The Great U.K. Depression: A Puzzle and Possible Resolution

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The United Kingdom entered a major depression shortly after World War I and remained depressed for twenty years, through the interwar period. This large and persistent depression was unique among the industrialized countries. Although many countries suffered depressions in the early 1930s, worldwide economic growth was rapid in the 1920s. For example, U.K. real GDP (gross domestic product) per adult fell about 5 percent between 1913 and 1929, while real GDP per capita in the rest of the world rose more than 30 percent during this same period. This paper asks why the United Kingdom had such a large and persistent depression after World War I. We analyze the U.K. depression using the same neoclassical methodology we developed in our analyses of the U.S. Great Depression (Cole and Ohanian, 1999, 2001a, 2001b). Our analysis suggests that government policies that reduced the incentive to work are almost surely the cause of the United Kingdom's twenty-year Great Depression.

We begin by summarizing U.K. macroeconomic performance during the interwar period. We present data on output, productivity, and factor inputs. These data show that all of the decrease in output is due to a large decrease in labor input, reflecting about an 18 percent decrease in hours per worker and a 9 percent decrease in employment per adult. We then evaluate the conventional wisdom that deflationary monetary/exchange rate policy caused the U.K. depression. We find that the data do not support the monetary/exchange rate explanation; most of the drop in output occurred before the monetary and exchange rate shocks occurred, and the depression lasted much longer than can be reasonably explained by monetary/exchange rate shocks.

This negative assessment of the conventional monetary explanation leads us to evaluate real shocks. The first real shock we consider is a reduction in the length of the workweek. We examine the macroeconomic effects of

this restriction with a dynamic general equilibrium business cycle model to estimate the equilibrium path of the U.K. economy during the 1920s. While the workweek shock explains the reduction in hours per worker, it does not explain the depression. This is because the model predicts that employment rises substantially in response to this shock and thus offsets much of the decrease in hours per worker. This predicted path of employment differs significantly from the actual large decrease, and suggests that some other large shock(s) depressed U.K. employment. We then present data on two policies that reduced the incentive to work: large increases in unemployment benefits and housing subsidies that raised the cost to workers of relocating from depressed regions. We then present a quantitative-theoretic analysis suggesting that policies that reduced incentives to work may be the key to understanding the United Kingdom's twenty-year Great Depression.

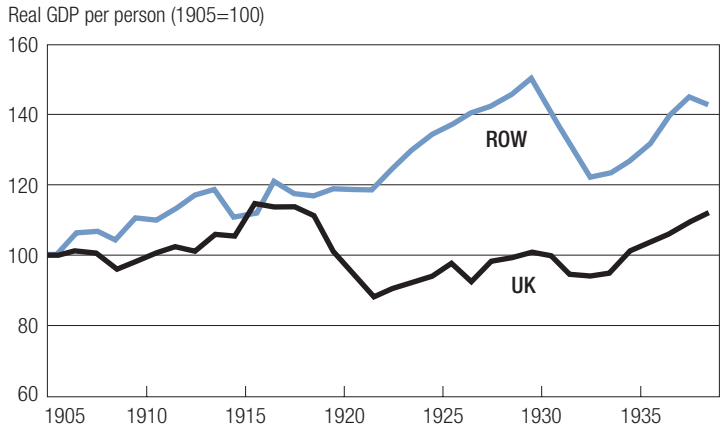
The paper is organized as follows. First we summarize U.K. macroeconomic performance during the interwar period. Then we assess the standard monetary/exchange rate explanation for the United Kingdom's interwar depression. Next we present a dynamic general equilibrium model to assess the macroeconomic effects of the restricted workweek. Then we summarize changes in unemployment benefits and other shocks that reduced the incentive to work during the interwar period, and present the quantitative analysis. We end with a summary and conclusions.

The U.K. Economy in the Interwar Period

This section presents data on the aggregate variables that are central to the neoclassical growth model: output and its components, labor input, and productivity. The source of all these data is Feinstein (1972); the appendix describes in detail these data and the other data used in this study. We focus on the 1920s, since this is the decade in which the U.K. economy does much worse than the world economy.

Figure 1 compares U.K. output with output for the rest of the world between 1905 and 1937.[1] These data show that the United Kingdom and the rest of the world (ROW) grew at roughly the same rate up to World War I, but diverged sharply thereafter. For example, U.K. real GDP per adult fell about 5 percent between 1913 and 1929. In contrast, real GDP per capita in the rest of the world rose more than 30 percent during this same period. The United Kingdom entered a depression shortly after World War I and remained depressed throughout the interwar period. Since the U.K. depression lasted so long, we also examine the U.K. output data relative to trend. Output is measured in constant pounds, is divided by the adult population, and is detrended at the historical average growth rate of 1.4 percent per year. It is also normalized to be 100 in the year 1911, so deviations from 100 are devia-

Figure 1. **Output in U.K. vs. rest of the world**



tions relative to trend. Table 1 shows that output (Y) fell about 20 percent relative to trend shortly after World War I and remained at roughly that level throughout the 1920s. These data suggest that the shocks that depressed the U.K. economy were U.K.-specific and were very persistent.

Table 1. **U.K. detrended output (1911= 100)**

Year	1911	1919	1920	1921	1923	1925	1927	1929
Y	100	89	81	75	76	79	77	77

We now analyze changes in the components of output. In Table 2 the shares of output are accounted for by consumption (C), investment (I), government spending (G), exports (X), and imports (M).

There are no large changes in the fractions of output accounted for by the major domestic GDP expenditure components. The ratio of consumption to output is about .8 in the 1920s, which is roughly unchanged from its prewar average. The ratio of investment to output is somewhat higher in the 1920s than its pre–World War I average. Given that this is a period of declining U.K. involvement in the British empire, this increase may reflect a reallocation of expenditure from foreign investment to domestic investment. The ratio of government spending to output is roughly unchanged in the 1920s relative to its pre-1920 average. The main difference in the foreign sector is that the shares of exports and imports are somewhat lower in the 1920s than before World War I. Trade is roughly balanced during the 1920s, which is consistent

Table 2. **U.K. output expenditure shares**

Year	*C*/*Y*	*I*/*Y*	*G*/*Y*	*X*/*Y*	*M*/*Y*
1911	83	7	8	28	27
1919	76	6	18	16	16
1920	82	5	11	20	18
1921	81	7	12	17	17
1923	81	6	10	22	19
1925	79	11	9	21	20
1927	80	10	9	21	21
1929	80	10	9	21	20

with its long-term pre–World War I average. Taken together, these output- and expenditure-share data suggest that a negative, permanent shock drove the U.K. economy onto a lower steady-state growth path in the 1920s.

