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**A Neoclassical Analysis of Britain's  
Interwar Depression**

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## 1. Introduction

Like many other countries, the United Kingdom was in a depression in the early 1930s. However, the United Kingdom's Great Depression began much earlier than depressions in other countries. The UK Depression began almost immediately after World War I, and continued through the 1930s. While the rest of the world grew rapidly in the 1920s, the UK stagnated. Between 1919 and 1929, real GDP per adult in the UK fell about 1 percent, while real GDP per adult grew nearly 24 percent in the rest of the world. It was not until 1936 that real GDP per adult in the UK surpassed its 1913 level.

Why did the UK suffer such a long depression? The most widely cited explanation is that it was largely caused by two factors: (1) deflationary monetary policy and (2) a fixed exchange rate that was too high. According to this explanation, persistent deflation, combined with inflexible nominal wages, raised real wages which reduced employment and output. The standard view also argues that the fixed exchange rate contributed further to the depression by raising the prices of British exports.

This paper studies the UK's interwar depression from the perspective of dynamic, general equilibrium theory. We begin by presenting some macroeconomic facts during the interwar period on output, consumption, investment, productivity, wages, the terms of trade, and the money stock and the price level. We use these data to analyze the monetary/exchange rate explanation for the interwar depression. This explanation requires that both real wages relative to productivity and the real price of British exports in foreign currency are high throughout the interwar period. Rather than being above average, however, both of these measures for much of the interwar period, are close to, or below, their long-run averages. These data raise questions about the monetary/exchange rate explanation for the fifteen-year interwar depression, and lead us to consider alternative explanations based on real shocks, including shocks to the workweek, world income, and productivity.

We develop a dynamic, equilibrium model to analyze the contributions of shocks to the workweek and world income to the depression during the 1920s, and shocks to productivity and to world income to the depression during the 1930s. Our first finding is that the 1920s depression is a puzzle - theory predicts that the economy should have grown rapidly during the 1920s because of low investment during the war and because of rapid growth in total

factor productivity. We conclude from this significant deviation between the theory and the data that a new shock is needed to understand why employment was so low during this period. We argue that the most promising candidate is the adoption of generous employment benefits in the 1920s. Our second main finding is that the worsening of the depression in the 1930s can be reasonably explained by lower world income and lower productivity.

The paper is organized as follows. Section 2 presents the standard monetary explanation for the UK's interwar depression. Section 3 presents some key UK macroeconomic facts, and interprets the monetary/exchange rate explanation in light of those facts. Section 4 presents a dynamic, general equilibrium model to assess the contribution of real shocks to the interwar economy. We do this through two sets of experiments: one for the 1920s and one for the 1930s. The experiments for the 1920s are presented in section 5. Section 6 analyzes how increased unemployment benefits may have contributed to the 1920s depression. This section presents new arguments that seek to revive Benjamin and Kochin's (1979) view about the importance of unemployment benefits - a view that has largely been dismissed by scholars studying the British interwar economy. Section 8 uses our model to analyze the deepening of the Depression in the 1930s. Section 9 presents a summary and conclusion.

## **2. The Monetary Explanation for the UK Interwar Depression**

A depression began in the UK shortly after World War I ended, and continued until the eve of World War II. Perhaps the most widely cited causes of this depression are monetary - persistent deflation and a fixed exchange rate for the pound sterling that was too high.

We first summarize the argument that deflation was a key factor behind the interwar depression. Empirical support for this view comes from the fact that there was considerable deflation during the interwar period. Following a large wartime inflation, the price level fell persistently through the 1920s until the mid-1930s. Overall, the price level fell 40 percent between the price level peak in 1920, and the trough in 1934. According to neoclassical theory, however, deflation does not cause a depression without some type of monetary nonneutrality. The standard view is that the nonneutrality was nominal wage inflexibility. According to this view, deflation, combined with inflexible nominal wages, raised real wages, which then reduced employment and output.

Keynes was among the first economists to argue that post World War I deflationary monetary policy was depressing the UK economy. He argued strongly against this policy during the 1920s, claiming that prices had fallen too much relative to wages. Rather than advocating nominal wage cuts, however, he recommended that the government should adopt policies that raised nominal prices. He argued that using inflation to reduce real wages was a superior means to raising employment and output than maintaining deflation and cutting nominal wages (See Garside (1991), pp. 11).<sup>1</sup> Keynes' view that deflation helped cause the interwar depression is now widely accepted among economic historians; It plays a central role in the discussions of Eichengreen (19xx), Garside (1991), Aldcroft (1986) and other texts.

The second element that comprises the monetary explanation of the interwar depression is that the UK pegged the exchange rate at too high of a rate. In 1925, the UK returned to the gold standard and adopted a fixed exchange rate of \$4.86 per pound sterling. According to this view, this exchange rate was too high, and reduced the UK's competitiveness by raising the prices of British exports. Keynes also argued against the \$4.86 exchange rate for the pound, claiming that the pound was overvalued by about 10 percent, and that this would reduce British exports. A number of economists have tried to quantify the macroeconomic effects of Keynes' claim of a 10 percent overvaluation by estimating what would have happened to the UK economy if the exchange rate had been set 10% lower at \$4.37 per pound, rather than at \$4.86 per pound. Hatton (1987) Dimsdale (19xx) and Moggridge (1972) fit regressions and report that the lower exchange rate would have increased employment by about three percent, and reduced the unemployment rate by 3-5 percentage points (see Garside (1991)). The view that the exchange rate rendered Britain uncompetitive throughout the 1920s continues to occupy a central role in accounting for the interwar depression in the UK. Garside (1991, p. 24) notes that "it is now widely accepted that the restoration of gold at the pre-war parity burdened the country with an overvalued exchange rate".

Accounting for such a long depression through monetary factors, however, requires either a very long sequence of negative monetary shocks, and/or very persistent monetary nonneutralities. The monetary/exchange rate explanation of the interwar period explicitly focuses on a long sequence of negative shocks through the 1920s and early 1930s. This view

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<sup>1</sup>Keynes also argued against deflation because it transferred wealth from borrowers to creditors.

of the long depression is based roughly on the following sequence of events. First, it assumes that the postwar deflation initiated the depression in the early 1920s. Second, the return to the gold standard in 1925 continued deflationary monetary policy, and brought the overvalued exchange rate. Third, further monetary contraction and deflation deepened the depression in the early 1930s. Fourth, the depression was halted when the UK went off the gold standard in September 1931, and the economy began to recover once expansionary policy was begun in the mid 1930s.

We now turn to a systematic assessment of the UK economy during the interwar period. The following section presents data on macroeconomic variables which we will use to evaluate the monetary/exchange explanation of the UK interwar depression.

### **3. The UK Economy in the Interwar Period**

This section present some macroeconomic facts from the perspective of neoclassical growth theory. This theory is based on an aggregate production technology which describes how labor and capital services produce final output, and on preferences which govern how households allocate their income between consumption and savings, and how they allocate their time between market and nonmarket activities. This suggests the following variables are key to understanding macroeconomic performance: output, the shares of output devoted to consumption and investment, the fraction of time spent working in market activities, and productivity. The source of all the data is Feinstein (1972). We focus on macroeconomic performance in the 1920s, since we will later argue that most of the puzzles about the UK interwar economy are during this decade.

Figure 1 shows the time path of real output per adult between 1905 and 1950. The most important feature of these data is that the UK depression began after World War I, and continued until the mid-1930s. Real output per adult throughout the 1920s and 1930s is below its level before World War I. For example, real output per adult in 1921 is 17% percent below its 1913 level. Adjusting these data for normal trend growth of 1.4 percent per year shows an even larger decrease. Relative to a 1.4 percent trend, real output in 1921 is 26% percent below its 1913 level, and remains well below this level until the mid 1930s.<sup>2</sup> UK

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<sup>2</sup>We constructed the trend by assuming that output per adult was on trend in 1910, and we used the

output growth in the 1920s is also low relative to growth in world output. Figure 2 shows the time path of real output per adult in the rest of the world. This measure grows about 24 percent between 1919 and 1929, compared to the one-percent decrease in British output per adult over the same period. It is also worth noting that the decrease in UK output per adult during the worldwide depression of 1929-33 is relatively mild. For example, output per adult in the UK fell about six percent during this period, compared to about a 30 percent decrease in output per adult in the United States.

We now decompose the decrease in UK output per adult into two components: the fraction due to changes in output per employee, and the fraction due to changes in employment relative to the adult population. Denoting output as  $Y$ , employment as  $N$ , and the adult population as  $A$ , the ratio of output to the adult population can be expressed as:

$$\frac{Y}{A} = \left(\frac{Y}{N}\right) \left(\frac{N}{A}\right)$$

This expression implies that the percentage change in output per adult over any time interval is equal to the sum of the percentage changes in output per worker and employment per adult:

$$\Delta \log \left(\frac{Y}{A}\right) = \Delta \log \left(\frac{Y}{N}\right) + \Delta \log \left(\frac{N}{A}\right)$$

We first reports changes in output per worker, which is also known as labor productivity. We report two measures. The first is real GDP divided by all workers, including military personnel. The second is real GDP less military wages divided by civilian workers. Figure 3 shows the time path of output per worker between 1905 and 1955. There are two key features of these data. First, it rises during both World Wars. Second, it falls substantially after World War I to a level well below its previous trend. Relative to its previous long-run growth rate of 1.1 percent, the average level of output per worker in the 1920s is about 15 percent below its 1913 level. These data thus show that about 60 percent of the drop in output per adult during the interwar depression was due to lower output per worker.

What caused this large decrease in output per worker? A drop in hours per worker is a key factor - aggregate hours per worker fell from about 2700 per year before World War

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average growth rate from 1921 to 1938.

I to about 2200 in 1924, and remained near that level in 1937. This reduction was largely due to unions' drive for shorter work days and guaranteed vacations. It is estimated that the workweek of about 40 percent of employees fell from about 55 hours per work to about 47 hours per week in 1919 and 1920. Unions were also able to negotiate this hours reduction with no reduction in pay. Thus, this hours reduction also represents an increase in the real wage per hour of work. <sup>3</sup>

We now report changes in the fraction of the adult population working. Figure 4 shows civilian employment per non-military adult population between 1880 and 1955. There are two key changes in these data during the interwar period. One key change is that employment rises in 1919 and 1920 - the years in which a number of employees received hours reductions. This increase in 1919 and 1920 is perhaps not surprising, given the hours reductions in these years. The second key change is that employment falls more than 10 percent in 1921, and remains at roughly that level until the mid-1930s. This represents about a 10 percent decrease in this ratio from a long-run average of .68 to .61. We will later argue that this long-term employment decrease is particularly puzzling, given lower hours per employee.

In summary, output per adult falls about 25% relative to trend between 1913 and 1921. This decrease is roughly due to a 25% decrease in labor input - about 15 percent is due to shorter hours per employee, and about 10 percent is due to a decrease in employment per adult. What factors might account for this decrease? Neoclassical growth theory implies that lower total factor productivity (TFP) can drive down labor input and output. We now examine changes in TFP during the interwar period, to see if there may be changes in this variable that are related to the UK interwar depression.

