

The German Input-Output Table for 1936 and the Reassessment of Hitler's Work Creation and Rearmament Programme

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Revitalization of the original plan of the German Statistical Office (Statistisches Reichsamt)

- “Matrix of economic interdependencies”
(Volkswirtschaftliche Verflechtungstabelle)
- Input-output table as basis for managing the business cycle
- Material balance sheets as statistical basis for preparing the war

2 Major data sources of the input-output table

- Industrial census of 1936 (Federal Archive) 332 industrial branches, 29 (30) industrial sectors
- Publications and archival material of the German Statistical Office
- Statistical compilations after 1945
- I-O calculations for the Federal Republic of Germany
- Secondary literature (e.g. Oshima, Ritschl, Budraß, Scherner)

The industrial census for economic planning of warfare

Foreword of the published version of the industrial census in 1939:

“a clarification of the economic problems of warfare is of paramount importance for the result of a war”.

“a war economy in Germany will be a planned ... one”

“its preparation ... has to be based on thorough statistical planning”.

- Improvement of the census data by covering small firms
- Extrapolation of available archival data from 1933 to 1936
- Transition from purchasers' prices to producers' prices
- Balancing the input-output table

Aggregated classification of the input-output table

	Aggregated classification		Disaggregated classification		Aggregated classification		Disaggregated classification
1	Agriculture, forestry, fishing	1	Agriculture	7	Timber, paper, leather, textiles	18	Saw mills, timber processing
		2	Forestry, fishery			19	Manufactured wood products
2	Energy, mining	3	Mining			24	Printing and duplicating
		4	Fuel industries			25	Leather industry
		32	Electricity, gas and water			26	Textiles
3	Chemicals, building materials	15	Stone and quarrying			27	Clothing
		16	Ceramics	8	Food, beverages and tobacco	28	Edible oil and fats
		17	Glass			29	Spirits industry
		20	Chemical industry			30	Food, beverages and tobacco
		21	Chemical-technical industry	9	Construction	31	Building and construction
		22	Rubber and asbestos manufacture	10	Trade	33	Wholesale trade
4	Iron and steel, non-ferrous metals	5	Basic iron and steel products			34	Retail trade
		6	Non-ferrous metals	11	Transportation, communication	35	Transport and communication
		7	Foundries	12	Government	38	Government
		8	Fabricated iron and steel products	13	Other services	36	Banking and insurance
5	Constructional steel, machinery, vehicles	9	Machinery			37	Dwelling
		10	Constructional steel			39	Other services
		11	Vehicles and aerospace			40	Domestic services
6	Electrical engineering, hardware, metal goods	12	Electrical engineering				
		13	Precision engineering, optics				
		14	Metal products				