To learn more about the nature of this depression, we conduct a growth accounting exercise by decomposing the change in output into the fractions due to changes in total factor productivity (TFP), changes in capital input, and changes in labor input. Since we will be using a model that includes the length of the workweek, we measure TFP using the following Cobb-Douglas technology: $Y_t = z_t h K_t^{\theta} E_t^{1-\theta}$, where z is TFP, h is the length of the workweek, K is the capital stock, and E is employment. We use factor shares of 0.3 for capital and 0.7 for employment. One key implication is that along a balanced-growth path, the marginal product of capital is constant, and this in turn implies that the capital-output ratio (K/Y) is also constant.[2]

We show averages of these variables for subperiods, since not all the data are consistently available throughout the period. Our measure of total hours is constructed from employment and periodic data on average hours per worker.[3] Table 3 suggests that the major change between the pre–World War I period and the interwar period was the large reduction in total hours coming from the combination of a reduction in average hours per worker and in employment. TFP actually grew slightly faster during the interwar period than before, indicating that this is not the key factor.

Regarding the capital stock, there are two available measures, the net stock (which is theoretically preferable, as it applies depreciation continuously) and the gross stock (which applies depreciation according to a "one hoss shay" formula). The contribution of the capital factor is small. Table 3 uses the net stock, which grew somewhat slower than TFP. (Note that along a balanced-growth path, it should grow slightly faster than TFP.) To evaluate the first-order impact of this slower growth of capital, we make use of the balanced-growth implication that the capital-output ratio should be constant

when output is growing at its trend rate. This implies that capital should have been 10 percent higher in 1929 and 22 percent higher in 1938. Given the 0.3 capital share, these capital deviations account for only between 12 and 25 percent of the total output decline. Alternatively, using the gross capital stock, which grows at 1.7 percent per year during this period, suggests that capital accounts for none of the decline. This leaves labor as the major factor accounting for the U.K. depression.

Table 3. **Changes in TFP, capital, and labor**

Years	TFP growth (%)	Capital growth (%)	Hours/worker	Workers/adult	Hours/adult
Pre–WWI	0.9	0.6	2,700	.68	100
1920–38	1.1	0.6	2,200	.61	73

Hours worked per adult was about 27 percent below its prewar level. Average hours per worker fell from about 2,700 per year before World War I to about 2,200 in 1924 and remained at roughly that level in the 1930s. This reduction was partially due to union demands for vacations and shorter workdays. Much of this decrease in hours per worker occurred shortly after World War I—average hours for about 40 percent of employees fell from about fifty-five hours per week to about forty-seven hours per week in 1919 and 1920 (see Aldcroft 1970).

The workweek restriction sheds light on why hours per worker fell, but makes the employment fall seem even more puzzling. This is because the restricted workweek would tend to increase employment, as households would presumably substitute workers for hours per worker. In contrast, the average fraction of the adult population working falls from about 0.68 prior to World War I to about 0.60 in 1921, and remains at roughly that level during the interwar period. This indicates that the key to understanding the U.K. interwar depression is finding a large and persistent shock that depressed employment. We next evaluate some possible candidates for this shock, beginning with monetary/exchange rate shocks.

The Monetary Explanation of the U.K. Depression

The consensus view is that monetary and exchange rate policies were the primary causes of the U.K. depression. This section evaluates the monetary/exchange rate explanation but finds that these factors do not plausibly account for the U.K. interwar depression.

Before presenting this evaluation, we briefly review the standard monetary/exchange rate explanation, which is largely a sticky wage/deflation story

due to Keynes (1932). He argued that post–World War I deflationary policy depressed the U.K. economy because nominal wages were imperfectly flexible. According to Keynes, the United Kingdom made two policy mistakes: it contracted the money supply too much, and it set the pound/dollar exchange rate at too high a level.

Keynes argued that deflation raised real wages and reduced labor input. He also argued that the exchange rate (pegged at $4.86 per pound in 1925), together with high real wages, reduced British exports. Specifically, he argued that the high real wage prevented the domestic price from falling enough so that British exports were competitively priced with the $4.86 exchange rate. Keynes recommended against nominal wage reductions and instead advocated ending deflationary monetary policy and adopting a pegged exchange rate of about $4.40 per pound. The crux of Keynes's argument is summarized in the following passages:

> If you fix the exchange rate at this gold parity . . . you are committing yourself to a policy of forcing down money wages and the cost of living to the necessary extent. We must warn you that this policy is not easy. It is certain to involve unemployment and industrial disputes. If as some people think real wages were already too high a year ago, that is all the worse, because the amount of the necessary wage reductions in terms of money will be all the greater. . . . You are intensifying unemployment deliberately in order to reduce wages. (Keynes 1932, 253)
>
> It is a grave criticism of our way of managing our economic affairs that (wage reductions in and of themselves) seem to any one to be a reasonable proposal. (260)

Keynes's monetary/exchange rate story is cited as the leading explanation for the U.K. Great Depression in several recent analyses, including those of Hatton (1994), Dimsdale (1981), Moggridge (1972), and Garside (1990). There are four reasons, however, why we find that monetary/exchange rate shocks do not plausibly account for the U.K. interwar depression. We present each of these in turn.

Problem 1: Timing—Depression Occurred Before Deflation

The first reason is timing: the U.K. depression began well before the monetary contraction. Table 4 shows that most of the decrease in output occurred while the money stock and the price level were still *rising*: output fell about **17** percent relative to trend between 1918 and 1920, while the money supply and the GDP deflator rose about **30** percent and **43** percent, respectively.[4] The money stock and price level did not fall until 1921. The fact that almost all of the output decrease occurred before the monetary contraction indicates that unanticipated monetary shocks are not the key factor that depressed the U.K. economy.