TFP is calculated using data on real output and measures of capital and labor inputs. We compute two different measures of TFP, which we denote as  $\lambda$ , that differ by how we measure the capital input. The first measure is from the standard production function which

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<sup>3</sup>There are two sources for hours per worker data. The first is average annual hours from British Historical Statistics and the second is micro data. There are average annual hours from the British Historical Statistics for 1873, 1913, 1924 and 1937. Hours worked were about 2700/year in 1873 and 1913, were 2200/year in 1924 and were 2300 in 1937. The second source of hours per worker is from micro data for bricklayers, painters and laborers in the construction trades. We estimated average annual hours for these trades using data on weekly wages and the wage per hour. These data show that hours per week were roughly constant between 1914 and 1918, fell sharply in 1919 and 1920, and remained roughly constant afterwards through the end of the 1930s.

defines capital input as the capital stock, ( $K$ ) and which defines labor input as total hours worked ( $H$ ).<sup>4</sup>

$$(1) \quad Y = \lambda K^\theta H^{1-\theta}.$$

The exponents in the production function are .7 for labor and .3 for capital, which is the long-run average in the data.

The second TFP measure is motivated by the shorter workweek that occurred after World War I. reduced hours per employee that occurred after World War I. What we try to capture here is the fact that factories were operated for fewer hours in the day, which means that capital input also decreased for a given stock of capital. For our second measure, we therefore assume that the level of capital services per unit of capital is proportional to the length of the workweek, which we denote as  $\bar{h}$ . Total hours worked is equal to the product of the workweek multiplied by the number of workers:  $\bar{h}N$ . This production function is given by:

$$(2) \quad Y = \lambda(\bar{h}K)^\theta(\bar{h}N)^{1-\theta} = \lambda\bar{h}K^\theta N^{1-\theta}.$$

Figure 5 shows these data for the two measures of TFP - they suggest that low TFP is not the cause of the interwar depression. In sharp contrast, TFP grows rapidly in the 1920s. The increase for both measures significantly exceeds the normal, long-run productivity growth the UK could expect, and implies that labor input and output should have been above normal

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<sup>4</sup>Since there is no annual time series of aggregate hours in the U.K, we have constructed an annual measure. We estimated this measure using data from British Historical Statistics and using micro data from individual industries. British Historical Statistics reports measures of averages hours per employee for 1873, 1913, 1924 and 1937. These data show that average hours were about 2,700/year in 1873 and in 1913, and were about 2200/ year in 1924 and 1937. Annual average hours can be is available for some of the building trades industries, We also were able to infer an annual average hours per week series between 1914 and 1938 in selected building occupations from weekly wage and average hourly earnings data from the Abstract of Labour Statistics. The occupational data show that hours per week drop sharply between 1918 and 1921. This is with historical souces that claim that the 8-hour day movement and the introduction of paid holidays for manual workers lead to a sharp drop in hours worked during this period. To construct an annual hours worked series we assumed that the before the war, annual hours were constant at the 1914 level. We assumed that the drop that was observed between 1913 and 1924 occured 1920 and 1921, with half the drop coming in each year. Between 1921 and 1924, we assumed that hours were constant at the 1924 level. Since average hours per year are only marginally higher in 1937 (2300/year) we linearly interpolated between these these years. We constructed the aggregate measure of hours because there is no consistent annual time series for this variable.

- rather than far below normal - during the 1920s. The data are not presented during World War I since there is no measure of the capital stock in this period.

Since the aggregate output and employment data appear to be a puzzle from the perspective of productivity changes, it is useful to examine the data in more detail. We therefore present changes in the components of output during the 1920s. We show changes in output and its components between 1915 and 1929. All variables are in constant pounds, are divided by the adult population, and are detrended at the historical average growth rate of 1.4 percent per year. To conserve space, the data are presented every other year, with the exception of the early 1920s. We present the data each year during this period because it is this period in which there are large changes in labor input and output.

Table 1, which is presented at the end of the document, shows these data. Output rises above trend during World War I, and then falls below trend beginning in 1919 when hours are reduced sharply. By the time most of hours restrictions are adopted in 1920, real output per adult is 17 percent below trend, and remains near that level over the rest of the decade. Consumption follows a similar pattern in the 1920s. It is 14 percent below trend in 1920, and subsequently falls to about 18 percent below trend.

The time path of investment differs considerably from the time paths of consumption and GDP during this decade. It rises substantially in the 1920s, and is more than 40 percent above trend by the end of the decade. This large increase raises the share of output devoted to investment from about seven percent before WWI to about 10 percent in the late 1920s. This increase is puzzling. On the one hand, above-average postwar investment is consistent with the fact that wartime investment was low, which reduced the capital stock below its steady state value. However, it is odd that investment would be so far above trend while labor input and consumption are so far below trend. We conjecture that this substantial increase may largely reflect a shift from foreign investment to domestic investment. This conjecture is based on two factors. First, the share of output devoted to gross private domestic investment in the UK is well below the U.S. share in the 1920s, but rises to roughly the US share in the post World War II period. This is consistent with a shift from foreign to domestic investment. Second, this investment increase coincides with the declining involvement of the UK in the British empire. More work is needed to evaluate this domestic investment increase in the

1920s, which we leave for future research.

Exports are well below trend in the 1920s, while imports are near trend in the decade. This seems odd since the UK maintained virtually balanced trade during this period. What explains these two seemingly disparate facts is a large change in the relative price of imports. As we described earlier, British terms of trade had been improving for a number of years prior to World War II. This change in the relative price is reflected in the change in base year prices for 1913, and this accounts for the apparent gap between exports and imports in the 1920s.

These data raise an important question. Why did output, consumption, and labor input remain so far below trend throughout the 1920s? The most widely cited explanation is a monetary explanation that has focused on inflexible wages and too high of a fixed exchange rate.

We now present some data on real wages and the real price of British exports to evaluate this monetary explanation. We first study the effect of deflation through imperfectly flexible wages. Figure 6 shows three measures of real wages between 1900 and 1938. The first measure is the average hourly wage rate divided by the GDP deflator.<sup>5</sup> This measure shows that real wages indeed rose in the 1920s. This increase has prompted some economists (e.g. Hatton) to argue that high wages depressed employment during this period. However, it is important to recognize that rising real wages per se do not imply that employment should be depressed. Instead, the sticky wage theory requires that the real wage increase faster than labor-augmenting total factor productivity. We therefore present the real wage relative to the traditional measure of labor augmenting TFP, which assumes that capital input is equal to the capital stock.<sup>6</sup> We also present an alternative measure of the real wage relative to productivity, which is the real wage relative to labor productivity. We include this second measure because it does not require measurement of capital input, which may have more measurement error than output or labor input.<sup>7</sup>

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<sup>5</sup>We constructed the hourly wage rate by dividing average weekly wages - which is the predominate form of U.K. wage data for this period - by output per employee. (Note that this equivalent to the hourly wage rate because the inverse of hours worked appears in both the numerator and denominator of this ratio.)

<sup>6</sup>In this model, labor augmenting total factor productivity is given by  $\lambda$

<sup>7</sup>Note that this measure is essentially labor's share of value added, and our use of the Cobb-Douglas production in (2) implies that this measure should be independent of the weekly wage and a change in hours

To account for lower labor input, the high wage theory requires that the wage relative to labor-augmenting TFP is higher than average throughout the interwar period, and that this increase is plausibly due to deflation. There are two empirical problems with this requirement. First, the depression begins in 1919, which is two years before the start of the postwar deflation - output is about 11 percent below trend in 1919, and 18 percent below trend in 1920.<sup>8</sup> Second, the Figure shows that the real wage relative to either TFP or labor productivity is significantly above average only in 1921, which is the first year of the post-World War I deflation. Given this timing, it is possible that this wage increase was caused by deflation and that it reduced employment in that year. However, the real wage relative to TFP returned to its normal level in 1922 and remained at or below that level for the remainder of the decade. Given this wage/productivity pattern, the wage explanation implies that employment should have rebounded sharply in 1922. This deviation between the prediction of the sticky wage theory after 1921 and the actual data suggests that high real wages may have depressed employment and output briefly in the early 1920s, but were not an import factor in the persistence of the interwar depression.

The other main element of the monetary explanation is that the adoption of a fixed exchange rate at \$4.86 per pound sterling raised the price of British exports and reduced the UK's competitiveness. If this factor significantly reduced employment and output, the real prices of exports in foreign currency units should have increased substantially after the fixed exchange rate was adopted in 1925. We examine this prediction by presenting data on Britain's terms of trade - the import price deflator divided by the export price deflator - and by presenting data on the real price of UK exports measured in US dollars. Figure 7 shows the terms of trade between 1900 and 1938. These data show that the price of UK imports was secularly falling relative to the price of UK exports since 1900. This improvement in the UK's terms of trade, however, was primarily due to cheaper imports - not more expensive exports. Figure 8 provides evidence for this argument. It shows the real price of British

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per employee. However, adjustment costs and any putty-clay aspect to capital would imply that at least temporarily, a shift in either of these variables might effect this ratio.

<sup>8</sup>Since unions were able to negotiate shorter hours without a paycut in 1919 and 1920, it is possible that the decrease in overall labor input and output beginning in 1919 was due to this higher wage. It is hard to evaluate this factor, since even with this pay raise the ratio of the real wage relative to TFP in 1920 is not much different than it was before World War I.

exports in US dollars. This is constructed by multiplying the British export price index by the dollar/pound exchange rate, divided by the US deflator.

There are two key features of these data. First, the average of this series during the interwar period is not historically high, as required by the theory. The average of this price during the interwar period is lower than its level in 1900. Second, this real price tends to be positively correlated with output, rather than negatively correlated as predicted by the theory. It is higher than normal during World War I, which is a period of very high output, it is lower than normal during the early 1930s, which is a period of low output, and it rises when UK output begins to rise in the mid-1930s.

These data indicate that neither real wages relative to productivity nor the real price of British exports in dollars were persistently high during the interwar period. This evidence raises questions about this particular monetary/exchange rate explanation for the UK interwar depression.

There are alternative monetary business cycle theories to the inflexible wage and high exchange rate theories. We now briefly consider three of these alternative theories, which include inflexible prices, (Blanchard and Kiyotaki (1987)), the misperceptions theory of Lucas (1972), and the debt-deflation theory of Irving Fisher. It seems unlikely, however, that these theories can plausibly account for the interwar depression.

Figure 9 shows the time path of real GDP per adult, the money stock per adult (M1) and the GDP deflator. These data raise a number of questions about these three monetary explanations. The first question about the monetary theories is timing. The depression begins before either the money stock or the price level begins to fall. Real output begins falling in 1918, while money and the price level continue to rise. When money and the price level peak in 1920, output has already decreased 18 percent. The fact that most of the output decrease had occurred before the monetary contraction suggests that much of the depression may be due to alternative shocks. The second question about the monetary theories is the persistence of the depression. The depression lasts too long to be plausibly explained by either the Lucas model or the sticky price model. Output and labor input remain about 25 percent below trend from 1921 to 1934, despite the fact that the monetary contraction is largely over by 1923.

