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**INTERWAR UNEMPLOYMENT IN THE UK AND US:
OLD AND NEW EVIDENCE**

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Naveen Srinivasan and Pratik Mitra

Abstract

Two contrasting views have dominated research on unemployment during the interwar years. The conventional Keynesian view attributes the persistence of high unemployment in the UK and US during the interwar period to sluggish adjustment of nominal wages to demand shocks. In contrast, equilibrium models of unemployment suggest that the natural rate is itself endogenous, determined by technological, institutional, and demographic factors, and is therefore not necessarily constant over time. According to this view unemployment may remain elevated because some (or all) of the driving forces are persisting. How do we discriminate between these competing explanations? To this end, we estimate a time-varying parameter (TVP) model of the unemployment rate for the UK and US. Kalman filter estimates of the natural rate of unemployment suggest that most macroeconomic activity during the interwar period reflects persistent movements in steady state, not from steady state. We conclude that the observed persistence in unemployment appears to be consistent with multiple equilibria models and models with an endogeneous natural rate.

Keywords: *Interwar Unemployment; Persistence; Natural rate of unemployment; Kalman Filter*

JEL Codes: *E24, J64*

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INTRODUCTION

Double digit unemployment devastated the UK economy for nearly 20 years and the US economy for a decade in the interwar period. The unemployment rate in both these countries reached levels that hitherto had never been experienced in either economy.¹ As Figure 1 shows, in the turbulent years following World War I the unemployment rate in the UK, which had averaged 4 percent during the 20 years before World War I, rose dramatically, averaging 10 percent even during the expansions of the late 1920s and late 1930s.² While the US also experienced a similar jump in the unemployment rate during the 1920s it recovered rather better than the UK. The 1930s presents a very different picture though. Between 1929 and 1933 the unemployment rate in the US soared to 25 percent of the workforce. By 1939, employment and output remained well below their 1929 levels despite the best efforts of the New Deal.³

Why were unemployment rates so high for so long? In the traditional Keynesian model, persistence of high unemployment is the outcome of sluggish adjustment of nominal wages to aggregate demand shocks. If wages possess some degree of nominal inertia then deflation will raise real wages and lower labor demand (see Eichengreen and Sachs (1985), Bernanke and Carey (1996) and Bordo *et. al.* (2000)). Thus, according to this view the high average unemployment experienced during the interwar period can be traced to a very slow speed of

¹ It was the chronic nature of unemployment between the wars which greatly undermined the respectability of the classical theory and was an impelling force behind the development of Keynesian economics. Indeed, as Eichengreen (1987) argues persistent unemployment in the interwar period was the crucible with which the Keynesian view of demand failure was forged.

² The data source is Matthews *et. al.* (2008). A detailed discussion of data is provided in section III of the paper.

³ The experience of mass unemployment in the interwar period greatly affected attitudes towards the economy. It led to rapid relaxation of policy in response to even modest rises in unemployment in the post-war years. This concern to maintain low unemployment regardless of cost was undoubtedly behind the disastrous policies of the 1970s- demand was boosted because unemployment was rising. Inflation, and the prospect of more inflation, was tolerated because it would bring down unemployment.

adjustment toward the steady state following an adverse shock rather than movements in the steady state itself. But why did the process of adjustment to nominal shocks appear to take so long in interwar economies? As Cole and Ohanian (2002, 2004) have pointed out the slow pace of recovery is puzzling, because economic fundamentals improved considerably in the UK in the mid-1920s and in the US after 1933. In the US productivity growth was rapid, liquidity was plentiful, deflation was eliminated, and the banking system was stabilized. With these fundamentals in place, the normal forces of supply, demand, and competition should have produced a robust recovery.

The conventional view that aggregate demand deficiency was the principal cause of unemployment in interwar Britain was first challenged by Benjamin and Kochin (1979) who argued that part of the explanation for the high level of unemployment was due to the generosity of unemployment benefits relative to wages. Their case rests on the assertion that both the level of unemployment insurance benefits and the regulations governing eligibility for such benefits were generous. Such benefits, therefore, reduced the costs of unemployment to the worker, making leisure less expensive as well as hardening the floor through which labor unions would not be prepared to allow wages for the employed to fall. According to this view persistently high unemployment experienced during the interwar period can be traced to endogenous movement of the steady state brought about by changes to labor market institutions.⁴

Identification of the causes of such unemployment persistence is crucial for public policy. If high unemployment is due to hysteresis (high-level of persistence) then shocks to demand would make a permanent

⁴ Benjamin and Kochin's explanation has been hotly contested in the academic literature. See for example the special issue of the *Journal of Political Economy*, Vol. 90, No. 2 (April 1982), devoted to the critics, Broadberry(1986) and Eichengreen (1987).

dent in unemployment.⁵ On the other hand, emphasis should be placed on reforming institutions that alter labour market incentives for workers (i.e., minimum wage, the level and duration of unemployment benefits, taxes, social security payments etc) if most of the rise in unemployment reflects movements in the natural rate.

