

A Neoclassical Perspective on the German Economy 1925-1938.*

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PRELIMINARY. DO NOT QUOTE.

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1 Introduction

As it is for other other countries, the Depression of the 1930s is considered to be an exceptional event in the economic history of 20th century Germany. For Germany, the Depression takes on added significance because it made the Nazi regime possible. While there obviously must be other political reasons which gave rise to Hitler in Germany, post WWII economic policy in Germany was influenced by the desire to prevent economic conditions which could give support to extreme right wing causes. Yet from the point of view of modern economic theory, the cause(s) of the Depression in Germany still appear to be unclear. In this paper we try to evaluate the role of fiscal policy and the role of real wages in the Depression and recovery. We find that fiscal policy influences the economy to a limited extent, whereas the behavior of real wages might have been very important for the economy. Finally, changes in productivity also might have been very important for the economy, but we do not have a story which can account for these changes.

In 1928 per-capita GDP reaches its peak in Germany, one year before the U.S. Other than that, the effects of the Depression on the German economy are of a similar magnitude as in the U.S., see Figure 1 and 2. Output declines by about thirty-five percent and employment declines by about thirty percent from peak to trough.¹ While the U.S. recovery phase stalls after about three years in 1936, Germany's recovery lasts for five years until 1937. Of the expenditure components, private consumption in Germany gradually declines by about 25 percent and never recovers, while private investment collapses to thirty percent of its 1928 value in 1932 and then stages a rapid recovery, see Figure 3.

Figure 1. Output in Germany and the U.S.

[GNP per capita: Germany 1928 to 1938 and U.S. 1929 to 1939; each series detrended with the long-run average growth rate; each series normalized to 100 at peak]

Figure 2. Employment in Germany and the U.S.

[Per capita hours worked; each series normalized to 100 at peak]

Figure 3. Investment and Consumption in Germany

¹Output (GDP) and the expenditure components are per capita and detrended. For Germany we use the pre-WWI growth rate of 1.86%, which is also close to the overall 20th-century growth rate of the German economy. For the U.S. output we use the long run average growth rate of xx percent.

[Per capita real private investment and consumption, 1928 to 1938; each series detrended with the long-run average growth rate; each series normalized to 100 at peak]

Figure 4. Exports and Imports in Germany
[fraction of GDP, 1928 to 1938]

Although the Depression appears to be of a similar magnitude in Germany and the U.S., it does play a different role in Germany's interwar period. While the Depression alone represents a singular event in 20th century U.S. economic history, the whole of the interwar period appears to be an exceptional event in 20th century German economic history, see Figure 5. Over the duration of WWI, per-capita GDP declined by 30 percent, and output in the Weimar Republic never really recovered to the pre-WWI levels. Even in 1928, when the Weimar Republic's economy is at its peak, output is still below the trend growth level. A number of economic historians have suggested that the cause of the Depression in Germany is to be found in the twenties, for example Borchardt (1979).

Figure 5. Output in 20th Century Germany and the U.S.
[per capita real GDP 1900 to 1994]

1.1 Data Issues

Before we study the Depression in Germany we would like to point out that there are considerable data problems for this period of German economic history. Reliable official statistics are not collected before the late twenties, and government budget obfuscations related to the Versailles reparation payments, and the Nazi rearmament program often make published official data unreliable. The standard source for German historical data is Hoffmann (1965), which represents an exhaustive collection of economic data from the mid 1800's on. Most of the English literature reports Hoffmann's data or relies on it for its own estimates, e.g. Maddison (1991, 1995) and Mitchell (19xx). Nevertheless Hoffmann's data has received some criticism in recent years. For example, Fremdling (1995) reviews Hoffmann (1965) for the pre-1913 time period, and suggests that his income numbers are biased downward. Fremdling suggests that a major revision is necessary, which apparently has not been done yet. For the interwar period, Ritschl and Sporer provide a complete revision of the NIA data, a description of which is

provided in the Appendix following the text of this paper. In our study of the German economy we rely on Ritschl and Spoerer's data set. There are differences in the data sets, for example Ritschl's revised GDP series shows the peak of German GDP in 1928, not in 1929 as does Maddison (1995), and GDP declines more for Ritschl's estimates.

Figure 6. Two Measures of German Output.
[graph with per-capita GDP, 1925 to 1938, from Ritschl, and Maddison]

1.2 Outline of the Paper

- The Standard Growth Model
 - Fiscal Policy
 - * Brüning 1930-32: austerity policies
 - * Hitler 1933-1938: fiscal expansion
 - Productivity
 - Reparations and Foreign Investment
- The Labor Market
 - Were wages too high in the depression?
 - Did high wage growth in the mid/late twenties contribute to the depression?
- Not covered: monetary policy (high interest rates) and the banking crises (DANAT bank collapse)

2 Fiscal Policy in the Growth Model

We first discuss the history of fiscal policy and then we quantify the effects of the changes in taxes and spending.

2.1 A Brief History of Fiscal Policy in Germany²

Government plays a bigger role in the Weimar Republic than in the pre-WWI German Reich, at least in terms of the share of government spending and taxation in GNP. The main expenditure components of the central government, the Reich, are social spending (about 40% of the Reich budget, excluding education) and agricultural subsidies. The main tax sources are a corporation tax, income tax and a turnover (sales) tax. For the fiscal budget of the Weimar Republic the fact that the party system is fragmented turns out to be a big problem. Almost all administrations are coalition governments with weak support in the parliament. These weak coalition governments cannot impose reductions in spending or raise taxes, and are constantly faced with problems of financing the budget deficit. In particular, the Reich governments are unable to implement a long-term borrowing policy, and are forced for the most part to rely on short term borrowing.³ The recession of 1928/29 then leads to the collapse of the Great Coalition because the coalition members cannot agree on how to finance the deficits of the unemployment insurance (UI) system and how to reform the tax system.⁴ Although UI was set up just a few years before such that it would be independently financed out of employer and employee contributions, the Reich remained responsible for any deficits of the system. The employer/employee contributions to UI were set to cover a temporary maximum of 1.4 million unemployed. In July 1928 UI was paid to 1.155 millions, and this was the month with the smallest number of unemployed. At the same time, because of reduced profits industry pushes for tax reductions and the abolition of the collective bargaining system (more on that in the next section).

²This short sketch of public finances in the Weimar Republic relies heavily on James (1986). Unless otherwise noted, numbers quoted are from this source.

³For example, although most contemporaneous observers agree that there is too much administrative overhead, that is activities at the Reich are duplicated at the state and municipal level, a reform of the governmental system is not undertaken.

⁴The Great Coalition members include the SPD (Social Democratic Party of Germany), the BVP (Bavarian People Party), and the liberal-conservative DVP (German National People Party).

For the following discussion we display the time path of government spending, transfers and taxes in Figures 7 through 9. Figure 7 displays per-capita government spending, detrended with the long-run growth rate of 1.86 percent. Government investment is in buildings and works, and it excludes investment by the post office, national railway and government-financed residential investment. We include the latter in private investment spending. Figure 8 is detrended per-capita government transfers. Figure 9 includes our estimates of the average income and sales tax rate. The direct tax measure is the sum of nominal direct taxes and contributions to social security divided by nominal factor income. The indirect tax measure is the ratio of indirect taxes to GDP. All data are taken from Ritschl.

2.1.1 Brüning government

The Great Coalition is succeeded by the Brüning cabinet, March 1930 to May 1932. Brüning has no majority in parliament, but he does have the trust of the president, Hindenburg. A particular feature of the Weimar constitution allows Brüning to govern through a series of Presidential Decrees (Notverordnungen). The cabinet consensus is that the Reich budget has to be balanced because (1) otherwise the government is subject to demands from lenders (banks) and (2) government borrowing displaces, or crowds out, private borrowing (investment) in the ongoing recession. In consequence, the Brüning cabinet then embarks on an austerity policy for its two years of existence.

The Brüning cabinet's spending cuts are reflected in Figure 7. The most (in)famous cuts are the reductions of civil service pay: from December 1930 to December 1931, civil service pay is cut by about 20 percent.⁵ These pay cuts not only apply to the Reich, but also to state and municipal employees. Government spending on investment goods is also substantially scaled back; for example, expenditures on housing construction are cut by 60%.⁶ The measures of the Brüning cabinet are reflected in the decline of government spending from 1930 to 1932.⁷ The Brüning cabinet also cuts subsidies by 25 percent, although this is not reflected in our numbers for government transfers, Figure 8. In order to balance the budget of the UI system, benefits are

⁵Besides reducing government expenditures, the civil service pay cuts were also supposed to signal that similar pay cuts should be implemented in the private sector.

⁶The cuts on housing expenditures are reflected in our private investment series.

⁷It is also apparent that the predecessor Great Coalition is already cutting back on investment projects in 1929.

cut and contribution rates are raised.⁸ Finally, in order to raise revenues a variety of income surtaxes are introduced, but the basic income and corporation tax structure is not changed. The cabinet also increases a variety of indirect taxes. Because the Reich reduces transfers to the states, the states and municipalities start to increase local taxes. Figure 9 captures the higher income taxes, but it does not reflect the higher indirect taxes. There might have been some tax avoidance here.

2.1.2 Hitler government

In May 1932 Brüning loses the trust of the president Hindenburg and after two short interim governments (Papen and Schleicher) Hitler is appointed Reich chancellor in January 1933. In terms of economic policy, the Hitler regime does not represent a radical break with past conservative policies, at least until 1936 (James 1986, Overy 1982).

The Hitler government maintains the tax rate increases of the Brüning government, and it starts to implement some work programs, which were discussed in the Brüning government. These work programs remain limited because of continued concern about the inflationary impact of large deficit financed work creation programs. As part of the takeover of the state and local governments (Gleichschaltung), the Reich government now enforces balanced budgets for state and municipal governments, and the overall government budget deficit as a fraction of GDP does not exceed 5 percent until 1935. Some of the higher investment spending by the Reich then just replaces reduced state and municipal investment, and large infrastructure programs, such as Autobahn construction only become quantitatively important by 1935/36, Ritschl (1999). On the other hand, rearmament immediately becomes an important part of the government budget: before 1935 military spending represents 20 percent of the Reich budget, and after 1935 that share increases from 50 percent to 80 percent, Ritschl (1999). This increase of government spending is reflected in Figure 7.

The more radical economic measures of the Hitler regime are the dissolution of the unions, whose remains are absorbed into the German Labor Front (Deutsche Arbeitsfront DAF), and a drastic enforcement of the system of price and wage controls started by the Brüning government. In order to

⁸The benefit rates are cut by 5% in June 1931, and in December 1931 the duration of benefits is shortened to 16-20 weeks. The contribution rate is raised from 4% of wages to 4 1/2% in July 1930, and another 6 1/2% in October 1930.

maintain low wages in the mid thirties, the regime imposes, with limited success, restrictions on labor mobility. The system of agricultural price controls is also used to support the system of wage controls. Finally, the use of price controls leads to significant quality reductions, especially for consumer goods. The turning point towards a state controlled economy is the Four Year Plan of 1936/37 which reallocates resources from private industry to government controlled steelworks.

2.2 Quantifying the Effects of Fiscal Policy

Fiscal policy during the period 1925-1938 consisted of dramatic changes in both taxes and spending. The path of taxes suggests the possibility of large distortions which may have contributed to the slump. The large increase in spending in the period after 1932 may have had significant wealth effects which may help explain the recovery. In this section we use the neoclassical growth model to assess these possibilities. We find that the effects of distortionary taxes may explain about 5 percentage points of the decline in hours and output from 1928-1932. The wealth effects of government spending are large and may explain as much as 15 percentage points of the expansion from 1933-1938.

2.2.1 The Model

There is a representative agent with preferences over consumption, c_t and leisure, $1 - n_t$,

$$\sum_{t=0}^{\infty} \beta^t \{ \ln c_t + \eta \ln (1 - n_t) \},$$

with $\eta > 0$, $0 < \beta < 1$. The household consumes and accumulates capital subject to an income tax, τ_t^i and an expenditure tax, τ_t^e . Its date t budget constraint is

$$(1 + \tau_t^e) (c_t + x_t) \leq (1 - \tau_t^i) (w_t n_t + r_t k_t) - \phi_t,$$

where x_t denotes purchases of investment goods, k_t is the household's beginning of period stock of capital, w_t is the wage, r_t is the rental rate on capital, and ϕ_t is a lump-sum tax. The household initial capital stock, k_0 is given. Capital accumulates according to

$$k_{t+1} = (1 - \delta)k_t + x_t.$$

The household rents capital and labor services to profit maximizing firms who combine it to produce output, y_t according to

$$y_t = \exp(\theta_t) k_t^\alpha (\gamma^t n_t)^{1-\alpha},$$

where $0 < \alpha < 1$, θ_t is a transitory disturbance to productivity and $\gamma \geq 1$ is the growth rate of labor augmenting technology.

The government uses its tax revenues to purchases goods g_t which are assumed not to be productive. Later we will consider the possibility that some of the infrastructure spending was productive and contributed to the recovery. We assume the government satisfies its budget constraint on a period by period basis:

$$g_t = \tau_t^i w_t n_t + \tau_t^i r_t k_t + \tau_t^e c_t + \tau_t^e x_t + \phi_t.$$

Given sequences for the fiscal policy variables and technology, a perfect foresight competitive equilibrium of this economy can be defined in the usual way. In this equilibrium markets for goods, capital and labor all clear. Goods market clearing requires

$$y_t = c_t + x_t + g_t.$$

Parameterization To assess the role of fiscal policy we set $\theta_t = 0$ and $\gamma = 1.0186$, the annual trend growth rate of per capita GDP in Germany, 1901-1913. We use an estimate of labor's share in GDP to select a value for α . Our estimate of labor income for this purpose is broad and includes wages and salaries, a proportion of proprietors income and the social security contributions of employers.⁹ The discussion of the labor market below highlights significant changes in the structure of worker compensation which shows up in our labor share measure as a downward trend, from about 0.69 in 1925 to about 0.63 in 1938. We use the mean over this period, 0.66. The annual depreciation rate δ is 0.0122, which is consistent with our data on the capital stock. We set $\beta = 1/(1.04)$ and η so that in steady state 1/3 of the time endowment is spent working. We consider several alternative specifications of fiscal policy. For this we use the sequences of taxes and government spending shown in Figures 7 through 10. In keeping with our assumption about

⁹We assume that 90% of proprietors income in forestry and agriculture is labor income. We assume that in trade and industry, the share of labor income in proprietors income is the same, as the labor income share for the economy as a whole.

government spending, we add the consumption and investment components of spending to derive the sequence of spending used in the model. The exact assumptions we make about the sequences are outlined in the next section.

Experiments We begin the computations assuming that the initial date is 1925. Given a value for k_{1925} , sequences of fiscal policy variables from 1925 onward, and assumptions about tax rates and spending in the long run we compute perfect foresight equilibria for three cases. In each case we choose k_{1925} so that the capital-output ratio in the initial period corresponds to our estimate of this ratio for 1925, 5.1. The first case we study assumes that government spending, as a fraction of income, is constant at its long run level. In this case tax rates are assumed to equal their empirical values until 1938, and to remain at their 1938 levels thereafter (along the transition to a new steady state). The second case assumes the tax rates are fixed at their 1925 levels and that spending follows its empirical sequence until 1938. We calibrate the initial value of government spending to correspond to its share in GDP in 1925 (13 percent). Obviously the degree of permanence of the spending increase is relevant for assessing the quantitative impact of the spending. In 1938 government spending had risen to 30 percent of GDP. We assume that after 1938 spending drops within 3 years to a level that approaches 20 per cent of GDP in the long run. This corresponds to the government spending share for Germany in 1995.

