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IS MISMATCH REALLY THE PROBLEM? SOME ESTIMATES OF THE CHELWOOD GATE II MODEL WITH US DATA

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Abstract

Estimates of the Chelwood Gate II model with postwar US data are reported. The results are strikingly similar to current work on Western European economies. In particular, our estimates imply a modest increase in the degree of mismatch or structural imbalance over the last ten years in the United States. The robustness of these results and the constancy of the estimated natural rate of unemployment over the sample period suggest that microeconomic "tension" across submarkets in the Lambert (1987) framework may play only a limited role in accounting for the divergent behavior of European and US unemployment rates.

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The United States has a potentially large contribution to make towards understanding the stubborn rise of European unemployment rates over the past fifteen years. As Figure 1 illustrates, unemployment in the US has fallen more or less continuously from 10.8% of the labor force in November 1982 to 5.2% in June 1988, its lowest level since May 1974. The gentle acceleration of inflation in recent months has already prompted a tighter monetary policy stance by the Federal Reserve. In contrast to Europe, there is little evidence of a sustained rise in the natural or equilibrium rate of unemployment since the 1960s. The motivation for including the United States in the European Unemployment Programme was the view that the markedly different labor market performance of the US should provide power to discriminate among alternative explanations of high employment, which in the Chelwood Gate II framework can be due to deficient demand, capacity shortage, adverse movements in labor supply, or an increase in tension or heterogeneity across micromarkets.

This paper reports estimates of a variant of the aggregate Chelwood Gate II model with postwar US data. At a general level, our findings are encouragingly similar to those for other Western European economies. For example, we find a significant and large "spillover effect" of capacity utilization on imports, controlling for the influence of income. Estimates for the US economy also imply a modest but robust increase in the degree of structural mismatch over the last ten years. The constancy of the estimated natural rate of unemployment however suggests that microeconomic "tension" across submarkets in the Lambert (1987) framework may play only a limited role in accounting for divergent behavior of European and US unemployment rates. The most evident difference seems to be the lack of trend in estimated US regime proportions over the sample period, lending more credibility to deficient demand, capital shortage, and labor supply explanations of Europe's disappointing labor market performance.

The presentation proceeds as follows. Section 1 briefly discusses the US labor market "miracle" of the past two decades. A broad outline of the aggregate disequilibrium approach and the model's econometric implementation comprise Section 2. The estimation results are presented in Section 3, and the computation of mismatch, proportions, and equilibrium unemployment rates are the subject of Section 4. Section 5 concludes the paper with a general discussion of tentative lessons than might be gleaned from the US experience.

I . The Background: The US "Employment Miracle"

The employment performance of the United States economy has often been characterized in hyperbole, yet by any standard it is remarkable just how many individuals seeking work have been absorbed by US labor markets over the past two decades. Since 1970, employment in the United States has increased by more than 35 million jobs, roughly one-quarter of the non-institutional civilian population.[1] High labor force growth in the 1970s (2.6% per annum), which has been linked to both the maturation of the baby-boom generation and the well-documented influx of women and minorities into the workforce, was considerably higher than in previous decades (1.1% and

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1. Manfred Wegner (1983) was one of the first to apply the term "employment miracle" to the United States experience.

1.7% in the 1950s and 1960s, respectively). Remarkably, growth in total employment in the 1970s roughly moved in tow at 2.4%, much higher than the 1.9% average growth of the previous decade. A symmetric phenomenon occurs in the 1980s: slower growth in labor force participation rates has contributed to a decline in labor force growth (1.8%), and employment growth has also slowed considerably (1.6%). In stark contrast, most of the large European economies have not matched labor force growth with jobs. Total employment in OECD Europe since 1970 has been flat (0.2% annual growth) while the labor force continues to expand at a 0.8% clip; it is not surprising that the unemployment rate averaged over the cycle has risen from 2-3% in the early 1970s to well over 10% in recent years.

The plight of the long-term unemployed in the United States seems to have improved dramatically in the past two years, in marked contrast to the European experience (OECD, 1987). Most recently, the number of unemployed in the United States in long-term unemployment (US definition: more than fifteen weeks) has dropped by about 550,000 since mid-1987, or roughly 25%. The resurgence of high-wage export industries (real exports grew at a 20% annual rate over the year ending in Q2:1988, real durables exports by almost 33%) has probably led to the reemployment of many workers experiencing long-term joblessness. The unemployment rate among those reporting a durables manufacturing job as last employment, which had hovered between 6.5% and 8.0% between January 1984 and March 1987, dropped as low as 4.4% in June 1988. The picture for the unemployed of longest duration (more than 26 weeks) has improved the least: they represented 0.67% of the labor force in August 1988, no less than they did in the early months of 1980. Thus while evidence on inflow and outflow rates indicates that average escape probabilities from unemployment have fallen slightly, variation in inflow rates may have been much more important in contributing to any rise in "normal unemployment" over the past fifteen years (Darby, Haltiwanger, and Plant 1986).[2] The lack of a European-style trend in the share of long-term unemployment in Figure 2 supports this assessment.

The miracle has not been without cost. Aggregate real (CPI deflated) wages in 1985 stood below 1978 levels, although the recent decline in oil prices and increased imports from newly industrialized countries have allowed them to rise at an average 1.2% rate in the 1980s (Figure 3).[3] Slow aggregate wage growth also masks a significant increase in wage dispersion across one-digit industries (Burda and Sachs 1988), meaning that real compensation in some service industries has declined significantly. Per-worker productivity for the aggregate non-farm economy has grown at only 0.3% per annum since OPEC I, compared with 1.55% for the period 1960-73. The current recovery has been characterized by a pickup in productivity growth (1.3% from 1984-1987) which is dominated by manufacturing (5.1% from 1984-1986), where the lean years of the high dollar have kept employment roughly constant since 1980.[4]

Another dark side of the "employment miracle" is the continuing US fiscal deficit, which has remained stubbornly large despite the economy's proximity to whatever "high" or "full" employment actually is (see Figure

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2. In contrast, Pissarides (1986) reports significant decreases in outflow rates in the UK. See Flanagan (1987) for evidence on other European countries.
3. The aggregate hourly earnings measure considered here includes all forms of compensation, including overtime, fringe benefits, sick leave, and health and social insurance contributions of both employer and employee.
4. Since January 1987, however, manufacturing employment has surged by roughly 700,000 to levels of mid-1984.

4). Central to the controversy is the link between the federal budget deficit and the current account. For given private savings and investment behavior, the national income identity implies that an increase in the government budget deficit will correspond to a deterioration of the current account. While foreign financing of the deficit was probably facilitated by the tax cuts, considerable concern has arisen that continued national dissaving on such a large scale (about $150 billion in 1987) will ultimately lead to large foreign indebtedness and/or the "great American selloff" of national assets. Others have argued that the current account deficit reflects productive investment and durable goods purchases, which properly measured would show less consumption and more private sector saving.

The role of the fiscal expansion in the current account deficit is one of several issues the model below may illuminate. Capacity utilization rates, which are plotted for key industrial sectors in Figure 5, have risen sharply. Can the model explain why imports continue to be strong despite a low dollar, i.e. via the so-called spillover effect? Has the fiscal expansion represented an increase in aggregate demand? Is there also a capital shortage in the United States, as some have argued for Europe? Is there evidence for state dependence in unemployment rates, i.e. that changes in unemployment influence the natural rate? Finally what are the most evident differences between the United States and Europe?

II. The Theoretical Model and its Econometric Specification

The great disappointment of the disequilibrium models of the last decade (Barro and Grossman 1971, Malinvaud 1977, Muellbauer and Portes 1978, and many others) was the difficulty with which they could be empirically implemented. First, the arbitrariness of the fixed-price assumption was compounded by equally arbitrary price adjustment mechanisms. Second, one is hard-pressed to identify empirically the discontinuity with which economies switch "regimes" in comparative statics exercises. It is thus not surprising that the paradigm model is often regarded (especially in US circles) as more relevant for Poland or the German Democratic Republic than for the industrialized capitalist economies.

This notwithstanding, the European Unemployment Programme has decided to adopt the Chelwood Gate II framework in light of two important innovations. The first is the monopolistic competition models of wage and price setting set out, for example, in Blanchard (1986a, 1988) or the London School of Economics in numerous papers (e.g. Newell and Symons 1985, Layard and Nickell 1986), and most recently summarized by Ball, Mankiw and Romer (1988). The central insight of this "neo-Keynesian" approach is that small costs of changing prices may lead to price inertia at the firm or worker level, which in turn has large impact on the way the macroeconomy responds to aggregate demand disturbances. The investigation of these models has been stimulated by recent advances in the econometrics of cointegration (Engle and Granger 1987), which allow imposition of long run equilibrium conditions (stationarity restrictions on linear combinations of fundamentally nonstationary time series), while leaving short run dynamics relatively unconstrained.

