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Resolving the Anglo-German Industrial Productivity Puzzle, 1895-1935: A Response to Professor Ritschl

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This response offers a critical appraisal of the claim of Albrecht Ritschl to have found a possible resolution to what he calls the Anglo-German industrial productivity puzzle, which arose as the result of a new industrial production index produced in an earlier paper by the same author.¹ Projection back from a widely accepted 1935/36 benchmark using the Ritschl index showed German industrial labour productivity in 1907 substantially higher than in Britain. This presented a puzzle for at least two reasons. First, other comparative information from the pre-World War I period, such as wages, seems difficult to square with much higher German labour productivity at this time.² Second, a direct benchmark estimate produced by Stephen Broadberry and Carsten Burhop, using production census information for Britain and industrial survey material of similar quality for Germany, suggested broadly equal labour productivity in 1907.³ Broadberry and Burhop also showed that if Walther Hoffmann's industrial output index was used instead of the Ritschl index for Germany, the puzzle largely disappeared.⁴

Ritschl now proposes some further changes to the German industrial output index, which move it closer to the Hoffmann index.⁵ However, to remove the remaining discrepancy, Ritschl proposes a number of amendments to the 1907 benchmark.⁶ In this reply, we argue that most of the proposed changes to the benchmark are unwarranted. We also show that applying a uniform weighting scheme to the branch output series used in the new Ritschl industrial production index removes most of the remaining discrepancy.

PROPOSED CHANGES TO THE 1907 BENCHMARK

The first basic difference between the Broadberry and Burhop and Ritschl benchmarks concerns our preference for the German industrial survey sources wherever possible.⁷ This is important because it means that we can be sure that the output and employment refer to the same production units. In our view, it is not worth sacrificing this advantage to obtain data for 1907 rather than 1908 or some other alleged benefit of an alternative source of employment data. Furthermore, if anything, this reliance on the German industrial surveys is likely to bias our benchmark in favour of Germany, since these surveys excluded the craft sector and most small firms, where productivity was lower than in the large industrial firms.

To ensure consistency of sources for output and employment, we used data for 1908 and 1910 for some German industries. Ritschl argues that this biases our results against Germany on the grounds that these industries went into recession after 1907.⁸ Yet it is clear from Hoffmann's data on both output and employment that labour productivity continued to increase after 1907, so that our use of later years for Germany must bias the benchmark in favour of Germany.⁹ Ritschl's cyclical adjustment nevertheless somehow raises the German productivity lead from 5 per cent to 12 per cent, or about one-third of his total proposed adjustment.¹⁰ This is wholly inappropriate, and any adjustment would have to be in the opposite direction.

Ritschl draws attention to the issue of multi-product firms, and asserts that this leads us to overstate employment in Germany because not all workers were producing the final product.¹¹ However, the direction of the bias is unclear. If workers were allocated to the industry in which they were mainly engaged, then for any particular industry there would be both included workers who were not producing wholly for

that industry (hence leading to an understatement of productivity) and output produced by workers who were allocated to other industries (hence leading to an overstatement of productivity). And for industry as a whole, any increase in productivity in one branch must surely be offset by a decrease in another branch, since the net effect of reallocating labour across multi-product firms must be zero. This spurious adjustment adds another 8 percentage points to the German productivity advantage.

Ritschl also proposes an adjustment to take account of the smaller cut-off-point in the size of firms in the German occupation census.¹² This adds another 8 percentage points to the German productivity lead, which is completely out of line with similar adjustments for other comparisons, including that of Rainer Fremdling, Herman de Jong and Marcel Timmer for the 1935/36 Anglo-German benchmark.¹³ But, more importantly, the adjustment is totally unwarranted, since we relied mainly on the industrial surveys, which had a higher cut-off point than the British production census. If anything, the adjustment should be in the other direction, but in any case much, much smaller.