The Fisher theory is based on deflation raising the real value of private debt levels, which then impedes private borrowing. The main drawback to this theory is the actual time path of investment. If a negative shock was impeding private investment, then investment should be well below trend during the 1920s. In contrast, investment is well above trend during the decade.

We conclude from this review that monetary factors do not seem to provide a plausible accounting for the 1920s depression. Neither real wages relative to productivity nor the real price of British exports in dollars is persistently high. Moreover, the depression began well before the deflation began. Given these questions about monetary theories, we now analyze the UK interwar depression from the perspective of neoclassical growth theory. This allows us to determine which observations are puzzling from the perspective of neoclassical theory, and the quantitative magnitudes of the deviations between data and theory. We do this by developing a dynamic, general equilibrium model for the interwar UK economy.

## 4. The Model Economy

This section presents the model economy we use to analyze the interwar UK depression. We begin by summarizing the environment.

There is an infinitely-lived representative household with perfect foresight, who has preferences over a single physical consumption good and leisure.<sup>9</sup> Since exports and imports in the UK were both about 20 percent of output during this period, we develop an open economy model - with two countries: the UK, and the rest of the world (ROW). There are two final goods in the economy at each date: (1) a good produced in the UK that can be used for consumption or investment and (2) a good produced in the UK that is exported to the ROW. There are also two intermediate goods: an intermediate good imported from the ROW, and an intermediate good produced in the UK which is produced from three inputs: capital, labor, and the imported good. The ROW has preferences over their own domestically produced good and a final good that is imported from Britain. The analysis is simplified considerably by assuming that income for the rest of the world is exogenous. Trade is required to be balanced each period, which is consistent with UK trade patterns in the

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<sup>9</sup>The perfect foresight specification simplifies the analysis considerably.

1920s.

**Households:** We utilize a framework that is similar in many respect to the Hansen (1985)-Rogerson (1988) formulation, in which households work either full-time at  $\bar{h}$  hours, or they do not work at all. We modify this formulation so that we can study the implications of the mandated change in the workweek. The model is modified by modeling a fixed cost of working. With this modification, households optimally choose not just the fraction of individuals working, but also choose the length of the workday. For simplicity, we analyze this problem as a social planning problem. Assuming a unit mass of households, the planner's preferences are:

$$\max \sum_{t=0}^{\infty} \beta^t \{ \log(C_t) + \pi_t [A \log(1 - \bar{h}_t) - \phi] + (1 - \pi_t) [A \log(1)] \},$$

where  $c$  denotes consumption,  $\pi$  is the number of individuals working,  $\bar{h}$  is the length of the workday, and  $\phi$  is a fixed cost of working.<sup>10</sup>

**UK Production:** The two final goods - consumption/investment and the export good - are produced from an intermediate good that is turn produced from capital services, labor services, and an imported intermediate good. The constraints the planner faces are:

$$g(C + I, X) \leq H(f(\bar{h}\pi, \bar{h}K), M)$$

$$g(C + I, X) = [\eta(C + I)^\sigma + (1 - \eta)X^\sigma]^{\frac{1}{\sigma}}$$

$$H(f(\bar{h}\pi, \bar{h}K), M) = \{((\bar{h}K)^\theta (A\bar{h}\pi)^{1-\theta})^\mu M^{1-\mu}\}$$

$$A_{t+1} = A_0(1 + \gamma)^t$$

$$K_{t+1} = (1 - \delta)K_t + I_t$$

$$P_m M = P_x X$$

The planner takes as given the intial stock of capital,  $K_0$ , and the sequences of import and export prices:  $\{P_{mt}\}, \{P_x\}$

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<sup>10</sup>There are a number of ways this cost could be modelled. In addition to the pure utility loss we specify, it could also be modelled as time spent commuting to work.

**The Rest of the World (ROW):** Since we are using an open economy model, we need to specify the maximization problem for the ROW. We simplify the analysis by abstracting from production and by abstracting from the consumption/investment decision. With these assumptions, the ROW chooses how to optimally allocate income between the their domestically produced good, which is exogenously given, and imports from the UK. The ROW behaves competitively.

The representative ROW household has preferences defined over the domestic good ( $D$ ) and the good imported from Britain ( $X$ ). The period utility function is:

$$\max D^\alpha X^{1-\alpha}$$

The period budget constraint is:

$$p_m Y^* = p_m D + p_x X$$

The solution to this static maximization problem yields a demand function for UK imports.

An equilibrium of this economy is a sequence of quantities  $\{C_t, I_t, X_t, M_t, \bar{h}_t, \pi_t, D_t\}$  and prices  $\{p_{mt}, p_{xt}\}$  which solve these two maximization problems.

## 5. Quantitative Experiments

We will use this model to conduct a number of experiments to analyze the behavior of the economy in both the 1920s and the 1930s. The first experiment provides a neoclassical benchmark for what should have happened to the UK economy during the 1920s, given the initial low capital stock coming out of World War I.

### A. What Should Have Happened to the UK Economy during the 1920s?

This experiment evaluates the nature and magnitude of the UK depression during the 1920s, and shows how this economy should have recovered from World War I, abstracting from changes in world income and changes in the workweek. It thus provides a simple benchmark that will be useful in assessing our other experiments. We solve for the equilibrium path of the economy, given an estimate of the initial UK capital stock and given time paths of world income and UK productivity. In this first experiment, we assume that the income in

the ROW is at its steady state growth path level every period, and that UK productivity is equal to its steady state level each year. To simplify the analysis, we do not include in this experiment the affects of the world depression of the early 1930s or World War II. The interpretation of this assumption is that households did not expect the worldwide depression nor did they expect World War II in the 1920s.

This experiment requires specifying parameter values. We choose the value of the household's discount factor ( $\beta$ ) so that the interest rate along the steady state growth path is six percent. We choose the leisure parameter  $B$  and the fixed cost  $\phi$  such that along the steady state growth path the representative household spends about 1/3 of their time endowment working, and about 70 percent of the population is employed. We choose the growth rate of labor-augmenting technological progress ( $\gamma$ ) to be 1.1 percent, which is the average growth rate of total factor productivity in the data. We choose the share parameter  $\mu$  so that on the steady state growth path of the model the value of imports is equal to 20 percent of output. The depreciation rate ( $\delta$ ) is 10 percent per year. The parameter  $\theta$  governs the distribution of income between capital and labor. It is chosen so that labor's share of income is 70 percent of output. We set the elasticity of substitution between exports and the domestic final good to be 1 (Cobb-Douglas). The share parameter  $\eta$  is chosen so that along the steady state growth path the value of exports is equal to 20 percent of output. The steady state ratio of investment to output is .12, which is somewhat higher than in the data. We choose a higher value to account for consumer durables and government investment, which are not listed separately in the product accounts.

The perfect foresight competitive equilibrium of this economy is characterized by a set of efficiency conditions and resource constraints. We compute the perfect foresight equilibrium path by exploiting the fact that this economy converges to a steady state growth path, given the constant terminal values we have assumed for productivity and world income. Given the initial condition for the capital stock, the sequences of productivity and world income and the terminal values for these variables, we solve for the entire path by computing the solution to a system of "N" equations in "N" unknowns. All variables are expressed relative to their steady state growth path levels.

This experiment shows that the UK economy should have grown quickly following the

war, with both labor input and investment initially above their normal trend levels. The predicted recovery in the model differs considerably from the actual recovery in the data. In particular, the predictions for output, consumption, and labor input are all much higher than in the data.

We now conduct additional experiments to understand how shocks may be contributing to the large deviation between the benchmark model predictions and the data. Our next experiment drops the assumption that the time path of world income was equal to its steady state level each period, and we instead replace it with a time path of world income from the data. Output in the rest of the world grew substantially in the 1920s, rising over 40 percent between 1919 and 1929. We do not feed in the actual time path, but rather feed in a smoothed version in which world income grows at a constant rate between 1919 and 1929.<sup>11</sup> We assume that this variable is on its steady state growth path by 1929.

The addition of this shock slows down the transition of the model economy to the steady state relative to the first experiment. The reason that the growing path of world income slows down the UK transition is because imports are an intermediate good in UK production, and are relatively scarce right after World War I. This leads households to delay investment in order to take advantage of the higher flow of the imported intermediate good in the future. Adding this shock, however, does little to explain the low level of labor input in the data. Predicted labor input in this experiment is near or slightly above its steady state growth path level, compared to the actual level of 25 percent below trend in the data.

What shock(s) could have depressed labor input so much? One possibility is that the cut in the workweek contributed to the depression. Our next experiment considers the possible impact of this shock.

## **B. How Much Did the “8 Hour Day” Depress the 1920s Economy?**

Trade unions began negotiating a shorter work day beginning in 1919. The “eight-hour day” movement continued through 1920. Aldcroft reports that about seven million workers received shorter hours from this movement, and that average hours worked fell from about 54

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<sup>11</sup>We feed in this smoothed sequence, rather than the actual sequence, since the predicted changes in the model are somewhat easier to interpret by omitting the year-to-year fluctuations.

hours per week to 48 hours or less per week between 1921 and 1919. These shorter hours were often negotiated without any cut in pay. Our next experiment evaluates the macroeconomic implications of this reduction in the workweek. Average hours per worker fell about 15 percent between the 1920s and 1913. In our model, we assume that this reduction is entirely due to the restricted workweek. We therefore set the maximum workweek 15 percent below the previous steady state level. All other aspects of the experiment remain the same - the capital stock is 15 percent below trend and the time path of world income is set at the same level as in the previous experiment. Since hours and bodies are substitutes - but not perfect substitutes - in this model, employment will increase in response to the hours restriction, but not enough to offset the decrease in hours. Consequently, total labor input will fall.

Table 4 shows the time paths of output, labor input, consumption, and investment. The main finding is that the hours restriction depresses output by an additional 3-5 percentage points relative to the benchmark model presented in Table 1, and brings the predictions of the model closer to the data, particularly for 1919 and 1920. The model now correctly predicts significantly lower output and higher employment in these two years. The model predictions diverge from the data after 1920, however. The model continues to predict that employment should be at least eleven percent above trend, and total labor input only five percent below trend. These predictions are sharply at variance with the 10 percent fall in employment and the 25 percent fall in labor input that actually occurred after 1920.

These three experiments indicate that the main puzzle about the UK after 1920 is the low level of labor input. Each experiment indicates that either total hours worked or employment should be at or above normal levels. In the data, however, both employment and total labor input are well below normal.

## **6. High Unemployment Benefits and the Interwar Depression**

The persistence of low employment despite rapid productivity growth suggests that a persistent shock affected the UK labor market. Since the ratio of the wage to productivity did not rise above average during this period, it appears that the shock was not a change in labor bargaining power. This suggests that unionization is not the key shock after 1921. An alternative labor market shock that can depress employment without changing the wage

is higher unemployment benefits. UK unemployment benefits increased substantially in the early 1920s. This change will reduce employment by raising the marginal return to spending time in non-market activities, such as job search, home production, or human capital investment.

