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An Input-Output Table for Germany and a New Benchmark for German Gross National Product in 1936

Research Memorandum GD-106

Rainer Fremdling and Reiner Stäglin

RESEARCH MEMORANDUM

An Input-Output Table for Germany and a New Benchmark for German Gross National Product in 1936

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Abstract:

This paper is based on the archival sources of the German industrial census of 1936. Originally, this census and its forerunner of 1933 had actually been designed by the German Imperial Statistical Office (StRA) to compile an input-output-table for Germany as a basis for managing the business cycle. In connection with rearmament, however, this endeavour was given up and instead, these data were used for constructing detailed material balance sheets, which served as a statistical basis for preparing the war. Based on these hitherto secret records and additional statistical information we have been busy to fulfil the original plan of the StRA of constructing the desired input-output table. Here we present an interim result covering the entire manufacturing sector in detail, agriculture and aggregate figures. The new benchmark for gross national product (GNP) with its components for the production and expenditure side deviates significantly from Hoffmann´s et al. well-known figures.

1. **Background and aim of the input-output oriented activities**

For the first time, the industrial census of 1936 provided a comprehensive account of input and output data for all branches of German industry. Also for the first time on this scale, German statisticians applied the Anglo-Saxon concept of net production value (*Nettoproduktionswert*) or value-added (*Wertschöpfung*) in order to measure output. The data were collected on the level of operating or technical units (*Betriebsstätten*) of German enterprises.

In 1939, the German Imperial Office for Military-Economic Planning (*Reichsamt für Wehrwirtschaftliche Planung* = RWP) published results in its first and only volume on the Outcome of the Official Census of Production – German Industry (*Gesamtergebnisse der amtlichen Produktionsstatistik – Die deutsche Industrie*).[2] For reasons of camouflage, however, certain industries considered important for warfare were hidden by the way the data were aggregated (e.g. iron and steel, chemicals) or under misleading categories. The foremost example is the aircraft industry which ended up hidden under "construction and others" (*Bauindustrie und sonstige Industriezweige*).

The reunification of German archives after 1990 has offered historians easier access to the records of the Imperial Statistical Office of Germany (*Statistisches Reichsamt* = StRA). Its archive, which used to be in Potsdam, is now housed in the Federal Archive Berlin-Lichterfelde (*Bundesarchiv Berlin-Lichterfelde* = BA). Historical research in this archive has unearthed important new information from the industrial census of 1936, which not only permits a re-evaluation of the official 1939-publication but also makes possible the construction of an input-output table for 1936.

Originally, this census and its forerunner of 1933 had actually been designed by the Imperial Statistical Office to compile an input-output-table for Germany as a basis for managing the business cycle. In connection with rearmament, however, this endeavour was given up and instead, these data were used for constructing detailed material balance sheets,

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[2] Formerly, this office was the department of industrial statistics of the Imperial Statistical Office. Renamed as *Reichsamt für Wehrwirtschaftliche Planung* it became an independent institution in 1938.

which served as a statistical basis for preparing the war (Tooze, 2001; Fremdling/Stäglin, 2003; Fremdling, 2005a,b).

Based on these hitherto secret records and additional statistical information, we have been busy to fulfil the original plan of the StRA of constructing the desired input-output table or as it was labelled at that time the *volkswirtschaftliche Verflechtungstabelle*. The availability of a table as such will provide a detailed and consistent account of the economy of the German Empire in 1936, the second largest economy of the world at that time. In several respects, 1936 is a useful benchmark year: About three years after the German economy had gone through the trough of the most severe business cycle of the world economy employment of people and capital stock had recovered significantly. Three years before the German Empire attacked Poland and thus started the Second World War it was nevertheless essentially still an economy in peace-times. Thus neither an exceptional position in the course of the business cycle nor an exceptional intervention of the government spoils this benchmark for qualifying as calibration year for international or inter-temporal comparisons.

Further research based on this table could be pursued along the following lines: Firstly, our input-output table could be used according to the original intention, namely - this time in retrospect and for historical research - to evaluate and design strategies for German recovery by implementing the then discussed (or any other counterfactual type of) "Keynesian" policy. Secondly, the table will shed new light on the statistical information system of the German war economy, because the 1936 census provided the only reliable overview of industry for that period. In fact already before the war, the statistics of the industrial census were directly applied for military exercises under the guidance of the Imperial Office for Military-Economic Planning. This office, however, failed in setting up a consistent information system for the war and was finally put back to its former position in the Imperial Statistical Office. The statistical body of the industrial census subsequently still became the information benchmark for Speer to run the German war economy under the statistical guidance of Wagenführ and the *Deutsches Institut für Wirtschaftsforschung* (Tooze, 2001, pp. 265f., pass.; Wagenführ, 1955 and 1963). Thirdly, the table and the related records could form the starting point to analyse East German economic policy. After the war, the census data served as benchmark information for implementing the East German plan economy (Fremdling, 2005a,b; Fremdling/Stäglin, 2007).

Applying the information we generated by constructing the rows and columns of our table our research thus far has concentrated on two other aspects. A minor point is a comparison of the structure of the German economy before and after the war. Was post-war recovery of both German economies a mere resumption or rather a radical break with past economic structures? Our preliminary results suggest more continuity than change, and the change there was mainly derived from investment and the creation of new industries and locations in connection with rearmament and the war economy itself (Fremdling/Stäglin 2007).

