Making Profits in War-Time: Corporate Profits, Inequality, and GDP in Germany During World War I

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Abstract

We reconsider – and reject – Kocka's (1973) hypothesis that a strong income redistribution from workers to capital owners occurred in Germany during WWI. In spite of a small number of war-profiteering firms, the majority of firms experienced a real income decline, similar to declining real wages of workers. This finding also has important implications for the political history of the Weimar Republic.

In addition, we employ our figures to improve German GDP estimates for the war period, since our sample allows a guesstimate of private service sector development. Economic indicators were worse for the war year of 1917 than previously believed.

Introduction

This study will use a new data base of firm level profit statements to investigate the development of income inequality between industrialists and the labour force during World War I. A second, minor aim of this study is to improve guesstimates of German GDP development during the war by providing private service sector figures.

How did German output develop during World War I? The existing literature agrees that GDP declined in Germany – in contrast to the United Kingdom which emerged from the war with approximately 10 percent greater output. 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% in 1917 (always relative to 1913=100%), to a modest decline to 88% in Henning's estimate.[2] Henning's influential estimate has recently been criticised by Ritschl as 'a mere guess' (partly because Henning did not document his sources).[3] Yet Maddison's estimate of 82% - cited even more frequently than Henning's figure - is not very far from it either.[4] Ritschl and Spoerer have recently revised those estimates downward to 74% (or 79%, depending on weights). We will add new evidence to this debate in the fourth section of this paper, but the main aim of this article (and sections 1 to 3) is to study the distribution of income during WWI.

In a situation as catastrophic as WWI, the question of how income should be distributed becomes ever more pressing than during normal times. Many contemporaries argued at the time, for instance, that the rich should carry a proportionately larger burden than the poor, because poor people were more likely to suffer from nutrition-related diseases which often lead to death during WWI (death rates related to such diseases increased dramatically in

[2] Roesler cited from Ritschl, 'Pity of Peace'. Henning, *Das industrialisierte Deutschland*, pp. 47-49. 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 deadly trenches were dug and most battles fought. Given the fact that the German territory was largely spared from 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'.

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 furthermore 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 WWI: '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 extraordinarily from WWI. However, other evidence on war-profiteering led to the famous Kocka hypothesis about income inequality: Juergen Kocka argued that there occurred 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 a similar income decline as 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 WWI, but this study will nevertheless argue that Kocka's hypothesis is to be rejected. Real profits declined at a similar rate as real wages, 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 hypothesised inequality surge during the war was a major justification for the revolution of 1918/19, as well as for the redistributional policies of the 1920s. As Borchardt has argued,

[5] Offer, *First World War*; Baten, 'Ethnic'.
[6] Burchardt, ‚Between War'.
[7] Kocka, *Klassengesellschaft.*

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.

Our study will reject the Kocka hypothesis and will support the competing view of recent, yet unpublished research by Ritschl who argues that no income redistribution from the poor to the rich occurred during the war. Ritschl's hypothesis is based on macroeconomic series, whose validity is difficult to assess at the present stage of research. Our article offers a complementary microfoundation for this view based on reliable corporate data.[9] In the first section of our study, we will review the literature on the question of inequality. We will then go on to discuss the contribution which our new source of company profits and market values can make to the current debate, and which pitfalls must be avoided (section 2). 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 will be counterchecked with the stock market prices of firms. We will also address the question of changes in taxation, as well as the issue of representativeness. In Section 3, we describe how profits developed in different industries during WWI and whether "war-profiteering" was indeed a widespread occurrence. We will also undertake comparisons with the British profit indices that were recently published by Arnold.[10] Finally, the experimental fourth section discusses some potential implications for the overall picture of German output during WWI.

1. Views on German inequality during the war

[8] Borchardt, 'Zwangslagen'.
[9] Ritschl, 'Pity of Reace'.
[10] Arnold, 'Profitability'.

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 developed rather positively during the war, whereas the lower classes suffered catastrophic income declines.[11] In a similar vein, Grumbach reports the Pareto-coefficient of income equality to have 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 wartime profits.[13]

Profits during war-time are always a delicate political issue. When millions are dying on the battle-fields 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 post-colonial Africa and Latin America. For example, Hardach supported Kocka's argument of excessive war profits on the side of entrepreneurs, relative to workers.[16] His argument was that a small number of large companies were earning high profits, while the military served solely as agent of the capitalist class.