The second advance is Lambert's (1987) aggregation theorem for mixed disequilibrium models, in which different regimes can exist simultaneously in different submarkets. Under certain assumptions on the distribution of "submarkets" across regimes, observed employment (LT) is no longer the minimum of effective labor demand (LD), notional or "capacity" labor demand given factor prices and capital stock (LC), and potential labor supply (LS), but a CES function of the three:

$$LT = [LC^{-\rho} + LD^{-\rho} + LS^{-\rho}]^{-1/\rho}. \quad (1)$$

Here ρ, which is constrained to be strictly positive, parametrizes the "tension" or mismatch across submarkets; the minimum condition obtains as the limiting case as mismatch disappears ($\rho \to \infty$). Unlike previous work, the Lambert approach allows all three regimes to exist simultaneously with the striking implication that a relaxation of the minimum of the three will not increase transacted employment pari passu, but by an elasticity equal to the fraction of markets in that regime. Thus, in the Chelwood Gate II model, which adopts the Lambert framework, there are decreasing returns with respect to the relaxation of aggregate demand, capacity and labor supply constraints.[5]

The strategy of the European Unemployment Programme is to use a common framework to estimate, track and compare LD, LC, and LS, the evolution of "mismatch" over time, the behavior of investment, and in addition, wage and price behavior across many countries. Proceeding under putty-clay assumptions, capacity employment at any point in time is defined as $LC = A^{-1}BK$, where K is the measured real capital stock, A is the technical coefficient for labor (adjusted for labor utilization or labor hoarding),

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5. The interested reader is referred to Lambert (1987) and Sneesens and Dreze (1986) for a complete treatment of the aggregate disequilibrium model and its empirical implementation.

and B is the technical coefficient for labor (adjusted for capacity utilization). The consensus approach has been to estimate these technical coefficients from regressions of average factor productivities on their neoclassical determinants, with due attention to factor utilization. The demand-determined employment level LD equals the product of an estimate of aggregate demand YD and the (adjusted) estimated labor technical coefficient. In theory, identification of aggregate demand is made possible through spillover effects of aggregate demand on imports and exports predicted by the model; consumers divert demand abroad as they are increasingly rationed at home. Demand-determined employment is then estimated as the employment level that would obtain if imports were at their "notional" levels; that is, if all imports resulting from domestic rationing were instead actually produced at home. Finally, under an assumption of inelastic labor supply, LS is simply the measured national labor force.

The common framework discussed below can be conveniently described in terms of three blocks: a production block, a trade block, and a wage/price block. Estimates of key parameters will enable the construction of the demand and capacity-constrained employment series, the evolution of mismatch over time, and the implied proportions of markets in each regime. Moreover, one can use the constructed series to compute the "structural unemployment rate in equilibrium" (SURE) which obtains when LC=LD=LS, or when $U=1-LT/LS=1-3^{-1/\rho}$. The wage and markup equations allow estimation of the NAIRU, the unemployment rate under steady state conditions, _inter alia_, when inflation rate is constant. The econometric implementation of the model follows other country studies fairly closely, and relies extensively on error correction parametrizations, which allow flexible dynamic structures while imposing some long-run conditions on the model. In the discussion below, we address more specifically the long-run relationships embedded in the equations.

Technical Coefficients

A putty-clay specification implies that at any point in time, output is produced according to a fixed coefficient (Ricardo/Marx/Leontief) technology; over time, these fixed coefficients are governed by a smooth neoclassical production function and respond to the usual stimuli: wages, the rental cost of capital, and technical progress. For the US, the Cobb-Douglas specification is probably not a bad approximation for the aggregate economy. National accounts data show that the labor share in non-farm GDP --appropriately adjusted for self-employment-- has been roughly constant since the early 1950s (see Figure 6) while the non-residential gross capital-output ratio has fluctuated widely from 1.5 to 1.9 over the same period, falling secularly until the mid 1960's, when it began rising again.[6]

Under cost minimization subject to Cobb-Douglas technology with constant returns to scale, the optimal output-capital and output-labor ratios are functions of the relative price of labor and capital services as well as the evolution of technical progress. At the same time, observed productivities YT/LT and YT/K will normally deviate over the cycle from values predicted by neoclassical theory if there is underutilization of

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6. Recall that constant labor share is consistent with non-unitary elasticities of substitution only along a constant capital-output growth path.

observed inputs. Capital is underutilized if factories are operating at lower than normal levels of capacity; labor may be hoarded over the cycle if there are fixed costs (training, search, etc) and if firms are output-constrained or have market power. Thus one would expect the Cobb-Douglas relationship to obtain only at normal levels of labor inputs and historically high levels of capacity.

This relationship was embedded in the following flexible specification:

$$\Delta(yt-lt-\beta DUL)_t = a_0 + a_1\Delta(yt-lt-\beta DUL)_{t-1} + a_2(yt-lt-\beta DUL)_{t-1} + a_3\omega_{t-1} + a_4\Delta\omega_{t-1} + a_5 t + a_6 t74 \quad (2)$$

$$\Delta(yt-k-\gamma DUC)_t = b_0 + b_1\Delta(yt-k-\gamma DUC)_{t-1} + b_2(yt-k-\gamma DUC)_{t-1} + b_3\omega_{t-1} + b_4\Delta\omega_{t-1} + b_5 t + b_6 t74 \quad (3)$$

where YT and LT are transacted output and employment in man-hours, K is the capital stock, Ω is the wage/user cost of capital ratio, t and t74 are a time trend and a time trend beginning in 1974. DUC is the rate of capacity utilization and DUL a measure of labor utilization. As throughout this volume, small letters denote natural logarithms. These equations can be interpreted as an error-correction model for the equilibrium factor productivities when the underlying technology has the Cobb-Douglas specification. Long-run equilibrium is given by setting Δ's to zero and DUC and DUL to arbitrary values, in which case the labor share parameter could be estimated as $-(1-a_3)/a_2$ or b_3/b_2. Technical progress is proxied by a time trend plus a time trend shift in 1974, and the estimated rate of change will be $-a_5/a_2$ or $-b_5/b_2$. Clearly, the Cobb-Douglas assumption will imply several cross equation restrictions that should be tested, if not actually imposed, at the estimation stage.

Investment

The evolution of real gross increments to the capital stock is captured by the investment equation. Success in estimating investment equations has been notoriously spotty with US data, as variables which neoclassical theory predicts should matter generally do not.[7] Why these models are rejected may be as much an artifact of errors-in-variables as misspecification. The cointegration approach is followed here: we let theory guide our choice of candidates for an error-correction relationship but retain a flexible misspecification.

Two obvious candidates for cointegration are investment and GDP. Intuitively, some fraction of output produced by residents in domestic production must be diverted towards maintenance of productive capacity. While volatile, the share of gross private domestic investment in US GDP has shown no trend, averaging about 16% since since World War II. In contrast, investment and Tobin's q--the ratio of the market value of capital to its replacement cost-- will not be cointegrated since most theories of investment under constant returns in production and adjustment technology predict it to be a stationary series, while investment levels appear

7. This point was first made by Bischoff (1971) and later by Clark (1979). More modern approaches, i.e. Euler equation techniques (Shapiro 1986) have had limited success, although overidentifying restrictions implied by the theory are almost always rejected and adjustment costs are generally imprecisely estimated.

nonstationary. On the other hand the level or changes in q may still have important effects on short run dynamics, exactly as predicted by modern theories of investment in which Tobin's q proxies for the shadow value of an additional unit of capital in place.

The specification we estimate is:

$$\Delta i_t = p_0 + p_1\Delta i_{t-1} + p_2\Delta i_{t-2} + p_3\Delta i_{t-3} + p_4\Delta q_{t-1} + p_5\Delta \pi_{t-1} + p_6\Delta yt_{-1} + p_7\Delta DUC_{t-1} + p_8 i_{t-1} + p_9 yt_{t-1} \quad (4)$$

where I is real gross investment, Q is the ratio of stock market value to the implicit GNP deflator for investment, and Π is real corporate profits.

