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*Making profits in wartime: corporate profits, inequality, and GDP in Germany during the First World War*¹

By JOERG BATEN and RAINER SCHULZ

This study uses a new database of firm-level profit statements to investigate the development of income inequality between industrialists and the labour force during the First World War. A second, minor aim of the study is to improve guesstimates of German GDP development during the war by providing figures for the private service sector.

How did German output develop during the First World War? The existing literature agrees that GDP declined there—in contrast to the United Kingdom which emerged from the war with an increase in output of approximately 10 per cent. However, there is considerable disagreement about the size of Germany's GDP decline during the war. Figures given range from Roesler's estimate of a catastrophic slump to 62 per cent in 1917 (always relative to 1913 = 100 per cent), to a modest decline to 88 per cent in Henning's influential estimate.² The latter has recently been criticized by Ritschl as 'a mere guess' (partly because Henning did not document his sources).³ Yet Maddison's estimate of 82 per cent—cited even more frequently than Henning's figure—is not very far from it.⁴ Ritschl and Spoerer have recently revised those estimates downwards to 74 per cent (or 79 per cent, depending on weights). We will add new evidence to this debate in the fourth section of this article, but our main aim (in sections I to III) is to study the distribution of income during the First World War.

In a situation as catastrophic as the First World War, the question of how income should be distributed becomes even more pressing than during normal times. Many argued at the time, for instance, that the rich should

¹ Joerg Baten thanks the Fritz Thyssen Foundation for financial support. Invaluable help with the context of this study came from Uwe Fraunholz, Sascha Moradi, Albrecht Ritschl, Brigitte Schneider, Mark Spoerer, and anonymous referees. Remaining mistakes are ours. We thank Deborah Rice for improving the English language style. Able research assistance was provided by Anna Ahlers, Isabel Bahret, Deni Franjkovic, Moghan Khanabadi, Rosa Wutz, Natalya Versal, and many others.

² Roesler, cited from Ritschl, 'Pity of peace'; Henning, *Das industrialisierte Deutschland*, pp. 47–9. These very pessimistic estimates put Germany at the bottom of European development; according to Roesler's estimates, it performed even worse than countries such as France and Belgium, in which most trenches were dug and most battles fought. Given that the German territory was largely spared these events, Roesler's decline estimate might seem exaggerated. On the other hand, Henning's very optimistic estimates would suggest that German output approximately matched that of the neutral countries in Europe.

³ Ritschl, 'Pity of peace', p. 5.

⁴ Maddison, *Dynamic forces*.

carry a proportionately larger burden than the poor, who were more likely to suffer from nutrition-related diseases which often led to death at that time (death rates related to such diseases increased dramatically in 1917).⁵ This view was shared by an astonishing alliance of left-wing social democrats and sceptics of capitalism on the far right wing of the political spectrum. In the latter case, criticism of capitalism often went hand in hand with anti-Semitic tendencies. Both groups complained about an alleged ‘war profiteering’ of German entrepreneurs, a debate which was further fuelled by newspaper reports about capitalists who made a fortune by selling arms products.

Burchardt cites H. G. Wells on a new style of business embraced by one such firm even before the First World War: ‘In the centre of this disaster, which would ultimately become a world catastrophe, is Kruppism—the dirty violent trade with the tools of Death.’⁶ It must be noted, however, that Burchardt arrives at the conclusion that Krupp did not benefit spectacularly from the First World War. However, other evidence on war profiteering led to Kocka’s famous hypothesis about income inequality, which held that there was a massive income redistribution in favour of the rich.⁷ We will argue in contrast that war profiteering was limited to a small minority of firms. The median entrepreneur experienced an income decline similar to that of the median worker. The normative question of whether there should be any income redistribution in favour of the poor during such an output decline will remain unanswered by this correction of the facts.

It is undisputed that the poor suffered catastrophically during the First World War, but this study will nevertheless argue that Kocka’s hypothesis should be rejected. Real profits and real wages declined at a similar rate, except for a very small number of arms manufacturers that were sometimes described as *pars pro toto* by the popular press of the time. Our revision has substantial implications for our understanding of Germany’s political history in the subsequent period, as the hypothesized inequality surge during the war was a major justification for the revolution of 1918–19, as well as for the redistributive policies of the 1920s. As Borchardt has argued, this income redistribution allegedly caused a ‘profit squeeze’ which ultimately aggravated the economic crisis in Germany and in turn paved the way for the National Socialist movement.⁸ Thus, there is a clear connection between war inequality and debates about income distribution in the subsequent periods of hyperinflation and the Great Depression following the First World War.

This article rejects the Kocka hypothesis and supports the opposing view of recent, still unpublished, research by Ritschl who argues that no income redistribution from the poor to the rich occurred during the war. Ritschl’s

⁵ Offer, *First World War*; Baten, ‘Demographic experiences’.

⁶ Burchardt, ‘War profits and war costs’.

⁷ Kocka, *Klassengesellschaft*.

⁸ Borchardt, ‘Zwangslagen’.

hypothesis is based on macroeconomic series whose validity is difficult to assess at the present stage of research. This article offers a complementary microfoundation for his view and is based on reliable corporate data.⁹ In the first section the literature on the question of inequality is reviewed. Section II discusses the contribution which our new source of company profits and market values can make to the current debate, and the pitfalls that must be avoided. For example, while capital and hidden reserve changes cannot be fully rejected, their size should be small enough not to distort our main results. In addition, profit data are counterchecked with the stock market prices of firms. The question of changes in taxation and the issue of representativeness are also addressed. Section III describes how profits developed in different industries during the First World War and investigates whether 'war profiteering' was indeed a widespread occurrence. It also undertakes comparisons with the British profit indices recently published by Arnold.¹⁰ Finally, the experimental fourth section discusses some potential implications for the overall picture of German output during the First World War.

I

How was income inequality in Germany affected by the First World War? A very influential study by Kocka has argued that the incomes of entrepreneurs and stock owners increased in relative terms during the war, whereas the lower classes suffered catastrophic income declines.¹¹ In a similar vein, Grumbach reports that the Pareto coefficient of income equality declined slightly during the war, from 1.44 to 1.35 (lower values of this coefficient indicate higher inequality).¹² Holtfrerich interprets this as a result of war-time profits.¹³

These profits are always a delicate political issue: when millions are dying on the battlefields and as a result of nutrition-related diseases, the *qui bono* question becomes prominent. Lenin asserted that monopoly capitalists initiated the war in order to prevent the profit rate from falling.¹⁴ In contrast, von Mises interpreted the economic order in Germany as an interesting example of a control economy that resembled socialist experiments with economic planning in many ways (though, naturally, not in its intentions).¹⁵ During the 1970s, many social historians addressed the issue of Lenin's monopoly capitalism theory on the background of war and the failure of development in postcolonial Africa and Latin America. For example,

⁹ Ritschl, 'Pity of Peace'.