Nevertheless, Ritschl does provide a useful critical survey of our estimates for particular industries, and we have taken on board some of his suggestions.¹⁴ As a result, we provide an updated version of our 1907 benchmark in Table 1, together with our original estimates and Ritschl's proposed revisions. The changes which we have made in response to Ritschl's critical evaluation are limited to four industries, cotton, cement, salt mining and iron ore mining, and details are provided in the longer

version of this paper.¹⁵ The overall effect is to raise the Germany/UK labour productivity lead in 1907 from 5 per cent in our original study to 8.4 percent.

PROPOSED CHANGES TO THE GERMAN PRODUCTION INDEX

Ritschl is critical of Hoffmann's treatment of the metal processing industry, where output is measured by labour income and the assumption of a constant labour income share.¹⁶ Instead, Ritschl uses volume series for mechanical engineering, electrical engineering, motor vehicles and shipbuilding.¹⁷ Here, we accept the use of Ritschl's volume series, but impose a uniform weighting scheme.

The starting point for the weighting scheme is Hoffmann, where the weights for each industrial branch are calculated as the product of the value added per employee of this branch in 1936 and its employment in 1907 (weights for the years 1896-1925) and 1933 (weights for the years 1925-1959), respectively.¹⁸ However, Hoffmann's original weighting scheme is modified to incorporate Fremdling et al.'s corrections to value added per employee in 1936 (as a result of distortions arising from war planning) and Fremdling's corrections to labour force estimates between 1925 and 1939 (as a result of confusion over boundary changes).¹⁹ In addition, we apply the same weighting scheme used for the industrial sector as a whole to the aggregation within metal processing. This is in contrast to Ritschl, who first combines output of the mechanical and electrical engineering industries using gross output in 1913 as weights and then combines the resulting index for mechanical and electrical engineering with the sub-indices for motor vehicle production and shipbuilding using 1928 weights.²⁰

With 1913=100, our new index of metal processing output takes a value of 95.9 in 1925 compared with Hoffmann's index value of 1925 = 131.4.²¹ On the other hand, the new index is somewhat higher than Ritschl's index, which had a level of 1925 = 84.4.²² We then incorporate this new index for the metal processing industry into a new index for manufacturing output in Germany for the period 1895-1938 using the same weighting scheme. Our recalculation of manufacturing output confirms qualitatively one of Ritschl's central results, that manufacturing/industrial output was lower during the interwar period than suggested by Hoffmann's figures. According to the new index, by 1936 output was nearly 13 per cent lower than Hoffmann believed. However, this does not translate into a 13 per cent effect on labour productivity, because the new output weights are derived from changes to the employment data. This, in turn, has implications for the main focus of this paper, the comparative Germany/UK manufacturing labour productivity level. The results are presented in Table 2.

Starting from the widely accepted Germany/UK comparative labour productivity level in manufacturing of 102 in 1936, the new time series projection for 1907 of 112.5 is quite close to our revised 1907 benchmark estimate of comparative manufacturing labour productivity of 108.4. What happens here is that over the long period 1907 to 1936, Hoffmann's over-estimation of output growth is partly cancelled out by his over-estimation of employment growth, so that the long run comparative labour productivity picture is much as suggested by Broadberry.²³

CONCLUSION

In this paper, we reaffirm the central claim of Broadberry and Burhop that manufacturing labour productivity was broadly equal in Britain and Germany during the first half of the twentieth century.²⁴ We first reject Ritschl's attempt to revise our 1907 benchmark substantially upwards.²⁵ We then show that applying a uniform weighting scheme to Ritschl's new output series for metal processing removes most of any remaining inconsistency between time series projections and benchmarks.

