased parliamentary participation in government (not a small gain under Germany's still autocratic system), and a first recognition of workers' representations on the factory floor. Furthermore, even the

Patriotic Service Act permitted workers to change the employer if the new job offered a higher wage, Hardach [1973, p. 195].

To organise war production and labour allocation, a new central planning authority called "*Kriegsamt*", or war office, was established. However, its competences remained unclear, and as a result of political horse-trading between the civilian government, parliamentary opposition, trade unions, and employers' associations, it became subordinate to the war ministry. This was not what the military had hoped for, and although it may have prevented Germany's political system from sliding into outright military dictatorship, it did less than expected to increase efficiency in production Feldman [1966, part VI].

The net effect of labour regulation and market forces on wages and the distributional position of labour is unclear. In an influential study, Kocka [1978, ch. II] has argued for a shift in income distribution towards organised capital. His evidence is based on data of Bry [1960] on the erosion of real wages in large parts of industry (Table 10).

(Table 10 about here)

The upper part of Table 10 shows that wages were robust in the armament industry and declined the most in civilian industries. Bry [1960, p. 210] also notes the relatively strong position of women's wages in armament industry, who suffered only modest real wage declines even towards the end of the war.

Kocka [1978, p. 25ff.] interprets German wage policies as evidence of intentional redistribution away from labour and hence, of increased social polarization. As an alternative test, Table 10 calculates the implied sectoral wage shares, obtained from calculating the earnings data into the sectoral output estimates of Table 2 above. This exercise yields three main results: first, there is indeed evidence of redistribution, however in different directions depending on industries. Whereas labour clearly lost out in the armament industries, the converse is true for non-military industries, while evidence on the intermediate sector is mixed. Second, wage differentials between male and female labour appear to have even widened during the first phase of the war. Only after 1916 do we observe a relative improvement of the female wage position. However, this is likely due to female wages hitting subsistence, as the general wage level declined, Daniel [1989, p. 117]. Third, the distributional position of labour clearly worsened only after 1916.

This result is corroborated by a further test, an index of cumulative changes in the wage share relative to 1913. This measure, called cumulative real wage position, has played a certain role in debates about income redistribution in the Weimar Republic, see Broadberry and Ritschl [1995]. We first calculate the unweighed average of the wage shares from the sectoral data above. Results suggest that the distributional position of labour indeed deteriorated sharply after 1916. However, they also imply that it actually increased before that. A second exercise (bottom panel part of Table 10) calculates aggregate wage data collected by Ferguson [1998, p. 272] from various different sources into the aggregate industrial production index of Wagenführ [1933, p.23]. Although the reliability of the wage series is not beyond doubt, the calculated wage share traces the sectoral evidence quite well.

Table 10 tells a clear-cut yet surprising story: aggregating over all sectors of industry, there seems to be no such thing as redistribution towards capital during World War I in Germany. The cumulative wage position of labour worsened in armament industry, which is in line with conventional wisdom. However, it stayed neutral in intermediate industries and improved strongly in the civilian sectors of industry. The available aggregate data indicate that the net effect essentially cancelled out: for industry as a whole, the cumulative real wage position shows no clear tendency throughout World War I.

Evidently, composition effects in the labour forces influenced also the industrial wage share. Women and unskilled workers were employed in increasing proportion, which tended to lower the wage bill. However, there existed also a counteracting effect, as the general decline in real wages was accompanied by a compression of the wage scale. Table 11 presents evidence on nominal earnings in a sample of 479 firms in Bavaria. As can be seen, unskilled males, women, and young workers generally gained ground in relative terms. The important exception to this rule is armament industry, where skill premia still increased.

(Table 11 about here)

Nevertheless, the country saw several waves of strikes during the war, beginning in 1915 with protests against shortened rations and with quests for peace, and then on an accelerating scale. Ferguson [1998, p. 275] has argued that labour disputes were far less widespread in Germany than in Britain and that their importance has therefore

been exaggerated. Table 12 summarises the evidence presented by Ferguson, with the German data based on Petzina, Abelshauser and Faust [1978].

(Table 12 about here)

The data in Table 12 show that except for 1917, the number of workers on strike in Britain exceeded those in Germany by far. This becomes even more pronounced when the duration of strikes is accounted for by the number of days lost. Here, Britain's working class outperformed the Germans almost by orders of magnitude, at least in the early phase of the war. Ferguson's point thus seems to be a valid one. Ferguson acknowledges that in either country, strikes were mostly not just industrial disputes but more commonly political in nature. However, strikes in Britain and Germany meant two potentially very different things. The lack of political legitimacy of Germany's government and a beginning schism in the social democratic party combined to create a policy of "*Burgfrieden*", a labour truce by which organised labour made make big concessions to receive very little in return. The weakness of either side had the strange effect of preventing the government from regulating the labour market as drastically as did Britain at the same time, Kocka [1978, ch. 2]. Indeed, the repeated attempts of the military to wield control over labour were defeated when in late 1916, only a very diluted version of the programme was put into law, Feldman [1966, part V]. The new upsurge in strikes in 1917 and again after the failed spring offensive of 1918 destabilised this shaky balance of power. The role of income distribution in this process is clearly minor, as table 10 above shows. However, the fact that output and living standards had declined overall can hardly be ignored.