¹⁰ Arnold, 'Profitability'.

¹¹ Kocka, *Klassengesellschaft*.

¹² Grumbach, 'Statistische Untersuchungen', pp. 89–96.

¹³ Holtfrerich, *Die deutsche Inflation*, p. 274.

¹⁴ Lenin, *Imperialism*.

¹⁵ von Mises, *Nation*.

Hardach supported Kocka's argument of excessive war profits on the side of entrepreneurs, relative to workers.¹⁶ His contention was that a small number of large companies were earning high profits, while the military served solely as the agent of the capitalist class.

Hardach emphasizes the enormous increase in profits of (a few) arms manufacturers in Germany, Austria-Hungary, and France, implying that the profit increase proved the entrepreneurial class to be the driving force behind the war. He rejects the view that regards profits as risk premia to compensate for the uncertain evolution of arms production. In support of his argument, he draws upon the example of the Krupp company, which removed 63.5 million Marks (about 50 per cent) of profit for generous deductions and reserves to compensate for restructuring losses. In fact, Hardach's evidence is based on only three German arms manufacturers (and he mentions that other data were not available), assuming that the development of profits was similar in other industries.¹⁷ Further, he does not deflate nominal profits, although, clearly, both wages and profits should be deflated by an appropriate price index.¹⁸ The most frequently used price index is based on calculations of the Imperial Statistical Office, which Kocka considers to be the best available.

But while deflation can be easily calculated, the composition of a representative sample is a more challenging task. Kocka, for example, could rely only on a sample with a strong bias in favour of war-related firms. This sample was published in a newspaper which intended to demonstrate the 'war-profiteering' activities of some capitalists. Even within industries that were not particularly war-related, those firms which were reported in that sample may well have produced more military goods than other firms.

II

Kocka acknowledges the fundamental weakness of any profit data: 'one has to characterise the question about true profits as unsolvable even today'.¹⁹ However, this is exactly where our new database comes in. Reliable individual data on the behaviour of firms and consumers have been lacking until now. We employ the strategy of Spoerer, who pioneered the study of corporate profits during the Weimar years and under the National Socialist

¹⁶ Hardach, *Der Erste Weltkrieg*, p. 116.

¹⁷ *Ibid.*, pp. 117–18.

¹⁸ Jacks et al., 'Real inequality'. In light of the fact that stock holders were typically richer than the average citizen, and that wealthier people tended to consume more personal services, luxury goods and housing as well as a lower share of basic foodstuffs and cheap textiles than the latter, one might consider the deflation of profits by a special price index for rich people. However, such an index is not available, and the price series suggested by Bry might serve as a reasonable approximation (see app. II), see also Bry, *Wages*.

¹⁹ 'muss man auch heute noch die Frage nach den wirklichen Gewinnen als unlösbar bezeichnen,'; Kocka, *Klassengesellschaft*, p. 25.

dictatorship.²⁰ A number of records (including profit figures) from the largest and most important firms have survived for the War period. We are therefore able to use income tax schedules from 140 firms. Five particular advantages and limitations of this source should be emphasized.

First, little was previously known about the profits of private firms. Our database draws not only on joint-stock companies, but on privately owned and other firms as well, which is a very important step forward.

Second, compared with balance sheet data, taxation records have some important advantages.²¹ Tax authorities certainly added value in standardizing those accounts and also used their knowledge gained from other forms of taxation (especially communal taxes) to assess the plausibility of declared profits. Hence, profits of joint-stock companies were closely scrutinized by tax officials, and excessive reserves and other tricks of under-declaration were identified as such. Hidden reserves and depreciation modes were closely monitored. Burchardt, for example, describes the intensive discussions between the Krupp company's management and tax officials about depreciation. Although Germany's most prominent arms manufacturer was finally able to convince tax officials that depreciation should be higher during the war (14 per cent instead of 8 per cent, in light of the fact that machines were used more intensively and that special machines for arms production would no longer be useful after the war), the intensity of those discussions reveals the strict policies of the tax officials.²²

Third, a disadvantage of tax lists is that they do not contain information on the capital stocks of all types of firms. Therefore, it has to be assumed that the capital invested was more or less constant in the short run, and that equity holders could not sell it easily. This assumption can be justified

²⁰ On the interwar period, see Spoerer, *Von Scheingewinnen*. On the First World War, see Fuchs, 'Kriegsgewinne', which relies mostly on data drawn from newspapers.

²¹ Kocka, *Klassengesellschaft*. In fact, even *Handelsbilanz*- (balance sheet)-based studies are not available for the history of profits in Germany during the First World War. The data available in Kocka and similar studies report only the profits of exceptional firms. If a large sample of *Handelsbilanz*-profits were to be created, it would soon become apparent that profit statements were far from standard, as a large number of various (non-hidden) reserves were declared.

²² Burchardt, 'War profits and war costs'. There is the problem that it is not known whether hidden reserves increased to some degree during the war. However, below we will also countercheck the treatment of hidden reserves with stock market data, because retained profits should have been evaluated positively by the stock market. This should also capture value increases, as is implied by Kocka's argument that industrial firms benefited from technological progress during the First World War, especially by saving raw material and human capital wage premia. For the latter, he also cites the substitution of skilled workers by unskilled workers (and often female workers). Moreover, it is unlikely that there was a marked increase in hidden reserves and underdeclared tax because the government was much better equipped and had available more information about firms than before the war. Roth describes in detail how much information about costs and benefits was collected by official and semi-official institutions. This allowed a judgement as to whether some firms underdeclared profits. The detrimental effects of unjust enrichment by some individual firms would not have led to increased military production by the complete set of firms. It would rather have set adverse incentives..

Our definition of profits is the usual residual profit, as left over from total revenues after deducting total accounting costs (including interest for bonds and loans, etc.). The figure for 'real profits' is obtained by deflating nominal profits by the most widely accepted price index in order to evaluate the purchasing power of profit incomes.

by the fact that most firms' capital stock did not change much, as Fuchs has found for a smaller sample of firms.²³ We also considered the nominal capital of 300 firms in the German joint-stock sample in our study (discussed below) and found that it increased by only 12 per cent. This modest nominal increase implies a substantial real decrease. In addition, for the overwhelming majority of firms, nominal capital did not change at all. Admittedly, there could have been changes in the (non-hidden) reserves which escaped our attention when using only nominal capital, but those effects were probably small and should be priced into the market valuation of firms which will be discussed below. We counter-checked our results with capital market evidence on 'holder's return', a measure that takes into account both dividends and possible changes in capital stock.