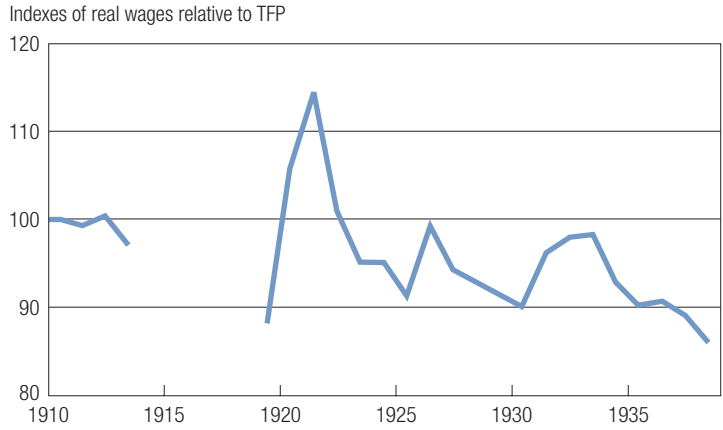
Table 4. **Changes in real output, money, and price level (1918 = 100)**

Year	Real GDP	Money	Price
1912	98.9	50.3	53.2
1918	**100.0**	**100.0**	**100.0**
1919	89.7	117.0	117.5
1920	**82.5**	**129.8**	**142.7**
1921	75.9	126.9	126.7
1922	76.8	122.7	106.6
1923	77.4	117.4	98.0
1929	77.7	120.0	92.4

Problem 2: Persistence

The second drawback to the monetary story is persistence: the U.K. interwar depression lasted much longer than can be reasonably accounted for by monetary shocks. Monetary business cycle theory predicts that monetary shocks have only transient effects on employment and output. If the monetary shock is identified as the decline in either the money stock or the price level, then the effects of these shocks should have died out shortly after 1923, when both the money supply and the price level were near their trough values. Alternatively, if the monetary shock is identified as the high real wage as in Keynes's story, then theory suggests that the effects of the wage shock should have died out shortly after 1921, which is the only year in the interwar period in which real wages were above their normal level. Figure 2 shows a

Figure 2. **Real wages relative to productivity**



measure of the real wage relative to its normal level, which we measure as the real wage relative to total factor productivity between 1910 and 1938. The figure shows that except for 1921, the real wage relative to productivity in the 1920s is about the same during the post–World War I depression as in the pre–World War I period. These data suggest that monetary shocks do not explain the persistence of the U.K. depression.

Problem 3: Worldwide Deflation but No Worldwide Depression

The third drawback to the monetary story is the international evidence: during the 1920s, many other countries experienced significant deflations but did not suffer major depressions. For example, the U.S. price level fell about 20 percent between 1919 and 1922, but real U.S. per capita output grew more than 20 percent between 1919 and 1929. The French price level fell 22 percent between 1920 and 1922, but real French per capita output grew more than 25 percent between 1920 and 1929. The fact that other countries had major postwar deflations but also grew substantially indicates that deflation by itself does not explain why the U.K. economy was depressed during the 1920s.

Problem 4: No Increase in Relative Price of British Exports

The fourth drawback to the monetary story is that the relative price of British exports did not rise during the interwar period. This fact is inconsistent with Keynes's exchange rate story, which states that the relative price of British exports rose substantially during the interwar period and reduced exports. We measure this relative price by forming the ratio of the price index of U.K. exports—multiplied by the dollar/pound exchange rate *e*—to the U.S. GDP deflator. This measure shows how the price of U.K. exports (multiplied by the exchange rate) relative to the domestic U.S. market basket of goods changed during the interwar period: $P_X^{\mathrm{UK}} e / P^{\mathrm{US}}$.[5] This relative price did not change much during the interwar period. Table 5 shows that this price is only 8.2 percent higher during the 1920s than during the 1890–1911 period. The table also shows the real exchange rate, which is an alternative measure of this relative price. This is the ratio of the price of U.K. domestic goods (multiplied by the exchange rate) to the price of U.S. goods: $P^{\mathrm{UK}} e / P^{\mathrm{US}}$. Table 5 shows that this measure is essentially unchanged between the 1920s and the pre–World War I period. The fact that neither of these relative price measures rose significantly during the interwar depression stands in contrast to the Keynesian view and suggests that an overvalued exchange rate is not the key shock that kept employment low during the interwar period.[6]

We conclude that the standard monetary/exchange rate story does not plausibly account for the 1920s U.K. depression. The timing of the shocks is not right, the shocks are not sufficiently persistent, other countries expe-

Table 5. **Real price of British exports and real exchange rate**

Years	$\frac{P_X^{UK} e}{P^{US}}$	$\frac{P^{UK} e}{P^{US}}$
1890–1911	100.0	100.0
1919–1929	108.2	99.6

rienced large deflations, but there were no other persistent depressions, and the price of U.K. exports relative to U.S. goods did not rise.

This negative assessment of the monetary story leads us to examine the effects of real shocks. We focus on the effect of the cut in the workweek. This allows us to estimate how much employment should have changed in response to this large policy shock. We conduct this evaluation by developing a dynamic general equilibrium model with a fixed cost of working, which leads to an optimal level of employment and an optimal length of the workweek.

The Model Economy

This section presents the model economy we use to analyze the effect of the workweek restriction. We begin by summarizing the environment. There is an infinitely lived representative family with many identical members. The household has preferences over a single physical consumption good and household leisure. To focus on the steady-state effects of changes in the workweek, we abstract from uncertainty and open economy issues.

Our framework is similar to the Hansen (1985) and Rogerson (1988) formulation in which individuals work either full-time or do not work at all. We modify this formulation by explicitly including a fixed cost of working. We choose a simple specification of this cost in our benchmark model such that each household member who works incurs a fixed, linear utility cost each period.[7] Preferences for the family are

$$(1) \qquad \max \sum_{t=0}^{\infty} \beta^t \{\log(c_t) + e_t[\psi \log(1-\bar{h}) - \phi] + (1-e_t)[\psi \log(1)]\},$$

where c denotes household consumption, e is the fraction of family members working, $\bar{h}$ is the length of the workday, and ϕ is a parameter in the utility function that captures the fixed cost of working. The resource constraint and the capital accumulation equation are given by

$$Y_t = \bar{h} K_t^{\theta} (A_t E_t)^{1-\theta} = C_t + I_t,$$

$$K_{t+1} = (1-\delta) K_t + I_t, K_0 \text{ given},$$

where Y is aggregate output, K is the aggregate capital stock, E is the aggregate employment rate, and A is labor-augmenting technological progress, which is given by

$$A_t = (1+\gamma)^t.$$

We conduct the analysis with a stationary version of the model, in which all growing variables are divided by A_t.

