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The impact of work creation, rearmament, public and private investment on production and employment in Germany 1930-1938-
A revisionist assessment based on input-output analysis

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(and a note on motorway construction - “Autobahnbau”)

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Abstract

This article is a revision and extension of our working paper on “Work creation and rearmament in Germany 1933-1938 – A revisionist assessment of NS-economic policy based on input-output analysis”, which was published in 2015. To this we now include an assessment of public and private investment in Germany between 1930 and 1938.

Theoretically based on an extended version of the conventional input-output analysis, our model or analytical framework integrates the Keynesian multiplier into Leontief’s traditional model. Empirically, we apply our input-output table of Germany for the benchmark year of 1936.

Putting together the effects of both work creation proper and rearmament yields that more than one million jobs were created as early as 1933. And in 1934 and 1935, even three to four million people had found jobs through these measures. Several hundred thousand and later millions of jobs profited from the additional income spent on consumption. In the years from 1936 onwards, the enormous increase to five million and even more jobs through armament production alone gave rise to additional income. Measures were taken to restrict additional consumption.

Before Hitler came into power (30. 1. 1933) public and private investment revealed the same level and moved in tandem. Under the NS-regime, however, public investment clearly forged ahead. In 1932, the trough year, total investment amounted to more than four billion RM generating directly something more than 700 thousand jobs. Indirectly, investment induced between 1.3 and 1.8 million new jobs. In the last pre-war year, 1938, capital formation of 19 billion RM created between 9.3 and 11.5 million jobs in total. Due to rearmament, public investment of 11.7 billion RM at that time clearly outstripped private spending of 7.5 billion RM.

A brief note on the negligible role of motorway construction (“Autobahnbau”) during the slump and recovery years complements our extended paper. By and large, it is a myth to corroborate a large impact to the “Autobahnbau” on the economic recovery before 1936.

The Leontief-multipliers induced significantly less jobs than those of the Keynesian type. In general, the multipliers show nearly the same magnitude for military outlays and investment whereas work creation proper yielded considerably lower multipliers.

Of course one can speculate about the counterfactual scenario of whether or not such an upswing would have taken place without Hitler’s economic policy. It is true that the turning

point of the business cycle had been passed in 1932, thus before Hitler had become chancellor and maybe it is also true that programs of work creation, of increased public investment and of rearmament were not a **necessary condition** to achieve full employment as early as 1936/37. On basis of our reassessment we can safely claim, however, that they were a **sufficient condition** for this purpose. The more so if we integrate our results on the impact of public investment between 1930 and 1938 into our previous findings on work creation and rearmament in Germany.

In more general terms, our reassessment rather supports the view put forward formerly, e. g. by Overy, that the NS-regime introduced “a wide range of government policies designed to augment and speed up the existing recovery”. We would, however, modify Overy’s chronology, that rearmament became increasingly important from 1936 onwards: actually, rearmament had gathered momentum as early as 1934.

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(and a note on motorway construction - “Autobahnbau”)

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I Introduction

This article is a revision and extension of our working paper on “**Work creation and rearmament in Germany 1933-1938 – A revisionist assessment of NS-economic policy based on input-output analysis**”. It replaces the version firstly published as a Research Memorandum by the Groningen Growth and Development Centre (GGDC) in February 2015.¹ In that paper, we measured the impact work creation programs and rearmament had on employment and production of the German economy before World War II. To this we now include an assessment of public and private investment in Germany between 1930 and 1938.²

Theoretically based on an extended version of the conventional input-output analysis, our model or analytical framework integrates the Keynesian multiplier into Leontief’s traditional open static quantity model. Empirically, we apply our input-output table of Germany for the benchmark year of 1936.³ This earliest German input-output table covers 40 economic

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¹ Slightly modified, it was published as well by the German Institute for Economic Research (DIW Berlin) in April 2015 as Deutsches Institut für Wirtschaftsforschung (DIW) Discussion Paper Nr. 1473: http://www.diw.de/documents/publikationen/73/diw_01.c.502764.de/dp1473.pdf

² In this foremost analytical paper, we cover the vast historiographic literature on the subject only selectively. For a comprehensive treatment in English, see the book by Silverman (1998); furthermore James (1986) and Cohn (1992). Most of the relevant literature written in German is touched upon in the footnotes and the bibliography. We refrain entirely from discussing issues of the so-called “Borchardt debate”, i. e. an evaluation of chancellor Brüning’s austerity policy. On this, see e.g. the English articles in the book edited by von Kruedener (1990).

³ Fremdling/Staeglin 2014a, b. Both articles describe the table in detail. The long version comprising 112 printed pages in the Economic History Yearbook offers a thorough description of sources and calculation/estimation procedures in addition. This table (A 1) can be downloaded from this research memorandum in excel format. See www.ggdc.nl research memoranda Fremdling/Staeglin 2016.

branches/sectors, five categories of final demand and five primary inputs. Recently, Yang and Cho have used our input-output table for their assessment of the “recovery from the Great Depression in the U.S., Britain, Germany and Japan”.⁴

II The model

An input-output table comprehensively and quantitatively discloses interdependencies between different branches of a national economy and thus reveals the structure of an economy. This is a powerful tool to measure and thus to analyse direct and indirect effects between production and final output or employment. At the same time, it is possible to assess the impact of final demand on employment and production. The traditional Leontief-model, however, does not cover the effects induced through increased income and thus additional consumption. Keynes’ theory of the multiplier deals with this phenomenon:

If final demand expands through an exogenous stimulus (e. g. additional government spending on a work creation program), cycles of spending are brought about that increase employment, production and income generated in the production process. This induced income will lead to additional consumption depending on the marginal propensity to consume and the consumption pattern of private households and further to another round of spending. This circuit incorporating changes in final demand, production, income and employment is reflected in the Keynesian income multiplier. The Keynesian consumption (demand) function and thus the multiplier can be integrated into Leontief’s static quantity model:⁵

Leontief model (L):

$$x_L = (I-A)^{-1} \cdot y$$

$$e_L = I \cdot x_L$$

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

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

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

$$e_{L+K} = I \cdot x_{L+K}$$

where

$$D = W \cdot A_v$$

$$W = w_1 \cdot w_2$$

$$A_v = A_g \cdot (I-A)^{-1}$$

$$M = A_g + W \cdot A_v$$

Matrix or vector of:

A = input coefficients

I = unity matrix

y = exogenous final demand

A_g = direct primary input coefficients for gross production

A_v = direct and indirect primary input coefficients for value added or income

⁴ They applied the Leontief-model for the input-output analysis. See Yang/Cho 2015.

⁵ For details of the model and its application, see Stäglin/Pischner (1976 a) and Stäglin et al. (1976 b).

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
 w_1 = expenditure structure of additional private consumption
 w_2 = share of value added or income used for additional private consumption
 W = weighted additional private consumption
 M = modified primary input coefficients

 $I-A$ = Leontief matrix
 $(I-A)^{-1}$ = production multiplier (Leontief inverse)
 $(I-D)^{-1}$ = private consumption multiplier (“Keynes” inverse)
 $(I-M)^{-1}$ = production and private consumption multiplier (extended inverse)

III Input-output table

The matrix of input coefficients (A) of 40 branches is directly derived from the first quadrant of the input-output (I-O) table by dividing input values by gross production values (row 1-45). The matrix of primary input coefficients for gross production (A_g) is calculated in a similar way by dividing the values in the rows 41 to 45 by gross production values.

For applying the input-output analysis to military spending, the basic data of the input-output table had to be rearranged: to isolate the effects of rearmament, the government sector was split up into civilian (non-military) and military spending. The civilian part of government activity remained in quadrant I of the input-output table whereas military expenditure became a separate vector in quadrant II, i. e. part of final demand. By this operation, both government components were artificially separated into an exogenous (military) and an endogenous (civilian) category within the input-output table. Employment in the government sector was split up as well to get an appropriate labour coefficient or labour output ratio (l). Table 8 presents our basic data on government expenditure in total and on military, in particular.