The Trade Block

The trade block similarly embodies a long-run relationship of among (possibly) nonstationary variables in an error-correction framework:

$$\Delta(x-\alpha_1 DUC)_t = a_0 + a_1\Delta(x-\alpha_1 DUC)_{t-1} + a_2(x-\alpha_1 DUC)_{t-1} + a_3(px-pw)_{t-1} + a_4\Delta(px-pw)_{t-1} + a_5 wt_{t-1} + a_6\Delta wt_t \quad (5)$$

$$\Delta(m-\alpha_2 DUC)_t = b_0 + b_1\Delta(m-\alpha_2 DUC)_{t-1} + b_2(m-\alpha_2 DUC)_{t-1} + b_3(pm-p)_{t-1} + b_4\Delta(pm-p)_{t-1} + b_5 yt_{t-1} + b_6\Delta yt_{t-1} \quad (6)$$

where M and X are real imports and exports with log deflators PM and PX, respectively; PW is the price index of industrial countries' exports, WT is an index of world trade, and YT is transacted output. As discussed above, the presence of the capacity variable should capture spillover effects of domestic aggregate demand. If consumers are rationed at home, they may import more than that predicted by notional demands; if producers are rationed, they may "dump" their output on the world market.

Wage/Price Block

Rather than an expectations-augmented Phillips curve, the following "battle of the markups" framework common to most other country studies was employed. The evolution of real wages is characterized by:

$$\Delta(w-p)_t = f_0 + f_1\Delta(w-p)_{t-1} + f_2(w-p)_{t-1} + f_3U_{t-1} + f_4\Delta U_{t-1} + f_5 wedge_{t-1} + f_6D_{t-1} + f_7\Delta^2 p_t + f_8 t \quad (7)$$

The long-run relationship incorporated in (7) relates the level of log real product wages to the unemployment rate (negatively), the logarithm of the wedge--defined here as (PM/P) -- (sign uncertain), demographic or other wage push factors represented by D, and the evolution of long term productivity, proxied here by a time trend. The speed of adjustment to the new equilibrium will be related to the size of f_2, which should be negative; a large (absolute) value will imply rapid adjustment to changes in the underlying determinants of W/P.

The evolution of the aggregate markup is modeled as a function of capacity utilization, the import price wedge, "wage surprises," and time:

$$\Delta(p-w)_t = g_0 + g_1\Delta(p-w)_{t-1} + g_2(p-w)_{t-1} + g_3DUC_{t-1} + g_5 wedge_{t-1} + g_7\Delta^2 w_t + g_8 t. \quad (8)$$

WEDGE will appear in the markup equation unless the production function is separable in value-added and materials (imports); in general, an increase in materials prices will induce changes in the relative marginal products of K and L and thus affect the price markup. [8]

Note that this specification allows for nominal rigidities to influence the dynamics of real wages and markup through the Δ^2 terms. A large (absolute) value of f_7 would signal nominal wage rigidities and real effects of unanticipated inflation. A large (absolute) value of g_7 would reflect similar effects of increases in nominal wage growth on the markup. On the other hand, the persistence of the real wage (and markup) over time is captured in f_2 and g_2; larger (absolute) values imply more rapid response to changes in its long run determinants. Real wage rigidity in the sense of Grubb, Layard, and Jackman (1983) or Coe and Gagliardi (1985), in which real wages are unresponsive to labor market conditions, may obtain in the short run either because f_2 or f_3 are small. Hysteresis or state dependence of the natural rate is implied if $f_3 = 0$ and $f_4 \neq 0$.

The two equations are estimated jointly. The NAIRU (U^N) and real product wage level (w-p) will constitute a solution of the system when $\Delta(w-p)=\Delta(p-w)=\Delta^2 w=\Delta^2 p= \Delta U = 0$, and DUC is set to some average value $\overline{DUC}$:

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8. For example, if energy and capital are complements in production, an increase in oil prices will reduce capital intensity and the marginal product of labor and thus increase marginal cost.

$$w\text{-}p = (1/g_2)\ (g_0 + g_3\bar{D}\bar{U}\bar{C} + g_5\ \text{wedge} + g_6 D + g_8 t) \tag{9}$$

$$U^N = (-1/f_2)\ [(f_0 + f_2 g_0/g_2) + g_3\bar{D}\bar{U}\bar{C} + (f_5 + f_2 g_5/g_2)\ \text{wedge} + f_6 D + (f_8 + f_2 g_8/g_2)t)] \tag{10}$$

The restrictions $f_5 = -f_2 g_5/g_2$, $f_6 = -f_2 g_6/g_2$, and $f_8 = -f_2 g_8/g_2$ might thus correspond to the null hypothesis of neutrality of WEDGE, D, and the time trend with respect to the NAIRU.

III. Econometric Results

Equations (2)-(8) were estimated for postwar annual US data, described in detail in this chapter's appendix. Whenever possible we have conformed to the consensus of the European Unemployment Programme.

The Productivity Block

Equations (2) and (3) were estimated jointly by nonlinear least squares with instrumental variables to exploit potential covariance of the disturbances. Since actual estimation included current DUC and DUL on the right hand side, an IV procedure was necessary to purge these of joint endogeneity with yt-lt and yt-k, as well as measurement error. The former may arise if productivity shocks induce contemporaneous responses in factor utilization. The latter is perforce present since DUC is a survey result and DUL is the (log) average workweek in manufacturing only. Current and two lags of real government spending and real exports, relatively uncontroversial "aggregate demand shifters," served as additional instruments. The results are presented in Tables 1 and 2.

The most striking and perhaps least surprising of all the results is the economic and statistical significance of β and γ, the responses of average factor productivities to factor utilization. An increase of the manufacturing workweek (which has no significant trend in US data) of 1% implies a 0.59% response of average labor productivity, ceteris paribus; a one percentage point increase in capacity utilization is associated with a 0.43% increase in average output per unit of capital. The implied speed of adjustment is remarkably slow: each year, labor productivity adjusts by only about 12% to its implied long-run equilibrium (15% for capital productivity). The inferred Cobb-Douglas capital share parameter from the labor productivity equation is somewhat low at 0.15 (a comparable figure from the capital productivity equation is not computable since b_3 was estimated positive, albeit imprecisely). Technical progress is estimated at 1.98% per annum in the labor productivity equation but only 0.39% in the corresponding equation for capital. Much closer are the estimated shifts in 1974, of 0.36% and 0.30%, respectively. Not surprisingly, the cross-equation restrictions on the long-run relationship between average productivities and factor prices implied by Cobb-Douglas production were rejected by the data ($\chi^2(3)=16.75$). These restrictions are: the response of log capital productivity to ω is equal to the corresponding response of labor productivity minus one; the rate of technical progress is equal in the two equations, and the shift in technical progress is equal in the two equations. We suspect the rejection may be a function of our modelling of technical progress as well as the quality of the relative factor price variable. Although the restrictions were not imposed to obtain estimates of β and γ, it should be noted that these two crucial parameter estimates were virtually unchanged across the two specifications.

Investment

The relatively unconstrained specification (4) yielded strong confirmation of the conjectures in the last section. The estimates for p_8 and p_9 are consistent with the cointegration of log real GDP and log real gross investment, as would be implied if investment were a constant fraction of value added produced by residents domestically.[9] Such an error-correction specification allows expression of the well-recognized accelerator effect, as the high coefficients on the levels of YT and I imply rapid response to deviations from the cointegrating relationship.[10] In addition, changes in YT were significant. Whereas the level of real share prices and real corporate profits are insignificant in unreported regressions, changes in these variables had significant and positive influences on the dynamics of investment behavior. One paradoxical result is the significant negative effect of changes in capacity utilization on investment dynamics.

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9. Simple cointegrating regression Durbin-Watson tests easily rejected the null of no cointegration of i and yt (D.W. = 1.54). See Engle and Granger (1987).

10. Fast response of the US manufacturing capital stock to changes in factor prices (implicitly, marginal q) is also a central finding of Shapiro (1986).

The Trade Block

The equations of the trade block (5) and (6) were estimated separately by nonlinear least squares. As with the productivity equations, measurement error and joint endogeneity of DUC with exports and imports necessitated the use of instrumental variables. The results may be found in Tables 4 and 5. Most noteworthy is the significance of $\hat{\alpha}_2$, which parametrizes the "spillover effect" of rationed domestic demand on imports. The result implies a 1.4% increase in imports for every percentage point increase in capacity utilization, controlling for income. As noted above, this has been a systematic finding for the European economies in the Programme. While $\hat{\alpha}_1$ was of correct sign in the export equation, it was not significant and was subsequently set to zero in constructing the demand-determined employment series.