Fourth, a further potential limitation could result from taxation laws if these led to distorted profit figures. Taxation in Germany during the war had probably only a limited effect on firms' profit statements. Holtfrerich estimates that out of the total cost of war which came to some 150 billion Marks, less than 6 per cent was raised by war taxation and furthermore that a large part of these taxes were indirect (raised on items such as tobacco).²⁴ Firms—like all property owners—were taxed additionally by a property tax called *Wehrbeitrag* in 1913–15. Had this not been comparably modest (accounting in total for 1 billion Marks, or 0.7 per cent of war expenditure), it could have influenced the valuation of property in the balance sheets.²⁵ Of more relevance was the war profit tax (*Kriegsgewinnsteuer*), designed to impose taxes on 50 per cent of the increase in the value of property held by all those liable to tax (including those who owned private firms). In addition, incorporated enterprises had to pay this tax according to their profit increase during the war, relative to the last five years of peace. Inflation probably increased this tax, because nominal profits were higher during the war than before. In total, the war profit tax yielded 5.7 billion Marks, mainly in 1917, but only part of this was payable by firms.²⁶ Any distorting effect of this taxation change should have influenced firms' profit statements (both in balance sheets and tax declarations) in 1917 and 1918 only. Underdeclaration may, in fact, have increased in those years, yet given that we focus on gross profits in the remainder of the article, the taxes paid

²³ Fuchs, 'Kriegsgewinne'. In addition, even if balance sheet capital figures had been available, measurement errors would still have been very large, as accounting methods for capital were even less sophisticated than those for profit statements at the time. The market evaluation of capital which took place during stock trading is a better proxy for firm value: p. 47.

²⁴ Holtfrerich, *Inflation*, reports that two-thirds of war expenditure was covered by government war loans (*Kriegsanleihen*), and about one-third by unsettled credits (*schwebende Schuld*). The total revenue of the Reich from mid-1914 to the end of 1918, 22 billion Marks (*ibid.*, p. 108, but note that this is not the increase in relation to prewar revenue) was insufficient even to pay the interest: p. 114.

²⁵ Holtfrerich, *Die deutsche Inflation*, pp. 106–10.

²⁶ This equals some 4% of total war expenditure, or 22% of the total (not additional) government revenue income of the Reich. However, we must take into account that most taxes were paid to the German *Länder* until 1920, and that those taxes in fact decreased in real terms due to production decline and inflation.

by entrepreneurs and shareholders overcompensate this bias. After-tax profit shares were probably even lower than our estimate here.

Fifth, the main advantage of our source is that taxation records include all firms in a given regional and size segment, and not merely war-relevant companies, as was the case with the newspaper samples of earlier studies.

In summary, the advantages of this new micro-evidence are substantial, and its limitations acceptable for our purposes. Real profits can be compared with real wages, which makes the distributional implications of the war economy in particular even more interesting. Following the methodology of Feinstein, we will concentrate on real profit indices, albeit at the level of individual firms.²⁷

For this study, we collected data on 207 firms whose tax records survived for the county (*Regierungsbezirk*) of Düsseldorf, and traced their profits over the period 1890–1919.²⁸ In 1913, 145 of these firms were in business, and for 140 of them profit statements are available. Most of the remainder had ceased to exist prior to this date, and very few were newly created during the war. The fact that entry and exit can be observed in the sample is a first hint that survivor bias might not be a general problem for our analysis. Moreover, the exit rates in the sample were similar to aggregate rates.²⁹

In order to ensure representativeness by both industry and size, we compare our results with the joint-stock company population of the Düsseldorf region and that of Germany as a whole. All joint-stock firms were listed in the *Handbuch der deutschen Aktiengesellschaften*, and it has thus been possible to identify 98 (47 per cent) of the firms in our sample as joint-stock companies. Another large group in this industrial area were *Berggewerkschaften* (mining societies, 14 per cent of our sample), which were very similar to joint-stock companies in legal form. Limited liability companies and co-operatives accounted for about 8 per cent, while the rest consisted of large private firms.

The region under study comprises a large proportion of Prussia's most important industrial cities, including Essen, Düsseldorf, Elberfeld, and Duisburg (see table 1). If we compare the regional distribution of the joint-stock companies in our tax record sample with all joint-stock companies in

²⁷ Feinstein, *National income*. Feinstein was forced to use aggregate data while admitting to potential problems: p. 169. Compared with Spoerer's interwar data, our dataset is less informative regarding equity, but we have counter-checked this with total returns based on a sample drawn from stock exchange data. On the other hand, our dataset includes not only joint-stock firms (as Spoerer's does), but also private firms. Spoerer's dataset is regionally concentrated on East German firms (yet also includes some from the West), whereas our sample is drawn from the West (Düsseldorf district). Both samples concentrate on large firms.

²⁸ In contrast, for the whole of Westphalia, only a handful of tax records have survived in state archives. For the other Rhineland counties, a large collection is available for Koblenz and Trier (but does not cover the First World War), whereas for Cologne and Aachen almost nothing has survived in the state archive. Some miscellaneous material is available in community archives, and we are currently editing a large part of it. Unfortunately, wage bills and sales figures are not included in company taxation records.

²⁹ Aggregate rates of net exits are reported for joint-stock companies in Kocka, *Klassengesellschaft*, p. 25.

Table 1. *Geographical distribution of joint-stock companies*

City	% share	
	in tax record sample (%)	in DJS sample (%)
Barmen	2	5
Duisburg	7	11
Düsseldorf	8	26
Elberfeld	3	6
Essen	19	10
Gladbach	3	5
Krefeld	3	7
Mülheim am Rhine	5	3
Neuss	0	3
Remscheid	5	2
Solingen	3	2
Ürdingen	2	0
Smaller towns	40	21

Sources: State Archive Düsseldorf, Reg. Düsseldorf, nr. 31477-41639; *Handbuch der Deutschen Aktiengesellschaften*, 1912/13

the Düsseldorf region (hereafter DJS), we find that nearly the same cities are covered.³⁰ However, our sample contains more firms from smaller towns. The reason for this discrepancy lies in the nature of the two sources: while the DJS sample lists all subsidiaries of one company under the location of the headquarters (Düsseldorf being prominent in this respect), our tax sources list profits separately by subsidiary.