Our major concern, however, is the construction of the input-output table as such with a new benchmark for gross national product and thus income, expenditure and production of the German Empire in 1936. These new data on German historical national accounts will shed new light on the national income figures of the Imperial Statistical Office itself and data sets derived from them. Above all, we work on a replacement of the grossly unreliable figures of Hoffmann and his collaborators (Hoffmann et al., 1965).[3] All three approaches to national accounting can be pursued in a consistent framework of an input-output table. The inevitable double-check of all figures within this system enforces the consistent entry of all numbers into the bookkeeping of national accounts. Neither the StRA nor Hoffmann underwent this coherent and demanding procedure. And consequently, besides presenting alternative estimates of national income and expenditure, we offer the first account of pre-war German output by measuring production through value-added.

Before presenting preliminary results of our input-output table and a discussion of related national accounting figures such as gross national product we confront our findings with the publication of 1939. We further show how we extended our compilation based on archival evidence to a full coverage of the industrial sector and how we covered agriculture.

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[3] For a critical assessment of Hoffmann et al. see: Fremdling, 1988, 1991, 1995, 2007; Fremdling/Stäglin, 2003a, b, 2004; Ritschl/Spoerer 1997; Ritschl 2004; Burhop/Wolff, 2005. See, however, also the controversy between Broadberry/Burhop, 2007, 2008 and Ritschl 2008.

2. Data sources of the input-output table

By keeping up the original intention of the Imperial Statistical Office to construct an input-output-table for Germany for the 1930s, we mainly draw on the unpublished figures of the industrial census of 1936. Thus far, we have completed a comprehensive set of input-output relations and aggregate figures for 29 industrial groups or sectors and construction (Baugewerbe) following the classification of the Imperial Statistical Office. In addition, the agricultural sector is covered. For industry, we can rely on three sources (*Quellen* = Q): Q1 and Q2 are the figures gathered and partly compiled by the Imperial Statistical Office filed in the Federal Archive (BA); Q1 contains detailed information for 326 industrial branches on employment, wages, intermediate input, gross production, sales, imports and exports, which allowed the quantification of the input-output relations. For each single branch, inputs are listed with the product name, quantities and values at purchaser's prices[4], thus including the margin for transportation and trade. The specific inputs of each of the 326 branches were assigned to the 30 industrial groups and agriculture from which they presumably had been purchased. Imports were separately accounted for. The other variables were aggregated and assigned to the proper fields in the input-output matrix. Source Q2 summarises some of these latter figures on the same level of aggregation for the 326 branches, however, without e.g. taking into account specific intermediate input products. Q1 is thus the preferred source for our detailed accounting, whereas Q2 serves as check and supplementary information on the aggregated numbers. Q2 is obviously based on Q1 and was calculated by the Imperial Statistical Office itself. In case of sometimes diverging numbers we opted for Q1.[5] Q3 comprehends the figures published in 1939. This detailed but misleading publication of 1939 was used uncritically in the literature (Hoffmann, 1965) and after the war by the Americans (Strategic Bombing Survey) and above all by the statistical offices in East and West Germany (Fremdling/Stäglin, 2007). Thus before turning to a comparison of our sources (Q1/2) with the official publication (Q3), a closer look into its genesis, background and pitfalls is due.

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[4] In some cases, only quantities were reported. Prices or unit values were calculated from the same type of source for another branch using the same input. In a very few cases, contemporary price quotations compiled by the StRA had to be drawn upon.

[5] For a detailed description of the sources, see Fremdling/Stäglin, 2003b, 2004; Fremdling/de Jong/Timmer, 2007a, b; for the number of the documents in the BA, see below archive sources.

2.1 Published and archive census data

A comparison of the published data of the German Imperial Office for Military-Economic Planning[6] (RWP) with the records then kept secret but being available now in the Federal Archives reveals that the published data seem to be reliable, at least at first glance. The publication in 1939 seems both comprehensive and detailed in comprising the entire German industry covering 30 sectors and a number of sub-sectors. In addition to net production value (*Nettoproduktionswert*) or gross value-added, it offers information on employment, wage bills, sales as well as foreign trade broken down by sectoral shares and giving both the origin of imports and the destination of exports. It even contains a regional breakdown according to German federal states (*Länder*) and the Prussian provinces.

Surprisingly frankly, the foreword owns that the industrial census of 1936 was used for planning the war. We quote the second paragraph:[7] 'In the course of Germany's rearmament, the economic planning of warfare increasingly came to the forefront. As the experience of the World War has shown for a country as Germany a clarification of the economic problems of warfare is of paramount importance for the result of a war. In addition, there is no doubt that due to our endowment with natural resources a war economy in Germany will be by and large a planned one by its nature. Thus its preparation essentially has to be based on thorough statistical planning.' With this statement in mind, one wonders why the RWP published the information at all. The foreword justifies the publication on the grounds that filling in the detailed enquiry had caused the industrial firms a lot of trouble. Their (and the public's) desire for a published summary account was therefore considered as understandable. As the main use of the census was the economic planning of warfare, the evaluation had to be kept secret from the public, though. But the detailed accounts also delivered valuable results for pure economic questions, which justified even their publication in parts as well.[8]

Such a publication was not undisputed of course. The central command of the army accused the RWP of having violated secrecy by this publication. It demanded the withdrawal of these data from public access. The respective letters are filed in the Federal

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[6] Wilhelm Leisse who had formerly directed the department of industrial statistics of the Imperial Statistical Office headed this *Reichsamt für Wehrwirtschaftliche Planung*.
[7] Reichsamt, 1939, p. 3. Translated from the German original.