The aggregated input-output table 1936

at producers' prices in millions of Reichsmark

Input	Output	Agriculture, forestry, fishery	Energy, mining	Chemicals, building materials	Iron and steel, non-ferrous metals	Constructional steel, machinery, vehicles	Electrical engineering, hardware and metal goods	Timber, paper, leather, textiles	Food, beverages and tobacco	Construction	Trade	Transportation, communication	Government	Other services	Domestic intermediate outputs
		1	2	3	4	5	6	7	8	9	10	11	12	13	1-13
1	Agriculture, forestry, fishery	205		13				604	3849			0	398	125	5195
2	Energy, mining	306	2201	554	729	139	88	307	240	12	90	643	246	366	5921
3	Chemicals, building materials	639	148	1077	363	150	171	465	96	963	55	237	591	266	5221
4	Iron and steel, non-ferrous metals	295	222	165	4566	2189	770	62	96	400	21	140	660	2	9588
5	Constructional steel, machinery, vehicles	65	105		76	367	19			236	61	280	2089	111	3407
6	Electrical engineering, hardware, metal goods	32	47	32	30	199	255	44	13	119	13	81	720	153	1739
7	Timber, paper, leather, textiles	160	173	232	42	113	90	5553	355	239	115	76	544	554	8246
8	Food, beverages and tobacco	323	5	118	21	10	3	53	2482		45	14	390	1206	4670
9	Construction	287	29	26	17	17	9	24	16	250	15	80	2513	1030	4313
10	Trade	303	141	175	251	188	80	399	493	144	1142	113	689	379	4497
11	Transportation, communication	214	396	379	373	268	144	824	598	241	1027	468	613	472	6017
12	Government	60	69	63	95	73	37	167	79	73	151	120	122	371	1480
13	Other services	527	347	256	390	361	184	669	171	158	2007	801	1338	2563	9771
1-13	Domestic intermediate and final inputs	3416	3883	3092	6954	4074	1849	9171	8487	2835	4741	3053	10912	7597	70065
14	Imports	139	89	286	445	21	45	1621	1127	0	118	385	89	718	5082
1-14	Total intermediate and final inputs	3555	3972	3378	7399	4094	1894	10792	9615	2835	4859	3438	11001	8315	75147
15	Compensation of employees	2002	1774	1565	1775	2315	1240	3855	1687	2893	2291	3495	6152	4872	35915
16	Indirect taxes minus subsidies	102	238	212	191	-397	103	538	3109	192	1611	330		601	6830
17	Consumption of fixed capital	806	839	436	261	588	171	391	224	101	239	644	600	1468	6767
18	Mixed income/operating surplus	6418	1175	1758	1399	1686	894	3831	2171	4173	1414	2060		6189	33167
15-18	Gross value added (net production)	9327	4026	3970	3626	4193	2408	8614	7191	7358	5554	6529	6752	13130	82679
1-18	Gross production/Total input	12882	7998	7348	11025	8287	4302	19406	16805	10193	10414	9967	17753	21445	157826

The aggregated input-output table 1936

at producers' prices in millions of Reichsmark

	Output	Private consumption	Government consumption	Gross fixed capital formation	Changes in inventories	Exports	Final output	Gross production/ Total output	
Input		14	15	16	17	18	14-18	1-18	Input
1	Agriculture, forestry, fishery	7222			410	55	7687	12882	1
2	Energy, mining	1586			-4	495	2077	7998	2
3	Chemicals, building materials	1267			29	831	2127	7348	3
4	Iron and steel, non-ferrous metals	123		275	219	820	1437	11025	4
5	Constructional steel, machinery, vehicles	914		3244	-200	922	4880	8287	5
6	Electrical engineering, hardware, metal goods	646		1241	9	667	2563	4302	6
7	Timber, paper, leather, textiles	9761		247	123	1030	11161	19406	7
8	Food, beverages and tobacco	11806			203	127	12136	16805	8
9	Construction	207		5619		54	5880	10193	9
10	Trade	4688		325	648	255	5917	10414	10
11	Transportation, communication	2779		201		970	3950	9967	11
12	Government	155	16060	34		24	16273	17753	12
13	Other services	11260		109		305	11674	21445	13
1-13	Domestic intermediate and final inputs	52413	16060	11296	1437	6555	87761	157826	1-13
14	Imports	786		72			858	5940	14
1-14	Total intermediate and final inputs	53199	16060	11368	1437	6555	88619	163766	1-14
15	Compensation of employees							35915	15
16	Indirect taxes minus subsidies							6830	16
17	Consumption of fixed capital							6767	17
18	Mixed income/operating surplus							33167	18
15-18	Gross value added (net production)							82679	15-18
1-18	Gross production/Total input	53199	16060	11368	1437	6555	88619	246445	1-18

- Government - intermediate sector - I. quadrant
- Government - 3 subsectors: - public administration, military spending and social security
- Public civilian investment: investment
- Military expenditure: government consumption not investment
- Rearmament: increase of government expenditure to more than nine billion *Reichsmark* military expenditure (eleven per cent of our newly estimated GDP of Germany in 1936)
- Proper assignment of military expenditure to the delivering branches through archival records and recent economic-historical secondary literature

Sub-table of the Input-Output Table for Germany in 1936 in millions of Reichsmark