5. No Milk Today: The German Food Crisis

Conventional wisdom has it that food scarcity caused German morale to wane on the home front, before military resistance collapsed. There are good reasons for this view, see e.g. the exposition in Offer [1989, chs. 4-5]. German food supplies may have resisted the Allied blockade longer and better than expected. But clearly, they fell throughout the war, and in the end barely exceeded subsistence. Table 13 lists German food imports from 1916 to 1918.

(Table 13 about here)

Again, the effects of the intensified blockade after 1916 are visible: imported quantities were reduced sharply and sometimes almost collapsed. For 1918, Table 10 provides a breakdown between the first and the second half of the year. It shows that apparently, an attempt was made in the last months of the war to improve the food situation slightly, however to little avail.

Regulation of food production and distribution started quite soon. Price caps were introduced and efforts made to put both production and distribution of agricultural commodities under public control. To increase the amount of grains available for human consumption, the government decreed a much-disputed mass slaughter of hogs, ironically referred to in the debate as "*Schweinemord*". Given the wrong price signals set by the price cap system and by quantity regulations, German agriculture arguably produced below capacity, see e.g. Skalweit [1927], from where the data are taken. However, much of the decline in German food rations is clearly due to faltering im-

ports. Up until 1916, Germany had been moderately successful in evading the Allied blockade by increasing imports of foodstuffs from the neighbouring neutrals, notably from the Netherlands and Denmark. Increased Allied control over the trade of neutral countries partly dried out this trade, Hardach [1973, ch. 1]. Furthermore, deliveries of foodstuffs from Eastern Europe did not come forth at the expected rates. The defeat of Romania led to an upsurge in German grain imports as expected. In contrast, the hopes for huge war spoils form the occupation of the Ukraine in the spring of 1918 were badly disappointed, as transport facilities and market integration proved insufficient, Offer [1989].

6. War Finance: Barro vs. Ramsey

Conventional wisdom has for a long time accepted almost unconditionally that German war finance was based far less on taxes than Britain's and was, hence, less sound and more prone to inflation. Faced with an adverse productivity shock of major proportions, an individual consumer has a strong incentive to smooth out consumption, be it through the depletion of stocks or through borrowing. This incentive is especially strong in the presence of a distortionary tax system, in which the government's attempt to cover the cost of war through taxation would cause immense deadweight loss. Provided the government's claim to honouring its war bonds after a war is credible, agents will prefer smoothing out the tax burden over time to paying the bill instantly. This, in loose and abridged form, is the Barro view of war finance. Viewed from this perspective, the popular argument that German war finance was necessarily unsound is economic nonsense. To the extent that German war finance was more strongly debt-oriented than in Britain, the Barro view would either conclude that the

Fritzes were more risk averse than the Tommies (that is to say, their period utility function had a stronger curvature), or it would hold that Germany's tax system was more distortionary than its British counterpart.

Bordo and White [1991] argue that since the 1720s, Britain under the gold standard had accumulated a sound record of honouring war bonds at par after a war. It seems that Germany, on the contrary, did not have an established reputation in 1913: while Prussia's fiscal policy had been extremely conservative throughout the 19th century, the same could not be said of the Southern German states. Germany had embarked on the gold standard only in 1875, and the credibility of this commitment had not yet been put to test. The same is not true of France, which had paid for the 1871 war and her reparations to Germany through borrowing, and had honoured the debt in full gold value despite deflationary tendencies in the Great Depression of the 1880s. Yet, Germany was remarkably successful in selling war bonds during most of World War I.

(Table 14 about here)

Table 14 shows the revenues and expenditure of the various levels of government in Germany together with the deficits, excluding seignorage from the calculations. As can be seen, deficits weighed heavily in financing Germany's budget during the war, although clearly less so than the older literature has claimed. This point has been made previously by Balderston [1989], from whose work the figures in Table 14 are adapted. Table 14 arrives at a cumulative total of 81% of expenditures financed by deficits if the last fiscal year, starting in April 1918, is omitted. Including the fiscal year of 1918/19 (which, however, included almost five months of post-war revolution

and chaos), the total percentage is 83.3 % for the war as a whole (the same as in Balderston, 1989, p. 228). Neither of the two figures is very far from the British percentage of 78,1%. In terms of borrowing vs. taxation, there was no fundamental difference between the two war economies.

A slightly harder exercise is to calculate the amount of debt monetisation through the central bank. In most accounts of the German hyperinflation of 1920 to 1923, debt finance during the war is still the main culprit. Careful reading of Holtfrerich [1986] already suggests that all is not well with this belief. Table 15 calculates the monetisation of central government debt from the debt statistics of the Reich, drawing on Holtfrerich's data.