The coefficient on relative export prices was significant and negative; the estimated long-run elasticity of exports with respect to the terms of trade is 1.58. In contrast, real imports show no statistically significant price sensitivity, even with the inclusion of several lagged first differences. The two equations suggest that the deterioration of the trade balance in the US during the early 1980s was a combination of rising domestic income and spillovers due to the fiscal expansion as well as to the deterioration of competitiveness, rather than merely the latter as stressed by Krugman and Baldwin (1987). The spillover effects represent an important additional channel by which rapid growth is translated into increased imports.

Finally, the implied speed of adjustment to equilibrium inferred from estimates of c_2 and d_2 is strikingly different for exports and imports. Exports adjust by 38% of the implied disequilibrium each period, compared with only 21% in the import equation. We thus have a ready explanation for "J-curve" responses of the dollar-denominated current account deficit to nominal exchange rate changes.

The Wage/Price Block

The wage-price block was estimated jointly by nonlinear least squares with instrumental variables for the period 1955-1986, and the results are reported in Table 6. Not reported are estimated coefficients on so-called "Gordon dummies" for each year from 1972 to 1975 inclusive, which were collectively and often individually significant[11]. Current, once, and twice-lagged real government spending and the current value of the import price deflator served as additional instruments. For D we chose the fraction of total population aged 20-35 years, which, while significant in the first differences in the separately estimated wage equation, entered the system insignificantly. Efforts to include other shift variables in the wage equation such as SURE, the variance of one-digit SIC employment growth rates, the effective minimum wage/average earnings rate, employer and employee tax rates, lagged actual labor productivity, the capital-labor ratio and shifts in the time trend were unsuccessful.

While the wedge, price surprise, and trend terms are significant in the wage equation with the expected signs, unemployment is only marginally

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11. See Blanchard (1986b, 1987).

significant. Blanchard (1986b) has also documented only weak links from real activity to wages in quarterly US data. We do, however, find a significant negative effect of capacity utilization on equilibrium markup: the estimates imply that a 1% point increase in capacity utilization is ultimately associated with a 0,53% decrease in the markup. This result is consistent with either average cost pricing in the presence of fixed costs, procyclical elasticity of demand (see, for example Bils 1987) or breakdown of oligopolistic pricing during booms (Rotemberg and Saloner 1986). The estimated effect of the (import) price wedge in the wage equation is negative[12]. In general, results imply that the real product wage reflects productivity growth, and that movements in relative prices of imports are borne by wage earners as implied by a long-run inelastic supply of labor (Newell and Symons 1985). We could not reject the joint neutrality of productivity (proxied by the time trend), and WEDGE on the evolution of the NAIRU ($f_5=-f_2g_5/g_2$, and $f_8=-f_2g_8/g_2$) with $\chi^2(2)= 0.61$.

The strong effect of $\Delta^2 P$ in the wage equation is consistent with other findings of significant nominal rigidities in the United States (Poterba, Rotemberg and Summers 1986, Blanchard 1987), and lends support to the view that US real wages may be influenced by movements in the price level (Sachs 1979, 1983). At the same time, US real wages are "rigid" in that these effects are persistent over time. It is informative to compare our estimates with earlier results of Gavosto and Bean (1987) for the UK; they

12. A. Oswald and D. Carruth have found similar effects in unpublished time series work with UK quarterly data. Unlike many European countries, there was no significant effect of the difference in the (log) wedge in our sample.

significant. Blanchard (1986b) has also documented only weak links from real activity to wages in quarterly US data. We do, however, find a significant negative effect of capacity utilization on equilibrium markup: the estimates imply that a 1% point increase in capacity utilization is ultimately associated with a 0,53% decrease in the markup. This result is consistent with either average cost pricing in the presence of fixed costs, procyclical elasticity of demand (see, for example Bils 1987) or breakdown of oligopolistic pricing during booms (Rotemberg and Saloner 1986). The estimated effect of the (import) price wedge in the wage equation is negative[12]. In general, results imply that the real product wage reflects productivity growth, and that movements in relative prices of imports are borne by wage earners as implied by a long-run inelastic supply of labor (Newell and Symons 1985). We could not reject the joint neutrality of productivity (proxied by the time trend), and WEDGE on the evolution of the NAIRU ($f_5=-f_2g_5/g_2$, and $f_8=-f_2g_8/g_2$) with $\chi^2(2)= 0.61$.

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The demand for labor at capacity output can be computed directly as LP = $\hat{A}^{-1}\hat{B}K$. Next, an aggregate demand (YD) series is constructed as the hypothetical demand in the absence of spillovers; that is, the sum of domestic absorption (DA) and net exports (X-M), adding back imports attributable to frustrated home demand and removing exports attributable to "export push" during periods of low aggregate demand:

$$YD = DA + (X-M) - \alpha_1(DUC-DUC_{max}) + \alpha_2(DUC-DUC_{min}). \qquad (13)$$

and simply compute LD = $\hat{A}^{-1}YD$. Since α_1 was not statistically significant, it was fixed at zero. The constructed LC and LD series are plotted with (actual) LT and LS in Figure 7.

Observed employment LT is always less than or equal to the minimum of LC, LD, and LS. In the Lambert (1987) framework, the deviation of LT from the min condition will depend inversely on the value of ρ; high (absolute) values imply more mobility and less mismatch or heterogeneity across markets. Tracking the evolution of ρ over time across countries may be an interesting exercise. One approach is to estimate ρ directly, positing that LT evolves, say via

$$LT_t = [LC_t^{-\rho_t} + LD_t^{-\rho_t} + LS_t^{-\rho_t}]^{-1/\rho_t} \times \varepsilon_t \qquad (14)$$

where ε is lognormally distributed and ρ_t is some function of time and perhaps other variables, including objective measures of mismatch. Although several country studies report success with direct estimation of (14), there are some econometric and conceptual problems with this specification. Most importantly, since the Lambert model rules out a priori ever observing

LT>min(LD,LC,LS), the distribution of the residual must have a truncated support and thus cannot be lognormal. Put differently, the distributional assumption on ε implies that the min condition will be periodically violated, even though the model does not provide for such a violation. As an alternative approach, we calculated ρ directly as the numerical solution of (1) using the estimates of LC and LD and actual LS and LT, implying that ρ itself is buffeted by a disturbance. The results are plotted in Figure 8 for the period 1955-1986. Over the first two decades, the mismatch parameter showed no visible trend with an average value of -26.3; in the last ten years however, ρ has risen from a 1967-1976 average of -25.8 to -20.7 over 1977-1986. This qualitative result is robust with respect to variation in estimates of β, γ, and α_2 that arose from altering the specification of (2)-(5).

The implied proportion of firms constrained by demand, capacity, and available labor supply $\Pi_i \equiv (Li/LT)^{-\rho}$ for i=D,C,S are plotted in Figure 9. They also equal the elasticities of aggregate transacted employment with respect to the level of aggregate demand, available capacity, and labor supply. In 1986, the estimated fractions of micromarkets or firms in demand-constrained, capacity-constrained, or labor shortage constrained firms were 0.37, 0.37, and 0.26, respectively, which implies for example that an exogenous increase in aggregate demand of 1% would result in a .37% increase in employment. The "decreasing returns" aspect of the CES specification for LT is especially evident for the fiscal expansion beginning in 1982-1983; employment growth was strongest in 1984, after which the fraction of firms in the demand-constrained regime dropped sharply. It is significant that the implied share of markets in the labor-constrained regime in 1986 corresponds roughly to that in the late 1960s and early 1970s.

The most important feature of Figure 9 that differentiates the US from most other European economies is the lack of any remarkable trend in any of the regime shares. Obviously, there was no shortage of aggregate demand over the past four years. The remarkable international increase in demand-determined unemployment in 1975 described by Dreze (1987) is also evident in the US, but is not atypical for a cyclical downtown (cf. 1982-83). Nor did a "capital shortage" emerge in the US during the late 1970s; if anything, there has been a slight decrease in the share of firms in the capacity-constrained regime over the past decade.