Hardach emphasised 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 as the driving force behind the war. He rejects the argument of 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 subtracted 63.5 mio.

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[11] Kocka, *Klassengesellschaft.*
[12] Grumbach, *Statistische Untersuchungen*, pp. 89-96.
[13] Holtfrerich, Die deutsche Inflation, p. 274.
[14] Lenin, '*Imperialism*'.
[15] von Mises, '*Nation'.*
[16] Hardach, *Der Erste Weltkrieg*, p. 116.

Marks (about 50%) of profits for generous deductions and reserves to cope with restructuring losses. In fact, Hardach's evidence is based on only three German arms manufacturers (he mentions that other data were not available), assuming that the development of profits was similar in other industries.[17] He also does not deflate nominal profits. Clearly, however, 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 (*StatRA* for short), which according to Kocka represents the closest approximation to reality.

But while deflation can be easily accomplished, the composition of a representative sample is a more challenging task. Kocka, for example, could only rely 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.

2. New micro-evidence on profits

Kocka acknowledges the basic weakness of any profit data: "one has to characterise the question about true profits as unsolvable even today".[19] However, this is exactly where the new database of this study comes in. Reliable individual data on the behaviour of firms and consumers was hitherto missing. We employ the strategy of Spoerer, who pioneered in the study of corporate profits during the Weimar years and under the national-socialist dictatorship.[20] A number of records (including profit figures) from the largest and most

[17] ibid, p. 117/8.

[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 also appendix B), see also Bry, *Wages*.

[19] „...., muss man auch heute noch die Frage nach den wirklichen Gewinnen als unlösbar bezeichnen." Kocka, 'Klassengesellschaft', p.25.

[20] On the interwar period, see Spoerer, *Von Scheingewinnen.* On WWI, see Fuchs, *Kriegsgewinne*. Fuchs' study relied mostly on data drawn from newspapers.

important firms have survived for the WWI period. We are therefore able to use income tax schedules from 140 firms. Five advantages and limitations of this source should be emphasised in particular:

(1) Little was previously known about the profits of private firms. Our database, in contrast, is based not only on joint-stock companies, but on privately owned and other firms as well, which is a very important step forward.

(2) Compared to balance sheet data, taxation records have some important advantages. [21] Tax authorities certainly added value in standardising 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 scrutinised 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 votes. Although Germany's most prominent arms manufacturer could finally convince tax officials that depreciation should be higher during the war (14% instead of 8%, in light of the fact that machines were used more intensively and special machines for arms production would no longer be useful after the war), the intensity of those discussions reveals the strong attitudes of the tax officials.[22]

[21] Kocka, *Klassengesellschaft.* In fact, even *Handelsbilanz*-(balance sheet)-based studies are not available for the history of profits in Germany during WWI. The available data in Kocka and similar studies only report 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 very heterogeneous, as a large number of various (non-hidden) reserves were declared.

[22] Burchardt, ‚Between War'. As a pitfall, it should be noted that we cannot ultimately judge 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 WWI, 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, hidden reserves and tax underdeclaration did probably not experience any strong increase, because the government was much better equipped and commanded 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 lead to increased military production by the complete set of firms. It would rather have set adverse incentives.

(3) A disadvantage of tax lists is that they do not contain information on the capital stocks of all types of firms. Therefore, we will have to assume 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 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 J.-S. sample in our study (discussed below) and found that it increased by only 12%. 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 will countercheck our results with capital market evidence on "holder's return", a measure that takes into account both dividends and possible changes in capital stock.

(4) A further potential limitation could result from taxation laws: Did taxation policies lead 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 of some 150 billion Marks, only 0-6% were raised by war taxation and that furthermore, a large part of these were indirect taxes (raised on tobacco etc.).[24] Firms were – as was the case with all property owners – taxed additionally by a property tax called *Wehrbeitrag* in 1913-15. Had this tax not been comparably modest (all together accounting for 1 billion, or 0.7% of war

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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 concept of "real profits" simply means the deflation of nominal profits by the most widely accepted price index in order to evaluate the purchasing power of profit incomes.