Archives in Berlin. In the letters exchanged between the heads of the two institutions, Wilhelm Leisse rejected this accusation by arguing that aggregating industrial branches had made the performance of individual industries unrecognisable.[9] In 1939, the Imperial Ministry of Economics, however, went over to prohibiting any publication and to refusing access to any statistical sources reaching back to 1914, e.g. even for the German Institute for Economic Research (DIW).[10]

According to the correspondence between the Ministry of Economics and the RWP, it becomes clear that it was not intended to publish faked data. Although publication had been limited or forbidden the guideline of February 1939 said: `… however, all publications should still tell the truth. In case of doubt, the publication of statistical and other details should rather be dropped than to report wrong details´.[11] Thus the guideline of the Ministry of Economics ruled out a deliberate falsification of the data. For camouflage, however, certain industrial sectors being considered important for warfare were firstly hidden by way of aggregation (Leisse´s argument). Basically, the data had been collected on the level of operational or technical units or plants (*Betriebsstätten*). They then were aggregated on an intermediate level for sub-sectors or branches. Concerning the delicate sector of iron and steel, statistics were published for the entire sector, whereas on the intermediate level four branches had been delimited. Concerning chemistry, the publication distinguishes merely among seven branches, whereas 38 are noted in the archival records. Secondly, certain industrial branches were hidden under misleading aggregates. The foremost example is the aircraft industry. According to the classification handled it should have fallen under 'vehicles' (*Fahrzeugindustrie*); it was, however, hidden under 'construction and others' (*Bauindustrie und sonstige Industriezweige*). As early as in 1936, aircraft industry employed at least 135 210 people.[12] This means about 80 % of the published work force (166 534) for vehicles. A similar camouflage was applied to other branches onto which

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[8] Ibidem, 2-3.

[9] BA R 3102 / 3082 (letter of 18.8.1939), answers by Leisse 25.8.1939.

[10] From 1936 onwards, only a limited publication had been allowed. BA R 3102 / 3082. In 1925, Ernst Wagemann, then head of the Imperial Statistical Office, had founded the DIW (formerly Institut für Konjunkturforschung, IfK) in order to pursue an independent research based on their data. For details see Tooze, 2001.

[11] BA R 3102 / 3082 F 9. The RWP had planned further publications.

[12] BA R 3102 / 5922. In BA R 3102 / 5866, even higher employment data are reported.

military importance was attached.[13] Table 1 shows figures on employment, the wage bill and gross value-added (GVA) for the aggregate and those two sectors where the divergence between Q1 and Q3 is most significant.

Table 1 *Selected Data from the German Industrial Census of 1936*

		Vehicles	Construction and others	Aggregate 30 sectors
Wage Bill	Q1	679.8	842.1	13257.3
Mill. RM	Q3	368.9	1192.0	13261.5
Employment	Q1	302.3	1075.7	7970.0
1000	Q3	166.5	1220.0	7950.2
GVA	Q1	1358.0	3634.0	34480.4
Mill. RM	Q3	836.4	4267.0	34185.5

Source: See text.

Table 2 *Industrial Employment in Germany 1936,* in 1000

	Census Publiction Q3	Census Archive Q1/2	Correction Factor	Census plus Estimate
1 Mining	565.66	579.18	1.00	579.18
2 Fuel industries	29.35	36.67	1.00	36.67
3 Basic iron and steel products	201.61	205.67	1.00	205.67
4 Non-ferrous metals	74.76	76.56	1.00	76.56
5 Metal foundries	173.57	179.12	1.00	179.12
6 Iron and steel products	439.98	453.39	1.00	453.39
7 Machinery	556.56	572.82	1.00	572.82
8 Constructional steel	146.38	149.62	1.33	199.44
9 Vehicles and aerospace	166.53	302.29	1.33	402.95
10 Electrical engineering	294.20	309.82	1.00	309.82
11 Precision engineering, optics	97.10	100.40	1.20	120.48
12 Metal products	223.11	228.05	1.20	273.66
13 Stone and quarrying	406.19	360.55	1.04	374.97
14 Ceramics	87.46	88.57	1.04	92.11
15 Glass	73.60	74.37	1.04	77.34
16 Saw mills, timber processing	107.47	101.39	1.25	126.74
17 Manufactured wood products	256.30	262.33	3.33	873.56
18 Chemical industry	180.99	177.75	1.00	177.75
19 Chemical-technical industry	90.36	87.60	1.00	87.60
20 Rubber and asbestos manufacture	57.12	58.09	1.00	58.09
21 Paper, cellulose and based manufacture	99.93	100.20	1.00	100.20
22 Printing and duplicating	283.62	287.84	1.20	345.40
23 Leather industry	196.03	196.86	2.20	433.09
24 Textiles	911.72	914.31	1.25	1142.89
25 Chlothing	229.72	233.21	3.33	776.58
26 Edible oil and fats	38.00	37.87	1.00	37.87
27 Spirits industry	29.41	25.86	1.22	31.55
28 Food, beverages and tobacco	549.68	513.21	3.33	1708.98
29 Building and construction	1220.00	1075.68	1.80	1936.22
30 Electricity, gas and water	163.79	180.90	1.00	180.90
Total Employment	7950.19	7970.15	1.50	11971.59

Source: see text.

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[13] These data concern stocks in cotton industry, „Zündererzeugung" (BA R 3102 / 3082 F37, 30.8.1939), „Schusswaffenindustrie", „Herstellung von Zündstoffen und Sprengkapseln" and „Sprengstoffindustrie". See also Sleifer, 2001.