It remains to calculate the SURE and NAIRU, two equilibrium unemployment concepts in the model. The former is the rate of unemployment that obtains when LC=LD=LS, or $1-3^{-1/\rho}$, and is positively related to the degree of mismatch (negatively correlated with ρ). In Figure 10, we plot estimates of SURE computed using both the raw ρ as well as fitted values from the following regression (1955-1986):

$$1/\rho_t = -0.0166 - 0.000487t \quad R^2=.375,\ D.W.=0.65.$$

The fitted series shows an increase from 3.8% in 1955 to a 1986 value of 5.3%, a typical finding for countries in the European Unemployment Programme.

While the SURE might be viewed as a "frictional" equilibrium unemployment rate, it has no direct influence in the model on the NAIRU or the "non-accelerating inflation rate of unemployment," which is estimated as the rate of unemployment consistent with zero change in the inflation rate using estimates of the wage-price block. Since the WEDGE and the time trend, were constrained to have equal and opposite long run effects on w-p, these variables do not affect the NAIRU.

The presence of a lagged difference of the unemployment rate on the right-hand side of (7) makes it useful to distinguish between the more traditional (long-run) NAIRU concept which obtains when $\Delta U=0$, and a short-run NAIRU conditioned on last period's unemployment rate. The existence of difference effects implies that changes in unemployment influence wage-price dynamics even far away from the long-run NAIRU. Both series are plotted with the actual unemployment rate for 1955-86 in Figure 11. The long-run NAIRU is estimated constant at 5.62, since DUC was set to its historical average in (10) and $\Delta D = 0$. The model's out of sample forecast of the short run NAIRU is 6.13% for 1987, while actual unemployment averaged 6.08%. Since $\hat{f}_4 < 0$, the recent steady decline of unemployment may have lowered the short-run NAIRU substantially, explaining the relatively moderate acceleration of inflation in the past year.

V. Conclusions

The model's fit with annual US data is encouragingly similar to that of other European countries. The positive association of imports with capacity utilization while controlling for income, which is well-established in European data, is also present in the US. There is also only weak evidence of "export push" in the data. The notable differences confirm established expectations: nominal rigidities and relative price developments are important influences on evolution of the US real wage, in contrast to most

European economies. Furthermore, there is no evidence that technical progress, the wedge, or labor utilization has had any impact on the NAIRU. In fact, the long-run NAIRU is estimated constant at 5.62%.

One most important finding of this "tracking exercise" is that estimated mismatch across markets has also increased in the US in the past ten years, a result not inconsistent with recent evidence on interstate differences in US unemployment rates. Summers (1986) has attributed the small rise in average US unemployment rates in the past fifteen years in part to job losers in traditional industries who have postponed a transition to other sectors in the hope of being rehired. Inter alia, it could be argued that unemployment insurance and two breadwinner families may have provided a financial cushion for a longer optimal "wait." More generally, increasing specialization of the workforce over time and the accumulation of industry or firm-specific human capital may increase wait propensities. Of course, a skeptical view is that the common cross-country trend is merely symptomatic of fundamental model misspecification, especially with respect to the distinction between measured and effective labor supply. At any rate, it seems doubtful that structural mismatch to the extent it is captured in our results represents the key difference between the US and European labor market experiences. Rather, the lack of trend in the evolution of US regime shares points to aggregate demand, capacity constraints and labor supply as more plausible candidates for explaining high unemployment in Europe.

Data Appendix *

YT Non-farm Gross Domestic Product, 1982 prices.

K Gross nonresidential capital stock, 1982 prices (I thank Mr. John Musgrave, Bureau of Economic Analysis, for kind assistance)

LT Civilian Employment (BLS household survey)

LS Civilian Labor force (BLS household survey)

W Hourly non-farm compensation, including employers contributions, constructed from series for total manhours (BLS) and compensation (GDP accounts).

P Implicit deflator for nonfarm GDP

DUC Capacity Utilization Index, percentage of available capacity in operation (Federal Reserve Board)

DUL Average hourly workweek (manufacturing only) (BLS)

X Exports, 1982 prices

M Imports, 1982 prices

PM Implicit import price deflator

PX Implicit export price deflator

Ω The relative cost of labour and capital, defined as W divided by PI($i-\pi_I^e + .1$), where PI is the <u>level</u> of the implicit investment goods price deflator, π_I^e is forecast of the annual rate of change of PI using an AR(1) process fitted over the estimation period, and .1 represents physical depreciation

D Share of population aged 20-35

PW Export Price Index, Industrial countries (IFS, International Monetary Fund)

WT World Trade Index (UN Monthly Digest)

t time trend

t74 t times the dummy: 1 if year>1973, 0 otherwise.

U Civilian Unemployment rate, as fraction of the labor force (BLS)

Q Share prices (IFS) divided by PI, the investment goods price deflator

* Unless indicated, all variables originate from the Commerce Department, National Income and Product Accounts.

Table 1

US Output-Labor Ratio, 1952-1986*

$$\Delta(yt-lt-\beta DUL)_t = a_0 + a_1\Delta(yt-lt-\beta DUL)_{t-1} + a_2(yt-lt-\beta DUL)_{t-1}$$

$$+ a_3\,\omega_{t-1} + a_4\Delta\omega_{t-1} + a_5 t + a_6 t74$$

Parameter	Estimate	t-statistic
β	0.5915	5.26
a_0	-0.2082	-1.92
a_1	0.2065	2.36
a_2	-0.1176	-2.98
a_3	0.0173	1.82
a_4	0.0015	0.20
a_5	0.0023	3.00
a_6	-0.0004	-3.64

S.E. 0.0079
DW 1.79
R^2 0.773

* Estimated by nonlinear instrumental variables jointly with the output-labor ratio; see Table 2. Cross correlation of estimated residuals: 0.83.

Instruments: constant, $(yt-lt)_{t-1}$, DUC_{t-1}, DUL_{t-1}, ω_{t-1}, $\Delta\omega_{t-1}$, t, t74, ΔDUC_{t-1}, ΔDUL_{t-1}; current, once and twice lagged log real government purchases and log real exports.

Table 2

US Output-Capital Ratio, 1952-1986*

$$\Delta(yt-k - \gamma DUC)_t = b_0 + b_1\Delta(yt-k-\gamma DUC)_{t-1} + b_2(yt-k-\gamma DUC)_{t-1}$$

$$+ b_3\omega_{t-1} + b_4\Delta\omega_{t-1} + b_5 t + b_6 t74$$

Parameter	Estimate	t-statistic
γ	0.0043	12.1
b_0	-0.1978	-2.25
b_1	0.1628	1.50
b_2	-0.1478	-3.02
b_3	0.0110	1.03
b_4	0.0037	0.51
b_5	0.0006	1.70
b_6	-0.0004	-3.34

S.E. 0.0080

D.W. 1.78

R^2 0.894

* Estimated by nonlinear instrumental variables jointly with the output-labor ratio; see Table 1.

Instruments: See Table 1.

Table 3

Real Gross Investment, 1952-1986*

$$\Delta i_t = p_0 + p_1\Delta i_{t-1} + p_2\Delta i_{t-2} + p_3\Delta i_{t-3} + p_4\Delta q_{t-1} + p_5\Delta \pi_{t-1} + p_6\Delta yt_{-1} + p_7\Delta DUC_{t-1} + p_8 i_{t-1} + p_9 yt_{t-1}$$

Parameter	Estimate	t-statistic
p_0	- 5.6282	- 6.37
p_1	0.1958	0.60
p_2	0.4747	2.90
p_3	- 0.0651	- 0.53
p_4	0.2410	2.65
p_5	0.6543	4.55
p_6	2.697	2.86
p_7	- 0.0199	- 3.31
p_8	- 2.004	-5.71
p_9	2.257	5.98

Note: yt here is total real GDP including the farm sector.

S.E.	0.0651
D.W.	1.91
R^2	0.757

Table 4

US Exports, 1952-1986

$$\Delta(x-\alpha_1 \, DUC)_t = c_0 + c_1\Delta(x-\alpha_1 DUC)_{t-1} + c_2(x-\alpha_1 DUC)_{t-1}$$

$$+ c_3(px-pw)_{t-1} + c_4\Delta(px-pw)_{t-1} + c_5 wt_{t-1} + c_6\Delta wt_t$$

Parameter	Estimate	t-statistic
α_1	-0.0035	-0.96
c_0	-2.207	-3.00
c_1	0.314	2.15
c_2	-0.3751	-2.22
c_3	-0.5943	-3.30
c_4	-0.1912	-0.54
c_5	0.3783	2.47
c_6	1.640	3.46

S.E. 0.0432

D.W. 2.18

R^2 0.720

Instruments: Constant, x_{t-1}, Δx_{t-1}, $(px-pw)_{t-1}$, $\Delta(px-pw)_{t-1}$, current and two lags of log real government spending, wt_{t-1}, Δwt_{t-1}, DUC_{t-1}, ΔDUC_{t-1}.