How representative is the dataset with regard to firm size? We find that it is broadly representative of the largest size-segments of firms in the economic heartland of Germany. The most famous firm names of Rhineland-Westphalia, such as Krupp, Stinnes, Thyssen, and Beckerath, are included in the sample. If we compare the joint-stock companies of our sample with the DJS sample for the prewar years (1912/13, profits for 1911), we find the size distribution to be broadly similar, but with the largest segment being slightly over-represented in our sample (see table 2).³¹ While this study's focus is on joint-stock companies, the private, limited liability, and *Bergwerkschaft* companies were also of considerable size.

The distribution by industry in the sample also suggests that it is representative of the large-scale industrial mix in the Rhineland region, again taking the composition of the DJS companies as a proxy for the large firm sector (see table 3). Mining and food processing are represented more

³⁰ This sample contains 381 firms, and for 1911, profit data are reported for 116 of them. Maria Hirschauer collected this dataset for her thesis: Hirschauer, 'Produktivität'. We thank her for providing us with the data.

³¹ For this calculation, we used the 61 joint-stock firms for which profits were reported for 1911 in the tax record sample, and the 116 firms of the DJS sample for which net profit figures were available.

Table 2. *Firm size of joint-stock companies*

<i>Profit level</i>	<i>Tax record sample (%)</i>	<i>DJS sample (%)</i>
Below 100,000 Marks	23	25
100–500,000 Marks	39	48
500,000–1,000,000 Marks	15	10
Above 1,000,000 Marks	23	17

Sources: See tab. 1

Table 3. *Composition of joint-stock companies by industries*

<i>Industry</i>	<i>Tax record sample (%)</i>	<i>DJS sample, 1911 (%)</i>	<i>GJS sample, 1914–1926 (%)</i>
Metal/machinery	26	24	31
Transport	5	5	6
Mining	13	6	6
Chemical/printing/stone	10	8	4
Lumber/paper	5	2	3
Food/tobacco	18	7	20
Textiles	8	8	8
Trade	3	2	3
Banking/other services	13	23	16
Other industrial/construction	0	14	4

Sources: See tab. 1

strongly in our sample than among joint-stock companies, whereas construction, banking, and other industries and services are under-represented. This, however, can be explained by the fact that the DJS sample includes a number of smaller companies which were disregarded in the large firm tax record sample.

Further comparisons can be made with yet another sample which was designed to represent all listed joint-stock companies in Germany.³² Beckschäfer used the shares of all joint-stock firms listed in Germany (hereafter GJS) in 1913 and 1926, on the basis of which he collected a stratified sample that was to be representative of German industry composition. Within the industries, he picked firms randomly (i.e. not by size or other criteria), but made sure that non-surviving firms were included. A comparison with this all-Germany sample indicated that our Düsseldorf sample was in effect quite representative of Germany (table 3, columns 1 and 3). Our sample includes slightly fewer (war-relevant) metal/machinery firms, but more (also war-relevant) chemical firms. As expected, our tax sample includes more mining firms, because in this industry the *Berggewerkschaft* as a legal form served as a close substitute for the legal form of the

³² Compiled recently by Beckschäfer, 'Einflussfaktoren'.

joint-stock company. To a certain extent, this might also explain why our sample contains more chemical firms, because many of those were limited liability companies. In all other industries, the similarities of industry shares across the two samples are striking. We will use the GJS sample created by Beckschäfer to assess holder's return and stock market value below.

To sum up, we found our sample to be broadly representative of the large firms in the Rhineland region by size, geographic distribution, and industry, and also representative of the overall large-firm segment in Germany.

III

After this methodological discussion and the scrutiny of sources, we are now in a good position to describe the real profit development of the firms covered in our sample. The development of profits is characterized by strong nominal increases, but declining real profits (see table 4). Real profits in industry declined to 86 per cent in 1915 (from the 1913 level), recovered modestly with the Hindenburg programme to 92 per cent in 1916, and reached a baseline of 68 per cent in 1917. In contrast, nominal profits

Table 4. *Real profit indices of individual industries (1913 = 100)*

	N 1913	1913	1914	1915	1916	1917
<i>War relevant, new estimates</i>	62	100	86	84	99	82
<i>War relevant, Kocka/newspaper</i>		100		135		
War relevant, excl. mining, new estimates	40	100	100	102	127	114
Chemicals	7	100	77	90	189	144
Metal/machinery	26	100	94	102	116	121
Transport	7	100	142	116	97	61
Mining	22	100	69	60	63	39
<i>Medium war relevant, new estimates</i>	10	100	83	76	70	41
<i>Medium war relevant, Kocka/newspaper</i>		100		77		
Construction	4	100	85	91	65	36
Paper	1	100	101	62	84	45
Stone/glass	3	100	50	70	71	44
Electricity/gas	2	100	90	69	52	45
<i>Not very war relevant, new estimates</i>	68	100	91	85	86	51
<i>Not very war relevant, Kocka/newspaper</i>		100		126		
Printing	4	100	91	76	29	35
Food/tobacco	23	100	102	102	71	53
Textiles/clothing	16	100	90	92	111	53
Bank/insurance	10	100	76	74	59	30
Trade	13	100	78	68	101	55
Other services	2	100	114	73	129	91
<i>Industry^a</i>	115	100	89	86	92	68
<i>Services</i>	25	100	84	72	89	51

Notes: For a definition of war-relevance, see Kocka, *Klassengesellschaft*.

For the above calculations, we eliminated extreme outliers with profit increases of more than 600%. We also considered an average of 1910–13 instead of 1913. The figures were robust. For the underlying numbers of cases, see app. tab. A1. Deflated by the price index of Bry, *Wages* and Statistisches Reichsamt.

^a Includes transport and construction

Sources: State Archive Düsseldorf, Reg. Düsseldorf, nr. 31477–41639; Kocka, *Klassengesellschaft*, p. 26

increased by 66 per cent in the same period, even when outliers (increases of 600 per cent and more) are removed. The question of whether outliers should be removed is itself debatable. Contemporary newspapers, for instance, supported their assertions forcefully by pointing to a handful of outliers, extreme cases of war profiteers. Because economists are generally more interested in the median firm, the discussion here is based on a sample from which extreme cases have been excluded. The most extreme case, the Siegen-Solinger Gusstahl-Aktien-Verein, is a case in point and illustrates clearly why outliers need to be removed: the profits of this firm were highly erratic after the economic crises of 1900/1 and 1907/8, leading to zero or negative profits in 1910 and 1911 (figures for 1912 are unknown). In 1913, the firm returned to profit for the first time after the crisis, but only by some 3,000 Marks, or roughly 2 per cent of its 1899 nominal profits. During the war, nominal profits increased further to 1.998 million Marks in 1917. Does this infer that the firm had a nominal profit increase of 26,000 per cent between 1913 and 1917? It is clear that the 1913 value was abnormal, and hence the percentage increase misleading. Thus, even if the increase resulted in part from arms production, only the exclusion of outliers can yield informative statistics. Nevertheless, what is important to keep in mind is that outliers may be used as *pars pro toto* examples in the mass media, thereby exercising a strong influence on public opinion.³³

The profits in the service sector declined even more strongly than in the industrial sector (reaching only 61 per cent of the 1913 level in 1917), especially during the Hindenburg programme which aimed to mobilize all resources and factor inputs for war production. If we accept the hypothesis that tax underdeclaration in 1913 was similar to that during the war years, and assume (as suggested by the available data) that the capital stock was not extremely reduced, it follows that firms performed much worse in the war than previously thought.