The final case we consider combines the tax and spending sequences, and addresses uncertainty over fiscal policy. It seems hard to imagine that the massive increase in government spending after 1932 was anticipated before that time. This is important in the neoclassical model because of the ample opportunities for intertemporal substitution which can lead agents to adjust their decisions before the spending actually materializes. We assume that before 1932 agents believe that the long run level of spending will remain at 13 percent of income after 1932 and that the tax rates will remain forever at their 1932 levels. When 1933 arrives, agents understand that the regime has changed and perfectly foresee the actual spending and tax rates that occurred from 1932 to 1938. Expectations after 1938 correspond to the assumptions made for the first of the two cases.

A notable feature of all the experiments is that the long run capital-output ratio implied by the models with taxes and spending is significantly lower than the value we estimate for Germany in 1925. Another way of saying

this is that the fiscal policies we examine involve large wealth effects.

Case 1: Taxes only To gauge the potential impact of the indirect and direct tax sequences, consider figure 10 which displays a measure of the effective tax on labor. Notice that it increased by almost 7 percentage points from 1925 to 1931 and declined somewhat during the recovery period before rising again after 1935. In the model, this has significant disincentive effects on labor supply and capital accumulation. We can see the effects in figure 11 where the endogenous sequences of (detrended) output, hours, investment and private consumption are displayed. Taxes clearly contribute to the downturn, putting downward pressure on activity from the very beginning. Note that, due to the higher level of taxes in the long run, the initial capital labor ratio, 5.1, is much higher than the long run ratio, 3.9. This means that output and consumption must decline eventually. Nevertheless there seem to be reasonably large transitory effects of the taxes. Output and labor fall by about 4 percent from 1928 to 1932 and investment falls by 15 percent. From 1932-1935, hours completely recover before succumbing to the rising taxes in the later part of the period. The impact of taxes on capital accumulation means that consumption must fall in the long run and indeed consumption declines throughout the episode. Interestingly, it falls by about 10 percent compared to its level in 1928, which is roughly half of the drop we see in the data.

Case 2: Spending only From figure 7 we saw that total government spending was essentially flat from 1925-1932 and by 1938 was two and half times its 1928 level. Even though we have assumed that the expected path after 1938 was for reduced spending, the wealth effects of such a large increase, even if not permanent, could be significant. Figure 12 shows the effects of government spending only. We do not expect the exact dynamics to correspond closely to the German experience since agents see the increase in spending coming and so adjust their work effort and savings accordingly. Nevertheless, the magnitudes of the changes from the beginning to the end of the period give some sense of how big the wealth effects are. Given the negative wealth effect of the large increase in spending, we expect consumption to decline. By 1938 it is 6 percent below the 1928 level. Hours rise by close to 10 percent over the same interval and output by about 6 percent. The pattern of investment is due to households saving to pay for their future

high tax burden. In the long run the capital stock must decline, because we assume that the long run level of spending is 20 percent of income, and the long run capital-output ratio is 4.2, which is lower than the initial value of 5.1.

Case 3: Taxes and spending with a regime change in 1933 Now combine the effects of taxes and spending on the economy under the assumption that government policy after 1932 was not foreseen before that time. We can use this experiment to address two questions. First, to what extent did the policy of austerity (here, mostly increases in taxes) contribute to the slump? Second, what was the contribution to the expansion of the dramatic increase in government spending after 1932?

The results of this experiment are shown in Figure 13. In the period before the slump, taxes and spending have a combined impact of about 5 percent on output and labor. This is mostly due to the increase in taxes. Investment does not move much, and to the extent that it does move, it is to offset what are perceived by agents in the model as transitory spending changes. Consumption falls due to the wealth effects of the higher long-run taxes. After 1932 the wealth effects dominate. Output and hours rise by about 15 percent from their troughs and investment triples before giving way to the high government spending at the end of the episode. By the end of the episode consumption is about 15 percent lower than its 1928 level, not too far off the actual drop.

2.3 Productivity

We can use the growth model with government spending and distortionary taxes to examine the impact of changes in measured productivity during the depression and recovery. Figure 14 displays an estimate of the Solow residual (detrended using $\gamma = 1.0186$). This estimate is based on the labor share parameter discussed above ($\alpha = 0.66$), Ritschl's measure of labor input and GDP, and own measure of the capital stock.¹⁰ The figure shows that total factor productivity fell by roughly 10 percent from 1928 to the trough

¹⁰This measure is based on Ritschl's investment series 1925-1938 and Gehrig's (1960) estimates of the capital stock for 1929 and 1939. Our measure of the capital stock includes some government capital, such as housing, the post office and the national railway, but does not include the buildings and works (including roads) that compose our government investment series. Hence it is consistent with our model.

in 1932.¹¹ Of course the usual caveats about using the Solow residual to estimate technology apply here. Nevertheless, changes in productivity are a potential explanation for the depression and recovery and it is interesting to know how much these two phases productivity could explain.

We use the growth model developed above for this. To implement the model we set the tax variables at their 1925 levels and fix government spending so that it accounts for 13 percent of income in steady state. The path of the transitory component of technology θ_t equals our estimate of the Solow residual. We assume the transitory component is zero after 1938 and that technology thereafter grows at its long run rate. We selected the remaining parameters and the initial capital stock k_{1925} as for the fiscal policy experiments. In the latter case perfect foresight is assumed.

The outcome of this experiment is shown in figure 15. As expected, this case is qualitatively quite successful at replicating the patterns of hours, output, investment and consumption. In quantitative terms, productivity “explains” quite a large fraction of the drop in output and hours, too much of the drop in investment, and not enough of the drop in consumption. Output falls by about 20 percent, about two thirds of the actual drop. Hours fall by less, about 12 percent, which is about half the amount in the data. Investment falls dramatically and even turns negative for two years. It is initially very low since the capital stock is quite high relative to the steady state in the 1925. Hence the amount of negative investment is quantitatively small. Consumption falls by at most 5 percent. Imposing the nonnegativity constraint on investment would make consumption fall by more and would reduce the drop in hours. In both cases the impact would be slight.

2.4 Consumption Smoothing in the Depression?

Private consumption falls by about 25 percent from 1928 to 1932. In our experiments with government spending and taxes, the behavior of consumption is determined by the transition to the long run steady state and it falls by about 5 percent in that time period. We observe the same limited decline for the productivity experiment. Basically, the representative agent is successful at smoothing consumption over the relevant time period. We might note that for a large fraction of the population, the hyperinflation of the early twenties

¹¹This is probably a conservative estimate, since we use Ritschl’s employment series, cf. the discussion of employment series on page xx.

could have severely limited the possibilities for intertemporal consumption smoothing. We do not have direct observations on wealth distribution and portfolio compositions in the twenties, but several observations are suggestive. First, the value of government securities was substantially reduced, James 1986, p. 48. If middle income families were buying government bonds to support the war effort, they would have lost a substantial share of their wealth. Second, between 1914 and 1927, the wealth distribution became much more concentrated in the lower ranges than did the income distribution, (James 1986, p.50, Table 1). Again, this suggests that a considerable fraction of the population lost wealth. Finally, assuming that a large part of precautionary savings are held in the form of savings accounts, it is of interest that compared to pre WWI, the deposit volume for savings accounts was substantially lower in the late twenties.¹²

¹²Savings accounts were mostly held at Sparkassen and Kreditgenossenschaften, almost 100 percent in 1930, (Deutsche Bundesbank 1976, p123, Tbl 2.04). In 1930 the deposit volume at Sparkassen was one half, and that of Kreditgenossenschaften was two third of the 1913 deposit volume (Deutsche Bundesbank 1976, p102, Tbl 1.15 and p.112, Tbl 1.20). On the other hand, for the Great Banks of Berlin the deposit volume in 1930 was about three times the volume of 1913 (Deutsche Bundesbank 1976, p78, Tbl 1.03).

3 Reparations and Foreign Investment in the Growth Model [Incomplete]

- wealth effects of reparations
 - Reparation bonds: A bonds (compensation for direct war damage) 10bn gold marks; B bonds (transfer of interallied debt from France and UK to Germany) 42bn gold marks; C bonds (propaganda) 80 bn gold marks. Payment of C bonds was not expected. A & B bonds represented 100 percent of 1913 GDP, or 125 percent of 1924 GDP (Ritschl 1999).
 - confiscation of German foreign assets and reparations in kind
 - from 1925 to 1930 actual reparations payments used up about 20 percent of the Reich government revenues (33 percent in 1939), from Ritschl's numbers on the balance of payments and the Reich budget.
- impact of foreign investment on domestic investment decisions

3.1 The Model

We use a variant of the model developed above evaluate the effects of reparations and foreign investment. We suppose that in addition to possessing domestic capital, firms have access to foreign-owned capital which evolves exogenously. Also, the government must pay reparations. To keep things simple, we assume that only lump sum taxation is available to the government. The household problem is identical as before except that distortionary taxes are set to zero. The firms' problem is different in that they may now rent capital from foreigners. Output is produced according to

$$y_t = \exp(\theta_t) (k_t + k_t^*)^\alpha (\gamma^t n_t)^{1-\alpha},$$

where k_t^* is the stock of foreign owned capital. We assume that the foreign owned stock of capital evolves according to

$$k_{t+1}^* = (1 - \delta)k_t^* + r_t k_t^* + u_t^*,$$

where u_t^* equals capital inflows. The initial stock of foreign owned capital is given.

The government uses its tax revenues to purchases goods g_t and to pay reparations q_t . We assume the government satisfies its budget constraint on a period by period basis:

$$g_t + q_t = \phi_t.$$

Given sequences for the fiscal policy and capital inflows, a perfect foresight competitive equilibrium of this economy can be defined in the usual way. In this equilibrium, markets for goods, capital, and labor all clear. Clearing of the domestic goods market implies

$$y_t - r_t k_t^* = c_t + x_t + g_t + q_t.$$

Substituting from the foreign capital accumulation equation and rearranging we have

$$y_t + u_t^* = c_t + x_t + x_t^* + g_t + q_t,$$

where $x_t^* = k_{t+1}^* - (1 - \delta)k_t^*$ is gross investment of foreign capital.

3.2 Parameterization

Fixing the initial capital stock...

3.3 Experiments

4 The Labor Market

The behavior of the German labor market in the depression is quite astounding. According to Ritschl's employment and real wage numbers employment falls by about 35 percent from 1928 to 1932, while at the same time real wages increase by 15 percent, Figure 2 and 16. While this observation is extreme, for example Bry (1960) reports a smaller and more short-lived increase of real wages, it is consistent with other research on wages by Lölhöffel (1974).¹³ This suggests that the labor market played an important role for the course of the Depression. In this section we briefly describe the institutional features of the German labor market in the twenties and thirties, and then describe how 'too high' real wages could have contributed to the Depression.

Figure 16. Real Wages Increase in the Depression.
[Detrended nominal wages deflated with the Wholesale Price Index for Finished Manufactures, Bry (1960), p.255.]

4.1 A Sketch of the German Labor Market.¹⁴

By the mid-twenties Germany is an industrialized society, albeit with a still large agricultural sector. About 30% of the labor force is employed in manufacturing, mining, and building crafts, 17% is employed in trade, transportation and communications, 7% is employed in public and private services, 4% is employed in domestic services, but agriculture still employs 30% of the labor force.¹⁵ Most members of the labor force are either wage earners (46%) or salaried (17%). The predominance of small businesses is reflected in the relatively large share of independent proprietors and managers (16%), and

¹³Ritschl calculates nominal wages as wage and salary income plus employer contributions to social security and unemployment insurance divided by his measure of hours worked. The big nominal wage increase in Ritschl's series derives mainly from the substantial drop in his employment series. Ritschl's employment series declines substantially more than does aggregate employment for either Hoffmann (1965) or Lölhöffel (1974). We suspect that this is so because Ritschl's employment series does not cover agriculture which contains about 30% of the labor force.

¹⁴The description of the German labor market relies heavily on Bry (1960) and James (1986).

¹⁵Census data from Bry (1960), Table 7, page 26.

the agricultural sector is reflected in the large share of unpaid family members (16%). Only 4% of the labor force is employed in domestic services.¹⁶ In this economy wage setting is to a large extent the outcome of collective bargaining between unions and employers and/or employer federations, and the government exercises a considerable degree of control, (Bry 1960, James 1986).

The Stinnes-Legien Agreement (November 15, 1918) and subsequent legislation establish the collective bargaining system in the Weimar Republic.¹⁷ Collective bargaining determines wages and working conditions, and in case of conflict an arbitration committee determines the contract. From October 1923 on, arbitration committees are under the supervision of the Reich Labor Ministry and the chairman of the committee, usually a Ministry bureaucrat, can impose binding arbitration (decree from December 1923). After arbitration the Reich Labor Ministry can make it legally binding, which makes subsequent strikes and lockouts illegal. In general, the Reich Labor Ministry and its arbitrators are seen as sympathetic to the wage demands by the unions.¹⁸ How pervasive is the collective bargaining process? In 1929 collective bargaining agreements covers 12 million workers out of a total of 17 million workers.¹⁹ Furthermore, many of the collective bargaining agreements have a regional or national coverage.²⁰

After the hyperinflation of 1923, unions use the collective bargaining system to negotiate wage increases which make up for real wage losses experienced in the hyperinflation. In 1927 the Reich government implements a 33% public sector pay increase, in response to which the unions bargain for comparable wage increases, because they anticipate a renewal of inflation. After 1928 large unions are faced with competition from radicalized independent unions with links to the KPD (Revolutionäre Gewerkschaftsopposition), and they initially refuse wage cuts in the depression (James 1986, p.216). As men-

¹⁶Census data from Bry (1960), Table 9, page 28.

¹⁷The collective bargaining system extends arrangements from the war economy of WWI. Another element of the Agreement was the introduction of the 8 hour work day/48 hour work week. This feature survived until 1923.

¹⁸A 1929 Ministry publication on its 10th anniversary contains the statements that (1) the Ministry supports high wages in order to raise the purchasing power of workers and (2) it believes that state policy was important for wage determination in the 1920s, James (1986), p.212.

¹⁹See Bry (1960), p. 42, Table 13, and James (1986), p. 210.

²⁰In 1929 1.4 m workers are covered by Reich contracts and 3.4m are covered by regional contracts, James (1986), p. 210.

tioned in the section on fiscal policy, the Brüning government then reduces civil service pay by 20 percent in 1931, and, as part of the fourth emergency decree (December 1931), it reduces private sector wages to their January 1927 level. In 1933, after Hitler takes power the unions are dissolved and become part of the Deutsche Arbeitsfront, an umbrella organization which includes all labor market participants. This organization serves the political and economic pacification of the labor market. In January 1934 the National Labor Law allows for minimum wages, and after the recovery the Nazi regime tries to impose maximum wages.