(Table 15 about here)

Given the opaqueness of Germany's public budgeting procedures, borrowing and debt statistics from various different sources are seldom compatible. Column I and II give the deficits in the two main components of its budget, the ordinary and extraordinary account. Column III provides independent figures on the increase in central government debt from the public debt statistics. As can be seen, the data are roughly consistent in their cumulative sum to 1917/18 but not afterwards (see Balderston, 1989, on the details). Adding seignorage, I arrive at a broad definition of central government deficit in column V. To obtain an estimate of funded debt (column VII), data on the increase in floating debt in column VI are subtracted from central government debt in column III. From the Reichsbank's statistics, the percentage of floating debt held by the central bank is known. This permits calculation of the amount of borrowing ab-

sorbed by the central bank each year (column VIII). This together with seignorage yields an estimate of total war finance by the printing press (column IX). Calculating this into the conservative estimate of the debt increase in column III, I obtain a ratio of debt monetisation of about 15% up until 1917/18. In the last year of the war (which also includes the take-off into post-war inflation after November, 1918), the rate of debt monetisation stood at 18%. These results on the monetisation of debt look surprisingly conservative. With no more than 15% debt monetisation during World War I, it appears that there can be no talk of war debt having been financed largely through the printing press. Other mechanisms driving suppressed inflation must have been at work

This is where an alternative interpretation comes in. The Ramsey view of war finance holds that distortions are minimised when it is mainly the fixed factors in the economy that are taxed away during the war. To provide proper dynamic incentives, these factors would have to remain tax free in peacetime. This is consistent with the standard result of the Ramsey theory of taxation, which holds that capital gains taxes are suboptimal. Ramsey taxation is one interpretation of the attempts after World War I to impose capital levies, as reviewed by Eichengreen [1990] in comparative perspective. It may be an interpretation of Germany's inflation after World War I. However, the willingness of the public to accept German war bonds evidently persisted throughout the war. Had German war finance consisted in expropriating holders of public debt and fiat money, some version of the Ramsey view of war finance could probably apply. Given the rather conservative figures on debt monetisation, there seems to be little justification for that.

7. *Drang nach Osten*: Rehearsal for World War II

German war planners preparing for World War II constantly looked back and tried to infer what they considered to be the lessons from World War I. This started with war tactics, where the Germans tried to perfection the use of the one weapon that had contributed most to their own military defeat in 1918: the tank. But lessons did not stop there. Whether real or imagined, German planners interpreted the war as an inherently economic problem, and designed the aims for a war of revenge accordingly. Starting in 1915, public and internal debates on Germany's war goals began to shift away from the classical ambitions of German overseas imperialism and towards building up a continental empire in Eastern Europe. Internal memoranda in the army's supreme command proposed the gradual Germanisation of Poland and the creation of a tight belt of German farm settlements in Western Ukraine. In a classic treatment of German wartime imperialism, Fischer [1967] has claimed that these ambitions were indeed official policy. Nowadays, a consensus has emerged that this is probably exaggerated, see e.g. Mommsen [2001]. However, there is no doubt that such ideas were seriously discussed in Germany's military and political leadership. One such memorandum, elaborated by the *Alldeutscher Verband*, or Pan-German Union, even proposed the ethnical cleansing of all annexed territories. Under the third military supreme command (*Dritte Oberste Heeresleitung*) of Hindenburg and Ludendorff, Germany came indeed close to putting such war aims into practice. The armistice concluded with Soviet Russia in Brest-Litovsk in December 1917 and a peace treaty imposed on Russia in March 1918 gave Germany almost unlimited freedom to pursue its territorial aspirations, both in the Baltic and in former Russian Poland. Germany occupied the Ukraine down to the Caucasus and even reached the oil fields of Baku

Ukraine down to the Caucasus and even reached the oil fields of Baku on the Caspian Sea, something that Hitler failed to achieve in the Second World War.

The similarities are not coincidental. A later analyst, writing after the war, argued that Germany's trade rivalry with Britain had unnecessarily provoked the war, and that Germany should have concentrated on establishing a continental empire instead. Given Britain's unquestionable maritime superiority, the argument went, Germany's attempts to break its food blockade had necessarily been futile. Given Germany's food dilemma, a future war against Britain would only be feasible with the backing of Russia, just as war against Russia was only feasible with British neutrality. That writer was no one else but Hitler himself [see on the details Ritschl, 1990].

Malthusian interpretations of Germany's food problem probably went back to the 1890s. Then, a controversy between defenders of unlimited industrialization and proponents of a balance between industry and agriculture had emerged, in which *Blockadefestigkeit*, or blockade proofness, and *Kriegsernährung*, or wartime food supplies, took centre stage. Malthusians argued that German population growth could not be stopped, as Darwinists would later add that it shouldn't. In the negotiations of the Treaty of Versailles, the German representatives used Malthusian reasoning to argue that without sufficient *Lebensraum*, or habitat, the German population would be doomed to immiserisation and starvation. This may not be surprising in itself. What does surprise in retrospect is the deep impression which this appears to have made on Keynes [1920]. In the 1920s, the German economist Werner Sombart, then a grand old man in his field, chaired a prize committee for a competition. Participants were asked to submit essays on how to feed a growing population on the reduced territory

of the Weimar Republic. Birth control and foreign trade had been excluded from the list of admissible answers as being trivial and unfeasible solutions to the problem, see Ritschl [1990]. This was the mindset that increasingly framed perceptions and expectations among the political right in Germany. Mommsen [2001, p.153] has referred to the First World War as "the incubation phase of a new, aggressively *völkisch* nationalism und of radical anti-semitism, which spread at a rapid speed and gradually cast its spell over larger and larger parts of the population". Given this state of mind, both Wilson's fourteen points and the Treaty of Versailles offered a peace arrangement that was too lax and too strict at the same time.