It is interesting to see how the Hindenburg programme influenced profits. After Hindenburg and Ludendorff joined the Supreme Command (*Oberste Heeresleitung, OHL*), they reversed the policies of the previous military leaders.³⁴ The key aim of the Hindenburg programme was the expansion of military power, requiring the construction of a great number of arms factories as well as the conversion from a civilian to a military mode of production. Hindenburg and Ludendorff abandoned the former strategies of the War Ministry, which had aimed at a 'careful husbanding of Germany's resources', and weakened its position within the decision-making process. They introduced a massive armament programme—without any consideration for the impact on civilian production—as well as government-regulated food distribution and a widened age span for compulsory military service. Their programme furthermore aimed to introduce compulsory

³³ A further check was made on the differences between private firms and capital firms, which turned out to be extremely similar.

³⁴ See Feldman, *Army*.

labour obligations for the entire population but, as Feldman has shown, trade unions were able to use the parliamentary process to subvert the purposes of the *Vaterländisches Hilfsdienstgesetz*.³⁵ Hindenburg gained full support from the industrialists, since they saw the programme as a chance for increasing their profits. This effect, however, was short lived. In 1916, real profits increased substantially, but the non-market allocation of factor inputs led to serious distortions in the production process. Except for the significantly war-related chemical and metal/machinery industries, the decline of the German industry and service sectors was even more dramatic in 1917, after the programme had taken full effect.

Compared with the newspaper reports about war profiteering cited by Kocka and others, our results are substantially different and more representative. We aggregated Kocka's profit figures into categories of war relevancy and deflated them with the price index of the Imperial Statistical Office. Both the war-relevant and the non-relevant industries of our tax sample had substantially lower profits (between 84 per cent and 85 per cent) than those few examples highlighted by contemporary newspapers (135 per cent and 126 per cent). Only in the intermediate group did profits display a similar evolution. The difference in the two categories can be partly explained by the fact that some extreme outliers were excluded from our sample in order to get a clearer picture of the median firm, and by the biased selection of the newspaper sample.

Substantial differences were observable between industries. The metal-processing and machinery industries increased their real profits to 121 per cent of the 1913 level, while profits in chemicals surged to 171 per cent (table 4). Most other industries experienced declining profits. The profits of banks and insurance companies dropped to a meagre 30 per cent, while those in mining (remarkably), construction, and printing went down to 50 per cent below the 1913 level. The poor performance of the mining industry is particularly astonishing. One possible explanation for it is the industry's high dependence on heavy physical labour which could not easily be substituted by female labour when healthy workers were drafted to the military. Thus, those who remained in the mines had lower labour productivity. The non-nutritious diet of the time compounded this problem. While mining performed particularly badly, the transport sector (being very capital-intensive) did relatively well, however. In general, the profit indices of most industries plummeted to a figure of only 30–55 per cent of the 1913 level in 1917.

An important counter-check of profit indices can be provided by the capital market. Officially, the stock exchange was closed for most of the war period, and investors developed alternative institutions to trade their stocks. A glance at the development of stock prices reveals that their day-to-day variability was very similar to that of the prewar period, and qualitative

³⁵ Ibid.

Table 5. *Holder's return and value development of stock investments (GJS sample)*

	1914	(1915)	(1916)	1917
<i>Holder's return</i>				
War relevant industries	-6.0	(-16.8)	(9.1)	-14.6
Medium war relevant	-10.7	(-20.5)	(9.8)	14.4
Not very war relevant industries	3.0	(-19.1)	(-27.9)	-25.1
Average	-2.0	(-18.1)	(-8.2)	-17.8
<i>100 invested Marks in 1913 were worth:</i>				
War relevant industries	94.0	(77.2)	(86.3)	71.7
Medium war relevant	98.3	(68.8)	(78.6)	93.0
Not very war relevant industries	103.0	(83.9)	(56.0)	30.9
Average	98.0	(79.9)	(71.7)	53.9

Source: GJS sample (300 firms). The values for 1915 and 1916 should be integrated, because prices were maintained from 1914 onwards and only dividends changed.

reports confirm that the volume of stock trading and information flows were as extensive as during the prewar period.³⁶ Which measure of stock returns allows for an optimal comparison with our annual profit figures? Annual 'holder's return' is composed of the stock price increase between the previous and current year, plus the dividend payment during the relevant year, relative to the previous year's stock price. In addition, the measure is deflated so as to yield real returns (table 5). Thus, if someone bought a stock in December 1913 and sold it in December 1914, return would have consisted of the price increase (which might well have been negative) plus the dividend payment, the sum of which is finally expressed as a percentage relative to the December 1913 investment (deflated).

For the purpose of counter-checking our results with capital market indicators, we used Beckschäfer's sample of 300 stocks which is broadly representative of German quoted companies.³⁷ It is important to note, however, that the figures for 1915 are underestimated and those for 1916 overestimated, because in 1915 stock prices were the same as in 1914, and only dividends changed. The figures for those years can only be interpreted relative to one another, by industry group. However, taken together, the two years are unbiased. This measure displays a development very similar to that of the profit index (table 5): after a modest decrease of only 2 per cent in 1914, strongly negative returns prevailed until 1917, just as in the profit sample. This congruence between two independent samples—one based on profits, one on market value—documents the robustness of our new estimates. Moreover, war relevancy was captured in the prices and dividends as soon as the Hindenburg programme was anticipated to begin in 1916. Before that, less war-relevant industries in fact performed better than highly

³⁶ Pohl and Goemmel, *Börsengeschichte*.

³⁷ Beckschäfer, 'Einschlussfaktoren'.