We found deviations from the published employment figures not only for vehicles but furthermore for some other sectors as well due to shifts among branches: notably fuel, chemistry, electricity and as mentioned above construction reveal significant differences compared with the published figures (Table 2). The employment figures, however, are not strictly comparable. In the published version, workers were counted at one moment of the year, usually June. For our purpose, we looked for an average number of people employed, hence we took the average of June and December as given in the archival records. In cases where the business year did not match the calendar year, two other appropriate months had been recorded. Our calculation with the archival records also canceled out seasonal employment peaks in specific industries. In sugar production and in preserved foods, employment had been overestimated in the published census figures because the number of seasonal workers was reported instead of a representative average for the whole year.

The gross value added figures (GVA), which are fully comparable indeed, reveal even more significant deviations than the employment figures between the published data and our compilation based on the archival records (Table 3). In addition, this holds good for such sectors as saw mills, rubber, fats, spirits, food and utilities as well. Probably the authors of the publication had more difficulties to hide value-added figures because productivity among employees and thus sectoral value-added diverged much more from each other than mere numbers of workers among different industrial activities. Thus camouflage of value-added and employment might not have been pursued exactly in tandem.

Table 3 *Industrial Gross Value Added (Nettoproduktionswert) in Germany 1936*, in 1000 RM

	Census Publication Q3	Census Archive Q1	Difference% (Q3-Q1)/Q1	Census plus Estimate Q1+	Difference% (Q3-Q1+)/Q1+
1 Mining	2234.80	2222.53	0.55	2222.53	0.55
2 Fuel industries	245.00	273.96	-10.57	273.96	-10.57
3 Basic iron and steel products	1173.60	1240.04	-5.36	1240.04	-5.36
4 Non-ferrous metals	536.30	517.61	3.61	517.61	3.61
5 Metal foundries	710.60	710.54	0.01	710.54	0.01
6 Iron and steel products	1790.30	1776.75	0.76	1776.75	0.76
7 Machinery	2615.30	2562.18	2.07	2562.18	2.07
8 Constructional steel	558.20	556.32	0.34	662.83	-15.79
9 Vehicles and aerospace	836.40	1358.02	-38.41	1578.72	-47.02
10 Electrical engineering	1502.60	1464.08	2.63	1464.08	2.63
11 Precision engineering, optics	367.80	370.23	-0.66	411.39	-10.60
12 Metal products	771.10	733.61	5.11	817.97	-5.73
13 Stone and quarrying	1231.10	1218.41	1.04	1268.73	-2.97
14 Ceramics	255.30	248.45	2.76	255.13	0.07
15 Glass	237.50	233.22	1.83	239.52	-0.84
16 Saw mills, timber processing	316.30	343.28	-7.86	383.90	-17.61
17 Manufactured wood products	720.80	708.39	1.75	1605.13	-55.09
18 Chemical industry	1533.90	1514.78	1.26	1514.78	1.26
19 Chemical-technical industry	742.10	721.80	2.81	721.80	2.81
20 Rubber and asbestos manufacture	270.40	304.93	-11.32	304.93	-11.32
21 Paper, cellulose and based manufacture	461.50	463.28	-0.38	463.28	-0.38
22 Printing and duplicating	1001.50	1026.25	-2.41	1162.73	-13.87
23 Leather industry	647.40	680.26	-4.83	1086.58	-40.42
24 Textiles	2839.70	2828.09	0.41	3152.10	-9.91
25 Chlothing	754.00	776.73	-2.93	1765.24	-57.29
26 Edible oil and fats	402.80	726.19	-44.53	726.19	-44.53
27 Spirits industry	228.60	207.43	10.21	229.98	-0.60
28 Food, beverages and tobacco	2961.50	3182.73	-6.95	6846.92	-56.75
29 Building and construction	4267.00	3633.95	17.42	6019.85	-29.12
30 Electricity, gas and water	1972.10	1876.38	5.10	1876.38	5.10
Industries covered	34185.50	34480.40	-0.86	43861.74	-22.06

Source: see text.

In any case, we are sure that the true contributions of branches or sectors to aggregate production and employment deviate significantly from the figures published in 1939. So these data will inevitably produce distorted results when using them as input for further quantitative research. Thus our finding not only casts more doubt on Walther Hoffmann's reconstruction of German national accounts in general but specifically on the time series on industrial output: For his indices of industrial production and handicraft, Hoffmann used the published gross value added figures of the 1936-census to generate his weights in order to compile the aggregate index of industrial production (*Industrie und Handwerk*) for the entire time-span from 1850 to 1959. More precisely, he proceeded as follows (Hoffmann, 1965, pp.389-395): First, he matched the 30 groups of the 1936-census with his 12 groups. This was not done explicitly and can only be reproduced with some guesswork. Second, the published labour productivity (gross value-added per employee) of the 1936-census was multiplied with employment figures of the workplace census of 1933 for each of the 12

groups. The result is a hybrid 1933/36-output based on 1933-employment and 1936-labour productivity for each group and total industry. Third, each group's share in total output served as weights to combine the 12 time-series, with 1913 as base year, to a single index number of total industrial output for the interwar years. For other rather long periods, the same 1936 labour productivity was multiplied by employment data of other workplace censuses (i.e. 1861, 1882, 1907) which Hoffmann considered representative. In addition to the questionable weighting scheme, Hoffmann´s index numbers themselves have faced severe criticism which we need not discuss here anymore (Ritschl, 2004, 2008; Fremdling, 2007; Broadberry/Burhop, 2007, 2008).