One reason is that the outcome of the war in 1918 was not as clear as it should have been. Germany's economy was exhausted but not in ruins. Food rations were minimal but not obviously below subsistence. The army was technically defeated, but Germany had not been invaded yet. Strikes in the metal industry and mutinies in the Navy – which was about to be sent off for a final suicide mission – accelerated the political implosion of Germany, all before the defeat was visible to the layman. Soon, "stab–in–the–back" myths were spreading, which asserted that the army had been knocked out, not by enemy action in the battlefield but by faltering morale on the home front. Such urban legends may have helped the uninformed average German to overcome the cognitive dissonance between propaganda and reality. However, they undermined the legitimacy of the new republic from the first day, and laid the ground for future revenge. Although the German side had sought an armistice and reluctantly began to cope with Wilson's Fourteen Points, neither the army under Hindenburg and Ludendorff nor the *Kaiser* himself accepted political liability for what followed. The army's high command was replaced, Wilhelm II. went into exile, and the onus for the armi-

stice and the terms of the peace treaty fell on the new republic that was hastily formed in November, 1918. The man who signed the armistice for Germany, Matthias Erzberger, did not survive for long: a death squad on the German Navy's unofficial payroll assassinated him in 1921, see Sabrow [1994].

France in 1870/1 had no doubt suffered greater and more obvious humiliation of its national pride on the battlefield than Germany did in World War I. After only six weeks of war, the French emperor fell into Prussian hands. Fanaticised troops and irregular units, the *franctireurs*, continued the struggle until well into 1871. In the end, Prussian troops encircled Paris and opened a corridor for the *franctireurs* to go in and quell a communist uprising. The victors even went as far as to proclaim Prussia's king as *Kaiser* of a new German empire, right in the castle of Versailles. Hardly anything could have made the military results of this war more manifest than this highly symbolic act of doubtful taste. At the same time, however, Germany's demonstration of power had the unintended consequence of stabilizing the new French republic.

To understand the implications of the incomplete end of World War I in 1918, assume a counterfactual which projects the end of the Franco-Prussian war of 1871 onto World War I with signs reversed. Imagine that allied troops had stormed the *Kaiser's* headquarters in Spa in late 1918, rather than allowing him to slip away into exile in the Netherlands. Suppose furthermore that war had continued, with irregular units forming on the German side just the way they did in 1919. The spring of 1919 would doubtlessly have seen the invasion of Germany by Allied troops. In further analogy to 1871, one might imagine the Allies encircling the cities of Berlin in the East and Munich in the South, while communist insurgents and the right-wing irredenta kept fight-

ing each other in the besieged city centres. To complete the counterfactual, imagine the proclamation of a new French monarchy in the mirror hall of Potsdam's Sanssouci castle in 1919, Evidently, the analogy is not complete: Berlin does not easily compare with Paris, and Sanssouci can by no means rival Versailles. However, what matters is the significance of these places in the political symbolism of either country, not the size of their respective mirror hall. It took another war and the rise of the Soviet Union for the Allies to finally make it to Potsdam and sign an agreement there in 1945.

The pity of the peace of 1919 is probably that the Allies lacked the necessary resolve to turn military advantage into political victory. There is no way of knowing how the Weimar Republic would have fared had the war ended with results as obvious and undisputable as those of 1871. Germany's war on France was clearly orchestrated by the Prussian hegemon, and Prussia's determination to carry it to the extreme indirectly helped to stabilize France's new republic. World War I against Germany was much more of a classical coalition war. Its premature end both revealed the fissures within that coalition and foreshadowed its later break-up. And it offered little help for political transition in Central Europe. Germany escaped from the horrors of World War I with its economy weakened but its determination to pursue its nationalist goals largely unscathed. The premature end of the war and America's sudden withdrawal from the scene, so bitterly criticized by Keynes, opened a security void in Europe that America's weakened allies could not easily fill. In this situation, the Treaty of Versailles was at best a poor substitute. It sought economic safeguards in the absence of a credible security arrangement. It prolonged the agony of Germany's economy for several more years. It strengthened the elements aiming at revenge instead of promoting

change and modernization. And when its feeble controls ultimately collapsed, nothing was left to prevent Germany from rearming for World War II.

8. Conclusion

The seemingly unexciting economics of World War I on the German side have a number of surprises on stock. Research over the past decades has pictured Germany's war economy as an increasingly repressive apparatus that combined massive redistribution towards capital with inflationary war finance and catastrophic food supplies. After military operations on the Western front became entrenched in late 1914, hardly anything happened that added explanatory power to the history of the war. According to this literature, the pity of this war lay in the tragic circumstances that provoked it. By comparison, what happened to the war economy after the beginning stalemate of late 1914 is considered hardly more than smallprint. Two exceptions to this rule are the alleged redistribution of income towards capital and the supposedly highly inflationary methods of war finance. Both would afford easy explanations for social unrest in Germany at the end of World War I and for the hyperinflation of 1920 to 1923.