Quantitative Experiments

We now use this model to analyze the U.K. macroeconomic performance in the 1920s. The first experiment provides a neoclassical benchmark for the U.K. economy during the 1920s without the change in the workweek. In this first experiment, both the length of the workweek and the fraction of individuals who work are optimally chosen. We contrast the results of this experiment with a second experiment in which the workweek is restricted to be below the optimal level.

To parameterize the model, we choose the value of the household's discount factor (β) so that the interest rate along the steady-state growth path is about 7 percent. We choose the leisure parameter (ψ) and the fixed cost (ϕ) such that along the steady-state growth path, the representative household spends about one-third of its discretionary time endowment working, and such that the employment rate in the model is equal to the pre–World War I average rate of 68 percent. We choose the growth rate of labor-augmenting technological progress (γ) so that output, consumption, and investment all grow at 1.1 percent, which is the average growth rate of total factor productivity in the data. The depreciation rate (δ) is 6 percent per year. The parameter θ is chosen so that labor's share of income is 70 percent of output.

We compute the perfect foresight competitive equilibrium path of this economy, given an initial condition for the capital stock, which we estimate to be about 12 percent below its prewar steady-state growth path level in 1919.

Benchmark Experiment: Fast Recovery

The benchmark experiment shows the predicted U.K. recovery from World War I with no change in the workweek. Table 6 shows the model's predictions for output and employment during the 1920s. The theory predicts that without the workweek restriction, the United Kingdom should have recovered quickly

Table 6. **Model path of U.K. recovery from World War I**

Year	*Y*	*E*
1920	0.99	1.06
1922	0.99	1.04
1924	1.00	1.02
1926	1.00	1.02
1928	1.00	1.01

after the war—just like the rest of the world—with employment above its steady-state level throughout the decade. This prediction of a robust recovery differs significantly from the data. We therefore next assess what fraction of the depression can be accounted for by the one large and permanent labor market shock we have identified so far—the workweek restriction adopted shortly after World War I.

Impact of "Eight-Hour Day" on the U.K. Economy

Trade unions began negotiating a shorter workday beginning in 1919. The "eight-hour-day" movement continued through 1920. Aldcroft (1970) reports that about seven million workers received shorter hours from this movement, that average hours worked fell about 11 percent—from fifty-four hours per week to forty-eight hours per week—between 1919 and 1921, and that average hours fell about 15 percent between 1913 and the late 1920s. Aldcroft also notes that there were very few hours reductions in the period after 1921.

We therefore model this decrease in the workweek by exogenously fixing the length of the workweek to be 15 percent less than the optimal steady-state level. All other aspects of the experiment remain the same. Table 7 shows the time paths of output and employment relative to their nondistorted

Table 7. **Predicted path of U.K. economy: Workweek cut 15%, constant fixed cost of working**

Year	*Y*	*E*
1920	0.95	1.24
1922	0.96	1.23
1924	0.96	1.22
1926	0.97	1.21
1928	0.97	1.20

steady-state levels. The main finding is that employment rises substantially in response to the workweek restriction, as households substitute workers for hours per worker. The steady-state employment level with the restricted workweek is about 20 percent above the nondistorted steady-state level, and the steady-state level of output is about 3 percent lower than its nondistorted steady-state level.

The quantitative effect of the workweek restriction in this model depends on the specification of the fixed cost function. The 20 percent employment increase predicted by this simple model may be too high because the model assumes that the marginal cost of working is constant. We therefore evaluate the robustness of the results in terms of two alternative specifications of the fixed cost function that allow for the fixed cost to rise as the fraction employed rises.

The first alternative specification we use is a quadratic function rather than a linear function. The cost specification is thus modeled as $e_t^2 \mu\phi$ rather than $e_t\phi$, where the value of μ is chosen so that the steady-state employment rate without the workweek restriction is identical for the linear and quadratic cost specifications. This quadratic specification predicts that employment should have increased about 18 percent in response to the workweek cut, compared to the 20 percent increase predicted by the linear cost specification. Thus, the model continues to generate a large employment increase with an increasing marginal cost of working.

In the second alternative specification, the cost is linear in the fraction employed, but the fixed cost rises if the employment rate rises above 68 percent, which was the pre–World War I average. The cost function is therefore given by $e_t\phi$ for $e_t \leq 0.68$, and is equal $e_t\phi^*$ for $e_t > 0.68$. This specification captures the idea that increasing employment above a threshold level requires employing individuals who have higher fixed costs of working. For example, married women with young children probably have a higher fixed cost of working than men. Cogan (1981) estimates that the fixed cost of working for women is about 28 percent of their earnings. We are unaware of comparable estimates for males, but if we assume that the fixed cost of working for men is about one hour per day (this includes commuting time and time to prepare for work) relative to an eight-hour workday, then the fixed cost of working for men is about one-eighth or 12.5 percent of their earnings. This is about 50 percent smaller than Cogan's estimate for women. We use these numbers to specify the two different fixed costs in the model. We thus choose a fixed cost for individuals brought in to increase the employment rate above 68 to be twice as high as that for other individuals. This specification of differential fixed costs leads the workweek restriction to increase the steady-state employment rate in our model by about 10 percent. Table 8 presents the transition path for this experiment.