Table 5

US Imports, 1950-1986

$$\Delta(m-\alpha_2 DUC)_t = d_0 + d_1\Delta(m-\alpha_2 DUC)_{t-1} + d_2(m-\alpha_2 DUC)_{t-1}$$

$$+ d_3(pm-p)_{t-1} + d_4\Delta(pm-p)_{t-1} + d_5 yt_{t-1} + d_6\Delta yt_{t-1}$$

Parameter	Estimate	t-statistic
α_2	0.0137	5.43
d_0	-2.353	-2.76
d_1	0.0394	0.22
d_2	-0.2101	-2.87
d_3	-0.0237	-0.49
d_4	-0.1973	-1.70
d_5	0.4264	2.89
d_6	-0.2091	-0.80

S.E. 0.0402

D.W. 2.05

R^2 0.704

Instruments: Constant, m_{t-1}, Δm_{t-1}, $(pm-p)_{t-1}$, $\Delta(pm-p)_{t-1}$ yt_{t-1}, Δyt_{t-1}, current and two lags of log real government spending, DUC_{t-1}, ΔDUC_{t-1}.

Table 6

US Real Wages and Markup, 1955-1986*

$$\Delta(w-p)_t = f_0 + f_1\Delta(w-p)_{t-1} + f_2(w-p)_{t-1} + f_3U_{t-1} + f_4\Delta U_{t-1}$$
$$+ f_5 wedge_{t-1} + f_6\Delta D_{t-1} + f_7 \Delta^2 p_t + f_8 t$$

$$\Delta(p-w)_t = g_0 + g\Delta(p-w)_{t-1} + g_2(p-w)_{t-1} + g_3 DUC_{t-1}$$
$$- (g_2f_5/f_2)wedge_{t-1} + g_7\Delta^2 w_t - (g_2f_8/f_2)t$$

Parameter	Estimate	t-statistic
f_0	0.1715	2.78
f_1	0.0010	0.01
f_2	-0.0972	-2.41
f_3	-0.1304	-1.89
f_4	-0.0914	-1.42
f_5	-0.0447	-3.66
f_6	-0.0600	-0.26
f_7	-0.3219	-4.37
f_8	0.0017	2.10
g_0	-0.1714	-2.42
g_1	-0.4121	-2.32
g_2	-0.1363	-2.91
g_3	-0.0007	-2.31
g_7	0.3615	2.67

	W-P Equation	P-W Equation
S.E.	0.0052	0.0064
D.W.	2.31	2.24
R^2	0.719	0.563

* Joint IV Estimation. Estimated residual correlation: -0.953.
Additional instruments: current and two lags of log real government spending, current and two lags of the import deflator.
Coefficients on the four price control dummies in the price equation not reported.

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DATA APPENDIX, US

	Unemployment Rate (%) (1)	Help-Wanted Index (1979=100) (2)	Employment (1979=100) (3)	Labor Force (1979=100) (4)
1948	NA	37.361	59.052	57.769
1949	NA	23.934	58.368	58.493
1950	5.108	28.977	59.592	59.185
1951	3.183	41.029	60.680	59.085
1952	2.908	43.841	60.989	59.215
1953	2.833	43.519	61.934	60.076
1954	5.417	26.639	60.821	60.663
1955	4.233	37.897	62.869	61.894
1956	4.017	43.498	64.551	63.392
1957	4.167	37.777	64.827	63.778
1958	6.642	26.871	63.793	64.472
1959	5.317	37.882	65.397	65.128
1960	5.417	35.938	66.567	66.366
1961	6.508	33.017	66.526	67.120
1962	5.383	37.740	67.495	67.282
1963	5.500	37.333	68.565	68.418
1964	5.025	42.649	70.125	69.623
1965	4.383	54.066	71.915	70.906
1966	3.692	66.189	73.744	72.165
1967	3.742	63.700	75.260	73.692
1968	3.450	69.971	76.816	74.990
1969	3.400	77.130	78.801	76.891
1970	4.850	61.077	79.604	78.883
1971	5.808	52.529	80.298	80.388
1972	5.483	65.544	83.112	82.898
1973	4.767	80.231	86.063	85.185
1974	5.533	71.887	87.835	87.629
1975	8.317	51.148	86.851	89.338
1976	7.558	60.512	89.808	91.606
1977	6.950	75.350	93.111	94.306
1978	5.967	94.945	97.188	97.401
1979	5.758	100.000	100.000	100.000
1980	7.067	82.893	100.484	101.918
1981	7.500	75.666	101.593	103.539
1982	9.575	55.574	100.713	105.033
1983	9.450	61.319	102.020	106.245
1984	7.392	83.099	106.251	108.165
1985	7.083	87.992	108.427	110.008
1986	6.883	88.240	110.901	112.271
1987	6.083	97.537	113.776	114.185

	Population 1979=100 (5)	Total GDP 1979=100 (6)	Investment/ Total GDP (%) (7)	Capital Stock (8)
1946	NA	NA	14.9	1,791.1
1947	NA	32.935	15.0	1,839.2
1948	65.448	34.090	18.1	1,894.9
1949	65.882	34.126	14.1	1,938.4
1950	66.359	37.080	19.2	1,992.8
1951	65.839	41.156	18.3	2,052.9
1952	65.984	42.788	15.3	2,112.2
1953	66.606	44.533	14.9	2,177.7
1954	67.290	43.844	14.6	2,237.0
1955	68.005	46.338	17.3	2,305.4
1956	68.660	47.339	17.1	2,381.9
1957	69.377	48.205	15.9	2,454.9
1958	70.211	47.803	14.0	2,505.2
1959	71.117	50.791	16.3	2,565.1
1960	72.225	51.857	15.3	2,627.9

1961	73.059	53.266	14.5	2,688.6
1962	73.423	56.178	15.4	2,757.5
1963	74.750	58.550	15.5	2,831.8
1964	76.070	61.829	15.5	2,922.0
1965	77.308	65.482	16.6	3,041.2
1966	78.202	69.588	16.8	3,177.0
1967	79.267	71.528	15.5	3,306.9
1968	80.574	74.616	15.5	3,444.4
1969	81.983	76.464	16.0	3,595.4
1970	83.685	76.119	14.8	3,737.8
1971	85.621	78.183	15.8	3,871.0
1972	87.955	82.123	16.8	4,015.8
1973	89.801	86.286	17.8	4,197.6
1974	91.550	85.702	16.6	4,377.9
1975	93.288	84.663	13.9	4,513.3
1976	95.016	88.905	15.8	4,649.3
1977	96.696	93.066	17.5	4,813.8
1978	98.332	98.046	18.8	5,009.4
1979	100.000	100.000	18.5	5,222.7
1980	101.628	99.853	16.3	5,420.0
1981	102.964	101.493	17.2	5,624.5
1982	104.101	98.888	14.4	5,785.7
1983	105.121	103.185	15.0	5,932.7
1984	106.273	110.320	17.8	6,127.5
1985	107.166	113.673	16.2	6,348.3
1986	108.499	117.180	15.8	6,544.7
1987	109.601	120.935	15.9	6,738.6

	Real labor cost 1979=100 (9)	Profit Share % (10)	Real wages and salaries 1979=100 (11)	Replacment Ratio (12)
1946	NA	NA	NA	NA
1947	NA	NA	NA	NA
1948	58.631	33.191	64.626	NA
1949	60.163	33.858	65.732	NA
1950	62.067	35.222	67.364	NA
1951	65.662	34.946	71.513	NA
1952	68.514	33.911	74.783	NA
1953	70.071	33.528	76.918	NA
1954	70.787	33.779	77.890	NA
1955	70.653	35.015	79.826	0.314
1956	71.968	33.552	81.728	0.316
1957	73.190	33.637	82.425	0.323
1958	75.140	33.553	82.479	0.386
1959	75.579	34.237	84.435	0.374
1960	77.513	33.201	85.186	0.349
1961	79.449	33.682	86.231	0.337
1962	80.642	34.376	88.170	0.355
1963	82.239	34.778	89.086	0.327
1964	84.524	34.934	91.340	0.316
1965	85.154	35.562	93.496	0.310
1966	87.195	35.238	96.138	0.306
1967	89.163	35.358	96.748	0.300
1968	91.389	35.021	99.346	0.285
1969	92.579	33.646	101.561	0.281
1970	94.203	32.764	101.836	0.276
1971	95.171	33.828	102.259	0.302
1972	96.769	33.682	103.546	0.334
1973	98.883	32.960	104.141	0.295
1974	98.155	32.289	100.621	0.299
1975	97.289	33.834	99.361	0.376
1976	98.601	34.200	99.915	0.405
1977	99.140	34.407	99.933	0.355
1978	99.805	34.216	100.470	0.315