This survey chapter on the German economy at war has taken issue with both the smallprint and the wider theme. It has argued that conventional wisdom on the redistribution of income during the war may need to be revised. Social history has pictured Germany during World War I as an increasingly oppressive regime that cut back on workers' rights and altered the distribution of income in favour of capital. This chapter shows that these results appear to suffer from sample selection bias. While profit margins indeed increased very strongly in armament industry, the picture in other in-

dustries is very different. In the aggregate, the distributional position of labour appears to have remained rather unchanged; a redistribution of incomes took place, not so much between labour and capital but rather between capital across different industries. Consequently, historical accounts of the early inter-war period in Germany and its social conflicts that rest on a worsened relative position of labour will likely need revision.

This paper has also taken a fresh look at the issue of German war finance and its inflationary character. Building on earlier research of Balderston [1989], we find that the ratio of public borrowing to tax revenues in Germany during the war hardly higher than in Britain. The same turns out to be true of the rate at which these debts were monetised. Thus, the fiscal histories of Britain and Germany during World War I look rather similar, while their inflation histories after the end of the war could hardly be more different. There appears to be little, if any role for public borrowing in Germany in explaining the later hyperinflation.

Still the most important perspective on the German war economy is perhaps not its immediate effects on the war or its immediate aftermath – the results in the present paper would tend to de-emphasise these even further. Crucial for the further evolution of German imperialism was the experience of the failed western *blitz* campaign of 1914. Under this impression, the thrust of Germany's imperialist drive turned away from maritime rivalry with Britain and towards territorial expansion in Eastern Europe, with many of the Malthusian and Darwinist forebodings of what was to come in World War II. Only a small step took Germany's extreme right from interpreting the British naval blockade as a new turn in a Malthusian struggle for survival to seeking

new arable *Lebensraum* in the East. This step was first taken, not by the Nazis after 1933 but by the advisors to Germany's supreme command in the middle of the First World War.

The pity of war lay in providing German imperialism with a new geographical aim, and the pity of peace in providing it with the necessary breathing space to get there. This paper has sketched a counterfactual borrowed from the Franco-Prussian war of 1871 to examine the possible effects of a more clear-cut end to World War I. Failure to fight the war to the end in 1919 and the hasty withdrawal of American troops generated a security void in Europe that the economic clauses of the Treaty of Versailles could not fill. Had a clear regime change in Germany been sought and supported by a credible security arrangement, the modernization of Germany and its economic recovery would have been secured against a fallback into its old vices. Lacking that, the Peace Treaty substituted military credibility with economic pressure, and the nascent Weimar Republic bore the double burden of unreasonable economic demands from without and of unreasonable charges of collaboration with the enemy from within.

References

Balderston, Theo [1989], "War Finance and Inflation in Britain and Germany, 1914-1918", *Economic History Review* 62, 222-244.

Bordo, Michael, and Eugene White [1991], "A Tale of Two Currencies: British and French Finance During the Napoleonic Wars", *Journal of Economic History* 51, 303-316.

Broadberry, Stephen, and Albrecht Ritschl [1995], "Real Wages, Productivity, and Unemployment in Britain and Germany during the 1920s", *Explorations in Economic History* 32, 327-349.

Bry, Gerhard [1960], *Wages in Germany, 1871-1945,* Princeton: Princeton University Press.

Daniel, Ute [1989], *Frauen in der Kriegsgesellschaft,* Göttingen: Vandenhoeck & Ruprecht.

Eichengreen, Barry [1990], "The Capital Levy in Theory and Practice" in: *Public Debt Management: Theory and History*, ed. by Rudiger Dornbusch and M. Draghi, Cambridge: Cambridge University Press, 191-220.

Elsner, Lothar, and Joachim Lehmann [1988], *Ausländische Arbeiter unter dem deutschen Imperialismus,* Berlin: Dietz.

Feinstein, Charles H. [1972], *National Income, Expenditure and Output of the United Kingdom 1855-1965,* Cambridge: Cambridge University Press.

Feldman, Gerald [1966], *Army, Industry and Labor in Germany, 1914-1918,* Princeton: Princeton University Press.

Ferguson, Niall [1998], *The Pity of War,* London: Penguin Press.

Fischer, Fritz [1967], *Germany's Aims In the First World War,* London: Chatto & Windus.

Hardach, Gerd [1973], *Der Erste Weltkrieg,* München: Deutscher Taschenbuch-Verlag.

Hoffmann, Walther G. [1965], *Das Wachstum der Deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts,* Berlin: Springer.

Holtfrerich, Carl-Ludwig [1986], *The German Inflation,* New York: de Gruyter.

Keynes, John Maynard [1920], *The Economic Consequences of the Peace,* London: Macmillan.

Kocka, Jürgen [1978], *Klassengesellschaft im Krieg. Deutsche Sozialgeschichte 1914-1918,* Göttingen: Vandenhoeck & Ruprecht.