4.2 Did high real wages contribute to the depression?

The available evidence suggests that, in the early phase of the Depression, real wages increase in all parts of the German economy, and that most of the real wage increase is due to the fact that prices fall faster than do wages. Lölhöffel (1974)'s work on nominal labor cost across industries shows that, in the first year of the Depression, nominal labor cost is still increasing, and that nominal labor cost is decreasing from 1930 until 1932, see Figure 17.²¹ In Figure 16 we have deflated nominal wage measures with the producer price index for finished manufacturing goods.²² As can be seen from Figure 18, other more broadly-based price indices show similar rates of decline for this time period. Given the relative rates of wage and price decline, detrended real wages increase substantially from 1928 to 1932: between 10 percent (Lölhöffel, 1974) and 15 percent (Ritschl). We now study the implications of a similar increase of real wages in the growth model.

Figure 17. Nominal Labor Cost Across Industries.

[Lölhöffel (1974), 1928=100]

Figure 18. Germany Deflates.

[Wholesale price index for finished manufactures and cost of living index from Bry (1960), p.255.]

²¹Labor cost includes wages, payments in kind, employer contributions to social security and UI, and payroll tax contributions. In Figure 17 nominal labor cost is not detrended.

²²This appears to be the standard deflator used in studies of the German economy of the twenties.

4.2.1 One-Sector Growth Model with Exogenous Wages.

The description of the collective bargaining arrangements in the Weimar Republic suggests that for a large part of the economy the competitive wage setting model may not be appropriate. At least one third of the labor force is covered by collective bargaining agreements: two thirds of blue-collar workers, which make up about half of the labor force. In addition, about thirty percent of white-collar employees are union members, and white-collar employees make up about seventeen percent of the labor force. From this we conclude that for about forty percent of the labor force, most of it in manufacturing, mining, and building crafts, are probably subject to some form of collective bargaining.²³ The evidence on industry nominal wages also suggests that the wage movements across industries were quite similar, in particular it appears that nominal wages in manufacturing actually declined more than in other industries. Because real wages increase in all industries we believe it is reasonable to study the question of ‘too high’ real wages in the basic one-sector growth model from the previous section. We find that the particular 1929-36 time path of real wages in Germany may have reduced output and employment substantially.

Experiment: Wages are above their market clearing level between 1929 and 1936. Assume that in 1928 the economy is on its competitive equilibrium path. Then impose the time path for real wages such that they follow the time path of real wages in the German economy from 1929 to 1935 relative to 1928.²⁴ Finally assume that from 1936 on wages are again competitively determined. During the time period when real wages are exogenously given, employment is determined by firm demand for labor, given the real wage, and the optimal labor supply decision need not be satisfied. The wage path is perfectly foreseen by the representative agent. We select the initial capital stock in 1928 such that we match the capital-output ratio in 1928. The growth model is parameterized as in the section 2.2.1.

The results from this experiment are quite dramatic: by 1932 output falls by about 20 percent, employment falls by about 30 percent, and there is no gross investment. Given the real wage path there is also no recovery, output

²³Our emphasis of the collective bargaining system might be a bit exaggerated. As Bry (1960, p.137) points out, in the early phase of the 1870 recession/depression (Günderjahre) real wages did also rise even though there was no collective bargaining system.

²⁴We use Lölhöffel (1974)’s numbers for this exercise.

and employment return to their trend growth path only after the real wages are no longer exogenously given.

Figure 19. The Effects of High Real Wages.

4.3 Did high wage growth in the mid/late twenties contribute to the depression?

High real wages are an issue not only in the Depression, but also throughout the twenties when employers argue that labor costs are too high. These high labor costs are supposed to reduce profitability and depress investment. On a similar note, the Council of Economic Advisors in Germany argues in the late seventies that growth is reduced and unemployment is increased when real wage growth outstrips labor productivity growth. Borchardt (1979) applies the same argument to the Weimar Republic and generates quite a bit of excitement in the German economic history profession, Holtfrerich (1984), Kruedener (1990). From Figure 20 we can see that wage income share indeed started to increase in the late twenties and declined only some time well into the depression. In this section we try to formalize Borchardt (1979)'s argument and study the implications of an increase in the bargaining power of labor in a growth model with labor market search, Andolfatto (1996). We find that this can lead to employment reductions of the same magnitude as observed in the Depression.

Figure 20. The Share of Wages and Salaries in Income Increases before the Depression.

[graph of wage income share]

4.3.1 Growth Model with labor market search

There is representative household/family with preferences over consumption

$$\sum_{t=0}^{\infty} \beta^t \ln c_t, \text{ with } 0 < \beta < 1.$$

The family has unit measure members and a fraction n_t are employed. Each employed family member, or worker, is matched to a production unit and earns a wage w_t . An unemployed family member, or searcher, will be employed in the next period with probability θ_t . A worker will be unemployed

with probability σ at the beginning of the next period. The number of workers associated with a household evolves according to

$$n_{t+1} = (1 - \sigma)n_t + \theta_t(1 - n_t).$$

The family can borrow and lend at the interest rate R_t and the family's budget constraint is

$$c_t + a_{t+1} = w_t n_t + R_t a_t.$$

A production unit which is matched with a worker hires capital and produces output $\tilde{y}_t = \tilde{k}_t^\alpha z_t^{1-\alpha}$. Productivity grows at the constant rate g . The capital rental rate is u_t and the production unit hires capital to maximize $q_t = \max_{\tilde{k}} \{\tilde{k}^\alpha z_t^{1-\alpha} - u_t \tilde{k}\}$. With probability σ the production unit is destroyed, and the worker becomes unemployed. Production units for the next period can be created by posting a vacancy during the period at a cost $\kappa z_t > 0$. With probability ϕ_t a vacancy will be matched with a worker at the end of the period. Given the wage rate we can define the capital value of a matched production unit J_t and worker W_t , a vacancy V_t , and a searcher U_t :

$$\begin{aligned} J_t &= q_t - w_t + (1 - \sigma) J_{t+1} / R_{t+1}; \\ W_t &= w_t + \{(1 - \sigma) W_{t+1} + \sigma U_{t+1}\} / R_{t+1}; \\ V_t &= -z_t \kappa + \phi_t J_{t+1} / R_{t+1}; \\ U_t &= \{\theta_t W_{t+1} + (1 - \theta_t) U_{t+1}\} / R_{t+1}. \end{aligned}$$

The surplus of a match is $S_t = J_t + W_t - U_t - V_t$, and we assume that wages are set to attain the Nash bargaining solution where the worker receives a fraction ω_t of the surplus. There is free entry for vacancies such that the capital value of a vacancy is zero when the measure of vacancies is positive, $V_t = 0$ when $v_t > 0$. The number of successful matches between searchers and vacancies is determined by the matching function

$$m_t = \min \left\{ v_t, 1 - n_t, A v_t^\psi (1 - n_t)^{1-\psi} \right\} \text{ with } 0 < \psi < 1.$$

The probability of a searcher (production unit) being matched with a production unit (searcher) is then $\theta_t = m_t / (1 - n_t)$ ($\phi_t = m_t / v_t$). The family takes the meeting probabilities as given.

Equilibrium Definition. [to be written]

Parameterization. The parameterization is essentially the same as in the basic growth model, with the exception of the search frictions. Lacking

any particular information on the search frictions for the interwar German economy, we follow Andolfatto (1996)'s parameterization for the baseline model. The period of time is now a quarter. The match separation rate is set at $\sigma = 0.15$, and we assume that in the steady state the rate at which vacancies are filled is $\phi = 0.9$. The vacancy coefficient in the matching function is set at $\psi = 0.6$. We parameterize the baseline model such that in the steady state the employment ratio is 0.57, and the vacancy-costs are about 5 percent of gross output. The vacancy costs are higher than Andolfatto (1996)'s 1 percent. We choose a higher vacancy-cost ratio because we want to generate some movement in the wage share from variation in the worker surplus share parameter ω . Since the surplus is limited by the cost of creating a vacancy, we need a relatively large vacancy cost to generate sufficient variation in the wage share. In order to match the lower wage and salary income share we also use a higher capital coefficient in the production function, $\alpha = 0.45$.

4.3.2 Experiment: The worker surplus share increases from 1925 to 1932. [Preliminary]

Assume that in 1925 the worker surplus share parameter starts to increase until it is twenty percent above its baseline value in 1930, and it then returns to its baseline value by 1933. We model the time path of the surplus share on each time segment as a cubic function with zero derivative at the endpoints. The following results are quite preliminary since they rely on a linear approximation which is inappropriate since the implied deviations from the steady state value are up to 80 percent.

We have picked the time path of the bargaining parameter to replicate the increase and decline of the wage share. What are its implications for output and employment? Apparently the movement in the labor surplus share parameter can account for a substantial decline of output, investment, and employment. According to the simulations, output declines by close to twenty percent, employment declines by about thirty percent, and investment declines by about sixty percent. These movements are of the magnitude observed for the German economy in the Depression.

Figure 20. The Effects of an Increasing Labor Surplus Share.

Our model is subject to the same critique as the one applied to Borchartt (1979)'s original proposal: not only was the wage share increasing

before 1928, but so was employment, Balderston (1993). If we want to stick with the bargaining story we have to find an off-setting effect for the mid/late twenties which can account for the increase in employment. One possible explanation is technical progress and increasing labor productivity during that time period. Some support for this argument can be found in the popularity of the 'rationalization' movement in Germany in the twenties, although James (1986, p. 146-161) argues that most of the productivity improvements were attained in the early twenties and that the late twenties were stagnant in that respect. The issue appears to be open to us, especially since our results on the transitory component of the Solow residual seems to indicate some additional productivity growth in the relevant time period.

5 Conclusion

[To be written]

Appendix

Ritschl's revised NIA data and comparison with Hoffmann (1965)

- Maddison (1991) uses official NIA statistics; Maddison (1995) uses Hoffmann (1965)
- Production
 - Hoffmann (1965): aggregate up industry value-added estimates to obtain net factor income
 - Ritschl and Spoerer (1997): official statistics (o.s.) on national income [based on income tax statistics], corrected for indirect taxes (o.s.), subsidies (est.), employer contributions to social security (o.s.), interest on government debt (est.) for net; and depreciation (est.) for gross
 - Consistency: Ritschl (1998) shows that Hoffmann (1965)'s output estimate is close to the official statistics of national income when he uses improved estimates for output in metal processing industry
- Expenditures
 - Investment
 - * Public: H65 from public budgets, R from o.s. on public investment
 - * Private: difference for the post 35 period; H65 extrapolates overall investment based on manufacturing investment; Ritschl (1992) uses unpublished o.s. on investment
 - Balance of payments [difference after 35]
 - * H65 extrapolates current account from capital account; Ritschl (1991) uses unpublished reports on balance of trade data
 - * Ritschl (1998) states that H's import and export price deflators are very different from the ones published in the official trade statistics which yields a downward adjustment of the current account estimates
 - Public Consumption

- * problems: (1) conversion of original German public budget balance sheet data to numbers consistent with NIA concepts; (2) accounting for interest payment on public debt; (3) budgetary manipulations related to reparations payments in 20s and rearmament in 30s
- * Ritschl (199?) and Hoffmann agree on the 20s and early 30s, but Ritschl finds a smaller increase of public consumption from 34 to 37, only from 38 on are the numbers roughly the same

– Private Consumption

- * Hoffmann (1965) estimates based on consumer goods production, from the 30s on assumes that private and public consumption are proportional
- * Ritschl (1998) and Ritschl and Spoerer (1997) calculate private consumption as the residual of production minus other expenditure components; find a slower increase than H in the 30s.

References

- [1] Andolfatto, David. 1996. Business Cycles and Labor-Market Search. *American Economic Review* v.86 no.1, 112-132.
- [2] Balderston, Theodore. 1993. *The Origins and Course of the German Crisis 1923-1932*. Berlin: Haude and Spencer.
- [3] Borchardt, Knut. 1979. Zwangslagen und Handlungsspielräume in der großen Wirtschaftskrise der frühen dreißiger Jahre: Zur Revision des überlieferten Geschichtsbildes. In *Jahrbuch der Bayerischen Akademie der Wissenschaften*, 85-132. Reprinted as Constraints and Room for Manoeuvre in the Great Depression of the Early Thirties: Towards a Revision of the Received Historical Picture, in Knut Borchardt. 1991. *Perspectives on modern German economic history and policy*. Cambridge: Cambridge University Press, 143-160.
- [4] Bry, Gerhard. 1960. *Wages in Germany 1871-1945*. Princeton: New York.
- [5] Deutsche Bundesbank. 1976. *Deutsches Geld und Bankwesen in Zahlen, 1876-1975*. Verlag Fritz Knapp: Frankfurt am Main.
- [6] Fremdling, R. 1995. German national accounts for the 19th and early 20th century. *Scandinavian Economic History Review* 43, 77-100.
- [7] Gehrig, Gerhard. 1961. Eine Zeitreihe für den Sachkapitalbestand (1925 bis 1938 und 1950 bis 1957), in *IFO-Studien* 7, 7-60.
- [8] Hoffman, W.G. (with F.Grumbach and H.Hesse). 1965. *Das Wachstum der Deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts*. Springer Verlag: Heidelberg.
- [9] Holtfrerich, Carl-Ludwig. 1984. Zu hohe Löhne in der Weimarer Republik? Anmerkungen zur Borchardt-These. *Geschichte und Gesellschaft* 10, p.122-141.
- [10] James, Harold. 1986. *The German slump: Politics and Economics, 1924-1936*. Oxford: Oxford University Press.
- [11] Kruedener, Jürgen von (ed.) (1990). *Economic Crises and Political Collapse: The Weimar Republic, 1924-1933*, New York: Berg Publishers.