1979	100.000	33.269	100.000	0.298
1980	100.293	32.879	98.650	0.304
1981	100.573	33.547	98.368	0.310
1982	101.857	32.434	98.872	0.344
1983	102.470	33.839	99.275	0.419
1984	103.015	34.533	100.368	0.352
1985	103.446	34.593	101.946	0.316
1986	104.866	34.680	102.946	0.311
1987	105.380	34.615	103.139	0.310

	Unionization Rate % (13)	Inflation rate %/annum (14)	Export Prices 1979=100 (15)	Current Acct Surplus % (16)	Total Govt Surplus % (17)
1946	NA	NA	NA	NA	2.552
1947	NA	NA	NA	NA	6.151
1948	NA	NA	101.697	NA	3.230
1949	NA	NA	103.052	NA	-1.313
1950	31.5	1.702	110.542	NA	2.790
1951	NA	5.021	103.687	NA	1.841
1952	NA	1.594	102.946	NA	-1.088
1953	NA	1.569	105.704	-0.530	-1.894
1954	NA	1.544	107.061	-0.089	-1.917
1955	NA	3.042	108.935	-0.092	0.769
1956	NA	3.690	110.212	0.355	1.223
1957	NA	3.559	110.840	0.739	0.201
1958	NA	2.062	113.877	-0.053	-2.776
1959	NA	2.357	115.856	-0.485	-0.325
1960	31.4	1.645	116.648	0.543	0.606
1961	NA	0.971	118.348	0.696	-0.811
1962	NA	2.244	119.033	0.574	-0.667
1963	NA	1.567	117.930	0.719	0.116
1964	28.9	1.543	117.735	1.041	-0.357
1965	NA	2.736	119.654	0.774	0.072
1966	NA	3.550	121.032	0.395	-0.170
1967	NA	2.571	123.170	0.320	-1.752
1968	NA	5.014	127.023	0.067	-0.677
1969	NA	5.570	127.713	0.044	1.034
1970	27.3	5.528	128.662	0.231	-1.051
1971	27.0	5.714	127.515	-0.133	-1.783
1972	26.4	4.730	119.966	-0.481	-0.283
1973	25.8	6.452	112.274	0.526	0.588
1974	25.8	9.091	107.640	0.132	-0.296
1975	25.3	9.815	106.724	1.147	-4.105
1976	24.7	6.408	111.650	0.237	-2.180
1977	24.8	6.656	108.515	-0.737	-0.972
1978	23.6	7.281	102.859	-0.696	-0.018
1979	NA	8.864	100.000	-0.039	0.467
1980	24.8	9.033	97.394	0.069	-1.285
1981	NA	9.685	109.447	0.229	-0.990
1982	22.1	6.383	116.320	-0.277	-3.557
1983	20.1	3.900	121.781	-1.379	-3.832
1984	18.8	3.657	127.250	-2.875	-2.819
1985	18.0	3.064	125.097	-2.930	-3.316
1986	17.5	2.613	108.879	-3.301	-3.434
1987	NA	3.336	98.181	-3.423	-2.333

Sources and Definitions

(1), (3), (4): Department of Labor, Bureau of Labor Statistics (BLS)

(2) Help wanted index, Conference Board

(5) Population aged 15-65. Bureau of the Census

(6) GDP, all sectors. GNP Accounts, Department of Commerce, Bureau of Economic Analysis

(7) Gross investment as a fraction of GDP, all sectors, 1988 estimates. Source: see (6).

(8) Real gross nonresidential capital stock, 1982 prices, all sectors, 1988 estimates. Source: see (6).

(9) Per hour compensation for nonagricultural workers, including all fringes and social insurance contributions, estimated by dividing total compensation (GNP accounts) by total manhours in nonagricultural establishments, (BLS), deflated by the nonagricultural implicit GDP deflator.

(10) Labor share estimated as total compensation adjusted for self-employment, divided by total nominal GDP. Source: see (6).

(11) Before tax, estimated as annual nonagricultural wages and salaries (GNP accounts) divided by wage and salary workers in nonagricultural sectors, deflated by the personal consumption deflator, GNP accounts

(12) Before tax, estimated as the fraction of average weekly wages and salaries (all wages and salaries from GNP accounts divided by total BLS employment) represented by the average weekly UI benefit (total benefits, GNP account basis, divided by the annual average number of weekly state and federal program recipients, 1987 Economic Report the President; 1986-7 estimated using growth rate of state claims from the Department of Labor, Employment and Training Administration). Note: because of changes in both the tax treatment of benefits (since 1979 the benefit is taxed) and actual tax rates since 1981, this series is likely to be a poor proxy for the after-tax ratio.

(13) Figures for 1950-1982 are from Ashenfelter and Card (1986); for 1983-86 are from the US Bureau of Labor Statistics, Employment and Earnings. Not strictly comparable across periods.

(14) Rate of change of annual GDP deflator, all sectors.

(15) Implicit export price deflator, GNP accounts (Source: see (6)) divided by export price index of all industrial countries (Source: IMF International Financial Statistics)

(16) Current account surplus (IMF, International Financial Statistics) % of GDP (cf (6))

(17) Total government surplus, % of GDP (cf (6))