Luxemburg, Rosa [1913], *Die Akkumulation des Kapitals. Ein Beitrag zur ökonomischen Erklärung des Kapitalismus,* Berlin.

Maddison, Angus [1991], *Dynamic Forces in Capitalist Development: A Long-Run Coparative View,* Oxford: Oxford University Press.

Mommsen, Wolfgang [2001], *Die Urkatastrophe Deutschlands. Der Erste Weltkrieg 1914-1918,* Stuttgart: Klett-Cotta.

Offer, Avner [1989], *The First World War. An Agrarian Interpretation,* Oxford: Clarendon.

Petzina, Dietmar, Werner Abelshauser, and Anselm Faust [1978], *Sozialgeschichtliches Arbeitsbuch III. Materialien zur Statistik des Deutschen Reiches 1914-1945,* München: C.H. Beck.

Ritschl, Albrecht [1990], "Zum Verhältnis von Markt und Staat in Hitlers Weltbild" in: *Die Schatten der Vergangenheit. Impulse zur Historisierung des Nationalsozialismus*, ed. by Uwe Backes, Eckhard Jesse, and Rainer Zitelmann, Frankurt/Main et.al.: Propyläen, 243-264.

Ritschl, Albrecht [2001], "Nazi Economic Imperialism and the Exploitation of the Small: Evidence from Germany's Secret Foreign Exchange Balances, 1938-40", *Economic History Review* 54, 324-245.

Ritschl, Albrecht, and Mark Spoerer [1997], "Das Bruttosozialprodukt in Deutschland nach den amtlichen Volkseinkommens- und Sozialproduktstatistiken 1901-1995", *Jahrbuch für Wirtschaftsgeschichte*, 11-37.

Roth, Regina [1997], *Staat und Wirtschaft im Ersten Weltkrieg. Kriegsgesellschaften als kriegswirtschaftliche Steuerungsinstrumente,* Berlin: Duncker & Humblot.

Sabrow, Martin [1994], *Der Rathenaumord. Rekonstruktion einer Verschwörung gegen die Republik von Weimar,* München: Oldenbourg.

Skalweit, August [1927], *Die deutsche Kriegsernährungswirtschaft,* Stuttgart: Deutsche Verlagsanstalt.

Wagenführ, Rolf [1933], “Die Industriewirtschaft. Entwicklungstendenzen der deutschen und internationalen Industrieproduktion 1860 bis 1932”, *Vierteljahreshefte zur Konjunkturforschung* Sonderheft 31, 3-70.

Table 1

Estimates of Real National Income in Germany across World War I

	Henning	Graham	Roesler	Witt	Maddison	Ritschl and Spoerer	
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**
1913	100	100	100	100	100	100	100
1914	96	82	83	90.2	85.2	90	92.3
1915	96	74	67	81.4	80.9	81.1	84.8
1916	92	69	64	80.2	81.7	75.8	80.9
1917	88	67	62	78.5	81.8	73.5	78.9
1918	88	66	57	74.7	82	71	76.8
1919	72	55		67.1	72.3	60.8	68.3
1920	74	66		74	78.6	70.7	76.5
1921	80	73		79.3	87.5	76.3	81.1
1922	83	80		82.6	95.2	81.4	85.9
1923	72	61		74.4	79.1	68.7	74.7
1924	82	74		87.3	92.6	80	83.2
1925					103	87.5	90
1926							
1927							
1928							

Legend: (1) All data expressed as indices 1913=100
(2) National income in 1913 is 49.5 bn marks, Ritschl and Spoerer [1997, Table 1]
(3) All data refer to changing territory (-10% of output in 1920)
(4) See text on methods of calculation

Sources: cols. I-IV: Holtfrerich [1990, Table 1]
col. V: Maddison [1991]
cols. VI, VII: Ritschl and Spoerer [1997, Table 2]

Table 2

Agricultural and Industrial Production during World War I

	Agriculture	Industry			
		Total	War-Related	Intermediate	Civilian
	I	**II**	**III**	**IV**	**V**
1913	100	100	100	100	100
1914	89	83	88	91	91
1915	85	67	78	77	53
1916	65	64	89	69	46
1917	60	62	103	63	43
1918	60	57	110	63	41

Source: I: Dessirier
II-V: Wagenführ [1933, p. 23]

Table 3

Employment in German Industry (thousand)

		By Sex		By Industry		
	Total	Male	Female	War-Related	Intermediate	Civilian
	I	**II**	**III**	**IV**	**V**	**VI**
1913	7387	5794	1593	2116	2970	2301
1918	6617	4297	2320	3050	2359	1380
% Change	-10.4	-25.8	45.6	44.1	-20.6	-40.0

Source: Bry [1960, p. 193], Kocka [1978, p. 12 f.]