Table 8. **Predicted path of U.K. economy: Workweek cut 15%, higher fixed cost for marginal family members**

Year	*Y*	*E*
1920	0.88	1.14
1922	0.90	1.12
1924	0.90	1.11
1926	0.91	1.11
1928	0.91	1.10

This analysis of the restricted workweek indicates that the U.K. employment rate should have increased significantly during the interwar period. This finding indicates that another large, negative shock to the labor market is responsible for the 10 percent drop in the U.K. employment rate. Since the ratio of wages to total factor productivity was relatively unchanged between the 1920s and the pre–World War I period, it is unlikely that the only shock that would have affected labor demand was changes in unionization or labor bargaining power. Instead, this constancy of the real wage suggests that the shock affected labor supply.[8]

Unemployment Benefits and Regional Concentration of Unemployment

This section argues that generous unemployment benefits and the regional concentration of declining U.K. industrial sectors were key contributing factors to the U.K. interwar depression. This view stands in sharp contrast to the conventional wisdom, which is summarized by Eichengreen (1987): "Although Keynesians have conceded that some small portion of interwar unemployment may be explicable on these grounds, few have sympathy for the notion that the insurance system contributed significantly to the magnitude of the problem." This conventional wisdom comes from an empirical debate between Benjamin and Kochin (1979, 1982), who present evidence that unemployment benefits raised unemployment substantially, and a number of critics who empirically criticize Benjamin and Kochin's findings.[9]

We address this question using a different approach. We make greater use of theory to focus on the incentive effects of unemployment benefits, and we use our model to quantitatively assess the effect of the observed increase in benefits on employment. Moreover, our argument is not based solely on unemployment benefits, but rather focuses on the interaction between these benefits, the regional concentration of declining industries, and government policies that raised the cost of relocating from declining regions. As we

discuss below, this general equilibrium approach leads us to draw a very different conclusion regarding the importance of government policies that changed the incentive to work.

Summary of the U.K. Unemployment Benefits System

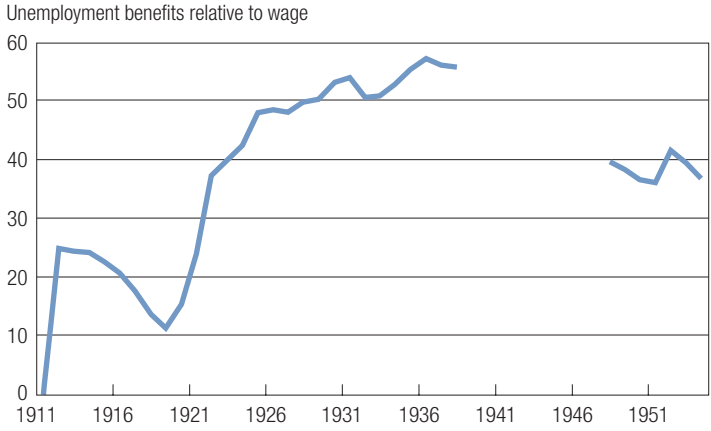
This section presents a summary of U.K. unemployment insurance, including a discussion of the generous benefit levels, the lack of experience rating, limited eligibility requirements, and the long duration of benefits, all of which significantly raised the opportunity cost of working.

Unemployment benefits were initially provided under the Unemployment Insurance Act of 1911, which extended benefits to 15 percent of the workforce—primarily manual laborers, many of whom were already covered by trade union insurance programs. The benefit level specified in the act was a fixed amount that depended upon age (16–17, 18–20, and over 20) and sex. The benefit was also fairly modest and was eroded by the inflation that took place during World War I. The act also specified a maximum duration of fifteen weeks per year.

Unemployment benefits rose substantially after World War I. This increase was provided through the Out-of-Work Donation, a noncontributory benefit that was available for a short period immediately after World War I, and provided about 47 percent of the average wage in 1918 and 1919, and about 39 percent in 1920. It was intended for returning soldiers but was quickly expanded to cover virtually all adults who registered as unemployed. This was replaced by the Unemployment Insurance Act of 1920, which increased weekly benefits and formally extended coverage to almost all privately employed workers (the main exceptions were agricultural workers and domestics). The 1920 act raised the maximum duration of benefits to twenty-six weeks. This duration limit was not enforced, however, because of high unemployment during 1920: "The contributory basis of the insurance scheme was abandoned within six months of the 1920 Act going into operation" (Deacon 1976, 14). The duration limit was formally abolished in 1928.

Figure 3 shows unemployment benefits measured as the "replacement rate"—the ratio of unemployment benefits (B) for a married worker with two children to the average wage (W) for manual workers (B/W). The replacement rate rises considerably after the 1920 Unemployment Insurance Act and is around 50 percent or higher during much of the interwar period. This replacement rate almost surely understates the effective relative benefit because individuals tend to experience large decreases in their market wage following a layoff. For example, Jacobson, LaLonde, and Sullivan (1993) show that workers who separate from their jobs during periods of high layoffs initially suffer a 45 percent decrease in earnings, and also show that

Figure 3. **Replacement rate**



their earnings remain 25 percent below their previous wage five years later. These statistics suggest that interwar unemployment benefits were roughly comparable to the market wage of displaced workers. This generous unemployment benefits program was expensive, accounting for about 4 percent of GDP in 1930.

In addition to the high level of benefits, other characteristics of the U.K. interwar benefits system significantly changed the incentive to work. We summarize these issues here; Benjamin and Kochin (1979) discuss them in detail. The first is that there was no experience rating: unemployment insurance contributions were independent of workers' and firms' past histories. The second is that benefits were independent of a worker's past wage. This feature significantly changed incentives for low-skill/low-wage workers who tend to have more frequent unemployment spells than high-skill/high-wage workers. The third feature is that benefits could be collected indefinitely and were payable for unemployment spells as short as one day. These features suggest that both moral hazard and adverse selection may have been important. Modern unemployment insurance systems differ significantly along these dimensions precisely because they try to limit the impact of these incentive problems.

While the U.K. unemployment insurance system reduced the incentive to work, benefits varied across demographic groups. In particular, groups with lower benefits tended to have lower unemployment rates. For example, Benjamin and Kochin (1979) document that juveniles—who received lower unemployment benefits—had much lower unemployment rates, and that unemployment among married women fell substantially after the October

Table 9. **Unemployment insurance and the labor market**

Year	Replacement ratio	Unemployment rates		Employment per adult
		Ormerod and Worswick 1982	Feinstein 1972	
1920	0.15	3.9	2.0	0.68
1921–24	0.35	13.3	9.1	0.60
1925–29	0.48	10.9	7.7	0.61
1930–34	0.52	19.2	13.6	0.59
1935–38	0.56	13.1	9.4	0.63
1948–54	0.38–0.43	—	1.3	0.67

Sources: Data for interwar period from Ormerod and Worswick 1982 and from Maki and Spindler 1975; data for post–World War II period from Metcalf, Nickell, and Floros 1982.