Table 6. *Labour share in Germany during the First World War*

<i>Year</i>	<i>Profit index</i>	<i>Wage index</i>	<i>Labour share</i>
1913	100.00	100.00	70.9
1914	88.91	96.33	72.6
1915	72.55	85.32	74.2
1916	77.74	76.15	70.6
1917	72.62	67.89	69.6

Notes: The profit index is a weighted average of industry and service sector profit indices. The wage index is based on Williamson, 'Evolution'; Williamson based his estimates on Bry, *Wages*, but calculated wages across the 1913 to 1914 gap. The labour share is derived from Hoffmann's estimate of the labour share in 1913.

war-relevant ones. In the lower half of the table, it is shown how much a 1913 investment of 100 Marks was worth in 1914 and 1917, respectively, provided that the stocks were not sold. In 1914, both capital market and dividend distributors had evaluated war-relevant firms as less promising. After the start of the Hindenburg programme, in contrast, the stock value of the 'not very war-relevant' category plummeted to a meagre 31 Marks in 1917 *vis-à-vis* its 1913 value, whereas the war-relevant firms did more than twice as well. This sample did not contain any extreme outliers, hence there was no need to remove any. On average, by 1917, an investment in those 300 listed joint-stock firms was worth only 54 per cent of its 1913 value, provided that it was not sold. The 1913 value of investment declined even more drastically than annual real profits, which halted at 73 per cent (weighted average of industry and services). This must be understood in a context where profit expectations (reflected in the stock price component of holder's return) might have declined even more than current profits, relative to 1913 levels.

How did the labour and profit shares of income develop, if we assume the real profit indices of the companies in our sample to be representative of Germany? Hoffmann estimated that the labour share amounted to 70.90 per cent in 1913.³⁸ Taking Williamson's real wage indices and our profit indices, we find that the labour share was in fact more or less constant (table 6). Given the more rapid declines of profit until 1915, the labour share rose slightly, but returned to its prewar level with the Hindenburg programme of 1916 and 1917.

British firms appear to have done better than German firms during the war. Arnold presents a broad array of different estimates, yet with the bottom line that British profits did not decline much in wartime, compared with the immediate prewar level. According to Feinstein's estimates, profits as measured in constant prices increased by 20 per cent between 1913 and

³⁸ Hoffmann, *Das Wachstum*.

1917 (93 per cent in current prices, as Britain also experienced inflation).³⁹ This increase in profits was partially skimmed off by the government, which had created an 'excess profits duty' on such profits that were mainly induced by government orders. According to Stamp, after-tax profits declined by 14–22 per cent between 1913 and 1917, and rose modestly (by less than 10 per cent) in 1915 and 1916. Parkinson's estimate indicates a post-tax decline of 18 per cent in 1917 (plus 1–3 per cent in 1915 and 1916).⁴⁰ These differences in the estimates—even among those based on the same sources (tax statistics and published profits in *The Economist*)—demonstrate the weakness of their empirical foundations.⁴¹ Arnold then took steps to improve this situation by considering internal profit calculations of 30 British joint-stock companies, finding that returns on capital increased from 8–9 per cent in 1910–13 to 17 per cent in 1917 (before tax, in constant prices). After tax, profitability increased only modestly in 1915 and 1916 and returned to approximately the prewar level in 1917.

However, as British real wages declined, the constancy of after-tax profitability entailed an increasing share of entrepreneurial income. Arnold estimates that the labour share of companies' value added declined from between 40 and 47 per cent (1910–13) to 38 per cent (1917), and the money capitalists' share from between 17 and 27 per cent to 12 per cent.⁴² The largest increase, however, accrued to the state (profit taxes surged from between zero and 1 per cent to 24 per cent), whereas the entrepreneurial share shifted from between 26 and 38 per cent to 27 per cent. As the state also taxed other income recipients, the total increase of the government's share was naturally much higher. If it is accepted that all recipients of income should carry their share of the war's burden, the disproportionate burden for labour and money capitalists must be considered unjust, even if a certain proportion of the war profits was probably perceived as a fair risk premium by equity holders themselves (since investment in arms production was not likely to remain profitable after the end of the war).

In summary, the tax financing of war in Britain was much more favourable for British firms, whereas the strategy of the German government, mainly financed by (hidden) deficit spending, turned out much worse for German firms.

How does the decline in firms' real profits compare with the decline of real incomes for the recipients of land rent in Germany? After all, food prices on the black market were spectacularly high, presumably causing an increase in the returns on agriculture accruing to landowners. On the other hand, agriculture suffered heavily from a lack of labour, fertilizer, and horse

³⁹ Arnold, 'Profitability', pp. 51–2.

⁴⁰ Parkinson, 'British industrial profits'; Stamp, 'Industrial profits'.

⁴¹ For example, published tax statistics were amalgamated with other income recipients, and the *Economist* data suffered from the well-known deficiencies of published data.

⁴² Arnold, 'Profitability', p. 64.

power, leading to a production decline. Thus, the question of which factor had a stronger influence—increasing black market prices or declining output—becomes first and foremost an empirical one. Black markets are difficult to observe, however, compelling us to use indirect methods.

Before the war, the *Handbuch der Millionäre* reported that most millionaires were still found among the land-owning elites.⁴³ At that time, German farms were under strong pressure from cheap imports. The blockade during the First World War led to rapid increases in the price of agricultural products and hence improved the profitability of many German farmers. Despite the control economy enforced by government officials, farmers were able to withhold some of their products and sell them on the black market. This was especially feasible for smaller farmers who produced surpluses and whose farms were near cities.

Fuchs measures the growth of profits in the agricultural sector indirectly. He considers the steady decline of mortgage debts in Bavaria during the war.⁴⁴ Statistics published by the Bodenkreditbank indicate a rapid decline in farmers' mortgage debts. Mortgage banks in rural areas such as Bavaria experienced particularly large declines in comparison with urban areas.

In Prussia, where the picture is less clear than in Bavaria, the mortgage debts of agricultural estates rose much less rapidly during the war than before it. In 1911–13, the annual increase of mortgage debts had been between 731 and 787 million Marks, but during the war the additional registration of debts declined gradually to 10 million Marks in 1917, or 1.3 per cent of the prewar figure.⁴⁵ In 1916, the amount was negative (by 31 million Marks). Another way of assessing the development of farm debts is to consider the number of farms being auctioned compulsorily. The annual level of farm auctions in Prussia between 1911 and 1913 was 690. By 1917, this number had declined to 275 farms, and only 131 were auctioned compulsorily in 1918. Apart from those indirect quantitative sources, there are many qualitative reports of new carpets finding their way to farmhouses, bartered for eggs and meat by city-dwellers searching for food in the countryside.⁴⁶ Even allowing for the overall decline in production from prewar levels, this development might indicate that farmers did slightly better than the rest of the German population as a result of high prices of food on the black market.