A number of economists in the 1920s argued that a large increase in unemployment benefits reduced employment. In particular, Garside (1990) notes that Pigou argued the unemployment rate was about five percentage points higher than it would have been had unemployment insurance benefits remained at their pre-World War I level. Benjamin and Kochin (1979) were the first economists to present formal empirical evidence that higher UK unemployment in the interwar period was primarily due to a substantial increase in unemployment benefits in the 1920s. Their argument was based on three features of the interwar unemployment insurance system. First, insurance contributions were independent of a worker or firm's past history. Second, benefits were relatively generous and independent of a worker's past wage. Third, benefits could be collected indefinitely and were payable for unemployment spells as short as one day. The lack of experience rating in this system suggests that both moral hazard and adverse selection problems may have been quantitatively important and increasing both the number of, and duration of, unemployment spells.

Benjamin and Kochin conducted an econometric analysis of the macroeconomic effects of UK unemployment benefits that follows less formal conjectures that date back to the 1920s by Pigou and others that the UK's unemployment system was reducing labor input. Despite this long-held view about the unemployment insurance system, the Pigou-Benjamin-Kochin explanation has recently been dismissed as an important contributing factor of the interwar depression (See for example Hatton). This section presents some new arguments why the observed changes in unemployment benefits in the 1920s are a prime candidate shock for the interwar depression. We first briefly review the history of unemployment benefits in the UK in the 20th century. We then summarize the evidence reported by Benjamin and Kochin and the criticisms leveled at this work. We then argue why these criticisms do not make convincing arguments against the unemployment insurance view, and present some new arguments for why unemployment insurance may indeed be a key factor behind the UK interwar depression.

Unemployment insurance was initially provided in the Unemployment Insurance Act

of 1911 which extended benefits to 15% of the workforce - largely manual laborers many of whom were already covered by trade union insurance programs. The program was to be funded by contributions from employees, employers, and the government. The benefit level specified in the Act of benefits was a fixed amount which depended upon age (16-17, 18-20, and greater than 20) and sex. It was also fairly modest and was eroded by the inflation that took place during WWI. The Act also specified limitations on receipt of benefits including a maximum duration of 15 weeks per year.

After World War I, the unemployment compensation was made much more generous. The Out of Work Donation which was put in for a short period immediately after WWI was a noncontributory benefit paid on a relatively generous scale.<sup>12</sup> It was initially intended for the returning soldiers, but was quickly expanded to virtually all adults who registered as unemployed. This was replaced by the Unemployment Insurance Act of 1920 which increased weekly benefits by nearly 40% relative to the level in the 1911 Act (though it was less generous than the Out-of-Work Donation) and extended coverage to almost all privately employed workers (exceptions were agricultural workers and domestics).<sup>13</sup> The 1920 Act included limits on the receipt of benefits similar to those in the 1911 Act, but raised the maximum duration to 26 weeks. This restriction, which was abolished in 1928, was not enforced. Because of the high unemployment realized during 1920: "The contributory basis of the insurance scheme was abandoned within 6 months of the 1920 Act going into operation."<sup>14</sup>

Figure 9 shows benefits relative to wages and the level of measured unemployment. The replacement rate is the ratio of the level of benefits accruing from unemployment insurance to a married worker with two children relative to the average wages for manual workers ( $B/W$ ). The most striking characteristic of these data is that unemployment benefits and the unemployment rate both rise about the same time. The replacement rate jumps up

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<sup>12</sup>The benefits associated with the out-of-work donation were originally set to 24 shillings for men and 20 shillings for women, and were increased in December of 1918 to 29 shillings for men and 25 shillings for women. (Source: Burns, *British Unemployment Programs*, p. 3-7.) We have estimated the ratio of benefits to average wages under the donation to have been .47 in 1918 and 1919, and .39 in 1920.

<sup>13</sup>The benefit in 1911 was a uniform 7 shillings (7s) per week. In 1919 it was increased to 11s per week. In 1920 the benefit was differentiated between men (whose benefit was increased to 15s) and women (whose benefit was increased to 12s). In 1921 benefits for dependants were introduced and the benefits were frequently changed thereafter in an upward direction, except in 1931. (Source: Burns, *British Unemployment Programs*, p. 3-7.)

<sup>14</sup>See Deacon p. 14.

after the 1920 Act and is at or over 50% during much of the interwar period. The level of unemployment among workers who were covered by the unemployment compensation system also rises sharply and never falls much below 10% during the entire period after 1920.<sup>15</sup>

Benjamin and Kochin (BK) argued that the generous system of unemployment insurance caused the high levels of unemployment, and the correspondingly low levels of employment. First, they estimated a time series regression for the interwar period of the unemployment rate on the  $B/W$  ratio and the deviation of output from trend, and noted that the coefficient on benefits was sizeable and significantly positive.<sup>16</sup> Second, they noted that the unemployment rate among juveniles was substantially lower during this period and attributed that to the fact that the benefits for them were substantially less generous. Third, they noted that when the Anomalies Regulations, instituted in Oct 1931, made married women satisfy more demanding contributory requirements, which lead to "wholesale disallowances of benefits claims of married women", the gap between the unemployment rate among married and unmarried women shrank substantially.

There have been 4 main criticisms of BK's argument. The first major criticism is that cross-sectional data do not support BKs time series regression. One criticism along these lines is from Eichengreen, who argues that cross-sectional data do not suggest that individuals with high  $B/W$  ratios do not have systematically higher levels of unemployment. Eichengreen uses data collected on households in the London area during 1929-31 on age, sex, martial status, home ownership, employment status, wages and unemployment benefits (if applicable) to undertake his analysis. The key step in the analysis is to estimate the  $B/W$  ratio for each household. For the employed this is relatively straightforward since

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<sup>15</sup>The levels of employment and unemployment among workers covered by the Act was tracked through the requirment that workers keep an employment/unemployment book. When insured person became unemployed, he got book from employer and "lodge" it with employment exchange. Upon getting work, person retrieved book and gave it to employer who affixed stamps for each week of employment. Books expired in July of each year, at which time there were exchanged for new books at employment exchange.

<sup>16</sup>Their main regression of unemployment on the ratio of benefits-to-average-wages and deviation of log output from trend is reproduced here:

$$\begin{aligned}
 U &= .19 + 18.3 * (B/W) - 90.0 * (\log(Q/Q^*)) \\
 &\quad (2.64) (4.46) \quad (-8.30) \\
 R^2 &= .84, \bar{R}^2 = .82, D-W = 2.18, SE = 1.90
 \end{aligned}$$

wages were directly measure in the survey, and benefits can be inferred by assuming that they were eligible for benefits and constructing an estimate of their benefits based upon their martial and demographic data. For the unemployed the level of their benefits was directly measured in the survey, however there is the much more difficult task of inferring their wages. Eichengreen did this by estimating a wage regression among the employed on the data he had available and then using that wage regression to provide an estimate of the unemployed's wage. In the final step, given these estimated  $B/W$  ratios, Eichengreen regresses employment status on his measure of the  $B/W$  ratio.

There are several problems with this analysis that raise serious questions about the conclusion. First, selectivity issues suggest that a wage regression estimate among the employed will not provide unbiased forecasts of the potential wage levels of the unemployed. Second, the wage equation for the employed is missing many of the standard variables included in these equations, such as measures of human capital, experience, or industry. The result is that the  $R^2$  in the wage regression is only 0.18. Moreover, much of the explanatory power of the wage regression may be coming from relatively young workers whose wages may be most closely tied to their age. In particular, the  $R^2$  among heads-of-households is only 0.08 while that among nonheads of households is 0.20. But juveniles were precisely the ones with low  $B/W$  ratios and low unemployment rates, so it is unlikely that observations for these individuals provide much information for the impact of unemployment benefits. Because of these problems, we conclude that Eichengreen's analysis is not a convincing rejection of BK's argument.

Another cross-sectional criticism has been made by Hatton (). His analysis is based on survey data conducted by the Ministry of Labor in the late 1930s. The government was worried that unemployment benefits were too generous, and asked unemployed individuals to compare their benefits to their last wage. Hatton argues that the fraction of individuals with high benefits - benefits close to or exceeding their previous wage - was too small to support BKs claim. Table 5 summarizes some of this data.

**Table 5: Benefit to Wage-Ratios for  
Claimants to Insurance Benefits, 1937**

<i>B/W</i> ratio	Men	Men	Women	Women
Greater than	18-20	21-64	18-20	21-46
1.0	2.6	0.5	3.4	0.9
0.8	6.5	2.0	8.2	4.4
0.6	17.1	11.7	23.1	17.5

These data show that a relatively small fraction of individuals received benefits that exceeded their previous wage, and that a greater fraction of individuals were receiving benefits between 60 percent and 80 percent of their previous wage. Two types of information are necessary to evaluate whether these data support BKs view, or Hatton's view: the ratio of the opportunity cost of working and the current benefit to the *current* - not past - wage. There are also good reasons to believe that the opportunity cost of working for these individuals was high, which would raise the marginal value of unemployment benefits. Most of the individuals covered under the insurance program were manual laborers. Thus, the opportunity cost of working would include not only the individual's value of the alternative use of time (e.g. home production or human capital investment), but also would include the disutility of working these types of jobs (e.g. coal mining). This factor would lower the level of replacement rates, relative to current wages, that would be sufficient to induce many of these individuals not to work. There are good reasons to believe that the current wage for many of these individuals may have been significantly lower than their past wage. Recent studies show that individuals who lose jobs during periods of large layoffs receive significantly lower wages for a number of years after the initial job loss. For example, Jacobson, Lalonde, and Sullivan (AER 1992) report that, on average, high tenure workers earn wages that are 25 percent lower than their previous wage five years after the loss of the previous. This implies that the replacement rates from the perspective of *current* wages may have been considerably higher than those presented in Table 5.

For these reasons, we find it striking that there are actually workers who had been receiving benefits that either exceeded or were fairly close to their previous wage. While more information is needed to draw conclusions from these survey data, there are good reasons to suspect that they may support BKs thesis, rather than reject it as argued by Hatton.

The second main criticism is regarding the evidence on married women. Collins argues that the reduced availability of the unemployment benefit to married women may have led them to leave the unemployment roles by dropping out of the labor force, rather than becoming employed. In the absence of microeconomic data about the labor force status of married women, Collins' point thus indicates that there is an alternative interpretation of the fact that married female unemployment rate dropped relative to the single female and males rates. This is not evidence against BKs argument about married women, but it does weaken their empirical argument

The third main criticism is sensitivity of the parameter on the  $B/W$  variable in BK's regression equation to small changes in the sample period (see Ormerod and Worswick JPE 1982). We think that this criticism is uninformative for two reasons. First, the regression is effectively a "one-observation" regression - both benefits and the unemployment rate rise sharply in the early 1920s. Second, the regression equation is probably misspecified. The BK equation is not derived explicitly from theory. An equation for the unemployment rate that was derived from dynamic theory would not involve just a static relationship between the aggregate unemployment rate and the current unemployment benefit and the deviation between current and trend output, but would also involve dynamic effects.