This paper focuses on the time series properties of unemployment during the interwar period to draw out some of the stylized facts any theory of the Great Depression would have to take into account. We do not estimate any particular model drawn from a well-defined economic theory. Instead, we focus on the time series properties of unemployment rates from a purely statistical point of view.⁶ Having said that, the results we find allows us to discriminate between these competing explanations. To anticipate our findings, our results suggest that most macroeconomic activity during the interwar period reflects movements in steady state, not from steady state. Indeed, movements in the natural rate account for most of the variation in UK and US unemployment rates during the interwar period. We conclude that the observed persistence in unemployment appears to be consistent with multiple equilibria models and models with an endogenous natural rate.⁷

The next section of the paper provides a brief overview of public policy in the UK and US during the interwar period which is followed by a

⁵ Models of unemployment hysteresis assume persistence in the unit root sense and measure the persistence by the sum of coefficients in an autoregressive process with a constant (i.e. time invariant) mean value parameter. For example, Blanchard and Summers (1986) have described the European unemployment experience as hysteresis.

⁶ In this respect the paper builds on Bianchi and Zoega (1998), Phelps and Zoega (1998), Papell *et al.* (2000) and King and Morley (2007).

⁷ Specifically, these models attribute persistence in the natural rate to institutions that alter labour market incentives for workers, such as, minimum wage, the level and duration of unemployment benefits, taxes etc (see Minford (1983) and Layard and Nickell (1986)). There are other classes of endogenous natural rate (equilibrium) models. They suggest that several real shocks and the ensuing adjustments to them (a rise in overseas real interest rates, productivity shock, a rise in welfare entitlements, etc.) shift up the path of the moving natural rate (Phelps and Zoega, 1998). According to this view unemployment may remain elevated because some (or all) of the driving forces are persisting.

discussion of the data, our econometric approach, and our empirical findings. The final section concludes.

A Brief Overview of Public Policy in the UK and US During the Interwar Period

In the period immediately following the World War I, the restoration of the gold standard was the primary objective of British public policy. It was widely believed that the dominance of British industry in the pre-war period and the pre-eminence of London as an international financial center were attributable to price stability engendered by the gold standard regime. The Cunliffe Committee recommended balanced government budgets and increases in the Bank Rate to check a foreign drain of gold in order to create the conditions necessary to the maintenance of an effective gold standard. The Bank Rate was raised from 5 percent in November 1919 to 7 percent in April 1920 and was held at that level for a year. Wholesale prices tumbled, but unemployment soon rocketed from a low of 4 percent in 1920 to over 20 percent in 1921.

With the emergence of large-scale unemployment, the unemployment insurance scheme was substantially overhauled in the UK (see Benjamin and Kochin (1979); Loungani (1991); Cole and Ohanian (2002) and Matthews *et. al.* (2008)).⁸ In a series of steps between 1920 and 1921, coverage was extended to most manual workers, weekly benefits for males were tripled, benefits were instituted for women, the number of contributions that had to be made before claiming benefits was reduced, and the number of weeks for which benefits could be claimed was increased. The Unemployment Insurance Act of 1927 granted all insured workers who had exhausted their standard benefits the right to claim extended benefits for as long as they were unemployed. The only requirement was that claimants had to prove that

⁸ Provision of unemployment insurance had been instituted as early as 1911. However, the provisions extended to only about a quarter of the total male labor force, benefits were fairly low and definitions of eligibility were stringent.

they were genuinely seeking work; but even this requirement was abolished by a 1930 Act. The relaxation of the insurance rules was also accompanied with a continuous increase in the average level of benefit.