TABLE 1: Comparative Germany/U.K. labor productivity circa 1907 (UK =100)

	Original Broadberry- Burhop	Ritschl	Revised Broadberry- Burhop
General chemicals	126.6	134.3	126.6
Coke	98.9	123.5	98.9
CHEMICALS & ALLIED	113.9	130.5	113.9
Iron & steel	137.8	144.0	137.8
Non-ferrous metals	157.9	221.5	157.9
Motor vehicles	89.7	135.2	89.7
METALS & ENGINEERING	139.2	152.1	139.2
Cotton	85.6	128.4	87.3
Silk	74.9	93.7	74.9
Leather	67.8	100.8	67.8
TEXTILES & CLOTHING	82.3	121.7	83.6
Brewing	90.5	102.7	90.5
Tobacco	28.3	38.4	28.3
Sugar	47.3	47.3	47.3
FOOD, DRINK & TOBACCO	66.9	73.0	66.9
Cement	108.1	124.2	124.1
OTHER MANUFACTURING	108.1		124.1
TOTAL MANUFACTURING	105.0	128.0	108.4
Salt mining	57.8	130.1	106.8
Coal mining	78.5	95.5	78.5
Iron ore mining	91.0	129.8	77.0
MINING	78.7	97.9	77.7
TOTAL INDUSTRY	101.8	124.5	104.7

Sources: Broadberry and Burhop, "Comparative Productivity", p. 321 and Ritschl "Anglo-German", Table 7.

TABLE 2: Projections of Germany/UK comparative labour productivity in manufacturing

	1907	1925	1933	1936
UK index of manufacturing output (1913=100)	88.8	111.8	119.6	155.7
UK index of manufacturing employment (1913=100)	93.0	93.4	89.4	101.1
UK index of manufacturing labour productivity (1936=100)	62.0	77.7	86.9	100.0
German index of manufacturing output (1913=100)	76.6	96.1	78.6	121.4
German index of manufacturing employment (1913=100)	92.6	111.8	77.6	100.5
German index of manufacturing labour productivity (1936=100)	68.4	71.1	83.8	100.0
Comparative Germany/UK manufacturing labour productivity (UK=100)	112.5	93.4	98.5	102.0

Sources: UK output and employment indices from Broadberry, *Productivity Race*, pp. 43-44. German output index: own calculation, see text. German employment own calculations using data from Hoffmann, *Das Wachstum*, p. 196 for 1907 and Fremdling, "German Industrial Employment", p. 178 for 1925, 1933 and 1936.

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¹ Ritschl, "Anglo-German" and "Spurious Growth."

² Broadberry and Burhop, "Comparative Productivity", pp. 330-332.

³ *Ibid.*, pp. 318-322.

⁴ *Ibid.*, pp. 328-330, Hoffmann, *Das Wachstum*, and Ritschl, "Spurious Growth."

⁵ Ritschl, "Anglo-German" and Hoffmann, *Das Wachstum*.

⁶ Ritschl, "Anglo-German."

⁷ Broadberry and Burhop, "Comparative Productivity" and Ritschl, "Anglo-German."

⁸ *Ibid.*

⁹ Hoffmann, *Das Wachstum*.

¹⁰ Ritschl, "Anglo-German."

¹¹ *Ibid.*

¹² *Ibid.*

¹³ Fremdling et al., "Censuses Compared."

¹⁴ Ritschl, "Anglo-German."

¹⁵ Available at <http://www2.warwick.ac.uk/fac/soc/economics/research/papers/>.

¹⁶ Ritschl, "Spurious Growth" and "Anglo-German", Hoffmann, *Das Wachstum*.

¹⁷ Ritschl, "Spurious Growth", p. 214.

¹⁸ Hoffmann, *Das Wachstum*.

¹⁹ Fremdling et al., "Censuses Compared" and Fremdling, "German Industrial Employment."

²⁰ Ritschl, "Spurious Growth", pp. 213-217 and "Anglo-German."

²¹ Hoffmann, *Das Wachstum*.

²² Ritschl, "Spurious growth."

²³ Broadberry, *Productivity Race*.

²⁴ Broadberry and Burhop, "Comparative Productivity."

²⁵ Ritschl, "Anglo-German."