IV

In this section, we consider the implications of our new micro-evidence for the average development of GDP. National income accounts for the

⁴³ Martin, *Handbuch der Millionäre*.

⁴⁴ Fuchs, 'Kriegsgewinne', p. 24.

⁴⁵ *Handwörterbuch der Staatswissenschaften* (1926), vol. 3, p. 761.

⁴⁶ We thank Christine Hansen for this important point.

First World War are notoriously unreliable, as was recently reconfirmed in an estimate of twentieth-century national income accounts for Germany.⁴⁷ Therefore, additional information is important, even if it represents only a fraction of national output (although a number of other limitations have to be noted as well). Three facts in particular encourage us to compare our profit indices with national income indices and to argue that they yield important insights for the national perspective.

First, our tax records report on the profits of very large firms, which renders their weight within the context of the German industry far from negligible.⁴⁸ In addition, our sample is not limited to incorporated enterprises, as taxation registers allow us to include a large number of private firms. This is an important step forward, since contemporaries argued that profits differed markedly between private and incorporated enterprises.⁴⁹

Second, Survivor bias is not a serious problem for our estimate. The sample in fact includes a small number of firms whose tax payments stopped at some point during the war, indicating that they were 'non-survivors' (see table A.1). Moreover, during the War, entry and exit of large firms was very limited; in most industries, 80–90 per cent of large firms survived. Similarly, for the joint-stock company sector as a whole, Kocka reports that 4,798 companies were in business in 1913 and 4,723 in 1917.⁵⁰ The very small number of new entries corresponded with the very small exit rate. Therefore, profit indices of surviving companies should (mainly) reflect the overall development of capital incomes.

Third, although we do not possess any detailed information on the procedures of the time, the statistical offices typically estimated output development by collecting and weighting sales data of a few hundred firms. For example, Kocka's wage data are based on a sample of 370 firms collected by the Imperial Statistical Office (StatRA).⁵¹ While this micro-census probably achieved a greater coverage of different firm sizes and regions, the 140 firms in our sample can to some extent be regarded as a micro-census as well (albeit with a bias towards large firms and those in the Rhineland). We estimated indices for value-added in industry and services by calculating weighted averages for our real profit indices and the respective wage indices (see table 7).⁵²

Recently, Ritschl and Spoerer have reviewed and improved estimates of national income. The estimates most widely cited are those by Maddison and by Henning. However, Maddison simply assumed constant growth

⁴⁷ Ritschl and Spoerer, 'Das Bruttosozialprodukt'.

⁴⁸ Rettig, 'Investitions- und Finanzierungsverhalten'; Tilly, 'Das Wachstum'.

⁴⁹ Knauss, *Die deutsche Kriegsfinanzierung*.

⁵⁰ Kocka, *Klassengesellschaft*, p. 25.

⁵¹ *Ibid.*, pp. 14–18.

⁵² We weighted both by Hoffmann's labour share estimate of 71% and by the varying labour share estimated by us. Given the high correlation of real profits and real wages, the difference was negligible. Bry, *Wages*; Williamson, 'Evolution'.

Table 7. *Estimates of real national income and value added in Germany*

	<i>Agriculture</i> (1) ^a	<i>Industry</i> (2) ^b	<i>Transport</i> (3) ^c	<i>Postal service</i> (4) ^d	<i>Private services (new)</i> (5) ^e	<i>Industry (new)</i> (6) ^f	<i>GDP (new)</i> (7) ^g	<i>GDP</i> (8) ^h
Weights	23.2	45.0	7.2	4.1	20.4	45.0	100.0	100.0
1913	100	100	100	100	100	100	100	100
1914	89	83	109	85	93	95	94	90
1915	85	67	97	73	78	81	82	81
1916	65	64	110	72	76	88	81	76
1917	60	62	108	68	64	70	69	74

Notes and Sources

a, b source: Dessirier (cited from Ritschl and Spoerer, 'Bruttosozialprodukt', p. 41)

c, d source: Ritschl and Spoerer, 'Bruttosozialprodukt', p. 41

e, f source: value-added as explained in the text

g new GDP: weighted average of (1) plus (2)–(6), using modified weights from Hoffmann, *Das Wachstum*, p. 455, see text

h Spoerer and Ritschl estimate of GDP: weighted average of (1)–(5), weights from Hoffmann, *Das Wachstum*, index 1913 = 100, p. 455

rates for the service and transport sectors between 1913 and 1924,⁵³ which leads to a serious overestimation of the service sector's output. In contrast, Henning—on whose estimates Holtfrerich's important study relied—did not document his estimation procedures sufficiently. Ritschl and Spoerer in turn improved the estimates for the public tertiary sector by considering the volume of railway transport (both freight and passengers), and mailed letters. The former remained stable or increased slightly (to 108 per cent of the 1913 volume in 1917), and the latter decreased to 66 per cent of the 1913 volume. This is not especially surprising, given that the transport of troops and war *matériel* was a necessity, as were the journeys of urban dwellers to the countryside to search for food. In contrast, expenses for postal services (except *Feldpostkarten*) were probably reduced. It is very likely that other services were in less demand as well, since they were not regarded as necessities. Even if public transport and postal services accounted for only 6.5 per cent of national income, this additional evidence from Ritschl and Spoerer is an important achievement, because postal service output might serve as a proxy for other public services that were not considered extremely war-relevant, but were relatively labour-intensive at the same time. On the other hand, public transport figures could be used as proxy estimates for war-relevant (and more capital-intensive) public services. Hence, we assign to them a weight of 4.1 and 7.2, respectively.⁵⁴

⁵³ Maddison, *Dynamic forces*, p. 204; Maddison, *Monitoring*, p. 60; Ritschl and Spoerer, 'Das Bruttosozialprodukt'.

⁵⁴ We arrived at these figures by dividing up Hoffmann's weight for 'other service without military' between public and private services, and adding 'transport'—which was predominantly publicly owned at that time—and other public services (including most of the military infrastructure) to the war-relevant public service category.

Ritschl and Spoerer raised the problematic point that they were compelled to assume total service sector output (excluding public transport and postal service) to have remained at 100 per cent, since until now, no data were available for the private service sector. They had to rely on this constant value-added assumption for 25.3 per cent of their national income estimates, which Ritschl and Spoerer themselves criticized as *wirklichkeitsfern* (far from reality), implicitly demanding exactly those further estimates which are provided by us here. And indeed, what we found was that private service sector value-added declined even more strongly than industrial profits, i.e. at a rate outstripping industrial profits by 17 percentage points.