IV Work creation programs 1933-1935

From the first, work creation programs have been closely associated with Hitler who became German chancellor on 30. 1. 1933. This year witnessed high unemployment and an extremely poor investment which not even covered the amount necessary to compensate for wear and tear (depreciation).⁶ One should keep in mind, however, that measures against the till then

⁶ Abelshausen 1999, p. 505. A report by the German Statistical Office (Statistisches Reichsamt, StRA) for the Minister of Economics classified as “confidential” was compiled in 1938 (BA R3102 2700, April 19, 1938). It revealed that in 1933 only “new” public investment bore a plus-sign, which indicated a growing public capital

unknown economic slump had been initiated before that year and that the turning point of the business cycle had been surpassed in 1933 as well.⁷ But the work creation programs proper did not get momentum before Hitler came into power.⁸ We thus concentrate on the three years from 1933 to 1935, when most of the money or funds were spent for work creation.⁹ Based on Grebler (1937) Buchheim (2008, Tabelle 3, p. 391) conveniently summarized the 12 programs specifying the amount and the year of **spending** of these funds. Not all of these measures truly qualified as additional spending for a specific work creation program.¹⁰ Our reassessment of the policy therefore inevitably contains some speculative elements. Several of the twelve work creation programs bore labels in rather general or meaningless terms (e. g. *Sofortprogramm, sonstige Massnahmen*) or (*Papen, Reinhardt*), which do not allow to assign them properly to economic activities or areas of spending.¹¹ We drew on Schiller's detailed tables for 1933 and 1934 on the amounts **granted** for specific purposes.¹²

stock. See as well StRA 1935, p. 689. For time series on investment figures, see StJR 1938, pp. 539 f.; StH1949, p. 604; Ritschl 1992, p. 160.

⁷ Borchardt 1984; Spree 2004 and Buchheim 2008. The argument can be based on figures collected by the German Institute for Business Research (*Institut für Konjunkturforschung, IfK*), renamed as German Institute for Economic Research (*Deutsches Institut für Wirtschaftsforschung, DIW*) from 1941 onwards (Stäglin/Fremdling 2016). Between 1928 and 1932, the IfK was in charge of the Industrial Reporting System (*Industrieberichterstattung*) and thus gathered information on employment and work capacity from selected industrial firms (Gierth 1941). The monthly figures on total hours worked in percent of workplace capacity of industry (*Arbeitsvolumen: geleistete Arbeitsstunden in Prozent der Stundenkapazität*) show a trough of the business cycle in 1932 and a clear upswing from January 1933 onwards. For corresponding monthly figures on more than 100 industrial branches, see also Wagemann 1935, pp. 17-45. Using a different method, i. e. an autoregressive model, Ritschl (2003, pp. 134 ff.) drew the same conclusion. Abelshauser (1999, p. 505), however, doubts this proposition.

⁸ See details about the timing and the amount of these measures in Grebler 1937, pp. 418-421; Schiller 1936, pp. 54 ff.; for a description and discussion of the programs, see as well Kroll 1958, especially chapters 10 to 13.

⁹ For the sake of simplicity we do not distinguish between direct (*unmittelbare*) and indirect (*mittelbare Arbeitsbeschaffung*) work creation programs. We assume that indirect measures such as tax vouchers (Steuerergutscheine) created funds of the same size for spending. Other indirect measures like increased allowance for depreciation of newly purchased equipment, however, are not included in the figures of the I-O analysis. Holtfrerich emphasized the impact of this measure (100 % immediate depreciation of investment) in his criticism of a book by Harold James (Holtfrerich 1992, p. 500). Schröder discussed the rules of depreciation in the 1934 tax reform in detail: 100 % immediate depreciation for investment goods with a lifetime of less than five years (*Abschreibungsfreiheit für kurzlebige Wirtschaftsgüter*) and for replacement investment (*Sofortabschreibung von Ersatzbeschaffung*), even in retrospect for these expenses before 1934, see Schröder 1996, pp. 73-80, 132 ff.

¹⁰ E. g. investment of railways which would have been carried out anyway or spending on rearmament. See Schiller (1936, p. 82 ff.); Grebler (1937, pp. 428 ff.); Buchheim (2008, pp. 395 f.). See also Ritschl (2003, pp. 130 ff.) who put forward that not all work creation programs were financed through deficit spending. Ritschl analyzed the impact on additional employment, and he also examined as to what extent those programs could be considered as truly "Keynesian".

¹¹ There is a vast literature describing these programs in detail, thus we refrain from repeating easily available information. For details of these programs see among others Spree 2004, pp. 112 ff. and Spoerer/Streb 2013, pp. 104 ff.

¹² Schiller 1936, pp. 158 f. Based on this information we compiled a suitable percentage distribution according to purposes. Schiller's detailed account covers the years of 1933 and 1934, referring to "granting" (*Bewilligung*) the funds, not to spending it. For 1935, we used the average percentage distribution of the two preceding years.

Here Table 1 Work creation programs and assignment to purposes/branches of spending

In a first step, we allocated total spending derived from Buchheim's table for the programs (*Maßnahmen no. 1-8, 12*) according to the percentage distribution calculated from Schiller's figures (see Table 1). The amounts spent on Germany's railways (*Reichsbahn no. 9*), post office (*Reichspost no. 10*) and the famous motorways (*Reichsautobahnen no. 11*) were directly inserted into Table 1.

In a second step, we decided on which branches of the economy the money was spent in the first round. We selected those specific branches from our I-O table which presumably would have met the demand. Technically, we constructed a vector of final demand which complies with the delimitation of the I-O table. The numbers of the rows of Table 2 refer to the corresponding rows of the I-O table. The numbers of the columns either refer to a column of our investment matrix (see appendix Table A 2)¹³ or a column of the I-O table: they indicate that a specific amount of a work creation program had to be assigned to several branches.¹⁴ In order to split this amount up the figures of the investment matrix or I-O table were used to generate a percentage distribution for the allocation. Accordingly, we assigned the funds (grants) of the work creation programs to specific branches of the I-O table. For the years from 1933 to 1935, we thus compiled three vectors of final demand (y). They are shown in Table 2.

Here Table 2 Spending for work creation assigned to branches of the I-O table

We proceeded in the following way: based on the input coefficients of our input-output table for 1936 of 40 sectors (A) we calculated the inverted Leontief matrix $(I-A)^{-1}$.¹⁵ After multiplying it by the vectors of final demand (y)¹⁶ we obtained the direct and indirect (Leontief) effects of the work creation programs on production for the three years of 1933, 1934 and 1935 (see Table 3 for the aggregate and Table 4 for sectoral¹⁷ results). The direct effects are the values, i. e. initial spending, of the final demand vectors (Table 2). Multiplying this initial spending by the labour output ratio ($l =$ labour coefficient) of each sector (number

Railways (*Reichsbahn*), the post office (*Reichspost*) and the motorways (*Reichsautobahnen*) were treated separately.

¹³ This table (A 2) can be downloaded from this research memorandum in excel format. See www.ggdc.nl research memoranda Fremdling/Staeglin 2016.

¹⁴ Our selection did not cover all entries (inputs) of a specific branch (column). The demand of the first round was thus deliberately concentrated on the most important delivering branches. Furthermore, we refrained from adjusting for trade margins and transport charges. This procedure underlines the partially hypothetical character of our reasoning.

¹⁵ An input-output analysis usually applies a table constructed for a certain year to the preceding and the following years as well. It is assumed that for the medium term structural relations within an economy are rather stable. This holds true especially for our 1936 table: in compiling the table we also used structural relations of neighbouring years, e.g. results of the 1933 industrial census. See Fremdling/Staeglin 2014 a.