[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 more underdeveloped 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 were 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, nota bene: not the increase vis-á-vis pre-war revenue) were not even enough to pay the interests, p. 114.

expenditure), this 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% of the property-value increase of all tax subjects (including those who owned private firms). In addition, capital firms had to pay this tax according to their profit increase during the war, relative to the last five years of peace. Inflation probably reinforced this tax, because nominal profits were higher during the war than before. All in all, the war profit tax yielded 5.7 billion Marks, mainly in 1917, but was paid only in part 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 might in fact have increased in those years, yet given that we focus on gross profits in the remainder of the article, the taxes paid by entrepreneurs and share-holders overcompensate this bias. After-tax profit shares were probably even lower than our estimate here.

(5) The main advantage of our source has already been mentioned above, namely 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 to 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 on the level of individual firms.[27]

[25] Holtfrerich, *Inflation*, p. 106-110.

[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 *Laender* ("lands", such as Prussia, Bavaria etc.) until 1920, and that those taxes in fact decreased in real terms due to production decline and inflation.

[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 will counter-check this with total returns based on a sample drawn from stock exchange data. On the other hand, our data set does not only include joint-stock firms (as Spoerer's does), but also includes private firms. Spoerer's

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 of 1890-1919.[28] In 1913, 145 of these firms existed, and for 140 of them profit statements are available. Most of the other firms 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 (see Table 2). Moreover, the exit rates in our 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 as well as the whole of Germany. All joint-stock firms were obliged to be listed in the Handbook of Joint-Stock Companies (*Handbuch der deutschen Aktiengesellschaften*), which enabled us to identify 98 (47%) of the firms in our sample as joint-stock companies. Another large group in this industrial area were *Berggewerkschaften* (mining societies, 14% of our sample), very similar to joint-stock companies in legal form. Limited liability companies and co-operatives (GmbH and eGmbH) accounted for about 8%, while the rest consisted of large private firms.

The region under study comprises a large proportion of Prussia's most important industrial cities, such as 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 the Düsseldorf region, 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 Düsseldorf's joint-stock companies

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data set is regionally concentrated on East German firms (yet also includes some from the West), whereas our sample is drawn from the West (Duesseldorf district). Both samples concentrate on large firms.

[28] In contrast, for the whole of Westfalia, only a handful of tax records have survived in state archives. For the other Rhenish counties, a large collection is available for Koblenz and Trier (but does not cover World War I), whereas for Koeln and Aachen, almost nothing survived in the state archive. Some heterogenous material is available in community archives, of which we will edit a large part in the near future. Unfortunately, wage bills and sales are not included in company taxation records.

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

(hereafter called Düsseldorf J.-S. sample) list all subsidiaries of one company under the location of the headquarter (Düsseldorf being a prominent location for headquarters), our tax sources list profits separately by subsidiary.

How representative is our data set 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 are included in the sample, such as Krupp, Stinnes, Thyssen, Beckerath and others. If we compare the joint-stock companies of our sample to the Düsseldorf J.-S. sample for the pre-war 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 *Berggewerkschaft* companies were also of considerable size.

The distribution by industry in our sample suggests it as well to be representative of the large-scale industrial mix in the Rhineland region, again taking the composition of the (Düsseldorf J.-S.) companies as a proxy for the large firm sector (see Table 3). Mining and food-processing are represented more strongly in our sample than among joint-stock companies, whereas construction, banking, and other industries and services are underrepresented. This, however, can be explained by the fact that the Düsseldorf J.-S. takes into account a number of smaller companies which were disregarded in the large firm tax record sample.

In addition, 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 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

[30] This sample contains 381 firms, and for 1911, profit data are reported for 116 of them. Maria Hirschauer, Munich, collected this data set for her thesis, see Hirschauer, ‚Produktivität'. We would like to take this opportunity to thank her the provision of 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 Duesseldorf J.-S. sample for whom net profit figures were available.

[32] compiled recently by Beckschäfer, *Einflussfaktoren*.