Our estimates of value-added in industry are somewhat more favourable than those of Dessirier, on which all the previous studies of the period relied. He estimated a rapid decline to 67 per cent in 1915 and to as low as 62 per cent in 1917 (compared with the 1913 level). In contrast, our new estimates are 81 per cent and 70 per cent for the industrial value-added in 1915 and 1917, respectively.⁵⁵

Our final estimate is slightly more pessimistic than Ritschl and Spoerer's figures. In 1917, only 69 per cent of the prewar production level was at the Kaiser's disposal, which is 5 percentage points below the previous estimates. On the other hand, our estimates showed a more gradual decline in GDP. The slow decline before, and abrupt fall during, 1917 is plausible—the famine in 1916/17 hit Germany catastrophically, leading to a stronger decline in production than previously thought.⁵⁶

As a caveat, our estimates for 1917 could be slightly underestimated if the war taxation law led to stronger underdeclaration (although many firms built up special reserves for this tax).⁵⁷ However, our earlier counter-check with stock market information indicates that our results are approximately correct. There is, of course, another limitation in the assumption that the 140 firms from the Düsseldorf district in our sample are representative of Germany as a whole.

V

We confirm Ritschl's hypothesis that inequality did not rise during the First World War. In an as yet unpublished study, he contradicted Kocka's argument that war profiteering led to redistribution in favour of the rich. Ritschl's study had to rely on macroeconomic data and Kocka's on company data of doubtful reliability, but we present new microeconomic evidence here. We find the newly created sample to be broadly representative of the large firm size segment of Düsseldorf county (*Regierungsbezirk*) as well as

⁵⁵ It is possible that our firms from Düsseldorf county were involved in war-relevant industries to an extent which exceeded that of the average German firm (which might have driven the index for the war years up). However, the comparison with the Beckschäfer sample of GJS firms indicates that our sample was in fact quite representative of war-relevancy, as well as of most German industries.

⁵⁶ Offer, *First World War*.

⁵⁷ Borchardt, 'Zwangslagen'.

of Germany as a whole. We used taxation records, following the seminal work of Spoerer who did the same for the Weimar years and the period of Nazi dictatorship.

Most companies did not make high profits during the war. Only the metal/machinery and chemical industries were able to secure increasing profits. The ‘outliers’ with their enormous profit increases influenced the popular image of ‘war profiteers’. The median entrepreneur in our sample, however, experienced an income decline of a magnitude similar to that of the decline in the real wage of workers during this period. The wage share remained almost constant. German corporate profits were much lower than profits internationally (such as those of British firms, for example).

Hence, our findings disprove conventional wisdom of an excessive redistribution of income towards capital-owners during the First World War. These results have far-reaching implications for the economic interpretation of Germany’s revolution of November 1918 and the political and economic history of the Weimar Republic, as the legitimization of income redistribution policies during the Weimar years rested partly on this alleged redistribution towards capital.

Finally, we have considered some implications of this new dataset for national income accounts. For the private service sector, in particular, profit indices can fill an important gap (under the special circumstances of the First World War). We assumed our real profit indices to be representative of the whole economy, and found that the output index may have declined much more strongly than previously thought.

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APPENDIX I: Number of cases

Table A1: *Number of cases included in profit indices*

<i>Industry</i>	<i>1913</i>	<i>1914</i>	<i>1915</i>	<i>1916</i>	<i>1917</i>
Mining	22	19	18	18	16
Chemicals	7	5	6	4	5
Electricity/gas	2	1	1	2	1
Metal/machinery	26	22	22	21	17
Transport	7	7	6	6	4
Construction	4	4	3	3	4
Paper	1	1	1	1	1
Stone/glass	3	2	1	2	2
Other services	2	2	2	1	1
Bank/insurance	10	10	10	9	9
Printing	4	4	4	3	2
Retail trade	13	12	12	11	10
Food/tobacco	23	23	20	16	16
Textiles/clothing	16	15	15	13	15

APPENDIX II: Price indices during the First World War

Because the German government strongly regulated prices in some segments, and black market prices are difficult to obtain, only rough estimates can be made.

The Imperial Statistical Office published a series of wholesale prices after the war. Other figures were published on the cost of living of various income groups, and there were non-official estimates such as the Calwer index. Wholesale prices increased more strongly than, for example, the Mark-dollar exchange rate (the latter being influenced by German economic policy).⁵⁸ After the war, wholesale prices were regulated to a very modest degree only, compared with the war years. However, they were certainly much less influenced by government than were rents, public transport, or schooling. Prices of clothing set an extreme in that they were largely unregulated throughout the war, whereas food prices were subject to a medium regulation level (basic foodstuffs more so than 'luxuries' such as meat). By excluding the highly regulated (and hence only modestly increasing) housing rents from the Imperial Statistical Office's cost of living index, one arrives at a 1355% price increase between 1913 and 1920 (excluding the War years).⁵⁹ If rents are included, the increase is 'only' 1058%. This index, like the well-known and disputed Calwer index, can be criticized for its failure to take adequate account of black market prices.⁶⁰ In 1919, these were two to three times higher than the official maximum price for meat and butter, and three to eight times higher than the official price for basic foodstuffs such as flour (data for the actual war years are not available in comparable quality).⁶¹ Hence, one can conclude that all available price indices underestimate the true price increase, especially in 1917 and thereafter, when price valuation rose to its maximum. The food-based Calwer index reports somewhat

⁵⁸ Holtfrerich, *Inflation*, pp. 14–15.

⁵⁹ *Ibid.*, p. 31.

⁶⁰ Used by Bry, *Wages*, and subsequently by Williamson, 'Evolution'.

⁶¹ Holtfrerich, *Inflation*, pp. 86–7.

higher price increases than the Bry/Stat RA index until 1916 (while the opposite is true for 1917), yet in a roughly similar size dimension. Compared with 1913, prices increased by 113% between 1914 and 1917.

Kocka argued that the Bry/Stat RA index reflects reality best. Given that we want to compare profits with Kocka's and Williamson's real wage estimates, we employ this price index as well, in order to make the real figures comparable. If we assume that entrepreneurs consume less government-controlled housing, and more luxury goods and clothes than workers, an income-group specific price index would probably reduce the relative real income of profit earners even further.

Table A2. *Price indices for Germany during the First World War*

Year	Calwer (1)	Bry/StatRA (2)	Exchange rate (3)
1913	100	100	100
1914	101	103	105
1915	143	129	142
1916	198	170	152
1917	213	253	179

Sources: see app. text

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