¹⁶ See Table 1 for the values. The values were assigned to the proper rows of the input-output table, see Table 2 and the corresponding vector for 1934 in Table 4 (third column: "direct").

¹⁷ We put forward the sectoral distribution only for one year, i. e. 1934. This is justified because we stuck to the same structural relations (i. e. fixed coefficients and labour output ratios) for all years.

of workers per output of one million RM)¹⁸ yielded the direct employment effects. Similarly, the impact both on direct and indirect (Leontief) employment was obtained by multiplying the labour coefficients by the vectors of direct and indirect production effects combined (see Tables 3 and 4). This matrix algebra solely provided the indirect effects based on the Leontief model. For the Keynesian extension of our model, a vector of the consumption pattern was needed: based on our consumption matrix¹⁹ we compiled the figures shown in Table 4, column 2 (w1). We lightly adjusted the structure of consumption by dropping items related to higher income households.²⁰

In addition to the structure of consumption, we had to assume as to what extent the extra income had been spent on consumption. Besides the marginal propensity to consume balancing effects had to be taken into account. For this purpose, a calculation by the German Statistical Office (i. e. Lautenbach)²¹ in 1933 was very helpful.²² The StRA distinguished between two different types of work creation programs: firstly *arbeitsintensive* programs demanding a high input of labour and secondly *materialintensive* programs demanding a high input of material. With this distinction in mind the StRA put forward a Keynesian type of reasoning about the secondary effects of government spending on work creation (**as soon as in 1933**). Displayed numerically and graphically, the StRA presented 12 rounds of circular spending via the income multiplier. It took into account that those people getting work through this measure did not claim unemployment money or any other pecuniary help from the government any more. Furthermore, the StRA reckoned that the government could profit from additional taxes and contributions to social security schemes. In analogy to the StRA, we allowed for these balancing effects and assumed rather low spending shares (w2) in two variants: ratios of 0.5 or 0.45 for dependent households and 0.5 and 0.3 for entrepreneurs.²³ Thus we got two different Keynesian private consumption multipliers depending on our assumed spending shares: D₁ (0.5 and 0.5) and D₂ (0.45 and 0.3). Table 3 shows our aggregate results of analysing the impact of work creation on the German economy between 1933 and

¹⁸ See the first column in Table 4.

¹⁹ See Table 4-16 in Fremdling/Staeglin 2014 a, p. 248.

²⁰ We still covered more than 70 percent of private consumption at purchasers' prices in 1936. For our subsequent calculation, we used as well a consumption vector at producers' prices. A sensitivity analysis revealed, however, that the difference in prices did not matter, thus we do not depict these results.

²¹ In our previous paper (Fremdling/Staeglin2015a, b.) we put forward that we used "an almost forgotten calculation by the German Statistical Office in 1933" to adjust our assumed consumption pattern for balancing effects. In the meantime, we learned that this calculation, published anonymously by the StRA, probably was written by Wilhelm Lautenbach. See Bombach et al., eds. (1981), where the report (Statistisches Reichsamt 1933) is reprinted and ascribed to Lautenbach. Wilhelm Lautenbach (1891-1948), sometimes labelled as the „German Keynes“, was a high ranked civil servant in the Ministry of Economics. He proposed detailed plans ("Lautenbach-Plan" 1931) to overcome the Great Depression in Germany unsuccessfully, however. After a conflict with Schacht (Minister of Economics) he was dismissed from his office and placed into the StRA in 1934. On Lautenbach and his plans see Borchardt/Schötz 1991; Jaeger 1982; Kroll 1958, pp. 379 ff. and a posthumously published collection of his works in Lautenbach 1952.

²² Statistisches Reichsamt 1933.

²³ Technically we assigned 0.5 and 0.45 to "Compensation of employees" and 0.5 and 0.3 to "Mixed income/operating surplus" in the matrix of primary inputs, whereas the other primary inputs were set at zero.

1935. Table 4 complements the results by a sectoral breakdown for 1934 both for production and employment. Due to our assumptions, the same structural relations hold true for the other two years in question, 1933 and 1935.

Here Table 3 The impact of work creation programs on employment

Here Table 4 Impact of work creation on production and employment in Germany 1934

The work creation programs generated nearly three hundred thousand jobs in 1933 directly and half a million in 1934 but in 1935 the number dropped significantly to 162 thousand. In addition, our method revealed a substantial indirect increase of work creation by nearly fifty percent through Leontief-type linkage effects and even more via the Keynesian multiplier: a higher propensity to consume (D1) resulted in a multiplier of 1.6, a lower one (D2) still generated a multiplier of 1.0. Indirectly induced employment altogether increased the amount of jobs by a factor of two (D1) or 1.5 (D2) (see Table 4). If both direct and indirect effects as revealed by our model are taken together (see Table 3) the work creation programs proper created up to one and a half million jobs in 1934 (D1) and at least 400 thousand ones in 1935 (D2). Concerning production (see the last row of Table 4) the Leontief linkage effects were higher and the Keynesian multiplier effects were lower than the indirect effects on employment. These differences are due to a different labour productivity of those industries/sectors which profited from the work creation programs.

It is thus helpful that our method also allows to detect those branches which profited most from indirect effects. Besides domestic services all other branches were involved by Leontief linkages. Concerning both production and employment, these indirect effects were most powerful in quite a number of branches closely linked to the production of producer goods namely mining, basic iron and steel, fabricated iron and steel products, stone and quarrying, saw mills and timber processing, food, beverages and tobacco, wholesale trade and transport and communication. Due to the pattern of our consumption function, the Keynesian multiplier effects were widespread on the one hand but mainly concentrated on those branches closely related to the demands of private households namely agriculture, manufactured wood products, printing and duplicating, leather industry, textiles, clothing, food, beverages and tobacco as well as retail trade.

Spoerer and Streb rightly claim that the economic leaders of the NS-regime did not at all want their work creation programs to stimulate consumption, they rather intended to channel the mobilized resources into more armament. Work creation was thus accompanied by a highly restrictive wage and income policy and by campaigns to save earned money.²⁴

These aims and measures of the German government of course went contrary to any type of Keynesian inspired economic policy and raises some doubts on our methodology of analysing this policy: the increasing preponderance of rearmament reveals the limitations of our model. This is based on fixed structural interdependencies of the German economy in 1936, clearly reflected in the Leontief matrix and its fixed input-output coefficients. According to our sectoral breakdown (see Table 4) agriculture would have profited overwhelmingly from the 2.5 billion RM the government spent on work creation in 1934: directly and indirectly

²⁴ Spoerer/Streb 2013, pp. 116, 143 ff., 202 ff.; see also the contemporary publication by the StRA 1943.

induced production by 7.3 (D2) or 9.3 (D1) percent and directly and indirectly induced employment by 26 (D2) or 32 (D1) percent of the macroeconomic effects. Compared with agricultural employment and gross production in 1936 this would have made up 3.4 (D2) or 5.1 (D1) percent. Given the priorities of the regime and the performance of agriculture such an increase of production and employment in agriculture itself is not conceivable.

Degler/Streb (2008) clearly show that the agrarian sector under the NS-regime performed poorly in comparison with productivity gains before (Weimar period) or after the War in West Germany. Except for some increase of output agricultural performance did not match the self-imposed goals of the regime, it was rather a “lost battle for production (*verlorene Erzeugungsschlacht*)”.²⁵ On the other hand, prices of agricultural products were kept down by the state’s price control. James concluded: “... cheap food after 1934/5 helped to sustain the growth of the 1930s.”²⁶ In any case our approach²⁷ reveals that tight controls of the government were necessary to channel resources into those branches of the German economy which met the increasing demand for rearmament and thus fulfilled the aims of the regime.