- [12] Lölhöffel, Margot von. 1974. Zeitreihen für den Arbeitsmarkt - Lohnsatz; Beschäftigungsfälle, Arbeitskosten und Arbeitsstunden (1925 bis 1938 und 1950 bis 1967). *IFO-Studien* v.20 no.1/2, 33-150.
- [13] Mitchell, B. *European Historical Statistics, 1750-1970*. Macmillan: London.
- [14] Overy, R.J. 1982. *The Nazi economic recovery, 1932-1938*. London: Macmillan.
- [15] Ritschl, Albrecht. 1998. Measuring National Product in Germany, 1925-38: The state of the debate and some new results, in T.Dick (ed.) *Business cycles since 1820*, Cheltenham: Elgar, pages 91-109.
- [16] Ritschl, Albrecht and M.Spoerer. 1997. Das Bruttosozialprodukt in Deutschland nach den amtlichen Volkseinkommens- und Sozialproduktsstatistiken 1901-1995. *Jahrbuch für Wirtschaftsgeschichte* 1997 / 2, pages 27-54.
- [17] Ritschl, Albrecht. 1992. Über die Höhe und Struktur der gesamtwirtschaftlichen Investitionen in Deutschland 1935-1938, *Vierteljahresschrift für Sozial- und Wirtschaftsgeschichte* 79: 156-176.
- [18] Ritschl, Albrecht. 1991. Die deutsche Zahlungsbilanz 1936-41 und das Problem des Devisenmangels vor dem Kriegsbeginn. *Vierteljahreshefte für Zeitgeschichte* 39: 103-23.
- [19] Ritschl, Albrecht. 1999. "L'Allemagne paiera" ou les conséquences économiques des JM Keynes: Lessons from Sovereign Debt Theory.
- [20] Spoerer, Mark. 1997. Weimar's Investment and Growth Record in Intertemporal and International Perspective. *European Review of Economic History*, 1(3), December, 271-97