2.2 Improvement of the census data by covering small firms

Unfortunately, the 1936-census did not include all industrial firms; for certain industrial groups, data of small firms were not recorded.[14] In the published version of the census, this omission was justified by claiming "… that the small companies, although large in number, did not comprise a large part of production."[15] For our purposes, however, i.e. for estimating the input-output flows and furthermore for measuring gross domestic product (GDP) we needed a full coverage of the industrial sector in 1936. Our estimates revealed that the RWP rather belittled the scope of underreporting.

Here we summarise the first crucial step of the procedure, namely, estimating the missing number of people employed in 1936.[16] The estimation of the inflated values of our input-output table for Germany in 1936, i.e. gross production, wages, gross value added and thus implicitly inputs and exports, is based on these employment estimations for small companies. In order to estimate missing employment numbers the scope of coverage had to be taken into account. The coverage ratios, however, varied per group or specific industry. In groups which were of military strategic importance, all firms had to report, in groups considered of less importance in most cases, the exemption and cut-off point was less than 5 people employed. This rule was not followed strictly, thus production and capacity measures were applied as well. In these cases, probably due to heavy seasonal fluctuations, employment seemed to be no feasible yardstick. As guideline, however, we used the

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[14] The exemption list in the published version (Reichsamt, pp. 44-55) is incomplete. See BA R3102 3036.

[15] „… die nichterfaßten Kleinbetriebe [fallen] trotz ihrer großen Anzahl mit ihrer Produktion nur sehr gering ins Gewicht." Reichsamt, p. 12f.

threshold of five or even ten people employed per production unit (*Betriebsstätte*) to close the information gap. In the following "census numbers" we always, if not stated otherwise, referred to our compiled data based on the archival records of the census.

Thus in order to estimate a correction factor for those employees not covered by the census the following procedure was applied: The non-agricultural or industrial workplace (*nichtlandwirtschaftliche* or *gewerbliche Arbeitsstätten)* censuses of 1925, 1933 (StR vol. 462 provides a comparison between both years) and 1939 (StR vol. 568.1 for Prussia)[17] were the starting point. In these statistical volumes, establishments were also classified according to the number of people employed. In most cases for 1925 and 1933, the size classes from 1-5 and 6-10 were used, for 1939 the more detailed classification among the sizes 1, 2-3, 4-5, 6-10, 11-20 was applied as well.[18] For the first time, the 1939 census recorded handicraft establishments (*Handwerksbetriebe*) separately, although this was not a statistical but a juridical category.[19] Mainly for ideological reasons, the regime tried to introduce a clear-cut distinction between industry and handicraft during the 1930s. Several laws were passed to reorganise the institutional and legal structure of entrepreneurship.

Unfortunately, the workplace censuses did not collect information on turnover, capacity, etc., thus for this information as well, we had to rely on the number of people employed given in the workplace censuses as a proxy for missing information. One should, however, keep in mind that the workplace census data refer to one day in the year with a seasonal peak in industrial activity (1925, June 16; 1933, June 16; 1939, May 17), whereas our employment data for 1936 are proxies for yearly averages (in most branches, precisely the arithmetic mean of the workforce at the end of June and December 1936).

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[16] For a comprehensive description of the estimation procedure, see Fremdling 2007.

[17] The volume with corresponding numbers according to firm size for entire Germany (StR 567) was never published. After the war, detailed figures of the workplace census of 1939 were compiled for the 1937-territory, however, without taking account of the firm size. The statistics were as well split up according to the Länder/occupied zones and the territory annexed by Poland and the Soviet Union, gathered up as East of Oder/Neisse (StH1949, table 4, pp. 246-269). For internal usage, The Office of the United States Military Government for Germany compiled extensive statistics on Germany (StH1946) after the war. Their figures of the 1939-census give detailed information on handicraft employment as well, however, not separately for the 1937-territorry (StH1946, III.A, I. u. H.A 2 a-dd). For the 1937-territory, handicraft employment with a rather crude delimitation of 20 industrial groups is given in StH1949 (table 3. pp. 244f.)

[18] This detailed information was also given for 1933 (StR vol. 462.2, pp. 60-101). In general, however, the benchmark years of 1925 and above all of 1939 proved to be more useful for estimating coverage ratios for 1936. In 1933, the share of small companies increased above average because people, who had formerly been workless, started their own business. Thus, with the exception of food and beverages, a large part of the increase of small companies directly resulted from the former economic crisis (StR 462.2, p. 9).

[19] StR 566 pp.14 f.

Thus employment shares according to firm size provided the most important information to estimate ratios/percentages of incomplete coverage. This was done separately for each industrial group or a cluster of groups. A detailed description of the estimation procedure is given in an article in *Jahrbuch für Wirtschaftsgeschichte – Economic History Yearbook* (Fremdling, 2007). The correction factors and the inflated employment numbers per industrial group are shown in Table 2. The estimation of the inflated values for gross production (BPWQ1+), wages (WQ1+), gross value added (NPWQ1+) and thus implicitly imports and exports (XQ1+) is based on these estimated employment figures for small companies.