Turning to the US, there was no centralised system of unemployment relief at the end of the World War I. Up until the 1930s, unemployment relief was local government based combined with private charitable organisations. The unprecedented unemployment and financial hardship that followed the 'Great Depression' brought forth a considerable expansion of relief activities under newly elected President Roosevelt. The Federal Emergency Relief Administration (FERA) was the centrepiece of the initial relief effort. Its principal aim was to put financial assistance directly into the hands of the unemployed through cash grants and work relief. Recipients of FERA were occasionally required to take part in public works programmes but it was far more commonplace for no work requirements be made. The ensuing expenditures on relief accounted for over two thirds of the 300 percent increase in federal spending from 1932 to 1940, with benefits going to a minimum of three million families each month (Wallis and Benjamin, 1981).

Other New Deal policies violated the most basic economic principles by suppressing competition, and setting prices and wages in many sectors well above their normal levels (see Cole and Ohanian (2004) for further details). For example, the National Industrial Recovery Act (NIRA) permitted industries to collusively raise prices provided that they shared their new-found monopoly rents with workers by substantially raising wages. While the artificially high wages created by the NIRA benefited the few that were fortunate to have a job in those industries, they significantly depressed production and employment, as the growth in wage costs far exceeded productivity growth. When the NIRA was declared unconstitutional in 1935 these measures were continued (and strengthened) under the National Labor Relations Act (NLRA or the Wagner Act), which also gave more bargaining power to

workers than had the NIRA and encouraged faster growth in unions. The NLRA increased labor bargaining power further by permitting unions to use previously unaccepted tactics such as “sit-down” strikes, in which strikers forcibly took over factories and prevented production. Using a DSGE model, Cole and Ohanian (2004) find that the effect of New Deal sponsored ‘cartelisation’ (including both the NIRA and the NLRA) prolonged the Depression by seven years.

EMPIRICAL ANALYSIS

Data

The data for the UK (1887.01-1939.10) is based on two variables Trade Union Members Unemployed (1887.01-1920.12) and Insured Workers Unemployed (1921.01-1939.10), the source being the NBER Macro History Database. These data can be regarded as a single variable as they are based on returns collected by the Board of Trade and the Ministry of Labour from various trade unions which paid unemployment benefits (Matthews *et. al.*, 2008).

The data for the US (1906.06-1942.06) is based on two different variables (1906.06-1933.01; Unemployment of Trade Union Members UT/T , where UT denotes the number of trade union members unemployed and T is the number of trade union members) and (1929.04-1942.; official unemployment rate U/L , where U is the number of unemployed and L is the size of the labour force). All figures are given in percentage terms. The source is from the NBER Macro History Database. To convert the first time series into the official unemployment rate U/L , Matthews *et. al.* (2008) make use of the splicing factor U/UT , which is calculated using the data where the two time series overlap, namely the period 1929.04-1933.01. First, we convert the monthly time series UT/T into UT/L by multiplying it by T/L (Source:- Table -I, Union Membership, 1897-1953, Bernstein (1954)), where only yearly data is available. We therefore make the assumption that union density is constant over the

year. Then to obtain the splicing factor U/UT they take U/L from the second time series (over the period 1929.04-1933.01) and divide it by UT/L. Finally, to obtain U/L they multiply UT/L by the splicing factor and hence convert the first time series into the second one.

Unit Roots in Unemployment

Following standard practice we begin by testing both the series for stationarity. Augmented Dickey-Fuller (ADF) and Phillips and Perron (1988) unit root tests does not reject the null hypothesis of a unit root for both countries at 5 percent significance level. However it is well known that standard unit root test is biased towards non-rejection of the unit root hypothesis if the true data generating process includes breaks in its deterministic components (Perron, 1990). In response, a number of studies have developed different methodologies for endogenizing the break dates in the analysis of unit root (e.g. Zivot and Andrews, 1992). The Zivot and Andrews test (allowing for both a change in the intercept and trend) does not contradict the results obtained from conventional unit root tests, thereby providing evidence for the unit root version of hysteresis in unemployment.