For example, in a dynamic model of unemployment, such as Mortenson and Pissarides, the surplus to be split between a worker and an employer from a job is stochastic. Hence, if the welfare level of the unemployed was suddenly raise due to an increase in the unemployment insurance benefit, then those workers in jobs with marginal levels of surplus would be induced to immediately quit their jobs. This would not be the only effect since the unemployment rate could continue to rise as workers initially in jobs with sufficiently high level of surplus experienced negative shocks to the surplus value of their job. This dynamic response is not captured by BK's static regression. Nor, would capturing it be simply a matter of adding some lags as to the benefit level. It is not all surprising that a misspecified regression using a short sample is sensitive to adding or dropping observations.<sup>17</sup>

The final and most serious criticism has been made by Metcalf, Nickell and Flores.

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<sup>17</sup>Interestingly, Metcalf, Nickell and Floros 1982 JPE) point out, the  $B/W$  coefficient in BK's regression is similar to that in studies for the post-WWII period. What is different is their intercept term.

They argue that unemployment benefits are not the key to interwar British unemployment, because the unemployment rate in the 1950s was much lower than in the 1930s, even though benefit levels during these periods were about the same. Table 6 shows the replacement rate and the unemployment rate during the interwar period and the 1950s. The data for the 1950s replacement rate are from Maki and Spindler.<sup>18</sup> The replacement rate falls from about 0.56 in the 1930s to 0.38 in the 1950s. This suggests that benefits in the 1950s were lower than those in the 1930s, but about the same as those in the 1920s.

**Table 6: Unemployment Insurance and the Labor Market**

Year	Replacement Ratio <sup>19</sup>	Unemployment % of Insured	Rates Feinstein's measure	Employment Per Adult
1920	0.15	3.9	2.0	0.68
1921-24	0.35	13.3	9.1	0.60
1925-29	0.48	11.1	7.7	0.60
1930-34	0.52	19.2	13.6	0.60
1935-38	0.56	13.1	9.4	0.63
1948-54	0.38	-	1.3	0.67

Benjamin and Kochin respond to this criticism by arguing that the pool of workers who were being insured after WWII had expanded to include many nonmanual workers who do not experience as frequent fluctuations in employment and who are less likely to engage in short-term unemployment. They also note that unemployment data after WWII do not count workers experiencing very short run spells as unemployed. However, these caveats do not resolve this issue - the employment rate per adult increases from 0.60 during the interwar period to it's pre-World War I level of 0.68.

<sup>18</sup>There seems to be a surprising degree of lack of consensus as to the level of the benefit to wage ratio in the postwar period. Metcalf, Nickell, and Floros (1982) report numbers that are much closer to the interwar level (.43 for 1951-57 and .54 for 1958-65). We have gone with Maki and Spindler's numbers which they cite as coming from the Department of Health and Social Security. Obviously using Metcalf et al's numbers would only sharpen the criticism.

<sup>19</sup>Based upon Ormerod and Worswick for the interwar period, and Maki and Spindler for the post-WWII period.

There is a key theoretical reason, however, why comparing the level of unemployment benefits between the interwar period and the post-World War II period is misleading. This is because the marginal value of unemployment benefits may have been much higher in the interwar period than the postwar period. Our argument for this view follows recent work by Ljungqvist and Sargent (1998). They show how a generous unemployment insurance system can lead to high levels of unemployment during some periods, but not others, because of changes in the marginal value of these benefits. The Ljungqvist-Sargent thesis is that during a period in which worker/job productivities are subject to more severe shocks, then the unemployment insurance system can lead to high levels of unemployment because relatively more workers are receiving sufficiently negative shocks to their job productivity to lead them to prefer unemployment rather than accept the cut in wages implied by the negative shock. However, during a period in which these shocks are smaller, fewer workers will suffer large negative shocks to their productivity. This effect is reinforced in their model by the assumption that worker's human capital deteriorates during periods of unemployment which reduces workers incentive to return to the ranks of the employed after being unemployed for a significant period. The LS model illustrates how this mechanism can explain both the low (pre-1970) and high (post-1970) unemployment levels in Europe with high benefit levels in both eras due to great magnitude and frequency of readjustment shocks during the later period.

There is empirical evidence why this same phenomena may explain why the unemployment compensation system had different effects in the UK during the interwar years and after World War II. It is widely acknowledge that the UK economy faced large readjustment during the post-WWI period. The major industries like coal, steel, and textiles faced increased competition from abroad, and lost market share. Moreover, since these declining industries were very regionally concentrated in the North, while the new industries were concentrated in the Midlands,<sup>20</sup> this readjustment was considered to be particularly difficult since mobility, especially among the lower class, was low.<sup>21</sup>

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<sup>20</sup>See Aldcroft: *The Interwar Economy: Britain 1919-1939*, p. 39.

<sup>21</sup>BK suggest that mobility within Britain was hindered by a policy of rent control and subsidized housing after 1918.

The combination of the large readjustment shock, along with high regional concentration of industry and low worker mobility suggests that workers may have experienced large negative shocks to their wages *and* large costs if they moved from their old jobs to the new jobs. The generous nature of the unemployment insurance benefit and the fact that there was no time limit on how long they could collect this benefit may have induced a significant fraction of those workers experiencing large negative shocks to prefer unemployment. In contrast, the literature argues that there was no major readjustment along these lines during the early post WWII period. Instead, Broadberry (The Productivity Race p.13), argues that British industry emerged from WWII highly dependent on home and Commonwealth markets, and this enabled them to avoid competition with US and German producers until they joined the EEC in 1973.

These views about the nature and magnitude of postwar readjustment shocks lead us to conjecture that the big differences between the UK experience with unemployment insurance during the interwar and the immediate post-WWII periods seems tailor-made for the kind of explanation that Ljungqvist and Sargent have suggested.

## **7. The Worsening of the Depression in the 1930s**

(TO BE ADDED)

## **8. Summary and Conclusion**

The UK experienced a major depression that began just after World War I and lasted until the late 1930s. During this period, output per adult and labor input were about 25 percent below their normal levels. The persistence of this depression during a period of rapid total factor productivity growth is a puzzle from the perspective of neoclassical theory.

The standard view is that the Depression was caused by negative monetary shocks operating through sticky wages and a pegged exchange rate that was too high. We presented data on real wages relative to productivity and the real price of British exports measured in dollars that are inconsistent with this view. Both real wages relative to TFP and the real price of exports in dollars are near or below their average levels in the 1920s.

We also investigated the contributions of changes in world income and changes in the workweek. We found that the change in the workweek should have depressed total labor

input modestly in the 1920s. However, we also find that it should have increased employment substantially. This prediction differs sharply from the data.

We conclude that a new shock is needed to explain why UK employment was so low in the interwar period. The most promising candidate shock is a substantial increase in unemployment benefits that began in the early 1920s. In future work, we will analyze the macroeconomic impact of this shock using a model along the lines of Ljungqvist and Sargent, who highlighted the important interaction between unemployment benefits and changes in the variance of idiosyncratic shocks to human capital. Given the view that the variance of idiosyncratic human capital shocks were very different after the two World Wars, it is possible that Benjamin and Kochin had it right - that unemployment benefits were an important contributing factor to the UK interwar depression.

**Table 1: Output and Its Components: 1913-1929 (1910 = 100)**

	Y	C	I	G	X	M
1913	101	100	100	100	105	107
1915	106	98	64	410	69	101
1917	102	80	49	491	54	77
1919	89	87	56	199	60	85
1920	82	86	95	112	64	84
1921	77	81	110	109	60	84
1923	78	82	99	92	79	100
1925	80	82	126	92	77	107
1927	79	82	130	90	76	108
1929	79	81	130	89	76	106

**Table 2: The Predicted Path of the UK Economy - World Income at Steady State**

	Y	L	C	I
1919	.98	1.04	.94	1.23
1920	.99	1.03	.96	1.17
1921	.99	1.02	.97	1.12
1922	.99	1.02	.97	1.09
1923	.99	1.01	.98	1.06
1924	.99	1.01	.98	1.05
1925	.99	1.01	.98	1.03
1926	.99	1.00	.99	1.03
1927	.99	1.00	.99	1.02
1928	1.00	1.00	.99	1.01
1929	1.00	1.00	1.00	1.00

**Table 3: The Predicted Time Path of the UK Economy - World Income  
Returns to Steady State**

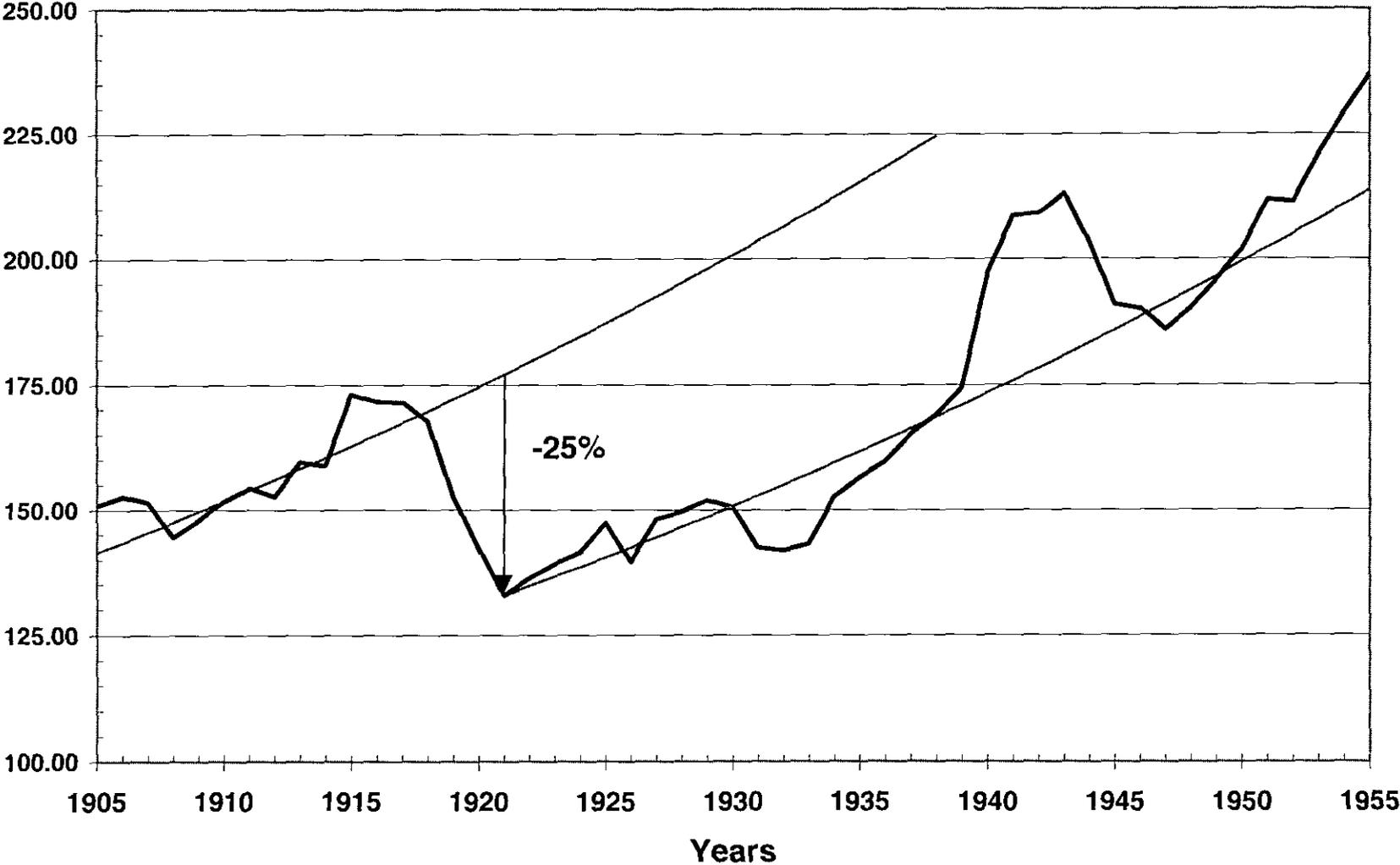
	Y	L	C	I
1919	.93	1.02	.91	1.03
1920	.94	1.01	.92	1.01
1921	.94	1.00	.93	1.00
1922	.95	1.00	.94	1.00
1923	.95	1.00	.95	1.00
1924	.96	1.00	.96	1.00
1925	.97	1.00	.97	1.00
1926	.97	1.00	.97	1.00
1927	.98	1.00	.97	1.01
1928	.98	1.00	.97	1.04
1929	.99	1.01	.98	1.07