	Government	Administration	Military	Social Security	Total	Investment
Input		1	2	3	4	5
1	Agriculture, forestry, fishery	286	88	25	398	
2	Energy, mining	134	62	50	246	
3	Chemicals, building materials	57	309	225	591	
4	Iron and steel, non-ferrous metals	100	560		660	10
5	Constructional steel, machinery, vehicles	225	1854	10	2089	497
6	Electrical engineering, hardware and metal goods	89	588	42	720	358
7	Timber, paper, leather, textiles	232	266	46	544	129
8	Food, beverages and tobacco	185	171	33	390	
9	Construction	74	2400	39	2513	1506
10	Trade	96	592		689	
11	Transportation, communication	121	470	22	613	
12	Government		122		122	
13	Other services	99	526	712	1338	
1-13	Domestic intermediate inputs	1698	8010	1204	10912	2500
14	Imports	14	75		89	11
1-14	Total intermediate inputs	1712	8085	1204	11001	2511
15	Compensation of employees	5140	597	415	6152	
16	Indirect taxes minus subsidies					
17	Consumption of fixed capital	600			600	
15-17	Gross value added (net production)	5740	597	415	6752	
1-17	Gross production	7452	8682	1619	17753	
	Subsidies		647		647	

National accounts data as new benchmark for economic historical analysis

- Estimation of GDP from the production side through Anglo-American concept of value added
- Consistent national accounts figures for production, national income and expenditure
- High level of GDP induced by significantly higher mixed income/operating surplus
- High income and hidden profits of armament industry

National accounts data as new benchmark for economic historical analysis

Gross National Product for Germany in 1936 billions of Reichsmark

Production side		Expenditure side	
Compensation of employees	35.9	Final private consumption	53.2
Mixed income/operating surplus	33.2	Final government consumption	16.1
Indirect taxes minus subsidies	6.8	Gross fixed capital formation	11.4
Consumption of fixed capital	6.8	Building	5.6
		Equipment	5.8
		Changes in inventories	1.4
		Exports	6.5
		Imports	- 5.9
Total	82.7	Total	82.7

Source: Input-Output Table for Germany 1936.

National accounts data as new benchmark for economic historical analysis

Comparison of National Accounts data for Germany 1936 in millions of Reichsmark

	Fremdling/ Stäglin		Hoffmann	Ritschl	Erbe	Grünig	StRA	StBA/ Schörry
	2012	1965	2002	1958	1948/49	1938	1949/50	
Gross national product (GNP)	83294		79171	81400	84300	81300	81400	
Gross domestic product (GDP)	82679				83600			
Consumption of fixed capital (Depreciation=D)	6767		7000	7000	5000		7000	
Net national product at market prices (NNP=GNP-D)	76527	78941	72171	74400			74400	
Net domestic product at market prices (NDP=GDP-D)	75912							
Indirect taxes minus subsidies (T)	6830	8978	9795	10800	10600		10800	
Net national product at factor costs (NNP-T)	69697	69963	62376	63600			63600	
Net domestic product at factor costs (NDP-T) Volkseinkommen	69082	70563		62900	65000	65600*		
Compensation of employees	35915	56941		37700	37700	35000		
Mixed income/operating surplus	33167	13622		25200	27300	30600		

*WiSta 1939: 64884

Comparison of National Accounts data for Germany 1936 in millions of Reichsmark

	Fremdling/ Stäglin						StBA/ Schörry
	2012	Hoffmann 1965	Ritschl 2002	Erbe 1958	Grünig 1948/49	StRA 1938	1949/50
Private consumption	53199		52621	52300	55000	51700	53200
Private consumption without purchases from government	53044	51582			54000		
Government consumption	16060	17689	16115	16900	9000	15500	13200
Gross fixed capital formation (GFCF)	11368		13800	10410	12000	13600	
Net fixed capital formation (GFCF-D)	4601	9000*	8220*	3410	4000		8000
Gross fixed capital formation of enterprises (GFCF)	8857		8400	6189			
Changes in inventories	1437		1420	1150	-300		
Exports	6555		6555	5800	5200	6500	
Imports	5940		5940	5200	4200	5900	