1931 Anomalies Regulations significantly raised married women's contributory requirements.

High unemployment compensation, however, is not the whole story behind the U.K. interwar depression. This is because employment recovered to nearly its pre–World War I average in the early 1950s, despite the continuation of high unemployment benefits.[10] Table 9 shows variations in the replacement rate, the unemployment rate, and employment per adult between 1920 and the 1950s.

The replacement rate falls from about 0.56 in the 1930s to about 0.38–0.43 in the 1950s.[11] This suggests that benefits in the 1950s were lower than those in the 1930s but roughly comparable to the average for the 1920s. These data indicate that if unemployment benefits are central, then an additional factor is required for understanding the difference in employment rates between the interwar period and the post–World War II period.

In summary, we find that unemployment benefits rose considerably after World War I and that employment recovered after World War II, despite the continuation of relatively generous benefits. A successful theory of the U.K. interwar macroeconomy requires a general equilibrium that predicts low employment during the interwar period but normal employment during the post–World War II period.

Sectoral Shocks and a Consistent Accounting of the U.K. Economy

Accounting for the U.K. interwar depression requires an additional factor that reduces the incentive to work during the interwar period relative to the post–World War II period. Our hypothesis for this interwar factor is a difference in the severity of sectoral shocks between the periods. We formulated

this hypothesis because large, negative sector-specific shocks hit the United Kingdom after World War I but not after World War II.

Given our hypothesis, we conduct two analyses. The first evaluates the steady-state effects of unemployment benefits without any sectoral shocks. This provides an estimate of the effects of this policy for the post–World War II period, in which there were no major sectoral shocks. Our main finding is that the model predicts a steady-state employment level that is very similar to the post–World War II U.K. employment level. Given this positive finding regarding the role of unemployment benefits, we then discuss our sectoral shock hypothesis in detail and present supporting evidence.

We begin by evaluating the effects of the unemployment subsidy without sectoral shocks. This requires adding the subsidy to the model developed above. We do this by specifying that benefits are financed through lump-sum transfers and are paid proportionately to the fraction of family members who do not work. The representative household therefore maximizes equation (1) subject to the following period budget constraint:

$$w_t e_t + r_t k_t + T_t + s_t(1 - e_t) - c_t - x_t \geq 0.$$

This budget constraint states that wage income $(w_t e_t)$ plus capital income $(r_t k_t)$ plus lump-sum transfers (T_t) plus family unemployment benefits $(s_t(1 - e_t))$ are sufficient to finance consumption (c_t) and investment (x_t).

Unemployment benefits reduce employment in our model by reducing the marginal benefit of working. This lower marginal benefit is clearly seen in the first-order condition:

$$\psi \log(1 - \bar{h}) - \phi = u_{ct}(w_t - s_t).$$

Note that this first-order condition differs from the standard one. In this model, the benefit of working is the difference between the market wage and the unemployment benefit $(w - s)$, compared to the standard model with no subsidy, in which the benefit of working is the full wage.

Estimating the impact of the subsidy requires quantifying the rate of unemployment benefits (s_t). We choose the benefit rate so that in the steady state, the total value of benefits in the model $(s_t(1 - e_t))$ is equal to the total amount of benefits paid in the data, which is about 4 percent of GNP (gross national product). Given this value of the subsidy, it is straightforward to calculate the impact of the subsidy on employment. This is because the steady-state capital-labor ratio is unaffected by the subsidy, which implies that the steady-state wage rate is also unaffected. This in turn implies that the marginal utility of consumption must rise to offset the subsidy. Given

our preference specification of log utility in consumption, and separability between consumption and leisure, it follows that the percentage decrease in the steady-state employment rate is equal to the percentage decrease in the wage, net of the subsidy. Therefore, our model predicts that the observed increase in unemployment benefits reduces steady-state employment about 10 percent, ceteris paribus.

We now use the model to estimate how much employment should have changed after World War II. Note that this requires taking account of both the unemployment subsidy, which tends to reduce employment, and the cut in the length of the workweek, which tends to increase employment. Our model generates a post–World War II employment rate that is very close to the data: 0.68 in the model, compared to 0.67 in the data. This reflects the roughly offsetting effects of the workweek restriction and unemployment benefits. The restricted workweek drives employment up about 10 percent, while unemployment benefits drive employment down by about the same amount. This estimate, reflecting the combined effects of the workweek restriction and unemployment benefits, suggests that the theory has the potential to explain why the employment rate in the 1950s was about the same as it was before World War I.

However, the large difference between interwar and post–World War II employment indicates that benefits are only part of the story. We therefore discuss how large, negative sectoral shocks could have further reduced the incentive to work during the interwar period relative to the post–World War II period. We discuss this possibility in the spirit of Ljungqvist and Sargent (1998).

These authors show how unemployment insurance can lead to changes in unemployment over time because of changes in the marginal value of unemployment benefits. Ljungqvist and Sargent develop a model in which the marginal value of a given level of unemployment benefits depends on the relative volatility of worker productivity. During periods of high volatility, a relatively large fraction of workers receive large, negative productivity shocks, causing them to prefer unemployment to retaining their jobs at a lower wage. The marginal value of unemployment benefits during these periods is thus relatively high. Alternatively, relatively few workers will experience large, negative shocks to their productivity during low-volatility periods. Thus, the marginal value of unemployment benefits during these low-volatility periods is low. Ljungqvist and Sargent argue that this model—together with their estimates of larger, negative shocks in the post-1970 period—can explain why European unemployment was low in the 1950s and 1960s but high after the 1970s, despite the fact that unemployment compensation was about the same in these two periods.

It follows that the Ljungqvist and Sargent theory predicts that unemployment would be higher after World War I than after World War II—despite similar benefit levels—if the variance of shocks to human capital were higher during the earlier period. The data consistent with this view are considerable. In particular, there were large, negative sectoral shocks to British industries immediately after World War I that would be expected to drive down the value-marginal products of the workers in these sectors, and thereby increase the marginal value of unemployment benefits. Moreover, these negative shocks were regionally concentrated, and government-subsidized housing policies that raised the cost of worker relocation raised the marginal value of these benefits even further. We now discuss these post–World War I negative sectoral shocks.