Having said that, there is no economic reason for restricting the analysis to one break. Bai and Perron (1998) develop methods to test for and estimate multiple structural changes. We apply their methods to our non-stationary data.⁹ Figure 2a and 2b plots the unemployment rates along with the mean unemployment rates before the first break and after each subsequent break for both countries. The UK unemployment data is characterized by five structural breaks (1895.08, 1903.07, 1912.04, 1920.12 and 1930.03) while the US data on the other hand has three breaks (1923.08, 1931.01 and 1936.05). This evidence is consistent with the results reported by Matthews *et. al.* (2008) which suggest that the

⁹ Papell *et. al.* (2000) point out that the Bai and Perron procedure is applicable only in cases where regime-wise stationarity has been established. They say that in cases where unit root tests do not provide evidence of regime-wise stationarity the Bai and Perron procedure cannot be used to provide evidence of structural change. Nevertheless, we believe that the results are illustrative.

dynamics of unemployment in both countries during the interwar period exhibit multiple equilibria- one stable low unemployment equilibrium, one stable high unemployment equilibrium and a non-stable intermediate unemployment equilibrium that lies between the two.

Estimating the Time-Varying Natural Rate of Unemployment

Our empirical strategy is to estimate the path of the time-varying natural rate (the mean unemployment rate). To this end, we estimate a reduced-form model for unemployment, treating unemployment rate as an observable variable and the intercept (δ) and persistence parameter (ρ) as unobserved time-varying state variables. We estimate the following *ARMA*(p, q) model:

$$u_t = \delta_t + \sum_{i=1}^p \rho_{it} u_{t-i} + \varepsilon_t + \sum_{j=1}^q \theta_j \varepsilon_{t-j}, \quad (1)$$

$$\delta_t = \delta_{t-1} + \xi_{\delta t} \quad (2)$$

$$\rho_{it} = \rho_{it-1} + \eta_{it} \quad (3)$$

where u_t is the unemployment rate and the order- q moving average (*MA*) error term is motivated by time aggregation as well as other measurement error that could well introduce such a component.¹⁰

The first equation represents the measurement equation and the remaining two equations are transition equations. The disturbances $\xi_{\delta t}$ and η_{it} are serially uncorrelated disturbances with zero mean and constant variances, and are assumed uncorrelated with each other in all time

¹⁰A number of studies have investigated persistence by estimating a reduced-form for the unemployment rate such as Eq. (1) above. For example, Blanchard and Summers (1986) estimated an *ARMA*(1, 1) model for the unemployment rate with constant parameters while Barro (1988) estimated an *AR*(1) model with constant parameters and found high levels of persistence for most of the countries. In contrast, Alogoskoufis and Manning (1988) estimate an *AR*(1) model with both a linear and quadratic trend. Papell *et. al.* (2000) allow for a discrete shift in the intercept, while Bianchi and Zoega (1998) and Phelps and Zoega (1998) estimate Markov switching-regression model to identify the dating of the infrequent shifts in the mean rate of unemployment for OECD countries.

periods. These equations represent a state space form, in which the unknown parameters of the model, including the variance of ξ_t and η_{it} can be estimated jointly by maximum likelihood estimation (MLE) using the Kalman Filter algorithm. Provided with an estimate of the variance of ξ_t and η_{it} the time series of the parameters δ_t and ρ_{it} can be obtained using the Kalman filter.

We use Kalman filter estimates to decide the best-fitting $ARMA(p,q)$ model for each country. Starting with $ARMA(1,0)$ for the measurement equation we first raised the order of MA by one and then that of the AR by one, and so on upwards. We went up to order 2 for AR and order 12 for MA as the information criteria values increased steadily for higher order AR terms.¹¹ We discarded those models where we found evidence of serial correlation in the error terms. Among all the specifications for which errors were not serially correlated the best-fitting $ARMA$ model was chosen. As per this criterion the best-fitting model for the UK and US turned out to be $ARMA(1,4)$ and $ARMA(2,2)$, respectively.

The estimated series ($\hat{\delta}_t$) and ($\hat{\rho}_{it}$) for UK and US is plotted as the solid line in Figure 3(a) and 3(b) respectively, along with two root mean-square error bands (95 percent confidence interval). There are two general points to note. First, the estimates of the intercept and persistence parameter (sum of AR coefficients in the case of the US) show distinctive jumps: in the case of the UK in the beginning of the 1920s and the beginning of the 1930s, the US in the early 1930s. The identified break date for the UK appears to coincide with the evolution of labour market institutions: both the level of unemployment insurance benefits and the regulations governing eligibility for such benefits became much more generous during this period. These developments were either more muted or totally absent in the US in the 1920s. But policies under the New Deal such as FERA brought forth a considerable expansion of

¹¹ The Schwartz Information Criterion (SIC), Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQC) were used to determine the model with the best fit.

relief activities in the 1930s. Other New Deal policies such as NIRA which permitted industries to collude and NLRA which gave more bargaining power to workers and encouraged faster growth in unions led to growing labour market rigidity in the US. Second, and perhaps more importantly, the persistence estimates obtained conditional on an intercept shift are clearly below one for both countries. Thus, the unit root hysteresis hypothesis can be resoundingly rejected in the case of both countries.