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, col. 1 and 3). Our sample includes slightly less (war-relevant) metal/machinery firms, yet 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 joint-stock company. To a certain extent, this might also explain why our sample contains more chemical firms, because of the latter, many were limited liability companies (*GmbHs*). In all other industries, the similarities of industry shares across both samples are striking. We will use the German J.-S. 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 Rheinish region by size, geographic distribution and industry, and also of the overall large-firm segment in Germany.

3. Results: firm profits and Inequality

3.1 Profit indices: were the Prussian firms war profiteers?

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 characterised by strong nominal increases, but declining real profits (see Table 4). Real profits in industry declined to 86% in 1915 (from the 1913 level), recovered modestly with the Hindenburg program to 92% in 1916 and reached a baseline of 68% in 1917. In contrast, nominal profits increased by 66% in the same period, even if outliers are removed (increases of 600% and more). The question of whether outliers should be removed is debatable and should therefore be addressed in more detail. Contemporary newspapers, for instance, supported their assertions forcefully by pointing to a handful of

outliers, extreme cases of war profiteers. As economists, however, we are generally more interested in the "typical" case, the median firm. Hence, the following discussion is based on a sample from which extreme cases were 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: this firm underwent a very problematic profit development after the economic crises of 1900/01 and 1907/08, leading to zero or negative profits in 1910 and 1911 (profits in 1912 unknown). In 1913, the firm returned to profits for the first time after the crisis, yet with a profit of some meagre 3,000 Marks, which only amounted to roughly 2% of their 1899 nominal profits. During the war, profits increased further to 1,998,000 Marks in 1917 (nominal). Does this infer that the firm under consideration had a nominal profit increase of 26,000 percent between 1913 and 1917? It is clear that the value of 1913 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 (only 61% of the 1913 level in 1917), especially during the Hindenburg program which aimed at mobilising all resources and factor inputs for war production. If we accept the hypothesis that tax underdeclaration in 1913 was similar than during the war years, and assume that the capital stock was not extremely reduced (available data suggests it was not), we conclude that firms performed much worse in the war than previously thought.

It is interesting to see how the Hindenburg program influenced profits. What did this program consist of? After Hindenburg and Ludendorff joined the Supreme Command (*Oberste Heeresleitung*, *OHL* for short), they reversed the policies of the previous military leaders.[34]

[33] Another issue we checked were the differences between private firms and capital firms, which turned out to be extremely similar.

[34] See Feldman, '*Army*'.

The key aim of the Hindenburg Program was the expansion of military power, requiring the construction of an extraordinary amount 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 and weakened its position within the decision-making process. (Previously, the War Ministry`s policy had aimed at a "careful husbanding of Germany`s resources". The Hindenburg Program, in contrast, introduced a massive armament programme – without any consideration for the impact on civilian production -, government-regulated food distribution and a widened age span for compulsory military service. It furthermore aimed at introducing compulsory labour obligations for the entire population, but as Feldman has shown, trade unions were able to instrumentalise the parliamentary process to subvert the purposes of the *Vaterlaendisches Hilfsdienstgesetz*.[35] Hindenburg gained full support from the industrialists, as they saw the Hindenburg Program 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 program had taken full effect.

Compared to 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% and 85%) than those few examples highlighted by contemporary newspapers (135% and 126%). Only in the intermediate group did profits display a similar evolution. The difference in the former two categories can be partly

[35] Feldman, *Army*.

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 144% of the 1913 level, while profits in chemicals surged to 171% (Table 4). Most other industries experienced declining profits. Banks and insurance companies' profits dropped to a meagre 30%, while profits in mining (!), construction, and printing went down to 50% 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, while healthy workers were drafted to the military. Thus, those who remained in the mines had lower labour productivity. In addition, the disastrous diet of the time did not provide any strength and motivation. 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 only 30-55% of the 1913 level in 1917.