Table 4

Estimates of Labour Productivity in German Industry (Index 1913=100)

	per employee					per hour (assuming 20% increase in hours)				
	Total	War-Related	Intermediate	Civilian	Adjusted Total	Total	War-Related	Intermediate	Civilian	Adjusted Total
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**
1913	100	100	100	100	100	100	100	100	100	100
1914										
1915										
1916										
1917										
1918	*63.6*	76.3	79.3	68.4	77.7	*53.0*	63.6	66.1	57.0	64.8
% Change	*-36.4*	-23.7	-20.7	-31.6	-22.3	*-47.0*	-36.4	-33.9	-43.0	-35.2

Note: (1) Industry classifications differ slightly between Tables 2 and 3.
(2) Industry totals in columns I and VI not consistent with sectoral totals.
(3) Corrected totals weighed by employment in same year from Table 3.

Source: Output: Table 2
Labour: Table 3

Table 5

Production of Selected Goods and Industries, 1913=100

	1913	1914	1915	1916	1917	1918
Mining	100	84	78	86	90	83
Iron and Steel	100	78	68	61	83	53
Construction Materials	100	88	69	59	58	35
Textiles	100	87	65	27	22	17
Non-Ferrous Metals	100	89	72	113	155	234
Residential Construction	100	68	30	10	4	4
Cereals	100	88	71	72	49	57

Sources: Wagenführ [1933]
Holtfrerich [1986, p. 180]

Table 6

Indices of Real Per-Capita Income in Germany across World War I (1913=100)

		National Income per Capita			
	Population	Witt	Maddison	Ritschl and Spoerer	
		I	**II**	**III**	**IV**
1913	66,978	100	100	100	100
1914	67,790	89.1	84.2	88.9	91.2
1915	67,883	80.3	79.8	80.0	83.7
1916	67,715	79.3	80.8	75.0	80.0
1917	67,368	78.0	81.3	73.1	78.4
1918	66,811	74.9	82.2	71.2	77.0

Source: Population: Statistisches Bundesamt [1972]
Income: Table 1

Table 7

The German Trade Balance, 1913-1918

	Current Prices			Constant Prices			Implicit		
	Exports	Imports	Balance	Exports	Imports	Balance	Export Prices	Import Prices	Terms of Trade
1913	10.1	10.8	-0.7	10.1	10.8	-0.7	1	1	1
1914	7.4	8.5	-1.1	7.5	8.5	-1	0.99	1	0.99
(Aug.-Dec.)	1.4	2.1	-0.7	1.5	2.1	-0.6	0.93	1	0.93
1915	3.1	7.1	-4.0	2.5	5.9	-3.4	1.24	1.20	1.03
1916	3.8	8.4	-4.6	2.9	6.4	-3.5	1.31	1.31	1.00
1917	3.5	7.1	-3.6	2.0	4.2	-2.2	1.75	1.69	1.04
1918	4.7	7.1	-2.4	2.8	4.2	-1.4	1.68	1.69	0.99

Source: Hardach [1973, Table 6]

Table 8

The Propensity to Import, 1913-1918 (bn. M)

				Avg. Import-Output Ratios			
	Imports	GNP I	GNP II	GNP I	GNP II	*Nazi Germany*	
1913	10.8	56.6	56.6	0.19	0.19	*1933*	0.20
1914	8.5	51.1	52.3	0.17	0.16	*1934*	0.18
1915	5.9	46.1	48.0	0.13	0.12	*1935*	0.15
1916	6.4	45.4	45.8	0.14	0.14	*1936*	0.14
1917	4.2	44.4	44.7	0.09	0.09	*1937*	0.15
1918	4.2	42.3	43.5	0.10	0.10	*1938*	0.16

Source: GNP 1913 (56.618 bn M): Ritschl and Spoerer [1997, Table 2]
Output I: Table 1, (IV).
Output II: Table 1, (VII).
Nazi Germany: Ritschl [2002, Appendix Tables B.7, B.9]

Table 9

Employment of Foreigners, POWs, and Forced Labour (thousand)

	Contracted Foreign Labour			Prisoners of War				Forced	Total
	Total	Industry	Agriculture	Total	Industry	Agriculture	abroad		
1916	589.4	249.5	339.9	1358	331	735	253		1694.4
1917	351.2	305.8		1703.5	392.6	837.5	258.8	<60>	1795.9

Notes: (1) Overall total excludes POWs abroad and forced labour.

Source: Daniel [1989, p. 57, 59].
Elsner and Lehmann [1988, p. 74].

Table 10

Real Wages in German Industry (Index 1914=100)

	1914		1915		1916		1917		1918	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Daily Real Earnings in 370 Establishments, March 1914-March 1918 (1914=100)										
War-related	100	100	91.8	90.8	88.9	101.5	76.2	83.5	77.8	86.0
Intermediate	100	100	83.4	83.6	79.9	77.6	62.3	65.9	60.4	64.0
Civilian	100	100	82.6	78.0	73.5	72.4	54.3	53.2	52.2	58.9
Unweighed avg.	100	100	85.9	84.1	80.8	83.8	64.3	67.5	63.4	69.6
Change in Implied Wage-Income Ratio/Cumulative Real Wage Position (1914=100)										
War-related	100	100	103.6	102.4	87.9	100.4	65.1	71.3	62.2	68.8
Intermediate	100	100	98.6	98.8	105.4	102.3	90.0	95.2	87.2	92.4
Civilian	100	100	141.8	133.9	145.4	143.2	114.9	112.6	115.9	130.7
Unweighed avg.	100	100	106.4	104.2	104.8	108.7	86.1	90.4	92.3	101.3
Employment-weighed avg.										