In order to extrapolate the census figures (Q1) we did not assume equal labour productivity, wages or gross output between the known sample and the estimated number of workers. Rather we requested the German Statistical Office (*Statistisches Bundesamt*) for a special compilation (*Sonderauswertung des Statistischen Bundesamtes*): For the period 2003-2005, we got figures about average turnover (gross production), gross value added and wages per employee classified according to firm size. Firm size is measured by the number of employees. Smaller firms were characterised by lower wages, lower labour productivity, etc. We estimated the average wage of employees working in small companies in 1936 by multiplying the ratio of e.g. average wage of firms with 1-9 people to 50 and more by the known average wage of our sample for 1936 (WQ1). By subsequently multiplying this average wage by the estimated number of employees working in small companies we got the wage bill for small companies. This procedure was pursued for all relevant industrial groups and all variables (see Table 3 for gross value added) which had to be inflated. The relevant input-output ratios and export quotas were kept constant. Subsequently, the values for small industrial companies were implemented into the input-output table (IO-Q1+). By this implementation the aggregate census values increased by the following percentages: employment 50%; wages 16%; gross value added 25%, and gross production 20%. As expected, small firms generated a low value added and paid their workers a low wage. In addition, however, these figures reflect the fact that mainly industrial branches with low wages and a moderate labour productivity were covered incompletely by the census.

2.3 Agriculture, forestry and fishery

A recent working paper by Fremdling (German Agricultural Employment, Production and Labour Productivity: A New Benchmark for 1936 and a Note on Hoffmann's Tales, Research Memorandum GD-94c, GGDC 2008) provides a comprehensive discussion of our figures on agriculture. Thus a few remarks on the estimation procedure, underlying assumptions and sources are sufficient.

The estimation of the labour force is based on the occupational census of 1933/35. This census is superior to the workplace census specifically in agriculture because it also covers small holdings up to 0.5 *Hektar* (StR 461 I, p. 8). After the census had also been conducted for Saarland in 1935, StRA published a special edition of the StR (470 II) adding up the numbers of 1933 and 1935. Thus StRA considered the results of 1933 as representative of 1935 as well. Furthermore, due to the declined unemployment, this category was not anymore presented in detail but just in the summarising table on the first pages of the volume (StR 470 II, Vorbemerkung). The rather low official share of unemployment - agriculture is notorious for hidden unemployment (WS 1940, p. 334) - made up 3.3 % in 1933 and 1.8 % just for Saarland in 1935 (StR 453 II, p. 30; 469 II, p. 26). It is reasonable to assume that this share decreased in 1936. It was decided here to take the total labour force, i.e. employed and unemployed[20] people (*Erwerbspersonen*), of the 1933/35 census as a proxy for fully employed labour in 1936. One can even argue that this proxy is a lower bound estimate: StRA also collected figures on second jobs. 1,694,006 people out of the 2,332,172 employed (*Erwerbstätige mit Nebenberuf*) worked in agriculture as well (StR 470 II, p. 9). This involvement probably accounted for a substantial part of labour input, because mere allotment gardening and comparable activities did not fall under this category (StR 453 II, p. 27). Table 4 presents the relevant approximate data for 1936.[21]

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[20] These comprised 309,968 people (StR 470 II, p. 4).

[21] The relevant figures for Saarland in 1935 are respectively: 45,354; 44, 695 and 659 (StR 469 II, p. 26). For 1939, the following figures concerning the two branches of agriculture are reported: Greater German Empire 10,616,276 and 231,240; Sudetenland 423,648 and 16,134; Austria without Vienna 1,365,439 and 29,187; Vienna 27,496 and 679 (StR 556 I, StR 557.6, 27, 28 p. 4).

Table 4 *Labour Force in German Agriculture, forestry and fishery* 1936

Total labour force persons	Agriculture, horticulture and stockbreeding	Forestry and fishery
9 388 139	9 219 558	168 581

Source: StR 470 II: 4, 10.

For the estimation of intermediate input, wages and sales of German agriculture, we followed the procedure of the StRA. In 1934, StRA published a detailed account on expenditure for intermediate inputs and investment of the German agricultural sector.[22] The assessment was based on official and private statistics, the relevant literature and direct information from professional organisations and experts. Total expenditure was broken down into 14 categories, two of which contained information on new buildings and replacement of machines and equipment, thus investment. All the others dealt with current spending thus intermediate input and wages for dependent agricultural workers. The first table presented data for the business years from 1924/25 up to 1933/34 (Betriebsaufwand, p. 518). In addition to this, StRA took over estimations of aggregate sales produced by the Institut für Konjunkturforschung (IfK, *Wochenbericht*).[23]

StRA conceded that the estimation yielded no more than a rough magnitude ("ungefähre Größenordnung"). Data based on the same estimation procedure nevertheless became the standard for assessing agricultural input and output in Germany after this first publication. On a regular basis, they were published in the official statistical yearbooks[24] and for explanation of the estimation procedure, StRA always referred to the article in WS (Betriebsaufwand). Hoffmann (1965, p. 315) relied on these data for calculating agricultural input whereas for output he pursued a different strategy (Hoffmann, 1965, pp. 265-334).

For the purpose here, the data of StRA were used as starting point (StJR 1941/42 p. 613). For the year of 1936, the average of the business years of 1935/36 and 1936/37 was calculated in order to obtain the magnitude of agricultural input, wages and output. For allocating the inputs towards those sectors, which delivered the goods and services, an unpublished compilation by StRA was applied (BA R3102 2705). This had been compiled

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[22] Der Betriebsaufwand der deutschen Landwirtschaft, in WS, 1934, pp. 518-521.
[23] Bauer/Dehen, 1938/39, pp. 413 f.
[24] See the last edition of StJR 1941/42, p. 623.

for preparing the basic data for the intended, but never finished, input-output table of StRA (Fremdling, 2003, 2005, pp. 156-157; Tooze, 2001, p. 226, pass.). Based on the published data on agricultural expenditure in 1933/34[25], StRA had assigned values to different sectors of origin. For the endeavour here, the percentage distribution was used to allocate the figures for 1936 in the same manner.