An important countercheck of profit indices can be provided by a look at the capital market. While officially, the stock exchange was closed for most of the time during the war, investors developed alternative institutions to trade their stocks. A glance at the development of stock prices reveals their day-to-day variability as being very similar to the pre-war period, and qualitative reports confirm that the volume of stock trading and information flow were as extensive as during the pre-war 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 of 1913 and sold it in December of 1914, return would have consisted of the price increase

[36] Pohl and Goemmel, *Boersengeschichte.*

(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, which is due to the fact that in 1915, stock prices were the same as in 1914, with only dividends changing. The figures for those years can only be interpreted relative to one another, by industry group. However, taken together, the two years are unbiased. It is fascinating to see that this measure displays a development very similar to that of the profit index (Table 5): After a modest decrease of only 2 percent 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 program was anticipated to begin in 1916. Before that, less war-relevant industries performed in fact better than highly war-relevant ones. In the bottom 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 initiation of the Hindenburg program, in contrast, the stock value of the "not very war-relevant" category plummeted to a meagre 31 Marks in 1917 vis-á-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% 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% (weighted average of industry and services). This must be understood in

[37] Beckschaefer, 'Einschlussfaktoren'.

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 (1965) estimated that the labour share amounted to 70.90 % in 1913. 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 back to its pre-war level with the Hindenburg program of1916 and 1917.

3.2 International comparison: What about the British?

British firms appear to have done better than German firms during the war. A recent article by Arnold presents a broad array of different estimates, yet with the bottom line that British profits did not decline much during war-time, compared to the pre-war level. According to Feinstein's estimates, profits as measured in constant prices increased by 20% between 1913 and 1917 (93% in current prices - as Britain also experienced inflation).[38] This increase in profits was partially skimmed off by the government, who 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% between 1913 and 1917, and rose modestly (by less than 10%) in 1915 and 1916. Parkinson's estimate indicates a post-tax decline of 18% in 1917 (plus 1-3% in 1915 and 1916). These differing estimates – even those based on the same sources (tax statistics and published profits in the *Economist*) – demonstrate the weakness of their empirical foundations.[39] Arnold then took steps to improve this situation by considering internal profit calculations of 30 British joint-stock companies, finding that pre-tax returns on capital increased from 8-9% in 1910-13 to 17% in 1917 (before tax, in constant prices). After

[38] Arnold, 'Profitability',pp. 51-52.

[39] For example, tax statistics were published in amalgamation with other income recipients, and the *Economist* data suffered from the well-known deficiencies of published data.

tax, profitability increased only modestly in 1915 and 1916 and returned approximately to the pre-war 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 40-47% (1910-13) to 38% (1917), and the money capitalist's share from 17-27% to 12%.[40] The largest increase, however, accrued to the state (profit taxes surged from 0-1% to 24%), whereas the entrepreneurial share shifted from 26-38% to 27%. As the state also taxed other income recipients, the total increase of the government's share was naturally much higher. If we take it as given that all recipients of income should carry their share of the war's burden , the disproportionate burden for labour and money capitalists must be called unjust, even if a certain proportion of the war profits was probably perceived as a fair risk premium by equity holders themselves (since investment into 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.

3.3 Comparison: Incomes of land rent recipients in Germany

How does the decline in real firm profits compare to the decline of real incomes for the recipients of land rent in Germany? After all, food prices on the black market were enormously high, presumably causing the returns on agriculture accruing to land-owners to increase. On the other hand, agriculture suffered heavily from a lack of labour, fertiliser and horse 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

[40] Arnold, 'Profitability', p. 64.

foremost an empirical one. Black markets are difficult to observe, however, compelling us to use indirect methods.

Before the war, the Handbook of Millionaires reported that most millionaires' incomes were still earned by land-owning elites.[41] During the pre-war period, German farmers were under strong pressure due to cheap imports. The blockade during the First World War lead to rapidly increasing prices of agricultural products and hence improved the profitability of many German farmers. Even in spite of the control economy behaviour of government officials, farmers were able to withhold some of their products and sell them on the black market. This possibility was especially feasible for smaller farmers who produced surpluses and were located in the vicinity of 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.[42] Statistics published by the *Bodenkreditbank* indicate a rapid decline of farmer's mortgage debts. Mortgage banks in rural areas such as Bavaria experienced particularly large declines in comparison to urban areas.