**Table 4: The Predicted Time Path of the UK Economy - Restricted Workweek**

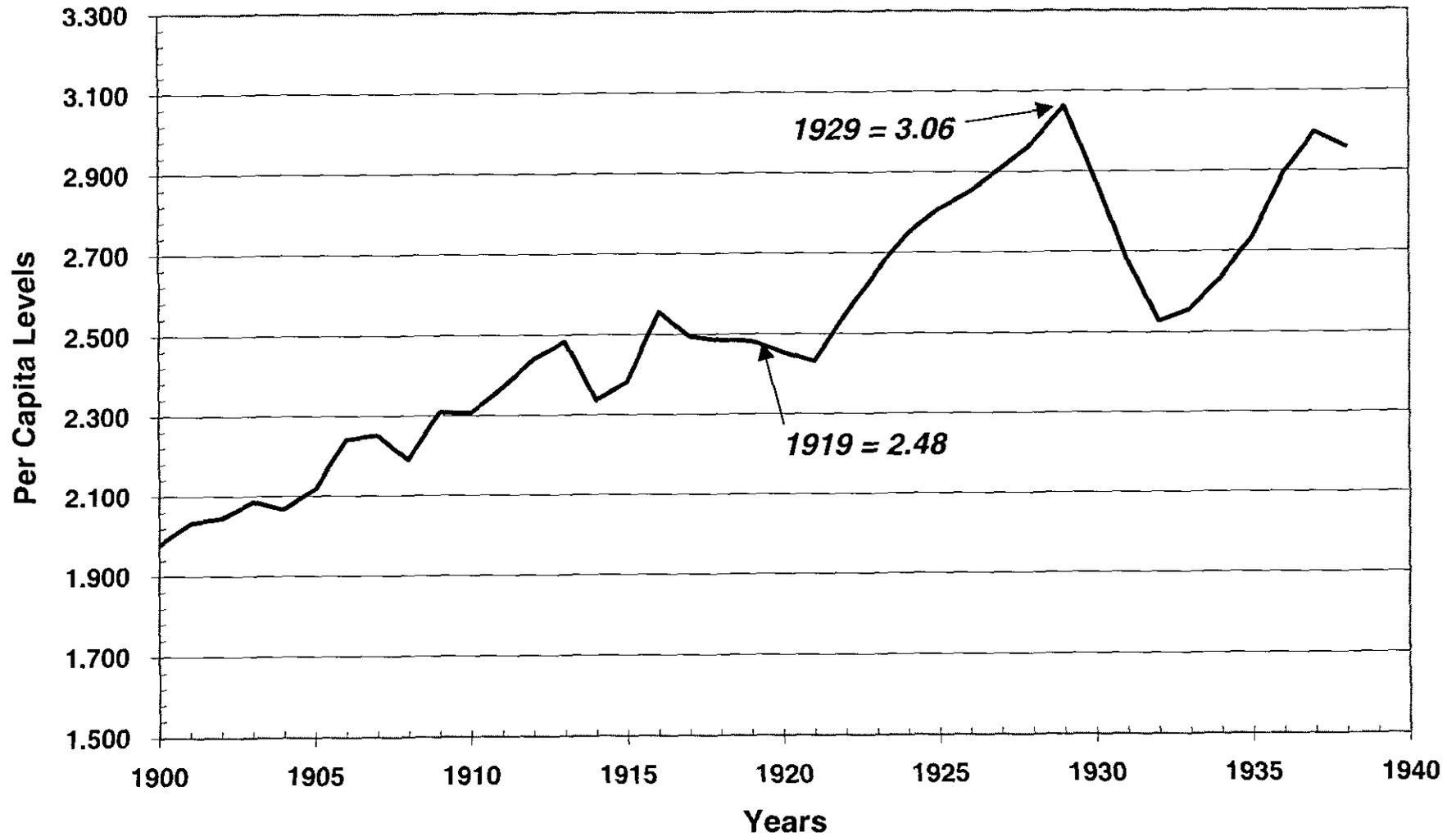
	Y	L	C	I	Emp
1919	.89	.94	.88	.92	1.11
1920	.90	.94	.89	.93	1.11
1921	.91	.94	.90	.94	1.11
1922	.92	.94	.90	.95	1.11
1923	.92	.94	.91	.95	1.11
1924	.93	.95	.91	.95	1.11
1925	.93	.95	.92	.96	1.12
1926	.94	.95	.92	.96	1.12
1927	.94	.95	.93	.97	1.12
1928	.95	.95	.93	.99	1.12
1929	.96	.95	.94	1.03	1.12