At first sight, our results seem to corroborate findings which put forward the rather modest impact of these work creation programs e. g. by Buchheim (2008) and Ritschl (2003).²⁸

Ritschl (2003) concluded “that public deficits were too small to account for the speed of recovery between 1933 and 1936”. By applying an autoregressive model he predicted in retrospect: “An upswing under selffulfilling expectations would have had exactly the same vigor without Hitler and without deficit spending.”

Buchheim (2008, p. 392) supported his own view by quantifying the direct effects of the work creation programs. He referred to Grebler (1937, p. 822) and even overestimated the direct impact: based on the assumption of 2000 RM per workplace and year Buchheim divided the entire amount of roughly 1.5 billion RM spent on work creation in 1933 by this yearly rate for employing one worker. In this way, he estimated that in 1933 between 700,000 and 800,000 additional jobs for one year were, or could have been, created. The reasoning is flawed, however: although Grebler arrived at about the same figure, he made clear that this figure of 2000 RM only applied to those works for which the public administration entirely financed the work program and he should have added, for which no significant additional costs were involved in getting people to work. This latter assumption probably held true for the publicly sponsored relief or relief works (*Notstandsarbeiten*) but not for regular employment in established firms. The funds of the work creation program were not solely spent on wages but

²⁵ On the poor performance of agriculture, see also Fremdling/Staeglin 2014 a, pp. 225-227 and Fremdling 2010.

²⁶ James 1986, p. 357.

²⁷ Our input-output table and the consumption pattern reflect the structure of the German economy in the mid-1930s pretty well: without government intervention additional employment and additional income would have increased the demand for consumption goods. Prices would have risen if production of food had not kept abreast.

²⁸ See also Spoerer 2005 and Spoerer/Streb 2013, pp. 104 ff.; for a summary account, see Spree (2004, pp. 122 ff.), who among others refers also to the controversial views between Borchardt and Wehler. Spree himself (2004, p. 126) favoured Ritschl’s claim that economic recovery from the fall of 1932 onwards didn’t succeed because of but rather in spite of Nazi-usurpation of political power in Germany.

on purchases from other firms at their selling price, i. e. the turnover or gross production value: it comprised value added (wages and profits) and costs of inputs from other firms.

In Table 5 we calculated figures of gross production, gross value added and gross wage per person employed in those branches for which we imputed the spending on work creation. Dividing gross production value per worker through Grebler's 2000 RM indicates how many times this amount would have had to be spent in order to create one workplace in a particular industry directly (workplace ratio): neglecting trade charges and transportation costs, more than three times for the average of the entire economy (without agriculture) and about three times for the branches 9, 10, 11 and 12 as well. In all the other branches the ratio is lower and in agriculture the 2000 RM even would have sufficed to induce more than one work place. This outcome highly correlates with labour productivity (GVA per worker) and average wage per branch.

Here Table 5 Gross production (GP), gross value added (GVA) and gross wage (GW) per person employed

Other than Buchheim/Grebler, we had these caveats in mind when we applied the labour output ratio (labour coefficient) to these work creation programs. Of course we got significantly lower figures for direct employment than Buchheim/Grebler had estimated (290 thousand in 1933, see Table 3; for the labour output ratio see Table 4).

On the other hand, work creation programs under the label of *Notstandsarbeiten* (relief works) or the *Arbeitsdienst* (semi-enforced labour) provided work for quite a lot of people explicitly not yet included in our analysis (see Table 6): After the First World War, the *wertschaffende Arbeitslosenfürsorge* (emergency work) was introduced.²⁹ From 1927 onwards, it was financed by the work exchange, and thus became a substitute for the payment of unemployment benefits (Syrup 1936, p. 134). In addition, a voluntary labour service was introduced in 1931 for unemployed young people.³⁰ These workers lived in camps and were mainly employed for cultivating soil (*Landeskulturarbeiten*) and increasingly for harvesting (*Einsatz bei landwirtschaftlichen Erntenotständen*).³¹ Grebler's 2000 RM surely would have sufficed to cover board and lodging, some cash payment (pocket money) and even simple tools. Probably his figure is still too high if one follows the reasoning of the German Statistical Office which calculated 1200 RM per workplace for these programs in 1933.³² This

²⁹ Petzina et al. 1978, p. 122; Schiller 1936, pp. 35 ff., 53 ff.; Syrup 1936, pp. 56 f., 77 ff.

³⁰ The "*Reichsarbeitsdienst*", a compulsory or semi-enforced labour service of young women and men, continued this program from 1934/35 onwards. In 1936/37, this workforce was planned to comprise 230,000 men. The labour service of women remained small, about 10,000 at any time around 1936, whereas more than 200,000 men were concerned before 1936 (Patel 2005, pp. 106, 121 ff., 137 ff.). In 1936, the actual workforce included between 183,968 (February) and 206,648 (April) men and between 9,508 (October) and 12,186 (April) women. (Statistisches Reichsamt 1938, pp. 126-130).

³¹ Syrup 1936, p. 76; Schiller 1936, p. 54.

³² See the detailed table for *arbeitsintensive Arbeitsbeschaffung* (work intensive programs), Statistisches Reichsamt 1933, p. 3.

type of work, however, presumably had barely any additional backward linkage effects on other branches of the economy.³³

It is not clear as to what extent these measures of creating cheap work are comprised in our I-O analysis.³⁴ Some money for this kind of work is included in Table 1 under the heading of *Grundförderung (einschließlich Arbeitsdienst)* (basic funds including semi-enforced labour). The amount spent is too low for financing all the labour approximately engaged in the programs 1 to 3 listed in Table 6. The bulk of these people was either financed by the other programs (Table 1) or by additional funds not yet dealt with. According to Grebler (1937, pp. 421 f.) *Arbeitsdienst* and *Landhilfe, Landjahr* (semi-enforced labour and support for agriculture) were not included in the work creation programs proper. The Institute for Business Cycle Research (*Institut für Konjunkturforschung, IfK*) distinguished between regular and additional employment (*zusätzliche Beschäftigung*). The figures for additional employment match rather well with the comparable numbers derived from other sources (see rows 4 and 4a of Table 6).

Here Table 6 People employed through work creation programs

In order to avoid double counting of cheap relief work in our I-O analysis, we dropped the funds spent for “*Grundförderung*”³⁵ from our calculation (see Table 6, rows 6a, b and Table 3). As shown in Table 3, these funds had a rather modest impact on direct and indirect work creation. In rows 7 a, b of Table 6, we calculated an approximation of the total labour force engaged directly and indirectly in some kind of work creation program. With all the caveats in mind, it seems pretty clear that these aggregates for the years 1933 to 1935 are an upper-bound estimate because probably the figures still contain some double counting. Thus far there is no clear-cut evidence to avoid this bias. Compared with the registered unemployed, those who got work through the programs referred to made up nearly twenty percent in 1933, more than fifty percent in 1934 and more than one fifth in 1935 (row 5a of Table 6).³⁶ The decrease of registered unemployed dependent workers (row 8 of Table 6) is in line with the numbers created by any kind of work creation (rows 7a, b of Table 6).

Although our findings are biased upwards it seems difficult to maintain the proposition that the work creation programs had a rather modest impact on employment. All the less as we did not yet account for the impact of rearmament and additional public investment on employment. Thus to some extent our findings support the views put forward by

³³ Without this work the young people would have had to receive some money anyway: 600 RM as unemployment money (*Arbeitslosenhilfe*), see Statistisches Reichsamtsamt 1933, p. 2; Schiller 1936, p. 35 ff.

³⁴ From 1932/33 onwards, the *wertschaffende Arbeitslosenfürsorge* (emergency work) was partly (*Restfinanzierung*) financed by funds from the work creation programs proper. See Schiller 1936, p. 36 ff.