The picture in Prussia is less clear than in Bavaria, however. Yet there as well, the mortgage debts of agricultural estates rose much less rapidly during the war than before. In 1911-13, the annual increase of mortgage debts had been 731-787 million Marks, whereas during the war, the additional registration of debts declined gradually to 10 million Marks in 1917, or 1.3% of the pre-war figure.[43] In 1916, it was even negative (by 31 million Marks). Another possibility to assess the development of farm debts is to consider the number of farms being auctioned by force. The annual pre-war level of farm auctions in Prussia between 1911-13 was 690. By 1917, this number had declined to 275 farms, with only 131 being auctioned by force in 1918. Apart from those indirect quantitative sources, there are many qualitative reports of new carpets finding their way to farmhouses, bartered in return for eggs and meat by city-dwellers

[41] Martin, *Handbuch der Millionäre*.
[42] Fuchs, *Kriegsgewinne*, p. 24.
[43] *Handwoerterbuch der Staatswissenschaften* (1926), vol. 3, p. 761.

searching for food in the country-side.[44] Even if we take into account the overall production decline compared to pre-war levels, this development might indicate that farmers did slightly better than the rest of the German population as a result of high black market prices of food.

4. Further Results: implications for the estimation of GDP

In the first three sections of this study, we considered the distribution of income in Germany during WWI. In this section, we now turn to consider the implications of our new micro-evidence for the average development of GDP. National income accounts for the First World War are notoriously uncertain, as was recently reconfirmed in an estimation of 20th century national income accounts for Germany.[45] Therefore, additional pieces of information are important, even if they represent only a fraction of national output (however, a number of other limitations have to be noted as well). Three facts in particular encourage us to compare our profit indices to national income indices and argue that they yield important insights for the national perspective:

1. 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.[46] In addition, our sample is not limited to capital companies, as taxation registers allow us to include a large number of private firms. This is an important step forward, since contemporaries argued that profits were quite different between private and capital firms.[47]

2. Survivor bias is not a large problem for our estimation. First of all, our sample does in fact include 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 WWI, entry and exit of large firms was at any rate very limited. In most industries, 80-90% of large firms survived. Similarly, for the whole joint-stock company sector, Kocka reports that 4798

[44] Thanks to Christine Hansen for this important hint.
[45] Ritschl and Spoerer, 'Das Bruttosozialprodukt', pp. 27-54.
[46] Tilly and Rettig, *Investitions- und Finanzierungsverhalten*; Tilly, 'Das Wachstum'.

companies existed in 1913 and 4723 companies in 1917.[48] Very small entry numbers corresponded with very small exit rates. Therefore, profit indices of surviving companies should (mainly) reflect the overall development of capital incomes.

3. Although we do not possess any detailed information on the procedures of the time, the statistical offices typically estimated output development by collecting and weighing sales data of a few hundred firms. For example, Kocka's wage data is based on a sample of 370 firms collected by the Imperial Statistical Office (hereafter *StatRA*).[49] 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 and Rheinish firms).

We estimated indices for value-added in industry and services by calculating weighted averages for our real profit indices and the respective wage indices.[50]

Recently, Ritschl and Spoerer have reviewed and improved estimates of national income. The estimates most widely cited are those by Maddison and Henning, respectively. However, Maddison simply assumed constant growth rates for the service and transports sector between 1913 and 1924,[51] 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 railway transport volumes (both freight and people), and mailed letters. The former remained stable or increased slightly (to 108% of the 1913 volume in 1917), the latter decreased to 66% of the 1913 volume. This is not very astonishing, given that the transport of soldiers and war material was a necessity, as was the

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[47] Knauss, 'Deutsche'.
[48] Kocka, *Klassengesellschaft*, p. 25.
[49] Ibid., p. 14-18.
[50] We weighted both by Hoffmann's labour share estimate of 71%, and 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'.
[51] Maddison, *Dynamic*, p. 204; Maddison, *Monitoring*, p. 60; Ritschl and Spoerer, 'Bruttosozialprodukt', pp. 27-54.

travelling of urban dwellers to the countryside in order 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, as they were not regarded as necessities. Even if public transport and postal services accounted for only 6.5% 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 them a weight of 4.1 and 7.2, respectively.[52]

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%, since until now, no data was available for the private service sector. They had to rely on this constant value-added assumption for 25.3% of their national income estimates, which Ritschl and Spoerer themselves criticised 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 surpassing the former by 17 percentage points.