Figure 4(a) and 4(b) plots our estimates of the natural rate, $E(u) = (\delta_t / 1 - \sum_{i=1}^p \rho_{it})$, alongside the actual unemployment rate for both countries.¹² There are two general points to note. First, the moving natural rate model tracks the actual unemployment path quite well. The rise in the natural rate occurred in the UK in the beginning of the 1920s and the beginning of the 1930s and in the US in the early 1930s, about the same time as the possible regime change discussed above. However, the estimate of the top equilibrium rate of unemployment for the UK of 37 percent in 1921, is harder to explain. In this regard we would like to point out that results for the UK do differ qualitatively if one allows for additional *MA* components. Figure 5 plots our estimates of the natural rate (alongside the actual unemployment rate) based on ARMA(1,7) model. The model does a much better job in tracking the evolution of UK unemployment during the interwar period. The estimate of the equilibrium rate of unemployment in 1921 drops to 27 percent. Second, the estimated natural rate leads the actual unemployment rate over the business cycle, which is inconsistent with the hysteresis view. On the basis of our results it appears that possibly a large part of the rise in unemployment in the UK and US can be attributed to a rise in the natural rate.

¹² The error bands (derived using the delta method) around the estimated natural rate are not plotted to avoid visual clustering. The bands were sufficiently wide suggesting considerable uncertainty surrounding these estimates.

Our findings are consistent with Benjamin and Kochin (1979) and Matthews *et. al.* (2008) who also attribute the interwar unemployment experience to a steady rise in the natural rate. It also accords well with King and Morley (2007) who find that fluctuations in the natural rate explain the bulk of variation in the post-War US unemployment rate. Their estimates of the natural rate ranges between 1.8 percent and 9.5 percent over a fifty year period which suggest that the natural rate is quite volatile and support the idea that most macroeconomic activity reflects movements in long-run equilibrium, not from equilibrium. The findings seem to suggest that a further look at the determinants of the natural rate in interwar economies might be worthwhile. Part of the solution to the persistence puzzle may lie in these.

CONCLUSION

The persistently high level of unemployment experienced by the UK and the US during the interwar period greatly undermined the respectability of the classical theory and was an impelling force behind the development of Keynesian economics. Traditionally, economists after Keynes have attributed persistently high unemployment to sluggish adjustment of nominal wages to aggregate demand shocks. Although output prices fell, various economic, legal, and institutional factors kept nominal wages from falling in tandem to restore full employment. The upshot was high involuntary unemployment, which remained high until reduced by the insatiable demands of a wartime economy in the early 1940s. In contrast, equilibrium theories attribute the persistence to movements in the natural rate. They suggest that several real shocks and the ensuing adjustments to them (a rise in overseas real interest rates, productivity shock, a rise in welfare entitlements, etc.) shift up the path of the moving natural rate. According to this view unemployment may remain elevated because some (or all) of the driving forces are persisting.

The question arises how one can empirically discriminate between these competing explanations. To this end, we estimate a time-varying parameter (TVP) model of the unemployment rate for the UK and US. The parameters of the model were estimated jointly by maximum likelihood estimation using the Kalman filter algorithm. When the moving natural rate model is tested against the alternative of a unit root process, the unit root hypothesis is resoundingly rejected. Specifically, our estimates of the natural rate suggest that most macroeconomic activity during the interwar period reflects persistent movements in steady state, not from steady state. The identified break dates appears to coincide with shifts in the natural rate fundamentals. The combination of these two factors is more consistent with endogenous natural rate models and models with multiple unemployment equilibria than with the traditional Keynesian explanation (where the natural rate is constant) or with the unit root hysteresis theories.

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Figure 1: UK and US Unemployment Rates, 1887-1942

Figure 2: Multiple Structural Changes in Unemployment

Figure 3: Estimates of Time-Varying Intercept and Slope Coefficient

Figure 4: Time-varying Estimates of the Natural Rate Along with Actual Unemployment Rate for the UK and US

Figure 5: UK Natural Rate Estimates Based on ARMA(1,7) Model

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