Figure 1. Output in Germany and the US

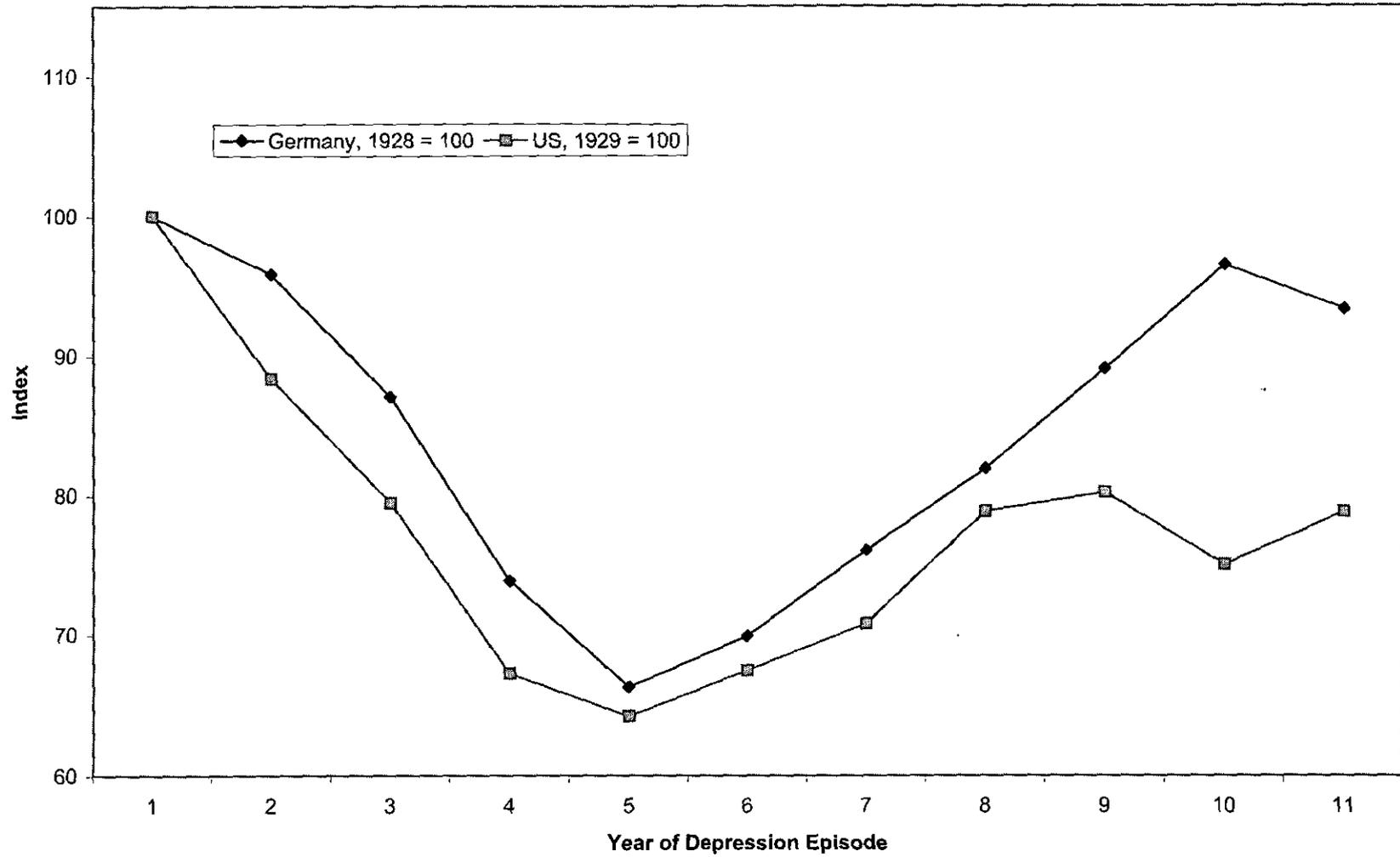


Figure 2. Employment in Germany and the US

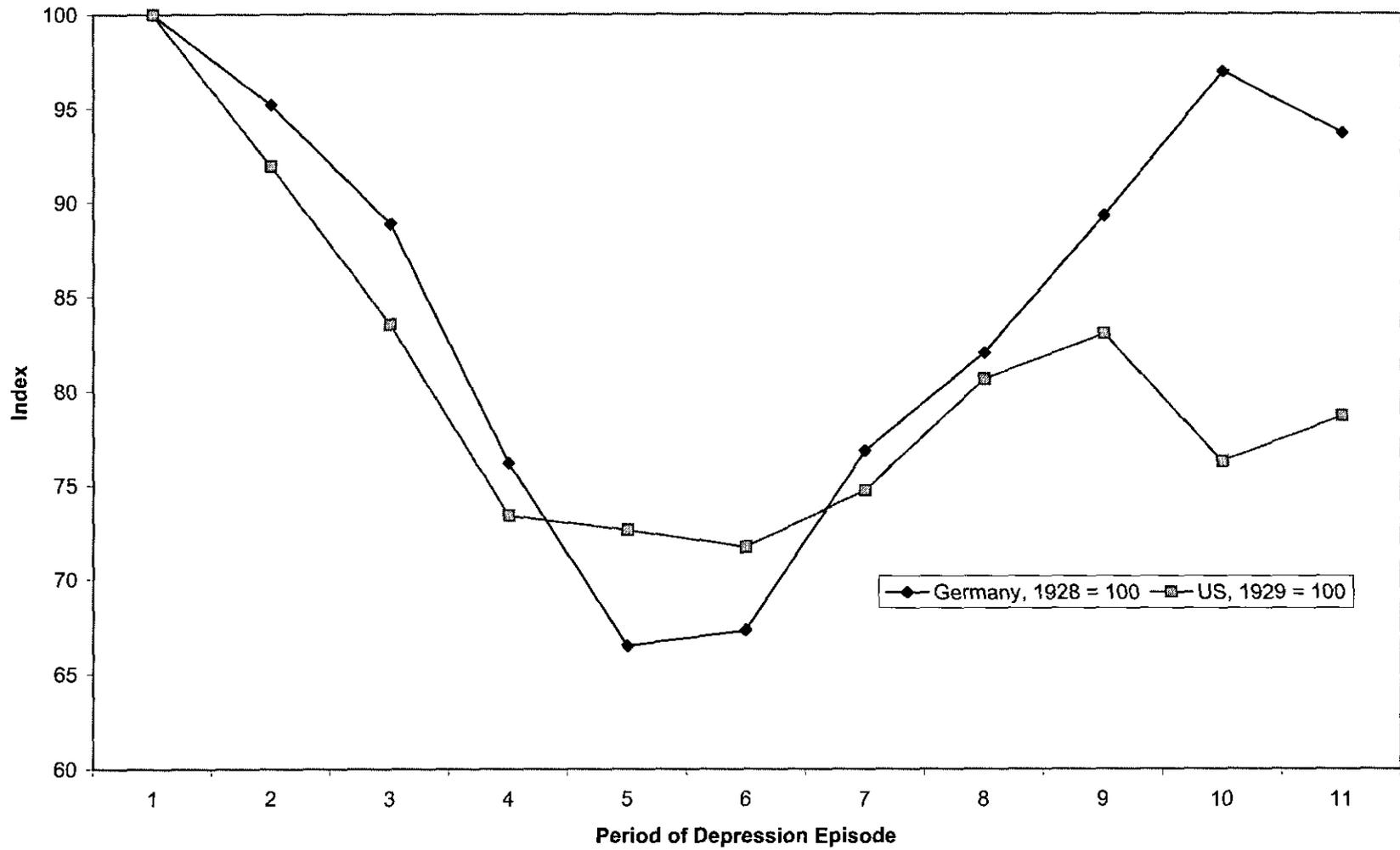


Figure 3. Private Consumption and Investment in Germany

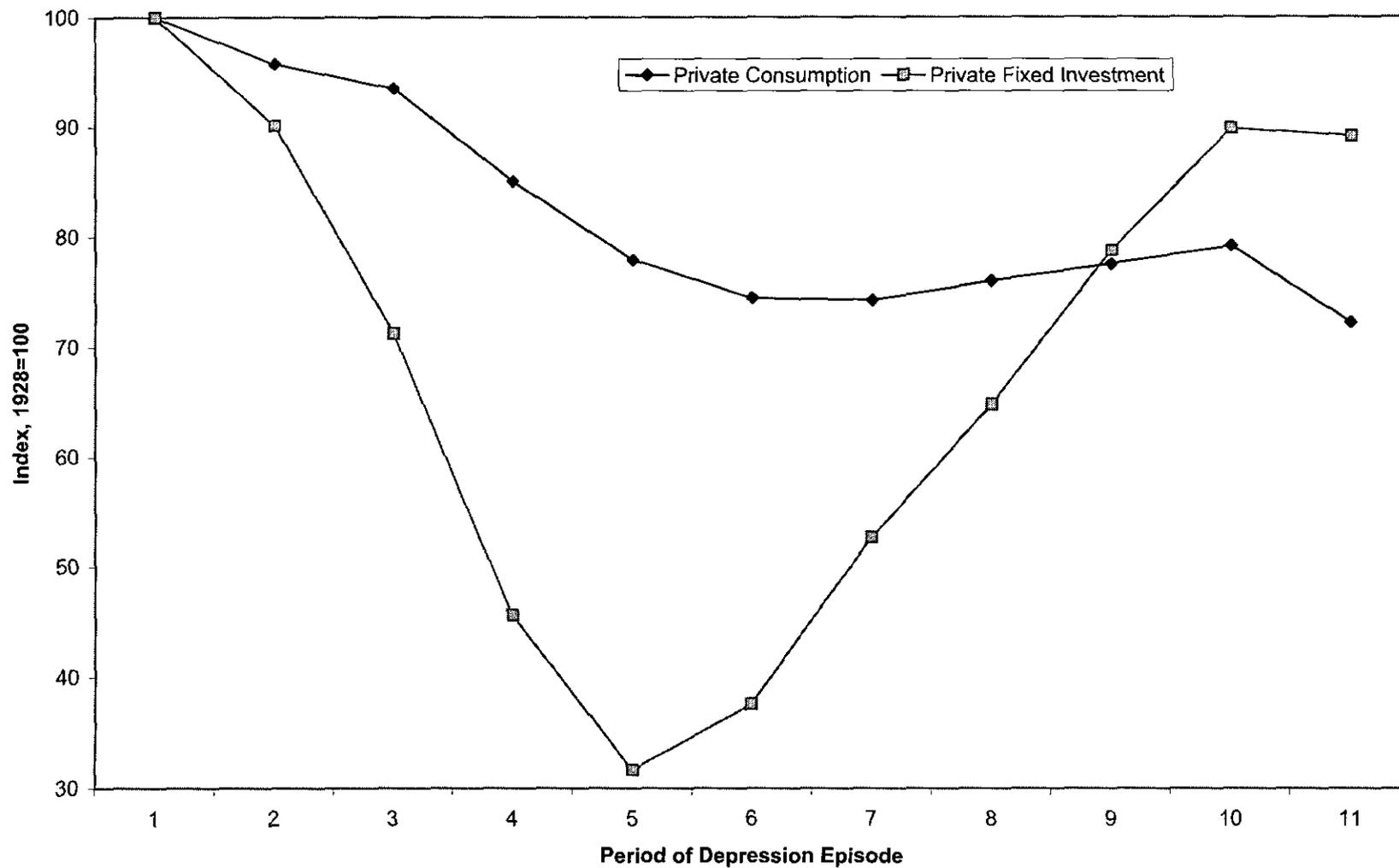


Figure 4. German Exports and Imports as Fractions of GDP, 1925-1938

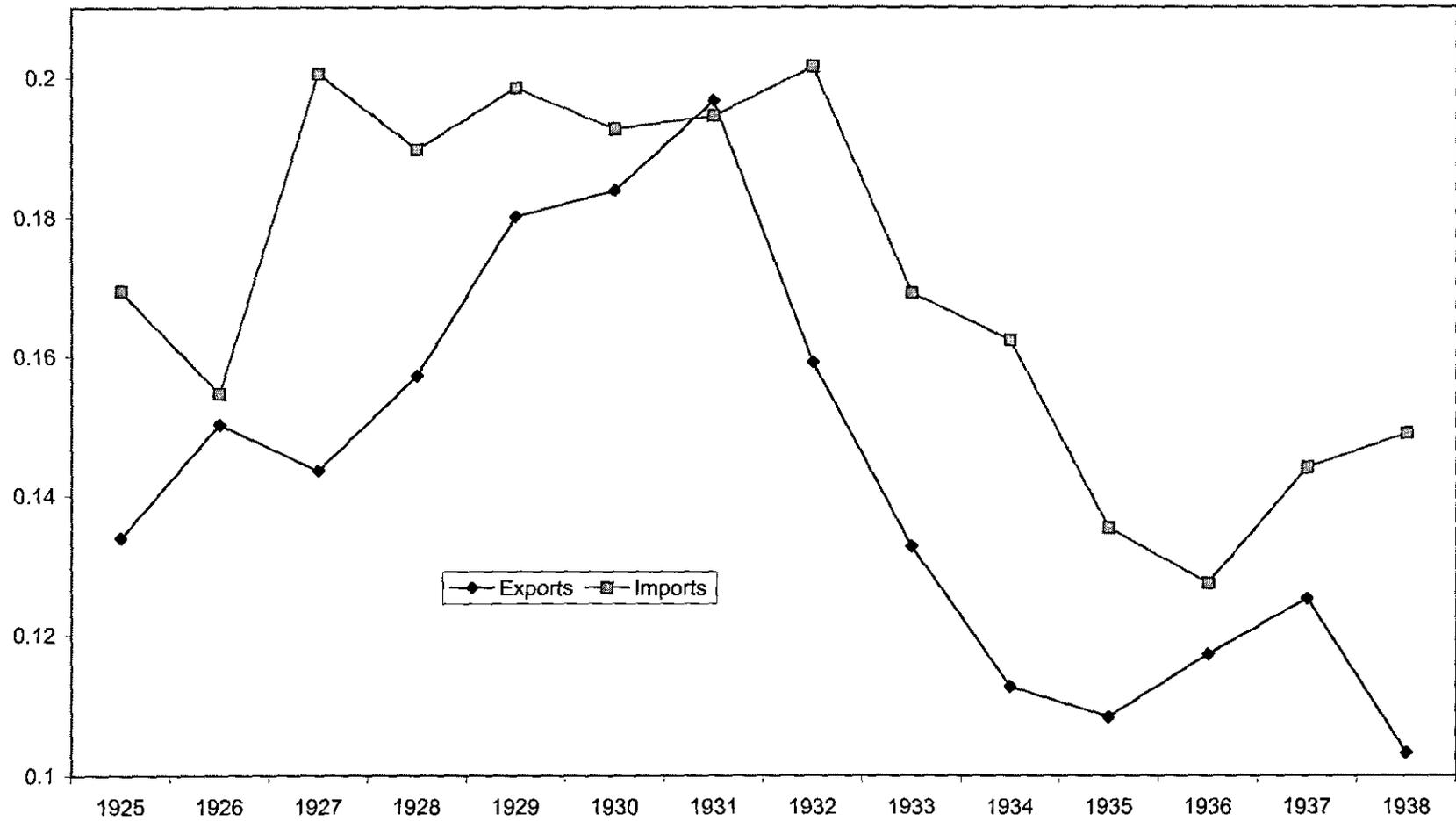


Figure 5. Output in 20th Century Germany and the US

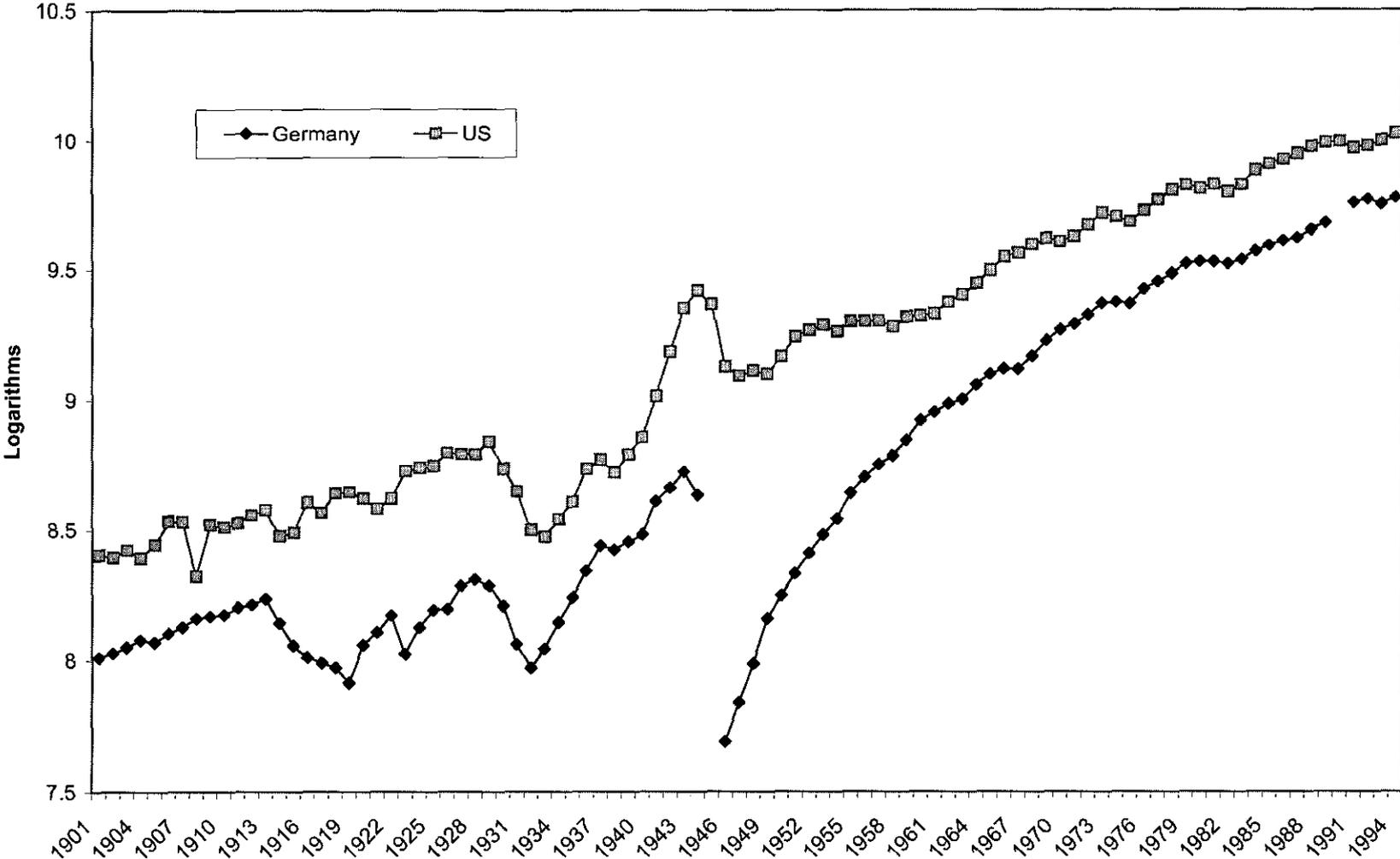


Figure 6. Alternative Measures of German GDP Per Capita, 1925-1938



Figure 7. Real Government Spending

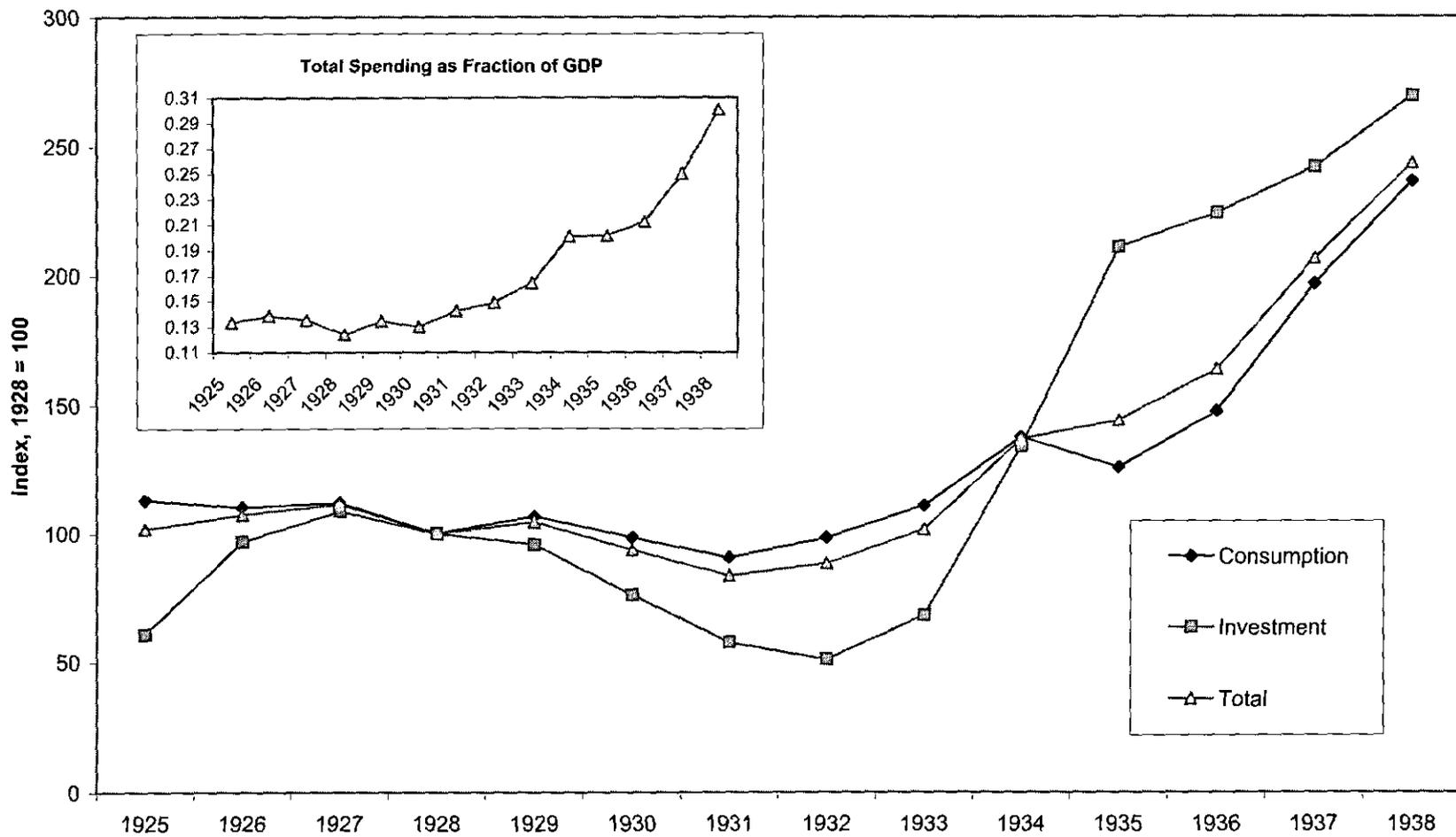


Figure 8. Government Transfers

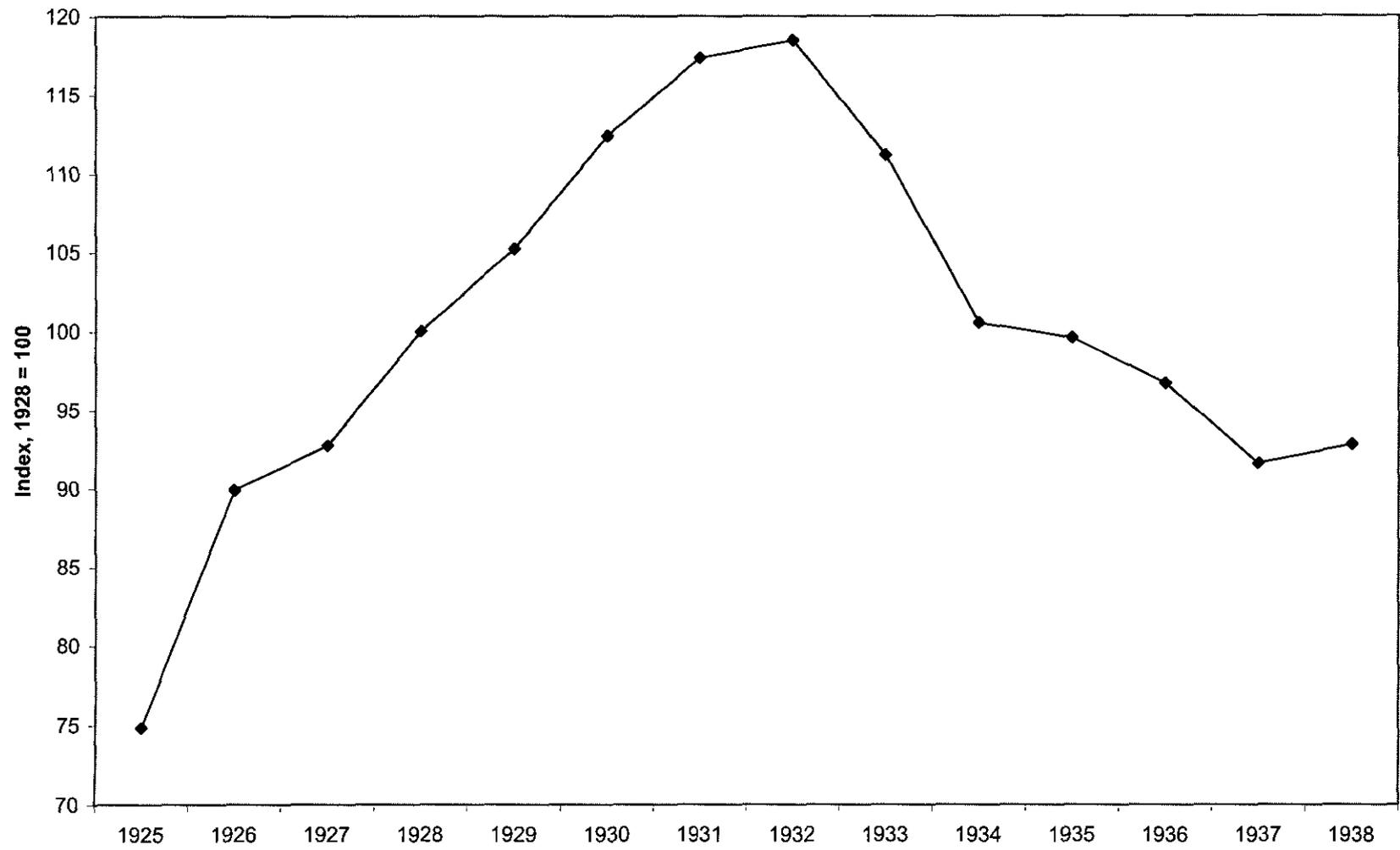