Bauer/Dehen (1938/39) used these figures published in StJR in order to estimate agricultural income, however, modifying some of the basic data slightly. They suggest, the item of 'new buildings and maintenance' to be totally counted as depreciation and that of 'machinery and equipment' to be assigned to depreciation by two third. We followed their suggestion, thus these figures were allocated to investment and depreciation accordingly. For agricultural dwellings, Bauer/Dehen estimated a value of 1.7 billion RM for hypothetical leasing and thus hypothetical agricultural income. In general, however, their modified figures were not taken into account here, as the focus is production and not income.

The wage bill for workers in agriculture, horticulture and stockbreeding comprised 1,763.5 million RM in 1936. It includes the employers' payment on social security. Total sales made up 9,008.5 million RM. Adding to this one third as production for own consumption gross output amounts to 11,981 million RM (IfK, *Wochenbericht* 9 no. 2, p. 128; Bauer/Dehen, 1938/39, p. 414 with slightly different figures).

Finally, the estimations of output, intermediate input and the wage bill for forestry and fishery were based on the unpublished source of StRA as well (BA R3102 2705). Output was assumed to comprise 10 % of the other agricultural output without production for own consumption, thus amounting to 901 million RM in 1936. This ratio is confirmed by figures in the mentioned archival source (F 50, F 63) and furthermore for 1935 by the statistics on turnover taxes (Umsatzsteuerstatistik, vol. I, pp. 79, 85, 165, 180). For forestry and fishery, the different items for inputs and wages were assigned according to their relative values for 1933.

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[25] StJR 1935, with reference to the article (Betriebsaufwand) in WS, is given as source.

3 The most recent version of the input-output table for 1936

In the annex, we show the most recent version of the input-output table as of January 2008 (Table 5). The table consists of the traditional four quadrants but intermediate outputs as well as intermediate and primary inputs have not been completed so far. The flows are generally valued at purchaser's prices because it has not been possible to deduct the trade and transport margins from the transaction values up to now.

3.1 The compilation of intermediate and primary inputs

As described above, the archive census data of Q1 are the main source to implement intermediate inputs and labour income of the 30 industries. The original data on intermediate inputs are disaggregated by products or branches but represent only the manufacturing part. The non-manufacturing part is unfortunately not covered. In some cases, the inputs of goods are also divided by domestic and foreign origin. Using this information, the intermediate inputs from abroad were aggregated and classified as imports by destination.

On account of the availability of information from the archive sources on gross production (total input = total output) and on net production of the 30 industries, it was possible to derive total intermediate inputs as balance. The deduction of imports industry by industry resulted in domestic intermediate inputs of which the inputs from the 30 industries are covered by the census data. Not specified so far are trade, transport, financial institutions, and other services which are summarized as residual in "other sectors" and which need to be separated in the final step. The data for branch 33 could be estimated after the inputs and outputs for agriculture and forestry, fishery had been calculated (see chapter 2.3) as balance between domestic intermediate outputs and the total of intermediate outputs of sectors 1 to 32.

3.2 The compilation of intermediate and final output

As a result of information on the intermediate inputs of 30 industries, the data on intermediate outputs or use are also available. This is due to the consistent system of inter-industrial flows and can be seen from the annex table. The table also shows that in analogy

to the input side the branches of agriculture and forestry, fishery appear on the output side with "other sectors" remaining as residual. This residual sector 33 comprising again trade, transport, financial institutions and other services was derived as difference between domestic intermediate inputs and the sum of intermediate inputs of sectors 1 to 32.

For the domestic final output, components of the input-output table of 1936, i.e. private consumption, government consumption, gross fixed capital formation, and changes in stocks, overall totals were estimated. These first estimates had to be revised after a new document[26] was discovered in the archives. This document comprises two tables on "Financing the economic activities 1933 – 1936" and "Gross turnover of the economy in the year 1936". Both tables were prepared by a department of the Imperial Statistical Office named "Statistics on turnover interdependencies" and prove the beginning of the work on an input-output table for Germany. Thus the same department which was in charge of the input-output table had compiled these hitherto unknown aggregate data on the performance of the German economy. Consequently, we can safely assume that the level of GNP is consistent with our input-output data.

Using the top-down approach, the overall totals for private consumption and gross fixed capital formation were disaggregated by delivering sectors. The disaggregation of private consumption started with an information on purchases of private households according to 10 expenditure groups in 1936 available from the StRA and the DIW (Grünig 1948). Based on this information, we estimated a percentage distribution of our own which referred to published results on economic accounts of workers' households (StJR 1939 and 1941/42). The percentages were used to split up the overall total of 49 700 Mill. RM (51 700 Mill. less imports of 2 000 Mill. RM) into absolute figures for 10 consumption purposes. Then these sub-totals were disaggregated by delivering branches and resulted in a private consumption matrix covering 10 purposes and 33 sectors. The aggregation of the individual cells in the consumption matrix according to sectors created the final private consumption pattern which is shown in column 34 of the annex table.

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[26] The document BA R3102 / 2700 presents an internal communication of 19.4.1938
prepared by the President of the Imperial Statistical Office for the Minister of
Economics of the Empire and Prussia.