A number of Britain's primary industries—including coal, steel, and textiles—declined significantly after World War I. This decline was primarily caused by large decreases in exports. For example, Alford (1981) notes that coal exports fell almost 70 percent between 1913 and 1921. These reductions in exports are likely due to Britain's loss of comparative advantage in producing these goods. This loss of comparative advantage reflects post–World War I British productivity decreases, postwar productivity growth in competing countries, and higher world trade barriers.

Regarding productivity, labor productivity in the coal industry between 1920 and 1929 was only 3 percent higher than in 1912, after correcting for the 15 percent decrease in the workweek. Alford (1981) argues that productivity decreases were caused by industry conflict. Two major coal strikes took place in 1921 and 1926. After correcting for the shorter post–World War I workweek, labor productivity fell about 25 percent and 38 percent, respectively, relative to its 1912 level, during these two years.[12]

Regarding the effects of trade barriers and foreign competition on British exports, Alford (1981) cites increased competition facing the staples industries and tariff protection, which closed previously open markets. Youngson (1967) cites the loss of Russian markets and competition from Poland for sales to Scandinavia as adversely affecting the coal industry during the 1920s. Youngson also discusses how Britain's textile industry was adversely affected by increased protectionism by China, Japan, and India, and by textile sales from these countries into Britain's other export markets. Aldcroft (1986) notes that cotton textile exports fell by more than 50 percent between 1913 and 1922. These large reductions in export demand suggest that the workers in these sectors suffered negative shocks to their value-marginal productivities.

The contraction of these export markets coincided with high unemployment. Aldcroft (1986) notes that manufacturing, mining, and construction

accounted for about 45 percent of British employment in 1929 but accounted for about 75 percent of all unemployment that year. Table 10 shows that unemployment in a number of industries in these sectors was higher than the aggregate unemployment rate.

Table 10. **Average unemployment rates among insured workers: Selected industries, 1924–29**

Industry	Unemployment rate (%)
Coal mining	15
Iron and steel	21–25*
Shipbuilding	30
Cotton textiles	14
Economy	11

Source: Mitchell and Deane 1962.

*The first number is the average for steel melting and iron pudding, plus iron and steel rolling and forging. The second number is the average for general engineering: engineers' iron and steel founding.

The concentration of unemployment in these declining sectors indicates that the marginal value of unemployment benefits was relatively high during the interwar period for a large fraction of British workers. Another key factor that raised the marginal value of benefits is the regional concentration of the declining industries, combined with government housing subsidies that raised the cost of moving.

Government housing and rent subsidies raised the marginal value of benefits even further by raising the cost to workers of relocating to sectors with better employment opportunities. Many of the declining industries were concentrated in northern England, while the new, growing industries were concentrated in the Midlands. For example, Aldcroft (1986) reports that 1929 unemployment rates ranged from a high of 18.8 percent in Wales, which was dominated by the coal industry, to a low of 3.8 percent in southeast England and London. The 1929 unemployment rate in southern England was 6.4 percent, compared to 12.9 percent unemployment in northern England and Wales.

This concentration of unemployment in the North differs considerably from prewar patterns, in which unemployment was high in London (7.8 percent) and low in Wales and Scotland (3.1 percent and 1.8 percent, respectively). This regional concentration raised the marginal value of unemployment benefits because local housing subsidies raised the costs of relocating from high unemployment regions. Benjamin and Kochin (1979) note that

rent control and housing subsidies were introduced after World War I and that these subsidies were lost once a household relocated.

The combination of large, negative sectoral shocks to Britain's traditional industries, high regional concentration of industry, and low worker mobility suggests that workers experienced large, negative shocks to their wages *and* faced high relocation costs if they moved to regions with better employment opportunities. These factors raised the marginal value of high, permanent unemployment insurance benefits and thus changed the incentives facing workers in these industries. High benefits, low market wages, and high relocation costs could have led some of these workers to prefer unemployment during the interwar period. But while this combination of factors was present during the interwar period, it was not present during the post–World War II period.

A key difference between the two postwar periods is that sectoral shocks appear to be much smaller after World War II. In particular, increased foreign competition, which significantly affected Britain's primary industries after World War I, did not affect British industry after World War II. For example, Broadberry (1997, 13) argues that Britain emerged from World War II highly dependent on its home and Commonwealth producers, and this enabled it to avoid competition with U.S. and German producers until it joined the EEC (European Economic Community) in 1973. These large differences in postwar sectoral shocks between the 1920s and 1950s, along with policies that distorted worker relocation, suggest that the big employment rate differences between the interwar period and the immediate post–World War II period may be consistent with government policies that changed the incentive to work.

Summary and Conclusions

The United Kingdom was depressed for twenty years between the end of World War I and the start of World War II. During this period, output per adult was roughly 20 percent below its pre–World War I trend. This decrease was entirely due to labor input, rather than decreases in productivity or the capital stock. Labor input fell more than 25 percent, reflecting declines in both hours per worker and employment.

Our analysis suggests that Keynes's (1932) views about the importance of Britain's declining export sectors during the interwar period were indeed correct—much of the employment loss in Britain was concentrated in these industries. However, our analysis raises questions about Keynes's views of the causes of Britain's interwar depression. Keynes argued that imperfectly flexible wages, deflation, and an overvalued exchange rate caused Britain's interwar depression. We find that the standard Keynesian monetary/exchange rate explanation of this depression is unconvincing. Most of the decrease in output occurred before the negative monetary and exchange rate shocks,

and the depression lasted much longer than can be reasonably explained by modern monetary business cycle theory. We also investigated the macroeconomic effects of real shocks, including a 15 percent cut in the workweek. The analysis predicts a substantial rise in the employment rate in response to the restricted workweek. This prediction stands in sharp contrast to the actual 11 percent decrease in the interwar employment rate. This finding indicates that the major puzzle about the U.K. Great Depression is the large fall in the employment rate.