³⁵ According to Schiller (1936, p. 38 ff.) it is not clear as to what extent emergency works were financed through additional, credit financed funds. The basic funds, thus the *Grundförderung*, were financed by detained unemployment compensation (*Unterstützungersparnisse*). The work exchange, however, refused to finance private enterprises and single communities by this measure. Syrup 1936, p. 134, 168.

³⁶ The officially registered unemployment figures refer only to those workers with a compulsory health-insurance (*Arbeiter* and *Angestellte*, Syrup 1936, pp. 161 f.). Thus this limited group among others does not cover hidden unemployment in agriculture and self-employed people out of business.

Abelshauser³⁷, Cohn³⁸ and Overy³⁹. Spree (2004, p. 122) presented a clear juxtaposition of the two conflicting views (Abelshauser versus Buchheim) on the effects of work creation.⁴⁰

Our I-O analysis catches pretty well the direct and indirect impact of the work creation programs through the interrelated production process covered in the first quadrant of the I-O table (Leontief effects). It furthermore reflects the secondary effects generated through additional income and thus increased private consumption (Keynes multiplier). In this evaluation, we can as well compare our results with similar attempts to calculate or rather assume the size of a Keynesian-type multiplier.

Here the study conducted by the German Statistical Office (i. e. Lautenbach) as early as in 1933 is helpful: by way of example and based on sound empirics, the StRA/Lautenbach calculated the secondary effects of work creation including e. g. additional income, increased state revenues, decreased unemployment compensation and increased savings.⁴¹ They applied the same reasoning which later became known as the Keynesian multiplier. Without putting forward the sophisticated assumptions and the four alternative calculations in detail here the StRA/Lautenbach arrived at multipliers within the range of 2.3 to 3.7 for government spending and 1.3 to 3.6 for job creation.

As early as in 1931 Wilhelm Lautenbach, high ranked civil servant in the Ministry of Economics, had proposed work creation programs to fight the economic crisis. Stützel, who edited Lautenbach's work posthumously, carefully juxtaposed two versions of a proposal for deficit spending put forward in 1931.⁴² In the same bundle an article of 1936⁴³ is reprinted in which Lautenbach discussed the multiplier of public investment. Through a saving ratio of one quarter the income effects "petered out" and thus Lautenbach got the rather high multiplier of four.⁴⁴

³⁷ "Der Erfolg [Vollbeschäftigung im Laufe des Jahres 1936] wurde von der öffentlichen Meinung – durchaus zu Recht – der NS-Krisenpolitik gutgeschrieben." (According to Abelshauser public opinion ascribed the success of achieving full employment in 1936 – "quite rightly" – to the economic policy of the NS- regime). Abelshauser 1999, p. 511.

³⁸ "In contrast to the United States and Britain, fiscal policies undertaken by the Nazis helped to promote a quick and complete economic recovery from the Great Depression in Germany." Conclusion by Cohn 1992, p. 318.

³⁹ Overy (1982), however, did not stick to the work creation program proper, but evaluated the entire package of government policy ("particularly in construction, motorisation and rearmament") which stimulated the economy. On the importance of the "motor-car revolution" in particular, see Overy (1975).

⁴⁰ See also Spoerer (2005), who supports Buchheim against Abelshauser.

⁴¹ Statistisches Reichsamt 1933.

⁴² Lautenbach 1952, pp. 137 ff.

⁴³ In that year, Lautenbach worked in the StRA. In 1934, Schacht had kicked him out of his ministry of economics. See Fremdling 2016.

⁴⁴ The assumptions, however, are very restrictive: closed economy, additional production exclusively for intermediate and consumption goods (no private investment), no time for adjustment needed. Thus the money spent immediately created additional income. Lautenbach 1952, pp. 102 ff.

In their textbook, published in 2013, Spoerer/Streb⁴⁵ discussed this issue referring to Erbe⁴⁶. He put forward a multiplier of 1.6 or 1.5 by comparing the increase of national income (*Volkseinkommen*) yielded by additional government spending between 1932 and 1936. His crude guestimate and references to a similar rather speculative reasoning of other scholars led him to conclude, that the secondary effects of public investment had been very modest (“*sehr gering*”). Spoerer/Streb accepted Erbe’s reasoning, not the least because they assumed an exaggerated (textbook) Keynesian multiplier of five for government spending as yardstick when discussing the effects of NS-economic policy. It seems pretty clear, however, that empirically founded calculations of multipliers yield significantly lower figures than textbook multipliers.⁴⁷ In line with this reasoning, our multipliers (see last column of Table 17) comply with contemporary compilations by the StRA. We thus conclude that rather low multipliers (compared with textbook calculations) are no convincing argument against the impact of any governmental programs to stimulate work creation by deficit spending.

V A note on deficit spending

We do not want to reopen the discussion on how far the NS-economic policy can be labelled as Keynesian⁴⁸ in its nature. Ritschl (2003) neatly summarized this discussion and referred to the relevant literature.⁴⁹ According to his findings, the NS-measures came too late and were too small to allow a Keynesian interpretation of the recovery process. He thus corroborated Erbe’s findings, but rejected among others Overy’s and Cohn’s conclusions.⁵⁰

One concern was, however, as to what degree work creation, public investment and rearmament had been financed by deficit spending. We can complement this aspect by referring to an archival source on this issue which we recently detected: in 1938 the Department VI *Statistik der Umsatzverflechtung*⁵¹ of the StRA (currently it would have been labelled: Department of National Accounting and Input-Output Analysis) provided a preliminary (*Entwurf*) report for the Minister of Economics on *Statistische Grundlagen für die Finanzierung der Volkswirtschaft* (basic statistics on financing the economy).⁵² According to these figures (see Table 7) the government (public administration) increased its yearly borrowing, on balance by between one to more than four billion RM between 1933 and

⁴⁵ Spoerer/Streb 2013, pp. 114 ff.

⁴⁶ Erbe 1958, pp. 163 ff.

⁴⁷ See Thomas (1983) with moderate, but empirically founded, multipliers of government spending for Britain during the 1930s.

⁴⁸ Notwithstanding Keynes’ opinion itself in the foreword to the German translation of his book published in 1936 where Keynes considered the economic policy of the NS-regime as an example for the successful application of his “General Theory”.

⁴⁹ On this, see among others in particular the classical study by Erbe (1958).

⁵⁰ Ritschl 2003, pp. 126-128.

⁵¹ This department was in charge of the section “Volkswirtschaftliche Bilanzen” (national accounts) of the German statistical yearbooks (StJR).

⁵² BA R 3102 2700, 19. 4. 1938.

1936.⁵³ During roughly the same period (until 1935) the private part of the German economy reduced its debt considerably, on balance by two and a half billion RM.

Here Table 7 Financing economic activity in Germany

We do not know as to what extent these additional funds of the government were used for work creation, rearmament or public investment.⁵⁴ It is remarkable, however, that between 1933 and 1935 the entire work creation program (aggregated 4.8 billion RM) as put forward in Table 3 was matched by deficit spending of the government (aggregated 7.5 billion RM). Government borrowing even contributed to financing the rearmament program by a substantial part. Above all, funds for increased government debt came from private savings held by banks and insurance companies as financial intermediaries. Not before 1934 did business firms come to the forefront as a source of government borrowing through providing short term funds, probably by accepting Mefo-bills.⁵⁵ Foreign creditors profited from increased repayment of debt. Partly, their claims were merely reduced by devaluation of their currencies, however. Without the devaluations of the Anglo-Saxon countries and of the gold-bloc in 1936 the debt of the German government would have had increased even more on balance.⁵⁶

For 1936, we got the reliable figure of 83 billion RM for GDP (Fremdling/Staeglin 2014 a, b): the 4.4 billion RM of public borrowing of that year made up more than five percent of GDP. Of course, one can doubt whether this figure and comparable ones for the years before qualify to be labelled as “pronounced (*ausgeprägtes*) deficit spending” as Ritschl (2003, p. 133) put it. The fact of a deficit-financed recovery-program as such is undeniable. The argument should be based on the impact of these programs rather than on some kind of scholastic discussion on its nature: to be or not to be Keynesian. This impact raises primarily an empirical question: And we tackled this issue as such – made possible by the now available input-output table of 1936.