**Figure 1: Output per Adult**

*1.4% trends*

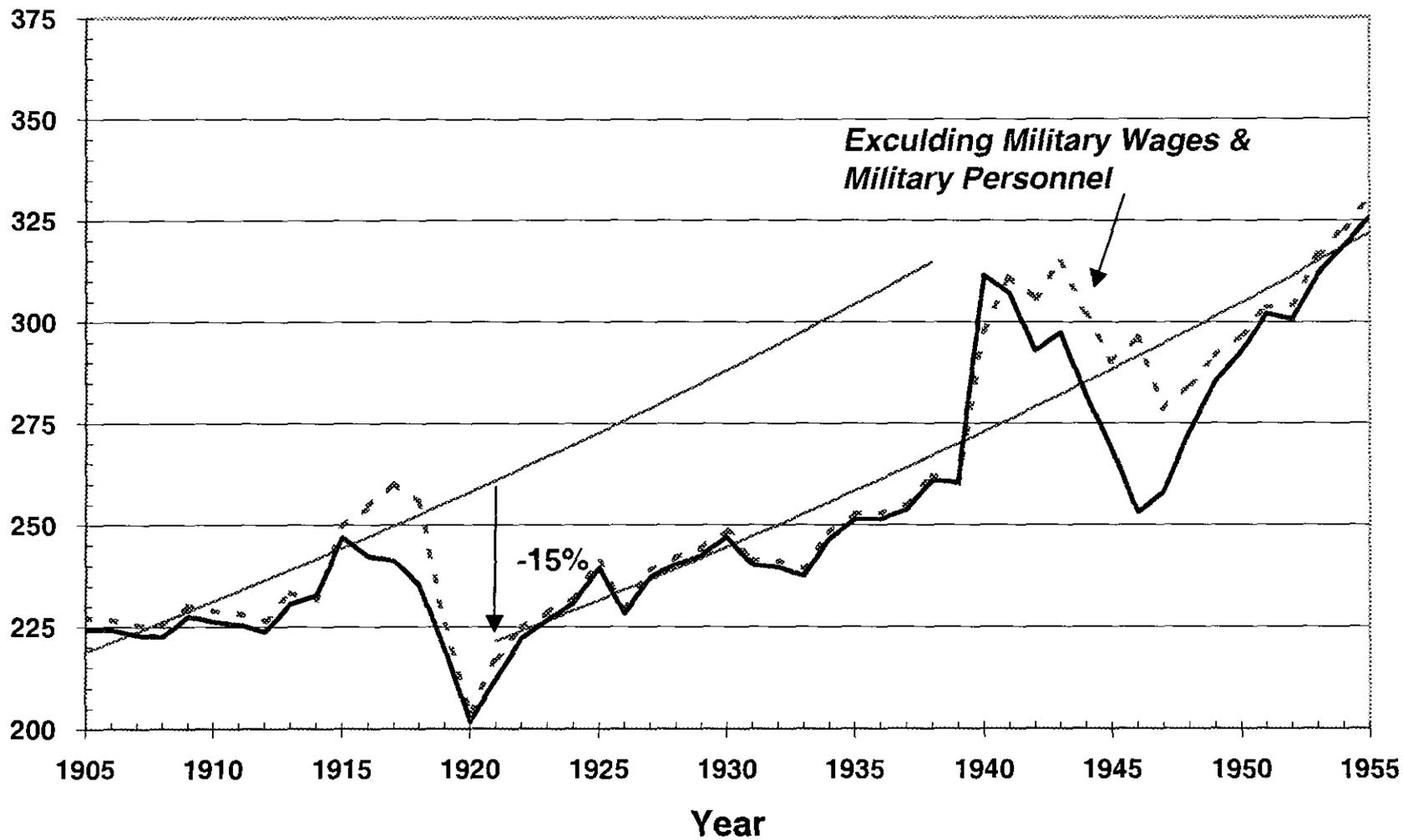


**Figure 2: World Per Capita Output**

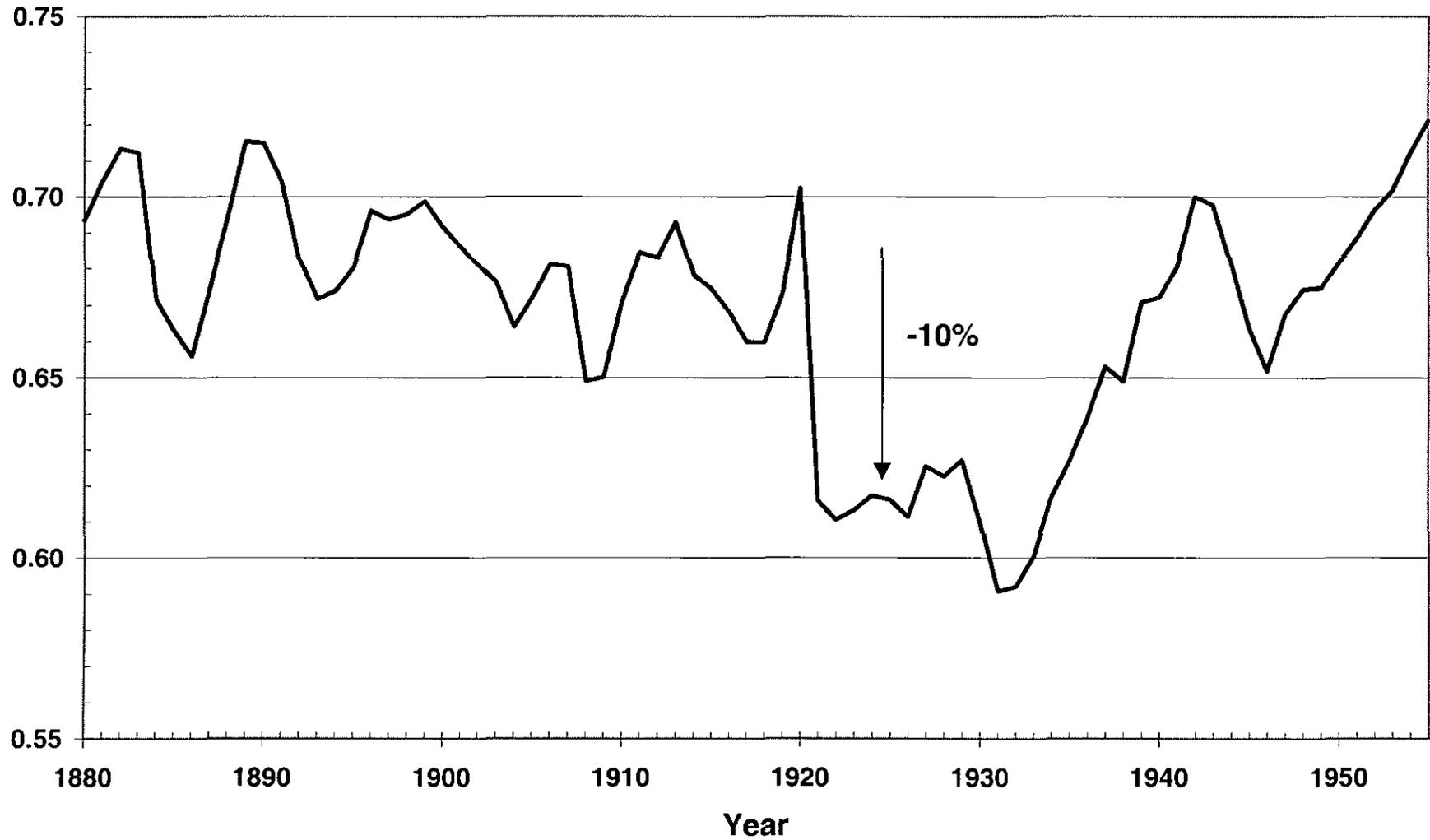


### Figure 3: GDP per Employee

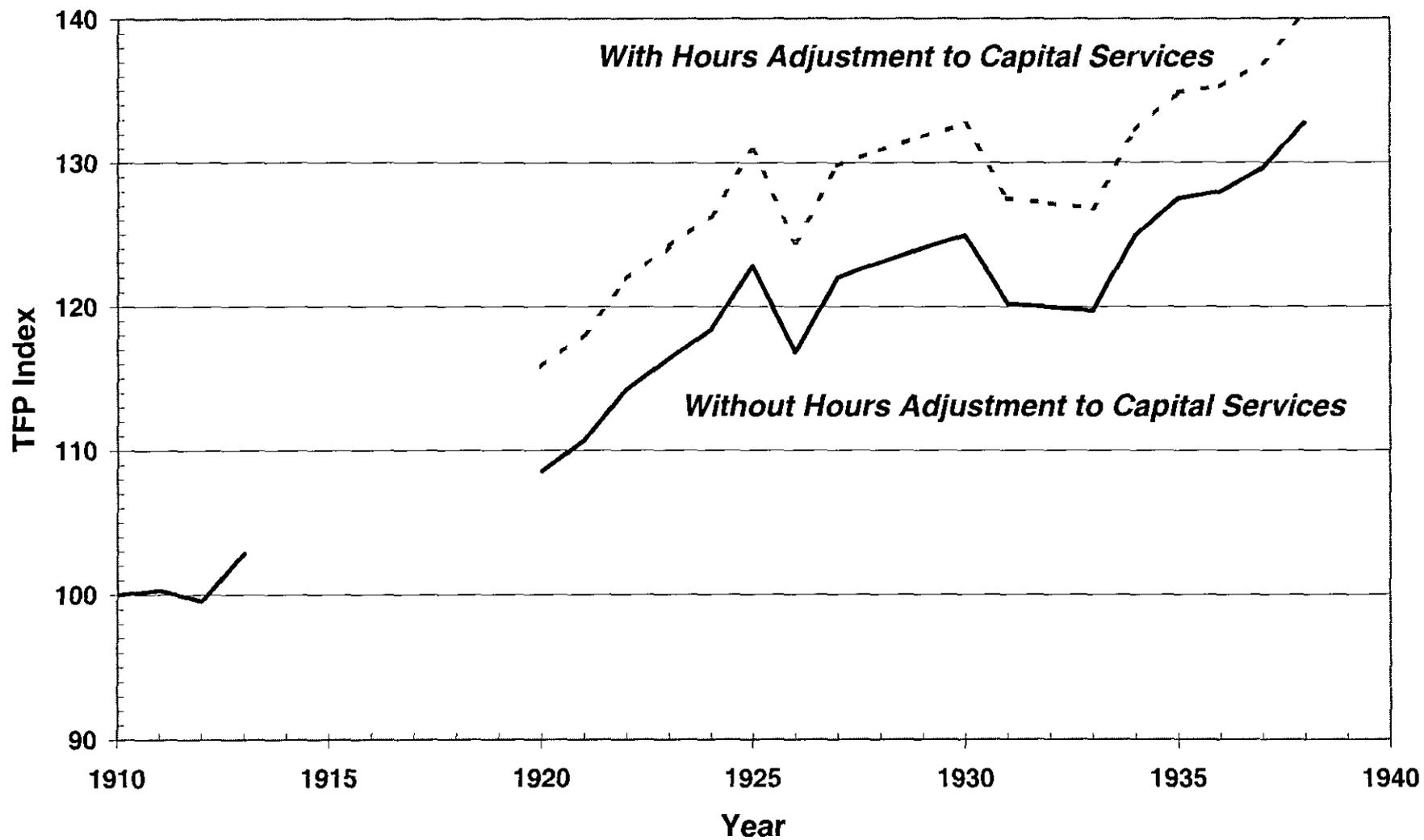
1.1% trends



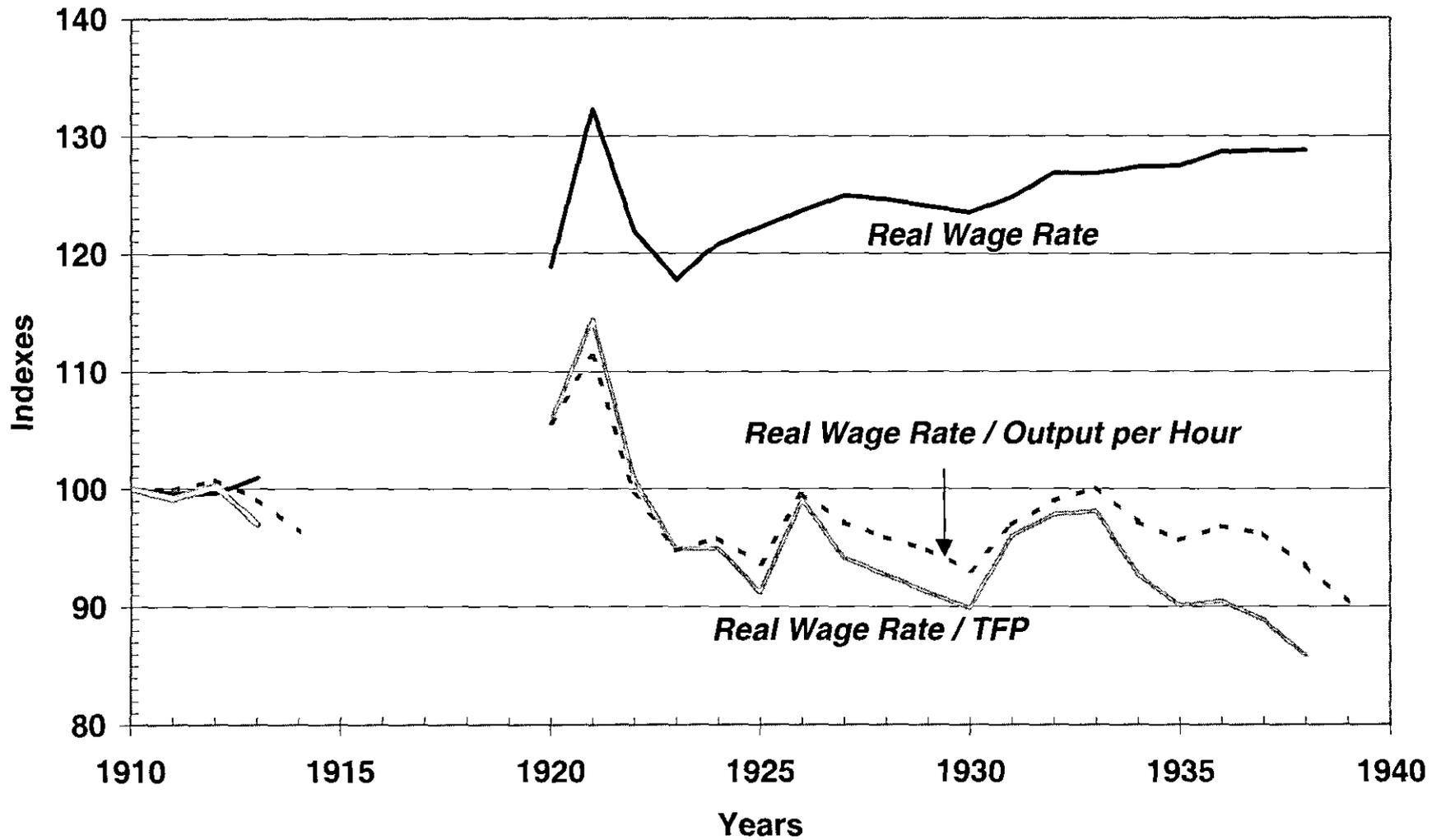
**Figure 4: Civilian Employment per Non-Military Adult**