Figure 9. Implicit Tax Rates

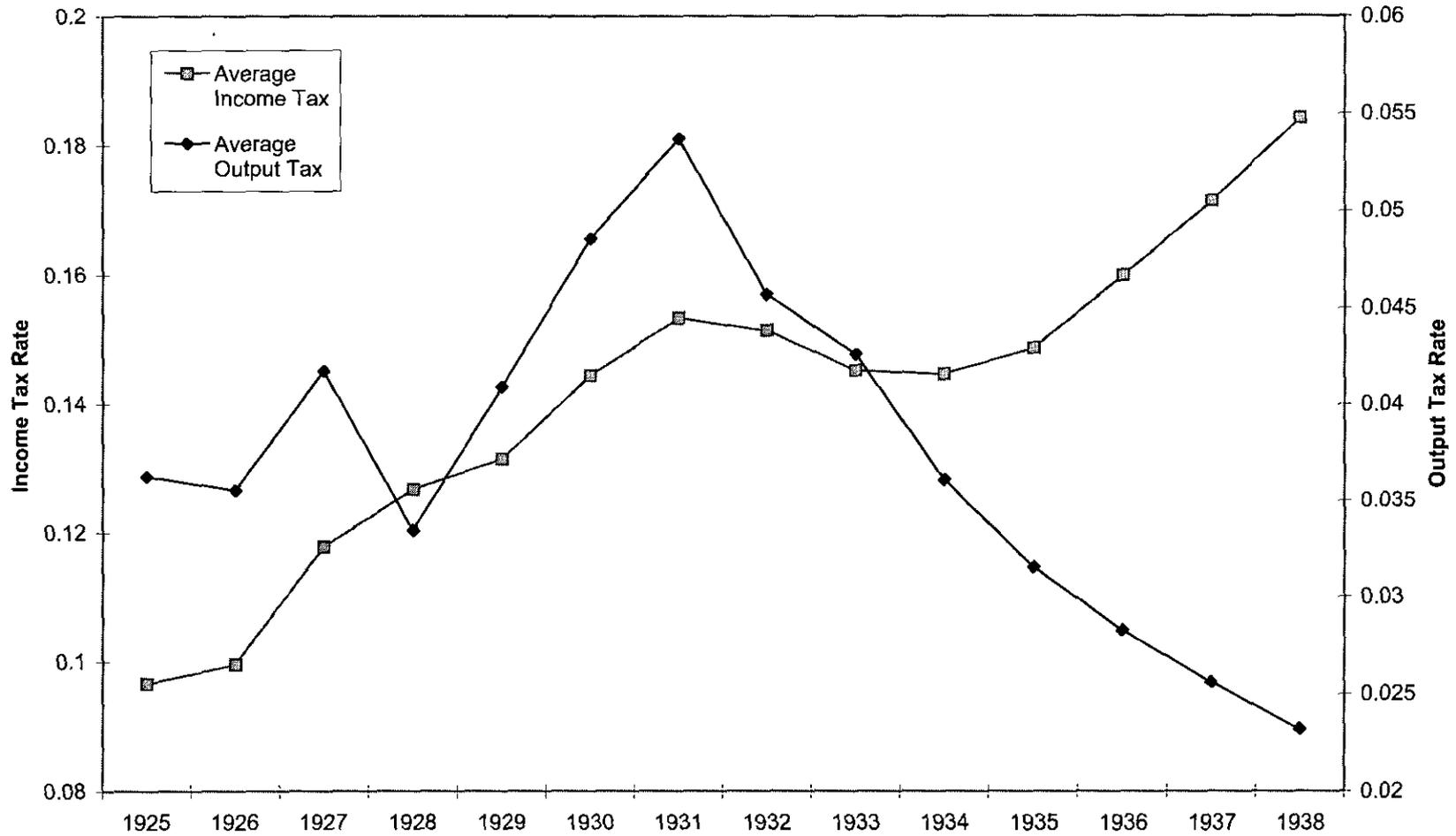
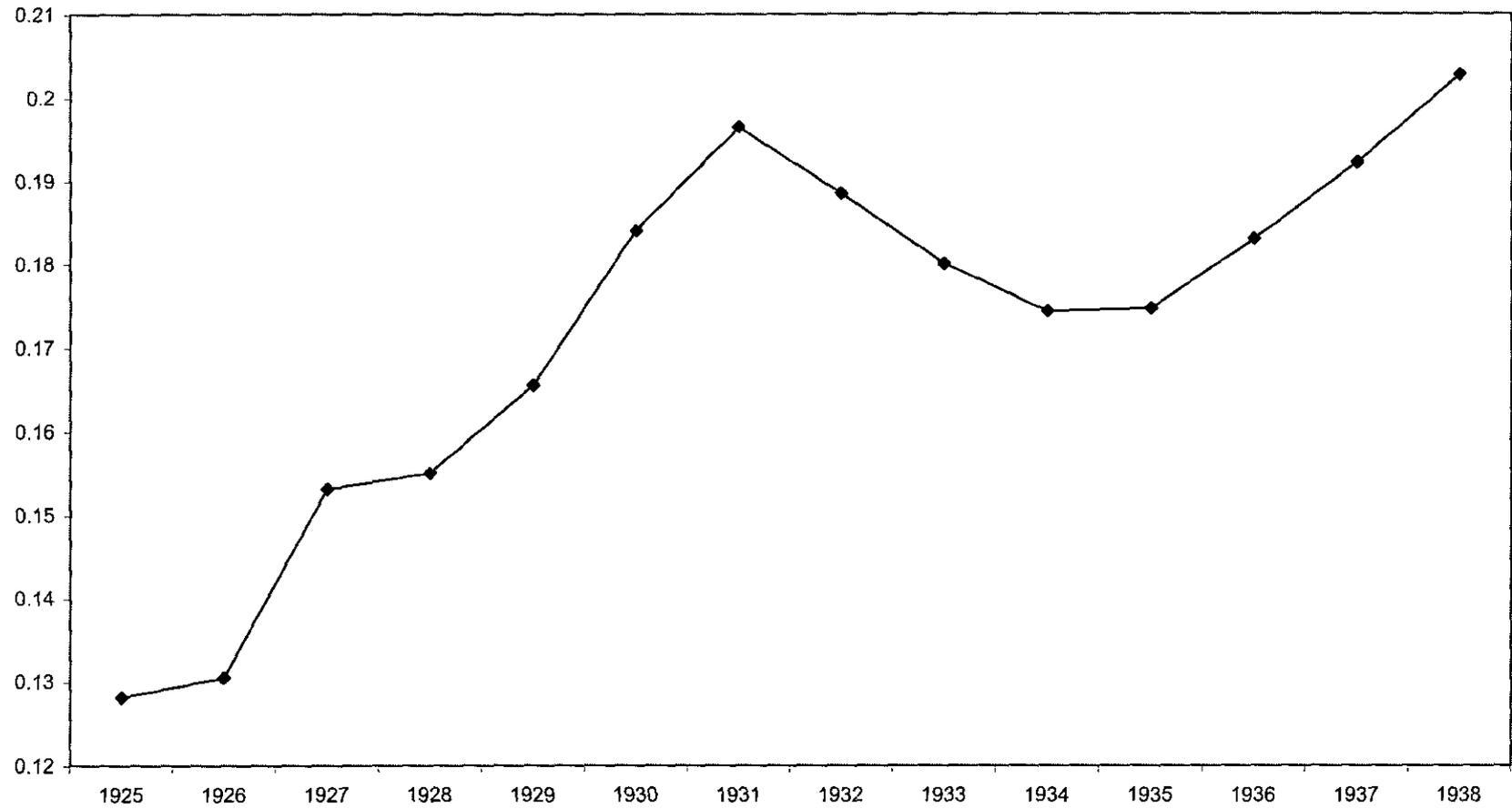


Figure 10. Effective Labor Tax



Note: Effective tax computed as $1 - (1 - \text{Direct Tax}) / (1 + \text{Indirect Tax})$

Figure 11. The effects of taxes only with perfect foresight

1928 = 100

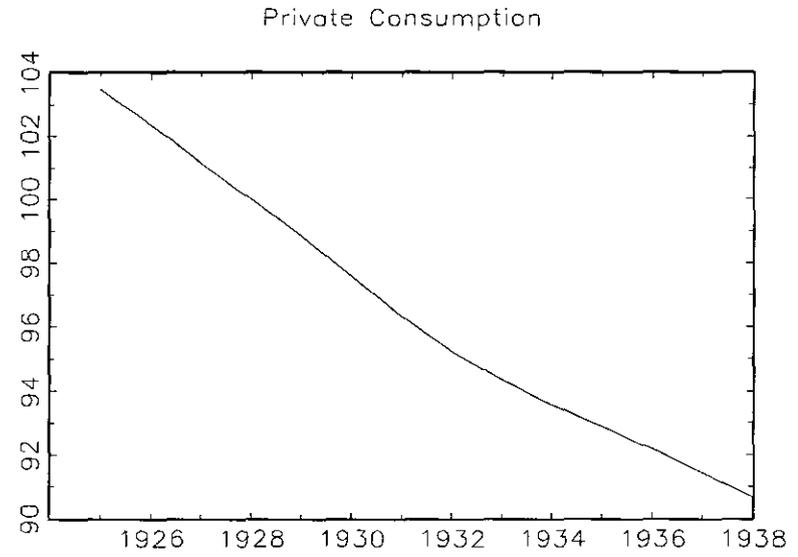
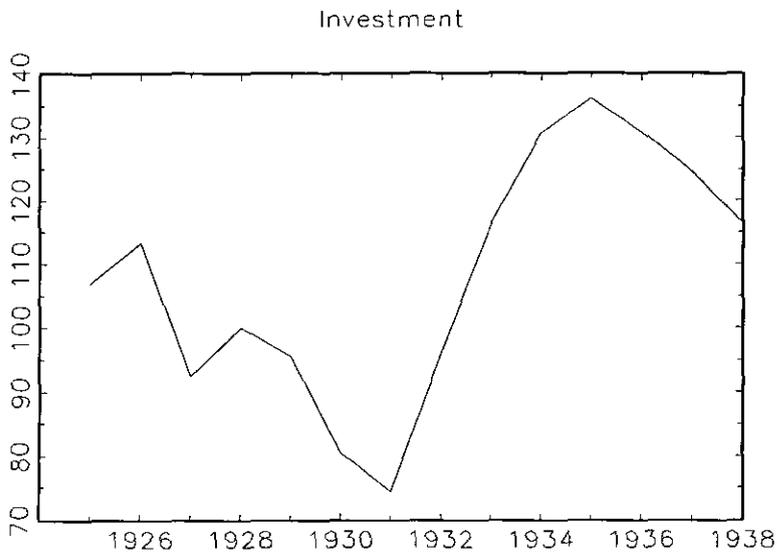
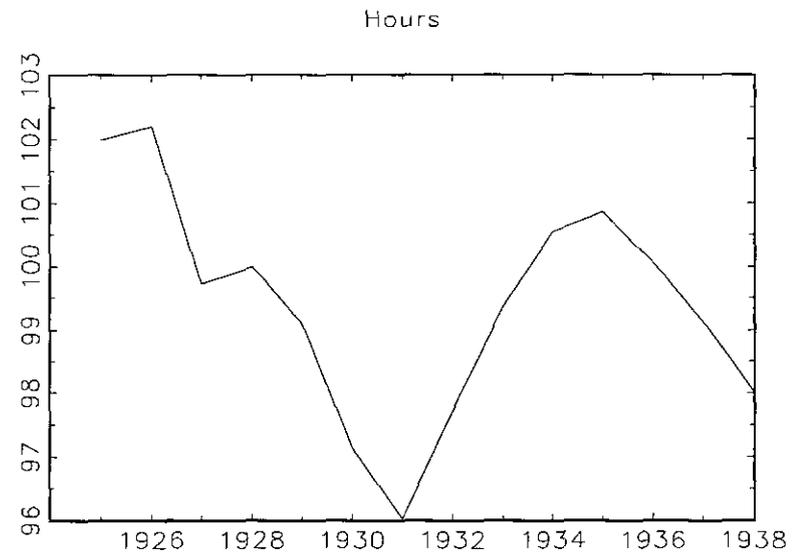
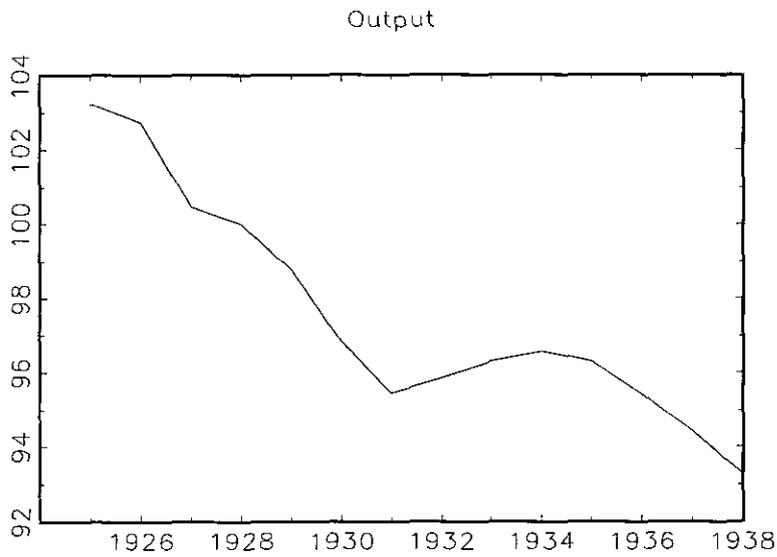


Figure 12. The effects of spending only with perfect foresight

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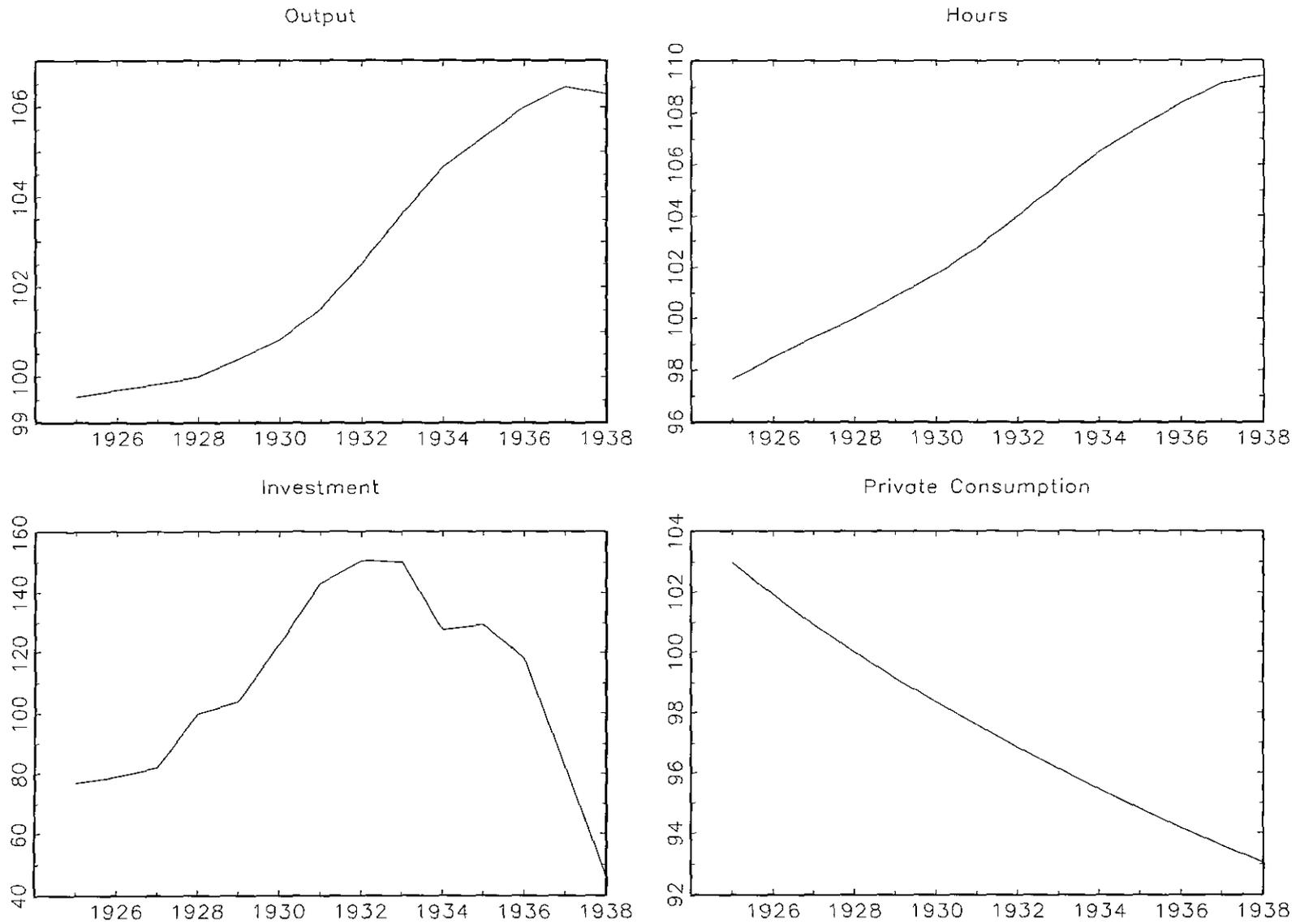


Figure 13. The effects of spending and taxes with an unanticipated regime change in 1933