VI Rearmament 1932/33-1938/39

For an earlier analysis of the impact of rearmament expenditure on production and employment in 1936 we used an aggregate version of the input-output table (Fremdling/Staeglin 2014 b). Here, we complement our results for 1936 and in addition, we extend the analysis to most of the other years of the 1930s by explicitly using the comprehensive version of our input-output table detailed for 40 branches or sectors. Furthermore, we apply the Leontief model combined with the Keynesian multiplier.

⁵³ Erbe and an earlier estimate by Ritschl present significantly higher amounts (see Table VIII in Ritschl 1992, p. 166). Ritschl’s revised figures for the central government (Reich) are, besides a slightly different timing, roughly the same for the years between 1933 and 1936 (Ritschl 2003, Tabelle 3: “Nettokreditaufnahme des Reichs”).

⁵⁴ Financing public investment is the primary concern of Ritschl 1992.

⁵⁵ Mefo-bills were specific bills of exchange for financing military outlays, see Ritschl 1992, pp. 166 ff.; Ritschl 2003, pp. 130 ff.; Oshima 2006.

⁵⁶ See footnote of the respective table and p. 3 of the text in BA R 3102 2700.

Here Table 8 Government expenditure

The basic data of the input-output table had to be rearranged for applying the input-output analysis: to isolate the effects of rearmament, the government sector was split up into civilian (non-military) and military spending. Table 8 presents our basic data on government expenditure in total and on military spending, in particular, for the year 1936. Military expenditure thus became a separate vector of final demand. We applied our model by using the same matrix algebra and the same consumption function as for the work creation programs (see section IV). Besides the adapted input-output table, we replaced the final demand by vectors of military spending. Table 9 shows the estimated impact of rearmament on the German economy in 1936.

Here Table 9 Impact of military expenditure on production and employment in Germany 1936*

Our calculation yielded the large direct and indirect impact (Leontief linkages) on the production of those industries closely associated (directly and indirectly) with arms production: vehicles and aerospace, basic iron and steel products, fabricated iron and steel products, chemical-technical industry and metal products and to a lesser degree machinery. In these industries a fifth to a third of their labour force worked directly and indirectly for military purposes. Building and construction was the largest single sector profiting from rearmament (see Table 9). Constructional steel, machinery and vehicles were the sectors which directly produced armament (e. g. air planes, war ships, tanks, cannons etc.). In these industries the indirect Leontief linkages were much weaker than those on the iron and steel industry and non-ferrous metal production, which delivered the intermediate inputs for the specific armament industries and their suppliers. Construction or the building industry built barracks for soldiers and constructed new and extended naval ports, airports for the *Luftwaffe* (air force), bunkers and fortifications.⁵⁷ The picture changes if employment and Keynesian multiplier effects are taken into account as well. Here “agriculture” comes to the forefront. The high share in induced employment was of course due to the low labour productivity (thus a high labour output ratio) of German agriculture. Furthermore the same pattern emerges as described in section IV for work creation programs. The multipliers induced by military spending (see last row of Table 9) are higher than those for work creation. This is due to the fact that direct military spending involved nearly all branches of our input-output table.

In 1936 between four and five million work places directly and indirectly depended on the military budget, thus between 13 and 16 percent of total labour force in that year. Direct and indirect Leontief effects alone reveal that more than 12 percent of the industrial workers and in total, seven percent of the labour force in Germany were directly or indirectly engaged in armament production. As early as 1936, when the major impact of rearmament was still to come Germany’s preparation for the war brought about these effects on employment.

⁵⁷ For the impact of rearmament on the British economy with similar leading sectors, see Thomas 1983. See, however, the revisionist approach by Crafts and Mills 2013.

We extended our analysis of German rearmament beyond the benchmark year of 1936 to the entire decade of the 1930s, the crucial period before the Second World War: we drew on figures of military expenditure compiled by Oshima for the fiscal years 1932/33 to 1938/39 and some months of 1939.⁵⁸ In order to assign this spending to the sectors of our input-output table we used the same percentage distribution as for the calendar year of 1936. In conformity with our model, the same procedure as for 1936 was applied to the military expenditure of each fiscal year. In this way we got eight vectors of final demand (y) concerning rearmament. Table 10 shows the results of assessing the impact of rearmament on the German economy from 1932/33 to 1939. One has to keep in mind the hypothetical nature of the outcome: we applied the production structure, labour productivity and the structure of military spending we had estimated for 1936 to military spending before and after 1936.

Here Table 10 Impact of military expenditure on production and employment

With this caveat in mind, we can draw the following conclusions: due to the reliance on the calibration year of 1936 the sectoral distribution of direct and indirect impact of rearmament on both production and employment was the same as described above for 1936. The multipliers for total production (2.5 (D2) or 2.9 (D1)) and employment (3.0 (D2) or 3.6 (D1)) were also the same for all these years. We thus consider only absolute impact figures on employment for the time span under question: in 1932/33 (fiscal year of 1932) barely 200 thousand people were engaged in armament industries directly and (Leontief) indirectly. As early as 1934/35 armament workers surpassed one million, and in the years 1936 and 1937 about three million people worked for military purposes. Shortly before the war nearly five million people were engaged in armament production (Table 10).⁵⁹ Via the Keynesian multiplier, thus through additional income and consumption, significantly more jobs depended on military spending: shortly before the war between nine and eleven million.

Here Table 11 Investment in Germany (new and replacement) 1924 - 1938 million RM

VII Public and private investment 1930-1938

We drew on a compilation of the German Statistical Office available in the Federal Archive Berlin (Bundesarchiv Berlin, BA) depicting public and private investment of Germany between 1924 and 1938 (see Table 11).⁶⁰ The cyclical pattern of total investment reached a peak in 1928, a trough in 1932 and increasing levels thereafter. The downturn of the Great

⁵⁸ Oshima 2006, p. 182, fiscal year april to march. Oshima's figures comply with similar numbers reported by Boelcke (1985, pp. 28, 51) and Klein (1948, p. 68).

⁵⁹ According to Wagenführ (1963, p. 159) in 1939 2.4 million people worked directly in industrial production for the army. For the timing of rearmament, see also Abelshauser 1999, pp. 512 ff.

⁶⁰ In addition the attached handwritten sheet provides some preliminary numbers for 1939 and 1940, incomplete however. Both Stäglin (2013) and Scherner (2013) refer to this source as well. Scherner calls it the main "newly discovered" source.

Depression is clearly visible and the recovery thereafter took until 1936, if not 1937, before the peak of Weimar's investment level was reached and even surpassed. Before 1933, public and private investment revealed the same level and moved in tandem. Under the NS-regime, however, public investment clearly forged ahead with private investment recovering delayed and surpassing its peak-level of the 1920s not before 1938. This probably indicates that the upswing of the NS-period has to be attributed primarily to the initiative of the NS-government and not to inherent forces of the private sector of the economy.⁶¹ The same picture appears when aggregate investment is broken down into specific categories or groups: Except for electricity, gas and water, all time-series confirm 1932 as the year of the turning point during the slump of the Great Depression. Thus for our input-output analysis we safely can keep to the aggregate level of the investment series when assessing the time pattern and the impact of these outlays on the German economy.