Our estimates of value-added in industry are somewhat more favourable than Dessirier`s estimates, on which all the previous WWI studies relied. The former estimated a rapid decline to 67% in 1915 and only 62% in 1917 (compared to the 1913 level). In contrast, our new estimates are 81% and 70% for the industrial value-added in 1915 and 1917, respectively.[53]

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[52] 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.

[53] One could imagine that our firms from *Duesseldorf* 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 Beckschaefer sample of all-German joint-stock firms indicates that our sample was in fact quite representative of war-relevancy, as well as ofmost German industries.

Our final estimate is slightly more pessimistic than Ritschl and Spoerer`s figures. In 1917, only 69% of the pre-war production level were at the *Kaiser*'s disposal, which is 5 percentage points below the previous estimates. On the other hand, we arrived at a more gradual decline of GDP. The slow decline before, and abrupt fall during, 1917 is plausible - the famine in 1916/17 hit Germany catastrophically, leading to a stronger production decline than previously thought.[54]

As to caveats, we have to admit that our estimates for 1917 could be slightly underestimated, if it were the case that the war taxation law led to stronger underdeclaration (although many firms built up special reserves for this tax)[55]. However, our earlier counter-check with stock market information indicates that our results are probably not too far from reality. Another limitation lies of course in the assumption that the 140 firms from the Düsseldorf district in our sample are representative of Germany.

5. Conclusion

We confirm the hypothesis of Ritschl that inequality did not rise during WWI. In a 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, whereas we present new microeconomic evidence in this study. We find the newly created sample to be broadly representative of the large firm size segment of the Düsseldorf county (*Regierungsbezirk*) as well as 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 Nazi dictatorship period.

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

[54] Offer, *First World War*.

our sample, however, experienced income declines of a magnitude similar to that of the real wage decline of workers during this period. The wage share remained almost constant. German corporate profits were much worse than profits by international comparison (like those of British firms, for example).

Hence, our findings disprove conventional wisdom of an excessive redistribution of income towards capital-owners during World War I, which has 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 legitimisation of income redistribution policies during the Weimar years rested partly on this alleged redistribution towards capital.

Finally, we considered some implications of this new data set for national income accounts. The previous lack of knowledge of private service sector development appears to be a particular case in point where profit indices can fill an important gap (under the special circumstances of WWI). We assumed our real profit indices to be representative of the whole economy, and found that the output index might have declined much more strongly than previously thought.

[55] Borchardt, 'Zwangslagen', pp. 85-132.

Table 1. *Geographic Distribution: Joint-Stock Companies in the Tax Record Sample and the Duesseldorf J.-S. Sample (in %)*

City	*Share in our sample*	*Share in Duesseldorf J.-S. sample*
	(1)	(2)
Barmen	2	5
Duisburg	7	11
Duesseldorf	8	26
Elberfeld	3	6
Essen	19	10
Gladbach	3	5
Krefeld	3	7
Muelheim a.R.	5	3
Neuss	0	3
Remscheid	5	2
Solingen	3	2
Uerdingen	2	0
Smaller Places	40	21

Sources: State Archive Duesseldorf, Reg. Duesseldorf, Nr. 31477-41639.

Handbuch der Deutschen Aktiengesellschaften, vol. 1912/13.

Table 2. *Firm size: joint-stock companies in our sample and the Duesseldorf J.-S. sample (in %)*

	Our sample	*Duesseldorf J.-S. sample*
	(1)	(2)
Profits below 100,000 M	23	25
100-500,000 M	39	48
500-1,000,000 M	15	10
Exceeding 1 Mio M	23	17

Sources: See Table 1.

Table 3. *Composition of joint-stock companies by industries (in %)*

City	*Share in tax profit sample (in %)*	*Share in Duesseldorf J.-S. sample 1911*	*Share in German J.-S. sample 1914-1926*
	(1)	(2)	(3)
Metal/Mach.	26	24	31
Transport	5	5	6
Mining	13	6	6
Chemical/Pr./St.	10	8	4
Lumber/Paper	5	2	3
Food/Tob.	18	7	20
Textiles	8	8	8
Trade	3	2	3
Bank/other Serv.	13	23	16
Other industrial /construction	0	14	4

Sources: See Table 1.