1928 = 100

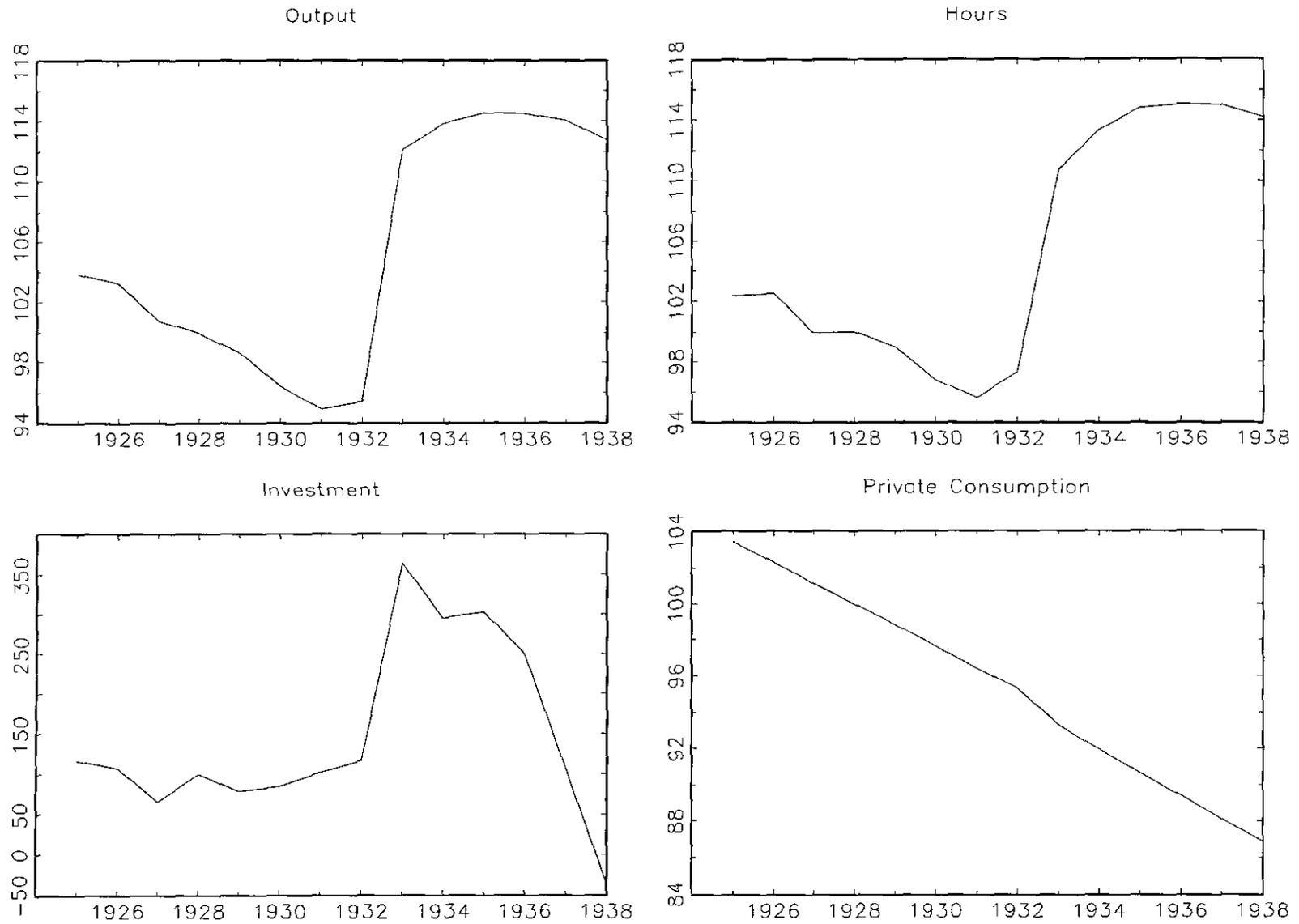


Figure 14. Transitory Component of the Solow Residual

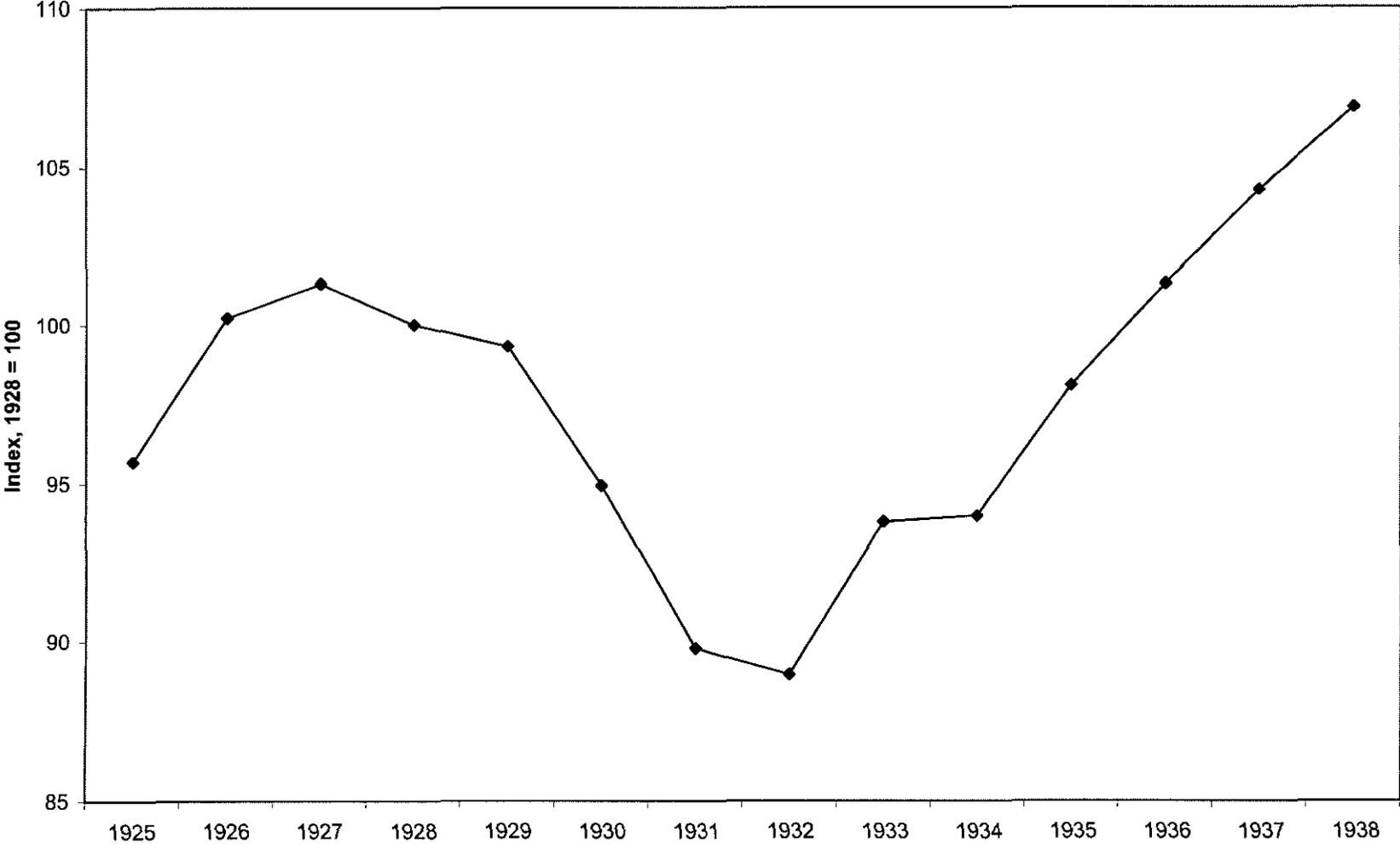


Figure 15. The impact of productivity

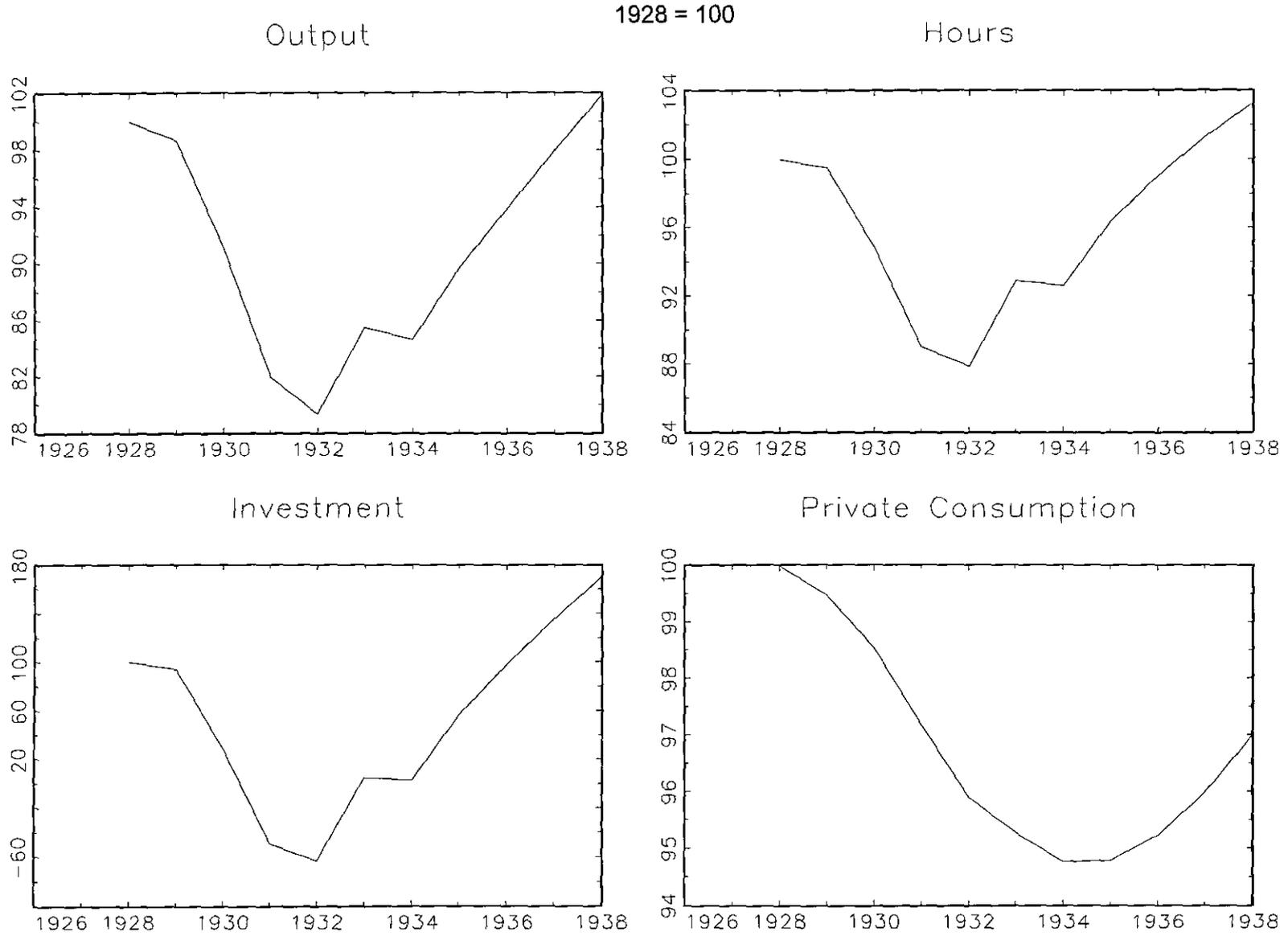
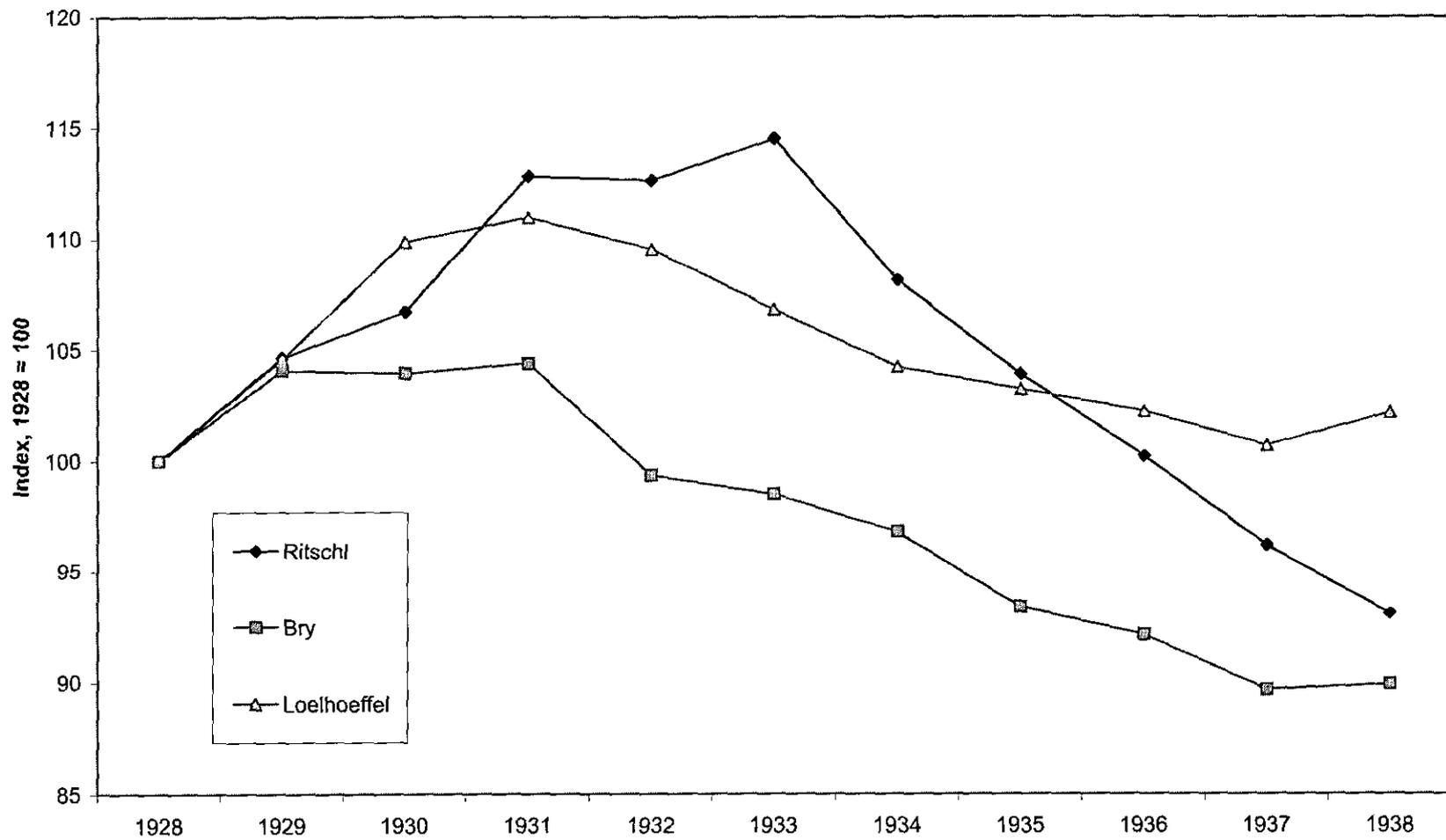
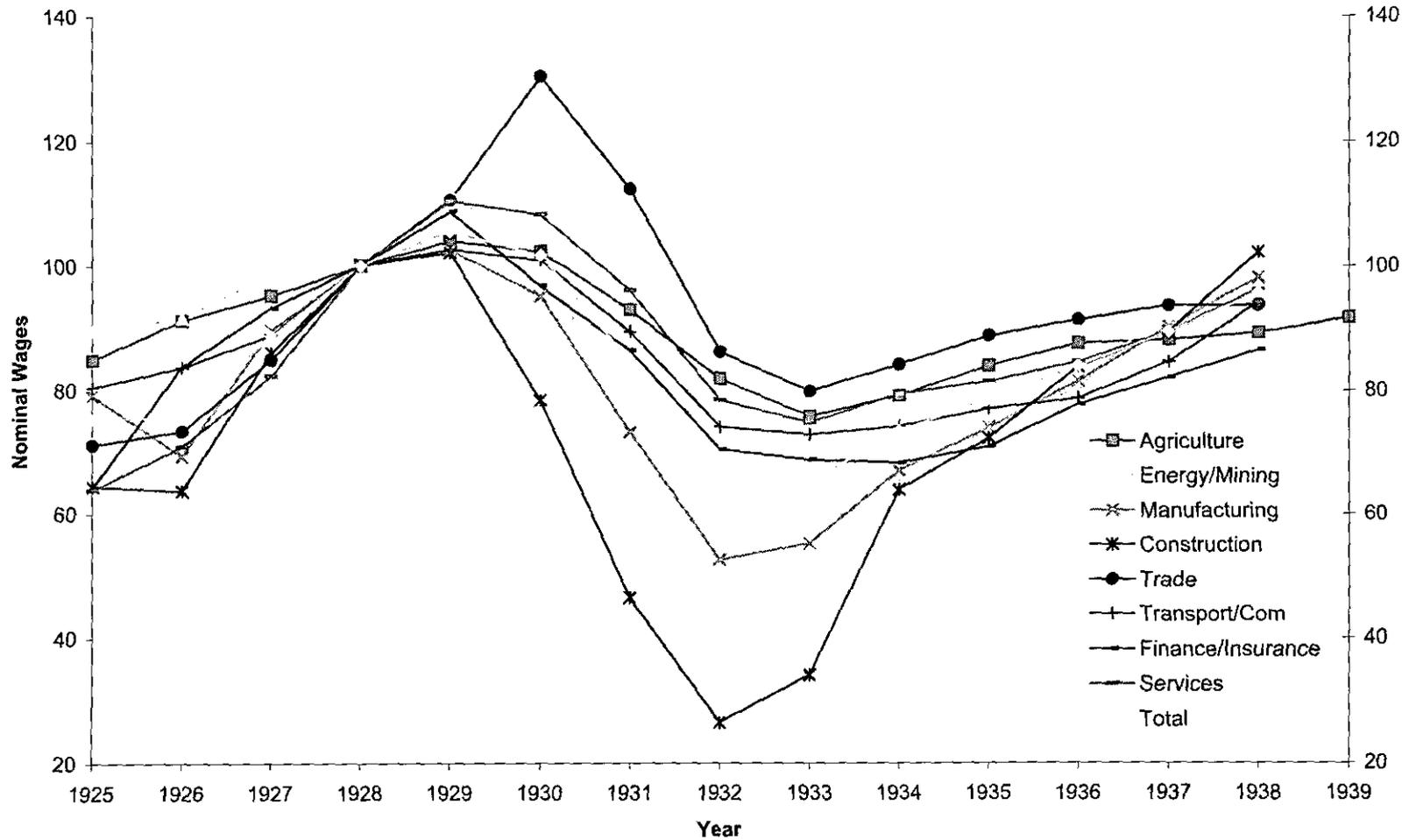