The key to understanding the U.K. interwar depression is finding a large, negative persistent shock to labor supply. The theory should account for depressed interwar employment and normal post–World War II employment, despite roughly the same level of unemployment benefits during both periods. We find that the observed level of benefits is consistent with the level of post–World War II U.K. employment. We conclude that the most plausible explanation of the U.K. interwar depression is the combination of generous unemployment benefits, large, negative sectoral shocks, and government policies that raised the cost of worker relocation. The impact of benefits was higher during the interwar period, given the large, negative shocks that hit Britain's export industries immediately after World War I. Benefits were particularly attractive to workers in export industries because they experienced large, negative shocks to their productivities and also faced high costs of leaving depressed regions due to local housing subsidy policies. Our future work will focus on quantitatively analyzing the implications of these shocks for the U.K. interwar period.

Appendix: Data Sources

Unless otherwise specified, data are from Charles Feinstein 1972: *National Income, Expenditure and Output of the United Kingdom 1855–1965*.

Data on the U.S./U.K. nominal exchange rate, the U.K. money stock, and the U.S. GNP deflator are from Friedman and Schwartz 1982: *Monetary Trends in the United States and the United Kingdom*.

Data on labor union membership, number of days lost through disputes, and average hours worked are from Mitchell and Deane 1962: *Abstract of British Historical Statistics*.

Data on nominal hourly wages by employment category are from *British Labor Statistics: Historical Abstract 1886–1968* (1971).

Data on French interwar output are from Mitchell and Deane 1962.

Data on unemployment benefits come from Maki and Spindler 1975: "The Effect of Unemployment Compensation on the Rate of Unemployment in Great Britain."

Data on the monthly retail price index, the wage index, the percentage of insured workers employed and unemployed, and the industrial production index are from Capie and Collins 1983.

World GDP and population data are from Maddison 1995: *Monitoring the World Economy, 1820–1992*. The countries in our measure of world output are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, the United States, Spain, Argentina, Brazil, Chile, and India.

Notes

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1. The source of the data for the rest of the world is Maddison 1995. This is the sum of real outputs in a number of industrialized countries. The appendix describes the countries included in this measure. We divide U.K. output by the adult population. Since this measure is not available for all the countries in our rest-of-the-world category, we divide this measure of output by the total population.

2. The constancy of capital-output ratio follows from the intertemporal optimality condition and the Cobb-Douglas technology. This first-order condition is given by

$$\theta z_{t+1} h\left(\frac{E_{t+1}}{K_{t+1}}\right)^{1-\theta} = \frac{u'(c_t)}{\beta u'(c_{t+1})} - (1-\delta),$$

where the left side is the marginal product of capital. Given the Cobb-Douglas technology, this marginal product is also equal to $\theta Y_{t+1} / K_{t+1}$. With balanced-growth preferences, this equation is constant along the balanced-growth path. Note that in this path, constancy of the marginal product is achieved with capital growing at the same rate as labor-augmenting productivity growth. If TFP grows at rate γ, then labor-augmenting TFP grows at rate $(1+\gamma)^{1/(1-\theta)} - 1$, which is slightly higher.

3. Since there is no annual time series of aggregate hours in the United Kingdom, we have constructed an annual measure. We estimated this measure using data from *British Historical Statistics* (Mitchell and Deane 1962) and using microeconomic data from individual industries. *British Historical Statistics* reports measures of average 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 2,200/year in 1924 and 1937. Annual average hours are 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 labor statistics (*British Labor Statistics*

1971). The occupational data show that hours per week drop sharply between 1918 and 1921. This is consistent with the "eight-hour-day" movement by trade unions and the introduction of paid holidays for manual workers that occurred in this period. To construct an annual hours worked series, we assumed that before the war, annual hours were constant at the 1914 level. We assumed that the drop that was observed between 1913 and 1924 occurred in 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 (2,300/year), we linearly interpolated between these years. We constructed the aggregate measure of hours because there is no consistent annual time series for this variable.

4. The data on the money supply and the deflator are from Friedman and Schwartz 1982.

5. We use the U.S. deflator, since the United States was a major trading partner of the United Kingdom and the data are of relatively high quality.

6. The U.K. price data are from Feinstein 1972. The U.S. deflator is from Friedman and Schwartz 1982.

7. Instead of modeling the fixed cost of working as a parameter of the utility function, it could alternatively be modeled as a resource cost or a time cost. The results are not sensitive to this choice, however.

8. The relative constancy of the pre-WWI and post-WWI U.K. real wage is consistent with the steady-state prediction of our model because the steady-state capital-labor ratio is pinned down in the Euler equation for capital by the household's discount rate and the physical depreciation rate on capital.

9. Benjamin and Kochin (1979) regress unemployment (U) on the ratio of unemployment benefits (B) to the average wage (W) and the deviation of the log output from trend $(\log(Q/Q^*))$. The following are the estimated equation (with *t*-values), along with the R^2 Durbin-Watson statistic and the standard error (SE) of the regression:

$$U = 0.19 + 18.3 * (B/W) - 90.0 * (\log(Q/Q^*)$$

$$(2.64) \quad (4.46) \quad (-8.30)$$

$$R^2 = 0.84, \ \bar{R}^2 = 0.82, \text{D-W} = 2.18, \ \text{SE} = 1.90$$

The *Journal of Political Economy* (1982, Vol. 90, No. 2/April) published four critiques of Benjamin and Kochin's 1979 paper and their reply to the critiques. Other critical discussions include Eichengreen 1987 and Hatton 1994. Cole and Ohanian (2001c) analyze these critiques in detail.

10. Metcalf, Nickell, and Floros (1982) initially pointed out that benefits remained high during the 1950s but that unemployment rates were low. Benjamin and Kochin (1982) responded to this critique by noting changes in the composition of the unemployed and in unemployment reporting. We therefore focus on employment rather than on unemployment.

11. There is a lack of consensus regarding the benefit-wage ratio in the postwar period. Metcalf, Nickell, and Floros (1982) report numbers that are much closer to the interwar level (0.43 for 1951–57 and 0.54 for 1958–65), while Maki and Spindler (1975), using data from the Department of Health and Social Security, report lower numbers.

12. These figures were computed using data in Mitchell and Deane 1962. The data are measured as output per worker. The postwar data are corrected for the 15 percent decrease in the workweek but are not corrected for normal trend productivity growth.

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