Estimates of Aggregate Real Wages in Industry and Change of Implied Wage-Income Ratio (1914=100)					
Aggregate real wage	100	88	79	65	66
Index of implied wage share/ Cumulative real wage position	100	109.0	102.5	87.0	96.1

Source: Earnings by sectors: Bry [1960, p. 211]
Aggregate real wages: Mitchell [1981, pp. 181 ff.], Ferguson [1998, p. 272].
Wage shares: own calculations, using output from Table 2.

Table 11

Wage Compression in the German War Economy

Change in Nominal Hourly Earnings from June 1914 to October 1918
479 Establishments in Bavaria

	Men		Women	Youths
	Skilled	Unskilled		
Four War Industries	+234	+220	+208	+240
Six Intermediate Industries	+203	+211	+216	+230
Eleven Civilian Industries	+185	+195	+206	+206
Unweighed avg.	+199	+204	+209	+219
Weighed avg.	+204	+220	+205	+235

Source: Bry [1960, p. 199]

Unweighed avg. From sectoral averages
Weighed avg. from total wage bill and total person-hours

Table 12

Strikes in the War Economies of Germany and Britain, 1914-1918

	No. of workers on strike (1000)		Days lost (1000)	
	Britain	Germany	Britain	Germany
1914	306	61	10000	1715
1915	401	14	3000	42
1916	235	129	2500	245
1917	575	667	5500	1862
1918	923	391	6000	1452

Source: Ferguson [1998, Table 30]
German data adapted from Petzina et al. [1978]

Table 13

Imports of Foodstuffs, 1916-1918, metric tons (monthly averages)

	1916		1917		1918:1 - 1918:6		1918:7-1918:11	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
Grains	20063	617	3089	492	989	694	7333	153
Flour	682	9018	229	2069	138	3090	279	298
Cattle (number)	29686	48	19699	79	9690	35	14502	43
Pigs (number)	322	114	116	216	33	3.3	549	32
Meat	5778	853	1848	557	244	450	260	6.0
Butter	7978	158	3513	118	1492	45	1239	38
Vegetable Oil and Fats	791	23	148	17	19	7.7	37.2	1.7
Margerine	555	22	106	78	2.1	0.1	0.4	0.4
Cheese	6553	20	3187	21	1258	23	1269	55
Fish	17573	300	5416	155	2278	192	2229	99

Source: Skalweit [1927, pp. 235-239]

Table 14

German War Finance, 1914-1918

	Total outlays			**Total revenues (excluding seignorage)**			**Deficit**			***Share of Expenditure Financed by Deficits***
	Reich	States	Public Sector	Reich	States	Public Sector	Reich	States	Public Sector	
1914/15	8788	3886	12644	2323	3273	5596	6465	613	7048	*56*
1915/16	25803	3494	29297	1442	3237	4679	24361	257	24618	*84*
1916/17	27839	3629	31468	2040	3816	5856	25799	-187	25612	*81*
1917/18	49277	5880	55157	4558	4327	8885	44719	1553	46272	*84*
cumulative:	111707	16889	128566	10363	14653	25016	101344	2236	103550	*81*
1918/19	58694	7041	65735	3663	3693	7356	55031	3348	58379	*89*

Notes: (1) Data refer to fiscal years, 1 April to 31 March

Source: Roesler [1967], Balderston [1989].

Table 15

The Monetization of Central Government Debt

	Borrowing on Ordinary Account	Borrowing on Extraordinary Account	Increase in Debt	Seignorage	Total Increase in Debt	Increase in Floating Debt	Increase in Funded Debt	Increrase in Monetized Floating Debt	Total Financed by Reichsbank	*Monetisation as Percentage of Debt Increase*
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**
1914/15	-698	7004	11513	103.6	11616.6	1800	9713	1596.6	1700.2	*14.6*
1915/16	51	23927	22781	259.7	23040.7	4600	18181	3340.2	3599.9	*15.6*
1916/17	945	24772	29381	465.3	29846.3	4100	25281	2802.8	3268.1	*10.9*
1917/18	-937	42204	36067	701.9	36768.9	14400	21667	4810.4	5512.3	*15.0*
cumulative:	-639	97907	99742	1530.5	101272.5	24900	74842	12550	14080.5	*13.9*
1918/19	150.6	34901	51148	390.5	51539	23800	27348	8699	9089.5	*17.6*

Notes: (1) Separation between ordinary and extraordinary account in German budgeting law.
(2) Borrowing figures in (I) and (II) from budget data, roughly consistent with Table 14.
(3) Debt figures from debt statistics.
(4) (V) = (III) + (IV)
(5) (VII) = (III) - (VI)
(6) (IX) = (IV) + (VIII)
(7) (X) = 100*(IX) / (V)
(8) Cumulative debt monetisation including 1918/19 is 15.2 %.

Sources: Roesler [1967]
Holtfrerich [1986]
Balderston [1989]