Figure 16. Real Wages Increase in the Depression



Note: Series have been detrended

Figure 17. Nominal Labor Cost Across Industries



Notes: Normalized nominal labor cost by industry, 1928=100.

Figure 18. Germany Deflates

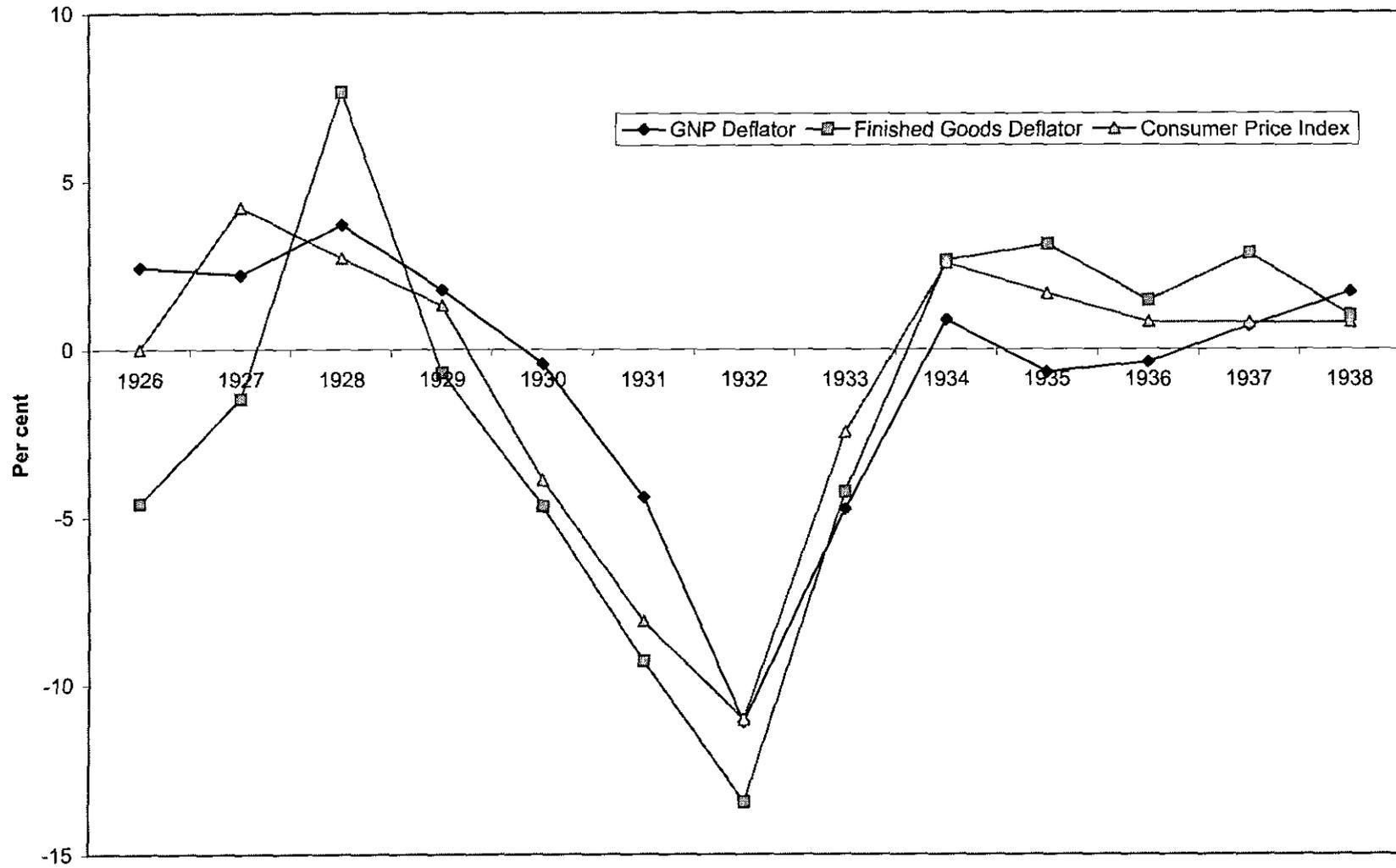


Figure 19. The Effects of High Real Wages

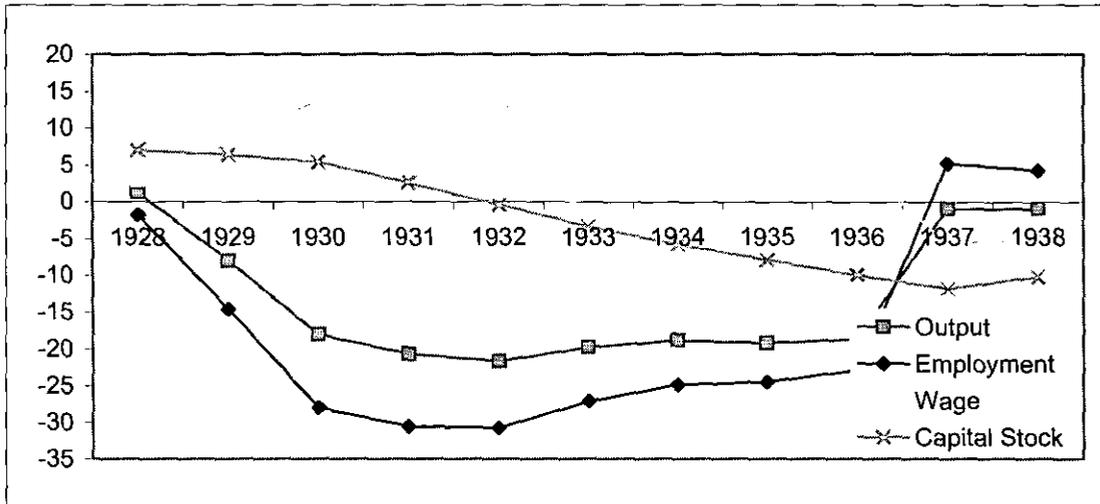
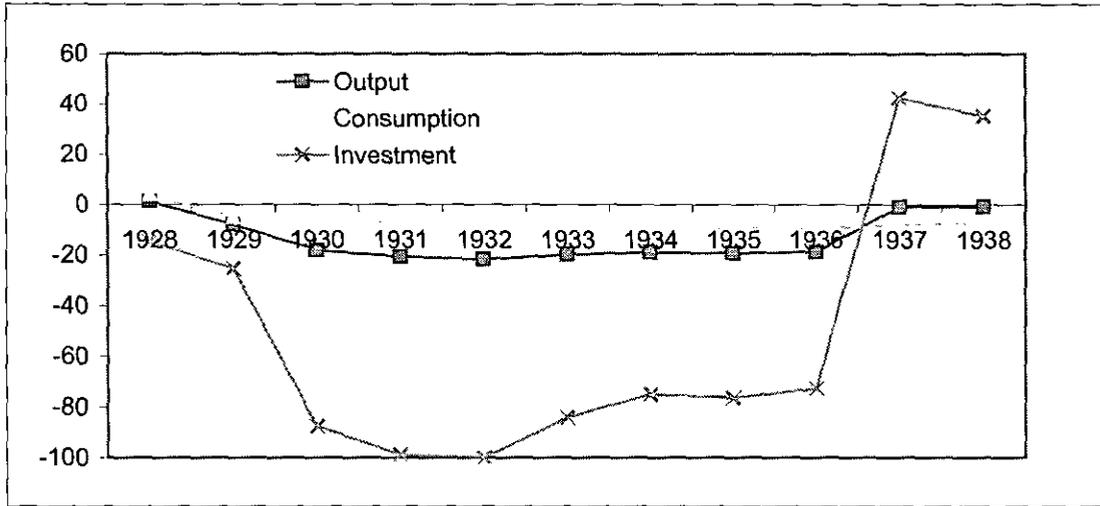


Figure 20. The Income Share of Wages and Salaries Increases Before the Depression

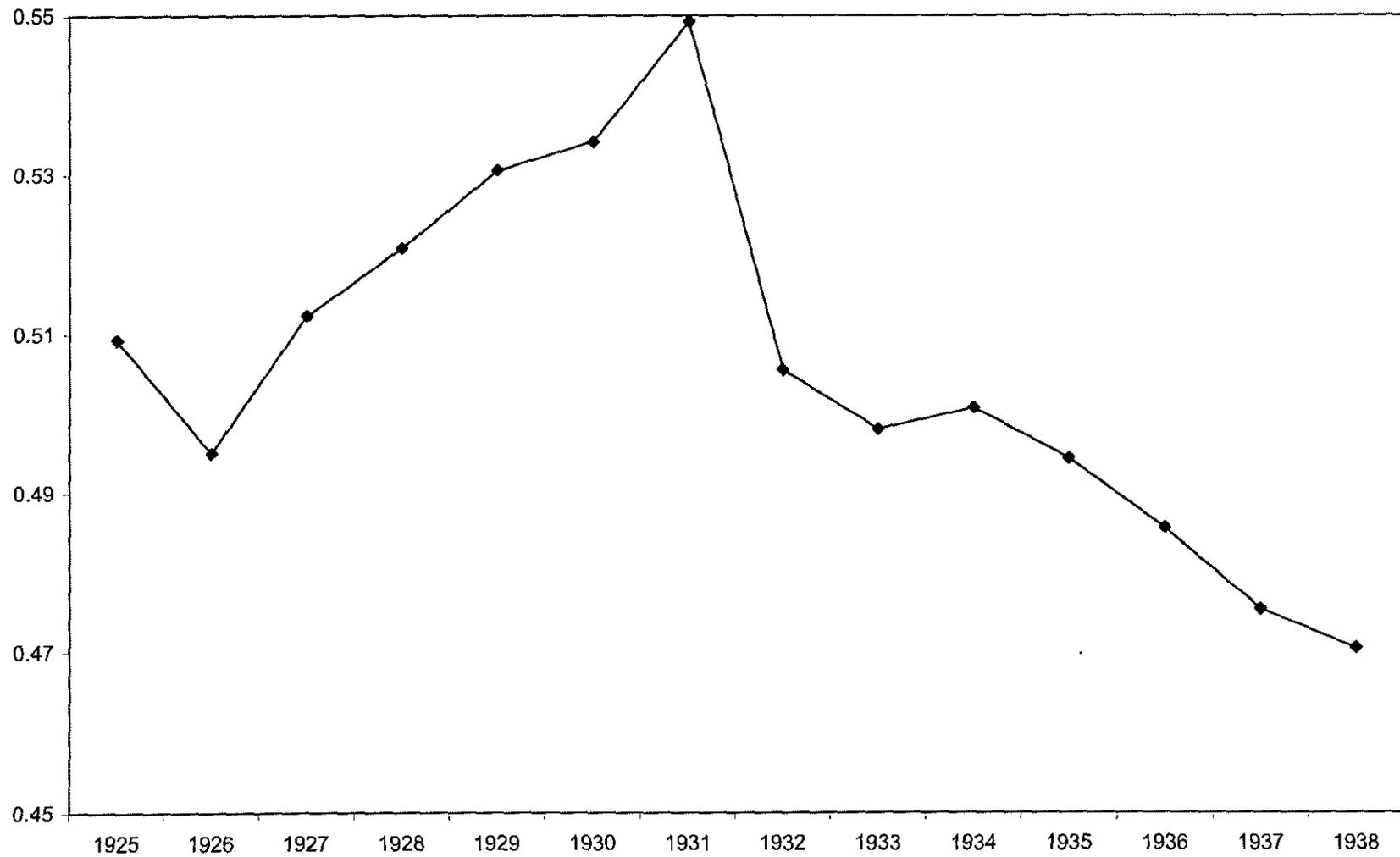


Figure 21. The Effects of an Increasing Labor Surplus Share