The data of the archival record correspond with total figures on investment in the respective volumes of the German statistical yearbook (StJR) and StRA (1935). These official publications by the StRA do not cover every year before World War II, however, and moreover they do not sufficiently distinguish between public and private investment as the StRA had done in the archival source we used.⁶² Ritschl's⁶³ figures for total investment between 1933 and 1938 comply with the data put forward here as well. His numbers for public investment between 1935 and 1938 are, however, significantly lower than those derived from the archival source compiled by the StRA.⁶⁴

The archival record is to some extent ambiguous, though: Firstly, it is not clear as to what extent public capital formation comprised hidden military spending, intended for barracks, airfields, fortifications and armament plants.⁶⁵ Secondly, investment in air force armament industries is entirely omitted.⁶⁶ Thirdly, as the figures in Table 11 do not disclose anything about financing these investments, public engagement in financing private investment is not covered sufficiently. The role of the government is therefore underestimated. The StRA itself put forward that in 1937 and 1938 a large share of private investment was financed by the public.⁶⁷ Scherner's re-estimation of industrial capital formation reveals this additional investment that had not been covered by the figures of the StRA, in particular from 1936 onwards. These engagements ranged from participating in newly founded private industrial

⁶¹ Of course it was a deliberate policy of the Nazi-regime to favour armament related investment which included private firms. There was thus no clear-cut preference between public and private investment. In addition, one has to take into account corresponding „crowding-out“ effects. On this see Scherner 2013.

⁶² BA R3102 2731.

⁶³ Ritschl 1992, p. 160 Tabelle II and p. 164 Tabelle VI.

⁶⁴ See also the discussion in Scherner 2013, pp. 502-505.

⁶⁵ This issue is tackled in detail by Stäglin 2013 and Scherner 2013.

⁶⁶ See footnote 2 on industrial investment (“Ohne Flugzeugbau”), BA R3102 2731; see also Stäglin 2013; Scherner 2010 and Eichholtz 1985, p. 381.

⁶⁷ See the notes in BA R3102 2731.

enterprises in the framework of rearmament (“Vierjahresplan-Unternehmungen”) to loans and subsidies from the government for supporting private investment. There were even cases in which the government completely financed factories, which were run by private companies. When the report was written in August 1939, thus just before the outbreak of the War, the StRA did not have exact figure on this involvement.⁶⁸ Due to these biases, our calculation yields lower-bound estimates about the impact of public investment.

With these caveats in mind, we nevertheless stuck to the data proper provided by the archival source of the StRA.⁶⁹ We assumed that military spending for building and equipment was covered by the figures for “public administration”.⁷⁰ Thus the statistical information gathered in Table 11 served as starting point for constructing the vectors of final demand for our input-output analysis. The structural relations, i.e. the input-output and the inverse coefficients of the I-O table of 1936 were applied to each year between 1930 and 1938. In any case we thus covered the year of the turning point 1932.

In order to assign the spending on investment (Table 11) to the sectors of our input-output table we drew on our gross fixed capital formation (investment) matrix for Germany in 1936 (see Table A 2). We applied the appropriate percentage distribution of the investment matrix (numbers of sectors or columns) to each investment category: Industry 3-31, electricity, gas and water 32, transportation 35, agriculture etc. 1-2, dwelling 37, public administration 38 as well as other investment 33, 34, 36, 39. The percentage distribution of public administration (government) had to be modified slightly. As we assigned military outlays such as buildings and equipment⁷¹ to current spending in our I-O table rather than to investment the respective column (No. 38) of the investment-matrix was augmented (m RM): Constructional steel by 50, vehicles and aerospace by 200, electrical engineering by 80, precision engineering and optics by 70 and building and construction by 2000.⁷²

Using these percentage distributions for each of the ten categories of Table 11, separately for public and private investment, the spending on capital formation was allocated to those specific branches or economic sectors from our I-O table which presumably would have met the demand in the first round. Technically, we constructed vectors of final demand which comply with the delimitation of the I-O table. By aggregating the results on each of the categories of Table 11 for each year we obtained vectors for private and for public investment for every single year between 1930 and 1938, thus in total $2 \times 9 = 18$ vectors of final demand for investment spending (Table 12). We applied our model by using the same procedure and

⁶⁸ See details about this issue in Scherner 2010 and 2013. “These figures ignore a large share of the armament industry's investments as they neglect, first, investments in those munitions plants that from 1934 were financed by the army and leased to private companies ... as well as so-called army-owned equipment goods leased to private companies” Scherner 2010, pp. 437-441 and his Tables 1 and 2.

⁶⁹ BA R3102 2731.

⁷⁰ The percentage distribution is adjusted adequately.

⁷¹ Of course we assumed that the StRA had counted these items as investment.

⁷² See also Scherner (2013) about the treatment of military spending as investment.

the same consumption function as for the work creation programs and military spending (see sections IV and VI).

Here Table 12 Public and private investment in Germany composed as vectors of final demand

Here Table 13 (13a-c)

Table 13a: Impact of private investment on production and employment in Germany 1936 and 123, 13c

The results of our calculation of the impact public and private investment had on production and employment in Germany are shown in detail in Table 13 for 1936. Our results concerning employment from 1930 to 1938 are summarized in Table 14.

Our calculation for 1936 yielded the large direct and indirect impact (Leontief linkages) on the production of those industries closely associated (directly and indirectly) with capital formation: In correspondence with our investment matrix (Table A 2) building and construction, machinery, electrical engineering, vehicles and aerospace, constructional steel, manufactured wood products, fabricated iron and steel products and precision engineering delivered the bulk of finished investment goods. Building alone employed 1.5 million workers directly. In these industries, the indirect Leontief linkages were much weaker than in those up-stream industries which delivered the intermediate inputs. The entire range of economic branches of the I-O table was involved. Notably, heavy industries such as basic iron and steel, non-ferrous metals, foundries, mining and stone and quarrying came to the forefront. In addition, utilities and service sectors such as trade and transport met the induced demand.

The picture changes if employment and Keynesian multiplier effects are taken into account as well. Due to the pattern of our consumption function, the Keynesian multiplier effects were widespread on the one hand but heavily concentrated on those branches closely related to the demands of private households. Consumer industries dominated indirect effects: Food and beverages, clothing, textiles etc. But “agriculture” as well came to the forefront. The high share German agriculture took in induced employment was of course due to its low labour productivity, thus a high labour output ratio. Given the priorities of the regime and the performance of agriculture an appropriate increase of production and employment in agriculture itself is not conceivable (on this issue see the remarks in section IV). Concerning production (see the last row of Table 13c) the Leontief linkage effects were higher and the Keynesian multiplier effects were lower than the indirect effects on employment. These differences are due to a different labour productivity of those industries/sectors which profited from investment. Concerning building and construction, the state was the most important customer, the same holds true for constructional steel, whereas machinery supplied its output mainly to private firms.

**Here Table 14 (14a-c) Table 14a The impact of private investment on employment
Germany 1930-1938 m RM and number of people employed
and 14b, 14c**

During the 1930s, public investment increased faster than private capital formation. The changing impact over time is shown in Table 14 covering the period from 1930 to 1938. Here we concentrated on employment which was calculated in the same way as for 1936 (see Table 13). Due to our methodology, the same structural relations as for 1936 apply to each year covered by the input-output analysis. In 1932, the trough year, total investment amounted to more than four billion RM generating directly something more than 700 thousand jobs. Public and private work creation were nearly on the same level. Indirectly, investment induced between 1.3 (D2) and 1.8 (D1) million jobs. In the last pre-war year, 1938, capital formation of 19 billion RM induced totally between 9.3 (D2) and 11.5 (D1) million jobs. Due to rearmament, public investment of 11.7 billion RM clearly outstripped private spending of 7.5 billion RM.