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

	N 1913	1913	1914	1915	1916	1917
	(1)	(2)	(3)	(4)	(5)	(6)
War relevant, new estimates	62	100	86	84	99	82
War relevant, Kocka/Newspaper		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
Medium war relevant, new estimates	10	100	83	76	70	41
Medium war relevant, Kocka/Newspaper		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
Not very war relevant, new estimates	68	100	91	85	86	51
Not very war relevant, Kocka/Newspaper		100		126		
Printing	4	100	91	76	29	35
Food/Tob.	23	100	102	102	71	53
Textiles/Cl.	16	100	90	92	111	53
Bank/Insur.	10	100	76	74	59	30
Trade	13	100	78	68	101	55
Other Services	2	100	114	73	129	91
*Industry**	115	100	89	86	92	68
Services	25	100	84	72	89	51

* Includes transport and construction.

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

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 appendix table A1. Deflated by the price index of Bry, *Wages* and Statistisches Reichsamt.

Sources: State Archive Duesseldorf, Reg. Duesseldorf, Nr. 31477-41639. Kocka, *Klassengesellschaft*, p. 26.

Table 5: *Holder's return and value development of stock investments (German J.-S.-sample)*

	1914	*(1915)*	*(1916)*	*1917*
	(1)	(2)	(3)	(4)
Holder's return				
War relevant industries	-6.0	(-16.8)	(9.1)	-14.6
Medium	-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
100 invested Marks in 1913 were worth…				
War relevant industries	94.0	(77.2)	(86.3)	71.7
Medium	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: German J.S.-sample (300 firms). The values for 1915 and 1916 should be integrated, because prices were maintained from 1914 onwards and only dividends changed.

Table 6: *Labour share in Germany during WWI*

Year	*Profit index*	*Wage index*	*Labour share*
	(1)	(2)	(3)
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', who 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.

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

	Agricul-ture (1)[a]	*Industry* (2)[b]	*Trans-port* (3)[c]	*Postal service* (4)[d]	*Private Services (new)* (5)[e]	*Industry (new)* (6)[f]	*GDP (new)* (7)[g]	*GDP* (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:
a, b *Source*: Dessirier (cited from Ritschl/Spoerer, 'Bruttosozialprodukt', p. 41)
c, d *Source*: Ritschl/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, *Wachstum*, p. 455, see text.
h Spoerer/Ritschl estimate of GDP: weighted average of (1)-(5), weights from Hoffmann, *Wachstum*, Index 1913=100, p. 455.

Appendix A: Number of Cases

Appendix Table A.1: *Number of cases for profit indices*

Industry	1913	1914	1915	1916	1917
	(1)	(2)	(3)	(4)	(5)
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/Insur.	10	10	10	9	9
Printing	4	4	4	3	2
Trade	13	12	12	11	10
Food/Tob.	23	23	20	16	16

Textiles/Cl.	16	15	15	13	15

Appendix B: Price indices during WWI

Most scholars who have tried to estimate price indices for the WWI period have found this task extremely difficult, and as a result only rough estimates can be given. The difficulties stem mainly from the fact that the German government strongly regulated prices in some segments, while black market prices are difficult to obtain.

Which price indices are available for the WWI period? 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 existed 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).[56] After the war, wholesale prices were regulated to a very modest degree only, whereas this is less trueof the war years. However, they were certainly much less influenced by government than rents, public transport or schooling. Prices of clothing set an extreme in that they were largely unregulated throughout the entire war, whereas food prices were subject to a medium regulation level (basic foodstuffs more so than "luxuries" such as meat etc.). By excluding the highly regulated (and hence only modestly increasing) housing rents from the imperial office's cost of living index, one arrives at a 1355% price increase between 1913 and 1920 (WWI years not given). [57] If rents are included, the increase is "only" + 1058%. This index, as well as the famous and disputed Calwer index, can be criticised for their failure to adequately take into account black market prices.[58] In 1919, black market prices 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

[56] Holtfrerich, *Inflation*, pp. 14-15.
[57] ibid, p. 31.
[58] used by Bry, *Wages*, and subsequently by Williamson, 'Evolution'.

available in comparable quality).[59] 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 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 to 1913, prices increased by 113% between 1914 to 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 B.1. *Price indices for Germany during WWI*

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

[59] Holtfrerich, *Inflation*, pp. 86-87.

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