* incl. changes in inventories

Leontief model (L):

$$\mathbf{x}_L = (\mathbf{I}-\mathbf{A})^{-1} \cdot \mathbf{y}$$

$$\mathbf{e}_L = \mathbf{l} \cdot \mathbf{x}_L$$

Leontief model and Keynesian (multiplier) model (K) combined:

$$\mathbf{x}_{L+K} = (\mathbf{I}-\mathbf{M})^{-1} \cdot \mathbf{y}$$

$$(\mathbf{I}-\mathbf{M})^{-1} = (\mathbf{I}-\mathbf{A})^{-1} \cdot (\mathbf{I}-\mathbf{D})^{-1}$$

$$\mathbf{e}_{L+K} = \mathbf{l} \cdot \mathbf{x}_{L+K}$$

Matrix or vector of:

A = input coefficients

I = unity matrix

y = exogenous final demand

D = induced additional private consumption

x = direct production

x_L = induced direct and indirect production based on the Leontief model

x_{L+K} = induced direct and indirect production based on the Leontief and Keynesian model combined

l = e/x labour coefficient (labour output ratio)

e = direct employment

e_L = induced direct and indirect employment based on the Leontief model

e_{L+K} = induced direct and indirect employment based on the Leontief and Keynesian model combined

The impact of work creation programmes on employment - Germany 1933-1935

Number of people employed

	Year		
	1933	1934	1935
Initial spending, m RM	1.555	2.449	804
Induced employment			
Direct	290.951	489.772	161.914
Indirect, Leontief model	140.559	225.031	70.842
Indirect, Leontief model and Keynesian multiplier D1	644.298	1.002.536	320.347
Direct and indirect induced employment D1	935.249	1.492.308	482.261
Indirect, Leontief model and Keynesian multiplier D2	467.135	728.004	231.860
Direct and indirect induced employment D2	758.086	1.217.776	393.774

Impact of military expenditure on production and employment - Germany 1932-1939

m RM and number of people employed

Fiscal year (april-march)	1932/33	1933/34	1934/35	1935/36	1936/37	1937/38	1938/39	1939*
Military budget, m RM	674	1.055	4.055	6.174	10.381	11.196	17.772	8.013
Induced production								
Direct	674	1.055	4.055	6.174	10.381	11.196	17.772	8.013
Indirect, Leontief model	515	806	3.098	4.716	7.930	8.552	13.576	6.121
Indirect, Leontief model and Keynesian multiplier D1	1.276	1.998	7.678	11.690	19.656	21.199	33.651	15.172
Direct and indirect induced production D1	1.950	3.053	11.733	17.864	30.037	32.395	51.423	23.185
Indirect, Leontief model and Keynesian multiplier D2	1.014	1.588	6.103	9.291	15.623	16.849	26.746	12.059
Direct and indirect induced production D2	1.688	2.643	10.158	15.465	26.004	28.045	44.518	20.072
Induced employment								
Direct	112.241	175.689	675.279	1.028.156	1.728.748	1.864.470	2.959.572	1.334.405
Indirect, Leontief model	72.502	113.486	436.196	664.137	1.116.684	1.204.354	1.911.734	861.958
Indirect, Leontief model and Keynesian multiplier D1	295.532	462.591	1.778.017	2.707.145	4.551.810	4.909.168	7.792.580	3.513.501
Direct and indirect induced employment D1	407.773	638.280	2.453.296	3.735.302	6.280.559	6.773.638	10.752.152	4.847.907
Indirect, Leontief model and Keynesian multiplier D2	218.818	342.512	1.316.481	2.004.427	3.370.256	3.634.851	5.769.790	2.601.470
Direct and indirect induced employment D2	331.060	518.201	1.991.760	3.032.584	5.099.005	5.499.321	8.729.362	3.935.875

* April-august.

Impact of work creation and rearmament on employment - Germany 1933-1935

Number of people employed

Year	1933	1934	1935
Direct and indirect induced employment D1			
Work creation (calendar year)	935.249	1.492.308	482.261
Rearmament (fiscal year)	638.280	2.453.296	3.735.302
Work creation and rearmament together	1.573.530	3.945.604	4.217.563
Direct and indirect induced employment D2			
Work creation (calendar year)	758.086	1.217.776	393.774
Rearmament (fiscal year)	518.201	1.991.760	3.032.584
Work creation and rearmament together	1.276.288	3.209.537	3.426.358

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