VIII A note on the construction of motorways (Autobahnen)

Public opinion considers the building of motorways as the very symbol of Hitler's successful work creation policy. Construction works started on 23. September 1933. Ritschl claimed in his article on investment in Germany during the 1930s that the construction of motorways was "nearly completely irrelevant" for economic recovery during the years 1933 and 1934. Even for the years thereafter other infrastructural investment in roads, waterways together and in railways still outnumbered the spending on motorways. So motorways as a means of economic recovery were nothing but a myth.⁷³ Ritschl's assessment is based on figures drawn from a statistical collection that had been compiled after the war. To a large extent it drew on original data from the StRA, the German statistical office until the end of World War II.⁷⁴ We applied our input-output analysis to these figures in order to measure the impact of motorway construction on employment. The results are shown in Table 15. Even with inclusion of the indirect Leontief and Keynesian effects work creation in 1933 was negligible indeed and rather modest in 1934, which confirms Ritschl's evaluation. Even after these years, this single

⁷³ In original: „Es zeigt sich nämlich die fast vollständige Bedeutungslosigkeit des Autobahnbaus für die Wiederbelebung der gesamtwirtschaftlichen Aktivität in den Jahren 1933 und 1934. Auch in den Folgejahren liegen die Investitionen in den Bau von Landstraßen und Wasserwegen zusammengenommen jedesmal über denen in den Autobahnbau, ebenso übrigens (mit der Ausnahme von 1936) die Investitionen der Reichsbahn. Die Autobahn als Konjunkturprogramm ist ein Mythos, sonst nichts.“ Ritschl 1992, p.163; see also Ritschl 2003.

⁷⁴ See Länderrat 1949, p. 606. The almost forgotten forerunner and basis for this collection of 1949 was compiled in the Ministerial Collecting Center in Fürstentagen immediately after the war under the direction of the United States Office of Military Government for Germany (OMGUS). Quite a number of former employees of the StRA were engaged in this operation. These statistics were not printed properly but just hectographed in several voluminous volumes. Probably only a few copies survived, e.g. in the library of the Kiel Institute. See Office of Military Government for Germany US 1946.

measure of public works created no more than half a million jobs in the peak year of 1938, taken all effects of our model together.

Here Table 15 The impact of motorway construction on employment in Germany

The statistical collection under the direction of OMGUS allows an independent check (see Table 16). In 1935, barely more than 100 km of motorways had been completed with more than 1800 km being under construction. In December 1938, more than 3000 km had been finished. This statistical collection does not present figures on workers directly engaged in this activity but rather records the workload measured in days of work (“Tagewerke”). Assuming an average of 300 days per year for a full-time equivalent of one worker, the numbers of labourers in Table 16 were calculated. Throughout these years the figures are higher than the people directly employed according to our model calculation depicted in Table 15. This is probably due to a too low labour coefficient, our average for the entire sector of “building and construction”. Labour productivity in motorway construction was lower than the average of this sector as the bulk of the workers just used shovel, spade and wheelbarrow for their work. Furthermore, the figures on the money spent on this investment do not exactly comply with the yearly figures on work completed and the corresponding aggregate work load. Nevertheless, both tables on motorway construction reveal the same pattern: The modest work force during the mid-1930 increased significantly in the last years of peace. By and large, it is indeed a myth to corroborate a large impact to the “Autobahnbau” on the economic recovery before 1936.

Here Table 16 German motorways (Autobahnen)

Here Table 17 The impact of work creation, rearmament, public and private investment on employment Germany 1930-1938

IX Evaluation – impact on employment

The impact work creation and military spending had on employment is summarized in Table 17 and juxtaposed with our findings on the impact of public and private investment on employment.

Putting together the effects of both work creation proper and rearmament yields that more than one million jobs were created as early as 1933. They formed a substantial part of the German labour force. And in 1934 and 1935, even three to four million people had found jobs through these measures. Several hundred thousand and later millions of jobs profited from the additional income spent on consumption. In the years from 1936 onwards, the enormous increase to five million and even more jobs through armament production alone gave rise to additional income. Measures were taken to restrict additional consumption.

Before Hitler came into power (30. 1. 1933) public and private investment revealed the same level and moved in tandem. Under the NS-regime, however, public investment clearly forged ahead. In 1932, the trough year, total investment amounted to more than four billion RM generating directly something more than 700 thousand jobs. Indirectly, investment induced between 1.3 and 1.8 million jobs. In the last pre-war year, 1938, capital formation of 19 billion RM created between 9.3 and 11.5 million jobs in total. Due to rearmament, public investment of 11.7 billion RM at that time clearly outstripped private spending of 7.5 billion RM.

The figures on public investment comprise substantial amounts of military spending as well (e. g. for building and construction). Thus only a cautious comparison is feasible: Clearly in 1932/33 and probably still in 1934, the “civilian” component of public capital formation dominated government induced work creation. During the following years, more and more military expenditure came to the forefront compared with public investment for other purposes. Probably from 1934/35 onwards, the “civilian” component of government spending, although still substantial, lagged behind the impact of the military budget on creating new jobs.

A brief note on the negligible role of motorway construction (“Autobahnbau”) during the slump and recovery years complements our extended paper. By and large, it is a myth to corroborate a large impact to the “Autobahnbau” on the economic recovery before 1936.

The Leontief-multipliers induced significantly less jobs than those of the Keynesian type. In general, the multipliers show nearly the same magnitude for military outlays and investment whereas work creation proper yielded considerably lower multipliers.⁷⁵

The steep rise of public spending, regardless of the questionable purposes, suggests a larger impact on employment than recent historical research maintained.⁷⁶ The more so as we left out the agricultural sector proper with its oversized work force and the notoriously poor productivity. Instead, we considered the industrial part of the German economy separately.

Of course one can speculate about a counterfactual scenario as has been suggested by Ritschl: “An upswing ... would have had exactly the same vigor without Hitler and without deficit spending.” It is true that the turning point of the business cycle had been passed in 1932, thus before Hitler had become chancellor and maybe it is also true that programs of work creation, of increased public investment and of rearmament were not a **necessary condition** to achieve full employment as early as 1936/37. On basis of our reassessment we can safely claim, however, that they were a **sufficient condition** for this purpose.⁷⁷

⁷⁵ See Tables 4, 9 and 13 for aggregate multipliers. Sectoral multipliers can easily be calculated as well by drawing on these tables. See also Yang/Cho (2015) for an extensive presentation and discussion of sectoral multipliers.

⁷⁶ For a summary of the discussion, see Spree (2004), Spoerer (2005) and Spoerer/Streb (2013, pp. 114 ff.).

⁷⁷ Keynes considered the economic policy of the NS-regime as an example for the successful application of his “General Theory”. See the foreword to the German translation of his book published in 1936 (Keynes 1936, 11. German Edition 2009). We got this hint from our colleague Margrit Grabas.

The substantial increase of employment through work creation programs, through rearmament and through public investment (subsequently poured into rearmament) surely helped the German economy to drive towards full employment: whereas in 1933 on a yearly average 4.8 million people had been registered as unemployed with peaks in January and February of about six million (see StJR 41/42, p. 426) this figure dropped to 1.6 million unemployed (StJR 41/42, p.426) in 1936 and to negligible proportions thereafter.

In more general terms, our reassessment rather supports the view put forward formerly, e. g. by Overy, that the NS-regime introduced “a wide range of government policies designed to augment and speed up the existing recovery” (Overy 1982, p. 65). We would, however, modify Overy’s chronology, that rearmament became increasingly important from 1936 onwards:⁷⁸ actually, rearmament had gathered momentum as early as 1934.

⁷⁸ Overy (1982, p, 65) reads: „Before 1936 the bulk of the expenditure was on work-creation, motorisation and general construction. After 1936 rearmament became increasingly important.”

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