**Figure 5: Total Factor Productivity**

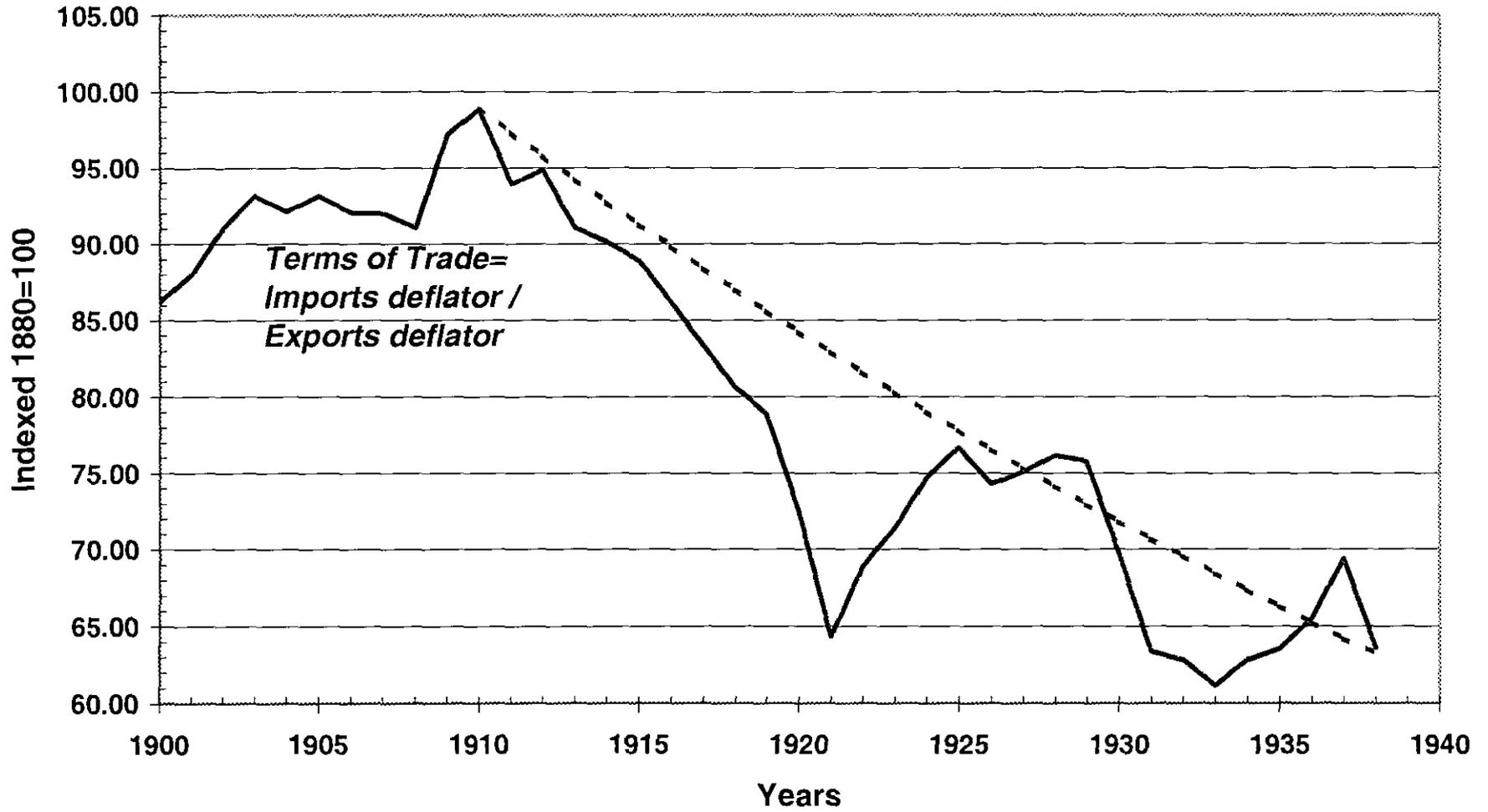


**Figure 6: Real Wages and Productivity**

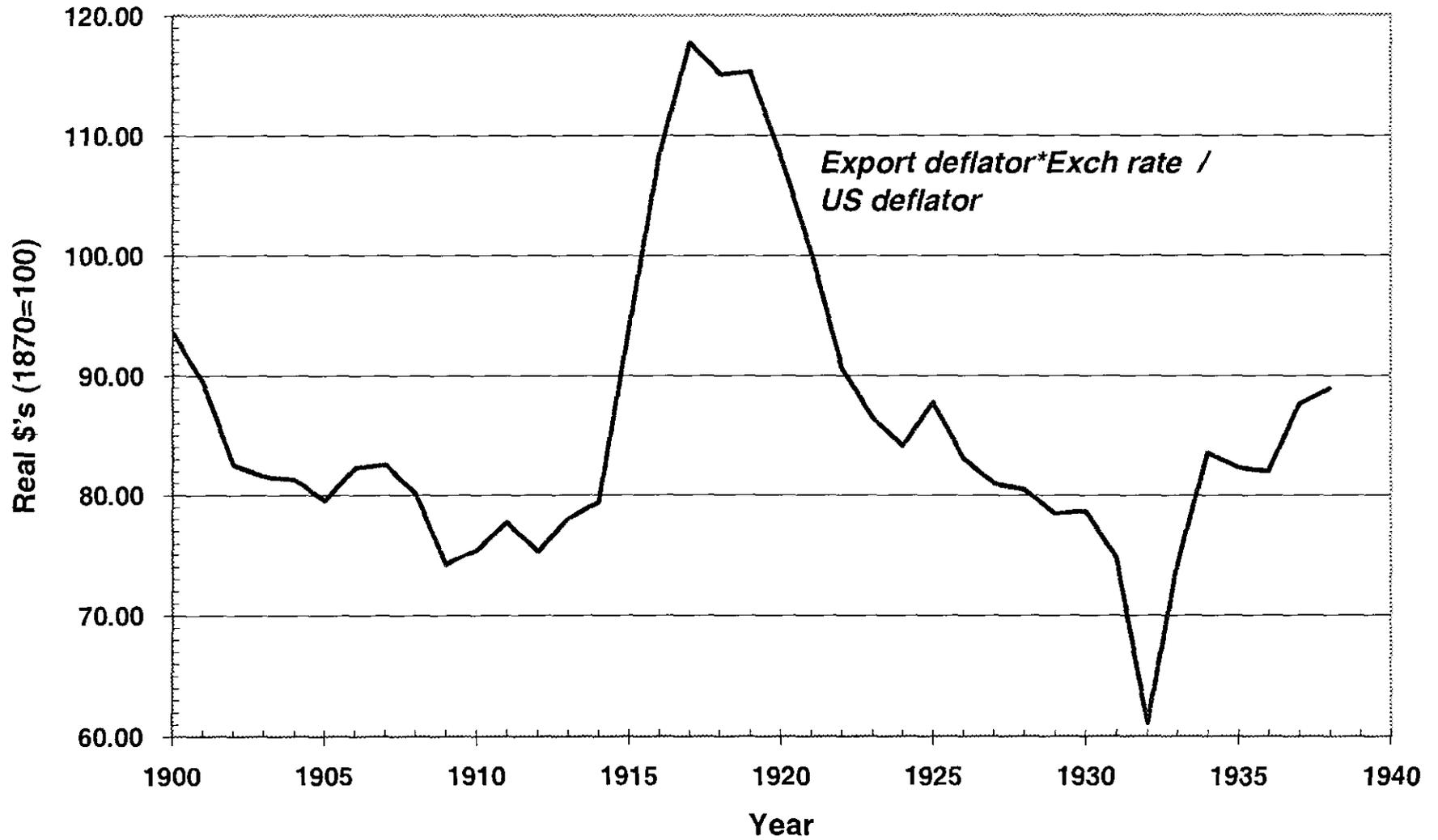


### Figure 7: Terms of Trade

-1.6% trend line



**Figure 8: Real Price of British Exports**



### Figure 9: Money, Prices and Output

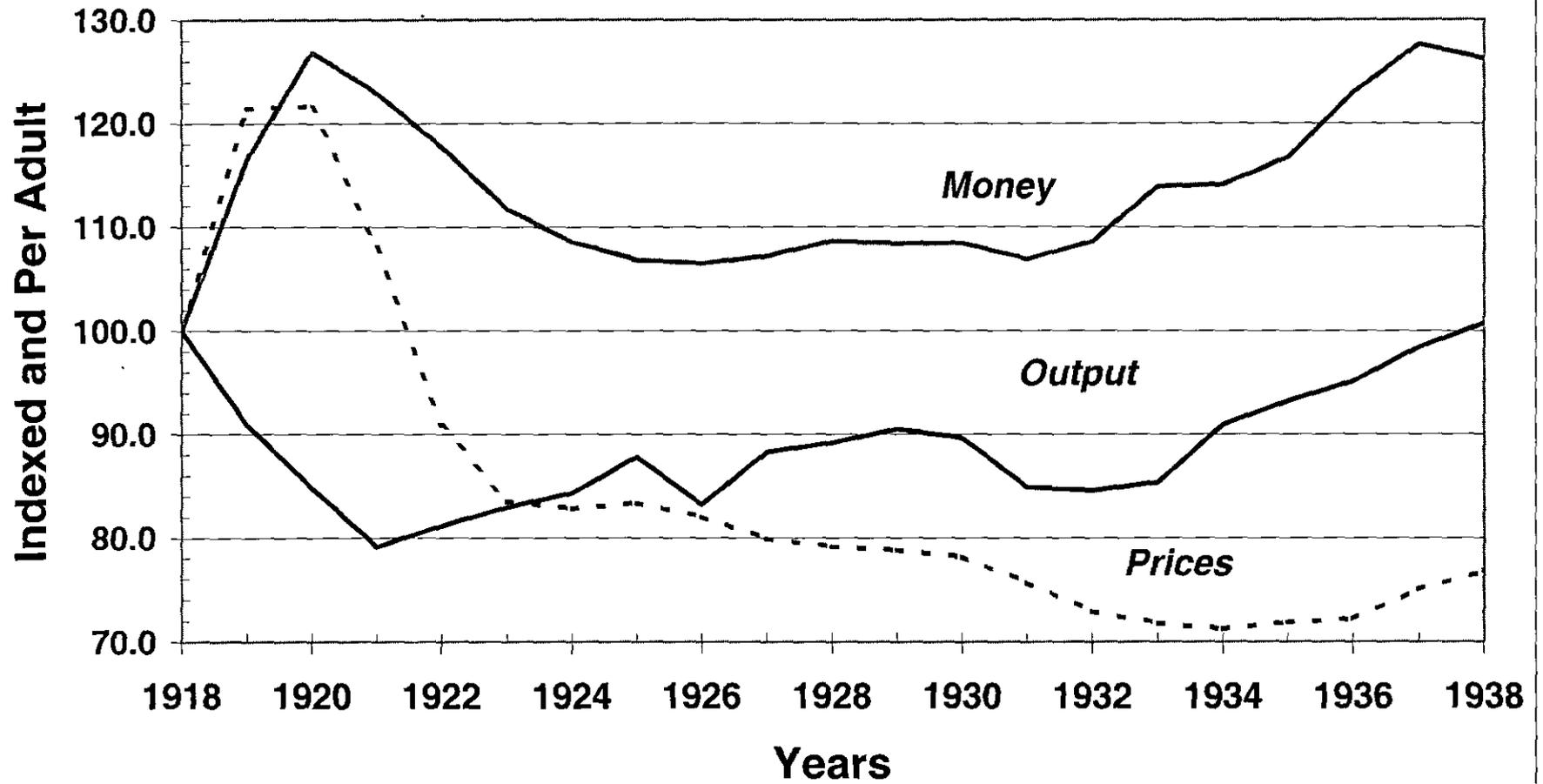


Figure 10

**Figure 10: Replacement and Unemployment Rates**