The disaggregation of 13 800 Mill. RM gross fixed capital formation started from a distinction between building (7 700 Mill. RM) and equipment (6 100 Mill. RM). The amount of building could easily be allocated to sector 29 of 'Building and construction' but the sectoral allocation of expenditures by equipment needed a deeper analysis. This analysis was based on published results about "gross fixed capital formation in the German Empire 1934 to 1944" (Kirner 1968) and about "gross fixed capital formation in equipment 1913, 1924 to 1938" (Gehrig 1961). Using these data sources, the overall total for equipment could also be disaggregated by originating sectors as can be seen from column 36 in the input-output table for 1936.

The final output components "government consumption" and "changes in stocks" have not been disaggregated by sectors so far. Government consumption expenditures defined as own-account-consumption were implicitly allocated to public activities represented by "other sectors"; the same was performed with changes in stocks reflecting inventories in trade.

In addition to the domestic final output components the exports had to be taken into consideration. The sectoral distribution of exports for industries could be collected from the census source Q1. The balance between total industry and agriculture on the one hand and the overall total from national accounts (exports of 6 500 Mill. RM) on the other has been allocated to sector 33 so far. This can be seen from column 37 in Table 5 (annex).

3.3   Macroeconomic input-output variables

It has already been mentioned that the overall totals for the expenditure side of the gross national product (GNP) were estimated independently from the input-output table. The same was the case for the components of the production side, i.e. for the primary inputs. Using the available sources (Grünig 1948 and 1949; Ritschl 2002), values for compensation of employees, indirect taxes less subsidies and consumption of fixed capital could be derived. The component mixed income/operating surplus was calculated as balance to GNP in 1936. The results for the expenditure side and for the production side are presented in Table 6. They show the required identity between both sides, i.e. the GNP of 81.3 billions of Reichsmark in 1936.

Table 6 *Gross National Product for Germany in 1936 billions of Reichsmark*

Production side		Expenditure side		
Compensation of employees	38.2	Final private consumption		51.7
Mixed income/operating surplus		Final government consumption		15.5
Indirect taxes less subsidies	25.3	Gross fixed capital formation		13.8
Consumption of fixed capital	9.8	Building	7,7	
	8.0	Equipment	6,1	
		Changes in stocks		- 0.3
		Exports		6.5
		Imports		- 5.9
Total	**81.3**	**Total**		**81.3**

Sources: StRA document BA R3102/2700, Grünig (1949), Ritschl (2002)

For checking the range of our estimates the data on national income (Y) and GNP were compared with the corresponding figures of other authors. For that comparison we used the data of Ritschl and Ritschl/Spoerer as can be seen from the sources given in Table 7. It becomes very clear that the Hoffmann et al. level of national income (Y) and thus implicitly GNP is significantly higher than respective figures presented in Table 7. We are sure that our newly explored benchmark should be preferred because it is consistent with the underlying data of the industrial census of 1936 and the other figures we used for the compilation of the input-output table.

Table 7 *National Income (Y) and Gross National Product (GNP) for Germany in 1936 billions of Reichsmark*

1936	Y	GNP
Fremdling/Stäglin	63.5	81.3
Ritschl	62.4	79.2
Statistisches Reichsamt	65.8	
Hoffmann/Müller	62.1	
Hoffmann et al.	70.0	

Sources: Ritschl (2002), Tables B1 and B5; Ritschl/Spoerer (1997), p. 51, Hoffmann (1965), p. 509, and Input-Output Table for Germany 1936

4   Conclusion and outlook

The input-output table for Germany in 1936 can be seen as an attempt to follow and to finalize the ambition of the Imperial Statistical Office to construct a corresponding table of the economy of the German Empire. Using the unearthed information from the industrial census of 1936 now available through the Federal Archive, the inter-industrial flows of goods could be compiled for manufacturing. In addition, some other input-output variables of the first and second quadrant of the table were also estimated on the basis of historical information for the first time.

The construction of the historic table is a time consuming and cumbersome process with a lot of surprises due to archive data sources. For that reason, the presented input-output table for Germany in 1936 has to be seen as an interim report on ongoing work. The next steps have already been laid down and can be derived from the annex table: The compilation of an input and output pattern for trade, transport, financial institutions, other services and public activities so far condensed in other sectors, the completion of the final output categories and the estimation of some components of gross domestic product.

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Abbreviations

BA	Bundesarchiv Berlin-Lichterfelde, Federal Archive
DIW	Deutsches Institut für Wirtschaftsforschung, German Institute for Economic Research
GNP	Gross National Product
IfK	Institut für Konjunkturforschung, Institute for Business Cycle Research, later DIW

Q	Quelle, Source
StH1946	Statistisches Handbuch von Deutschland, Statistical Handbook of Germany 1946
StH1949	Statistisches Handbuch von Deutschland 1928-1944, Statistical Handbook of Germany 1928-1944
StJR	Statistisches Jahrbuch für das Deutsche Reich, Statistical Yearbook of the German Empire
StRA	Statistisches Reichsamt, Imperial Statistical Office
StR	Statistik des Deutschen Reichs, Statistics of the German Empire
RWP	Reichsamt für Wehrwirtschaftliche Planung, Imperial Office for Military-Economic Planning
VH	Vierteljahrshefte zur Statistik des Deutschen Reichs
VJK	Vierteljahrshefte zur Konjunkturforschung
VJW	Vierteljahrshefte zur Wirtschaftsforschung
Y	National Income

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