FIGURE 1

UNEMPLOYMENT RATE IN THE UNITED STATES, 1950:1-88:4

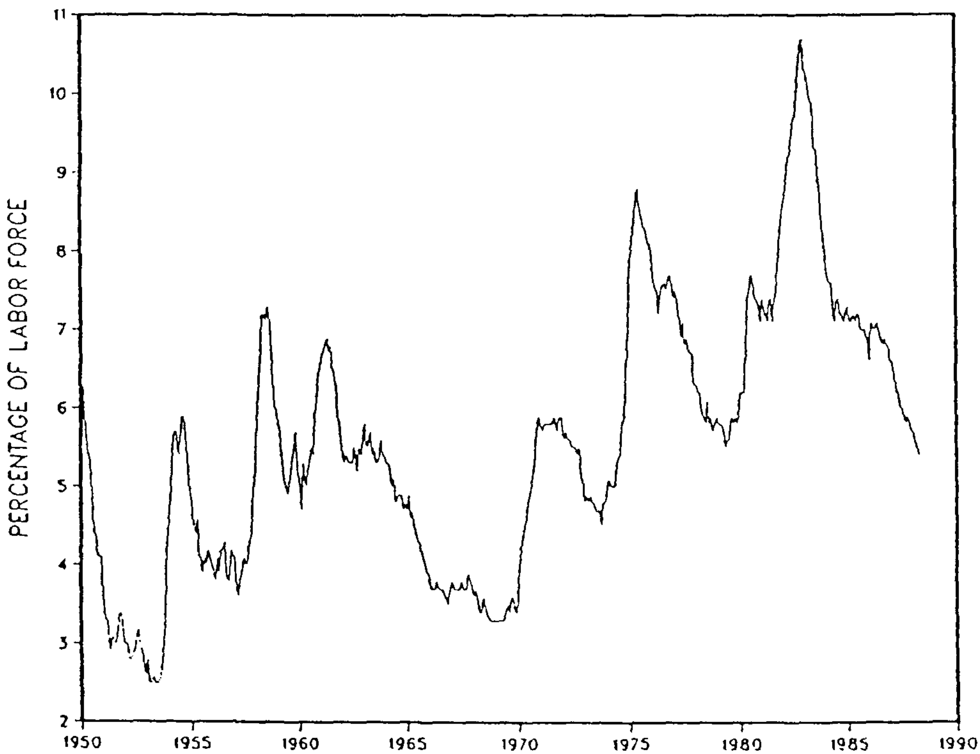


FIGURE 2

DURATION OF INTERRUPTED UNEMPLOYMENT SPELLS IN THE US
1950-88

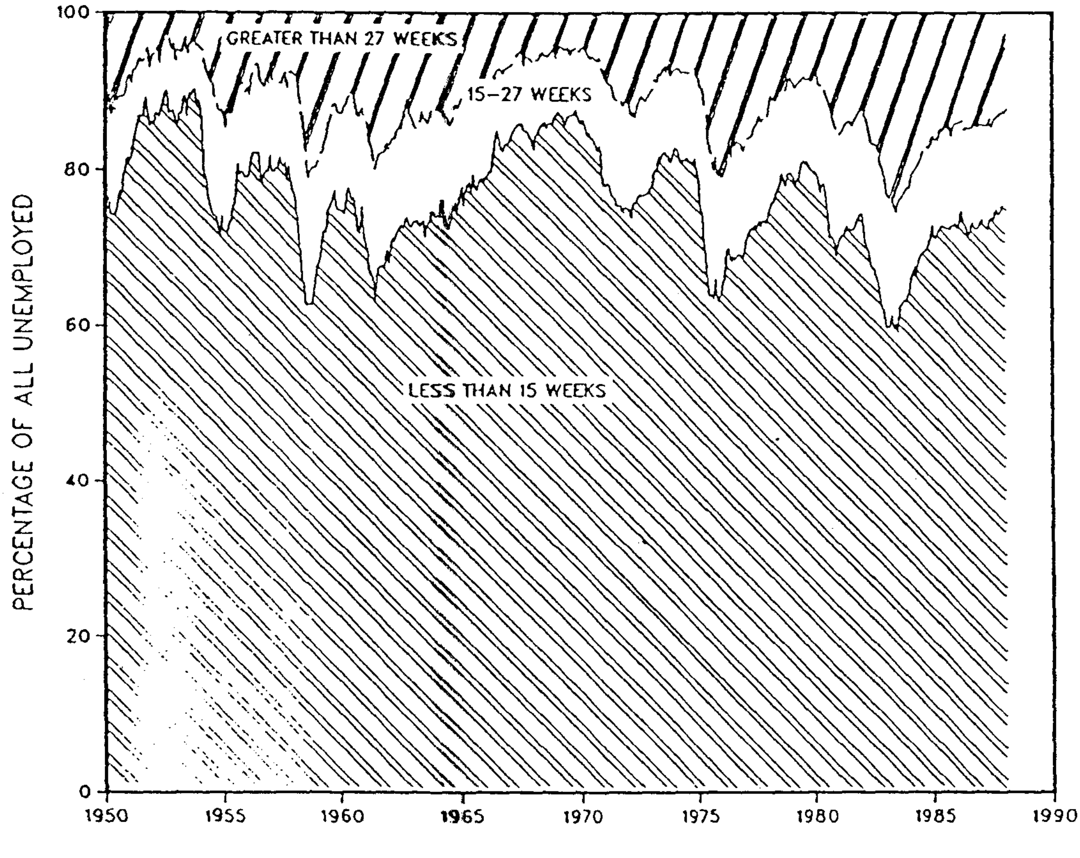
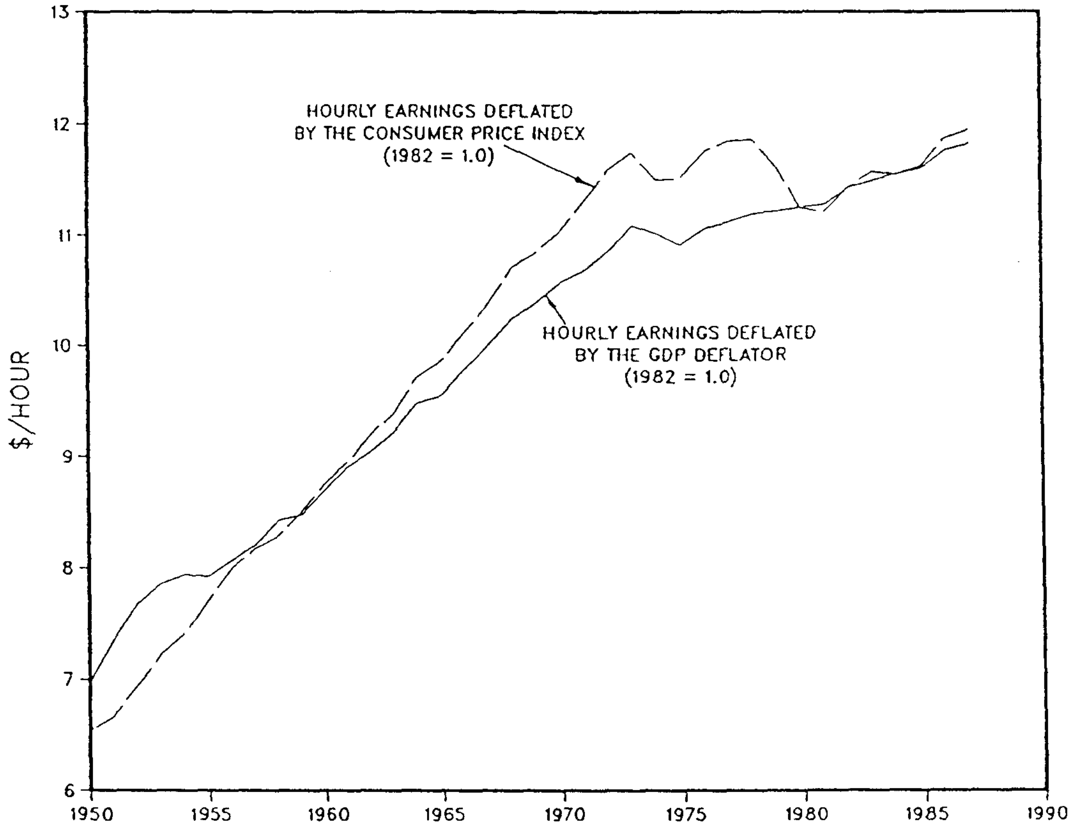


FIGURE 3
REAL WAGES IN THE UNITED STATES, 1950-1987



F I G U R E 4

CURRENT ACCOUNT AND CYCLICALLY ADJUSTED FEDERAL BUDGET SURPLUSES
1955:I-1987:IV

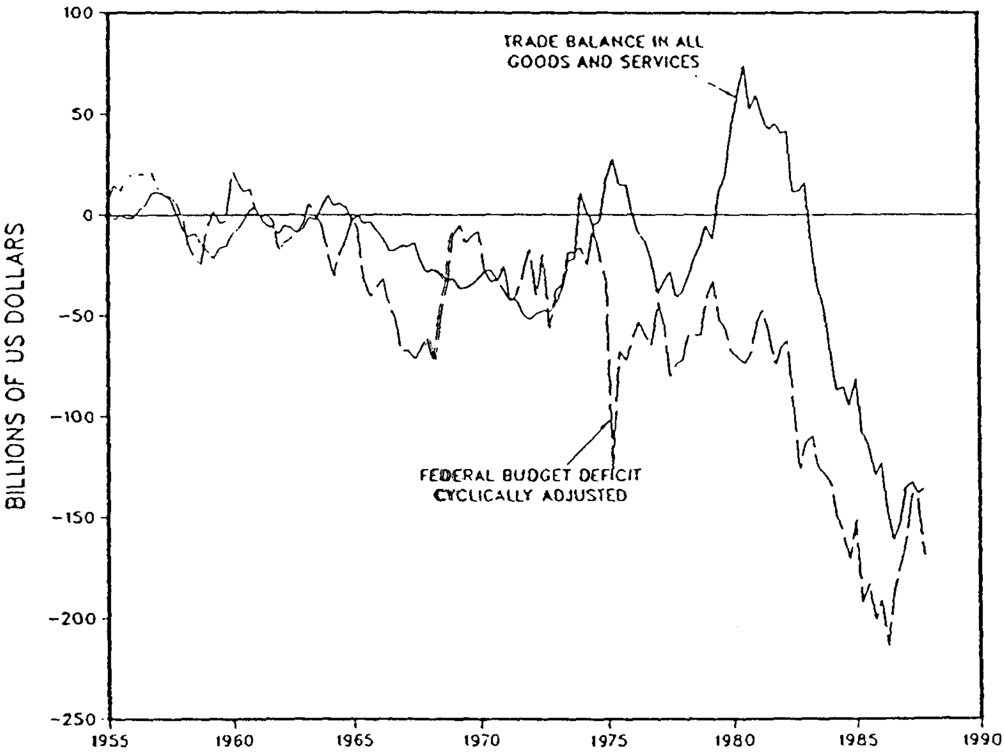


FIGURE 5

CAPACITY UTILIZATION IN MANUFACTURING
1970:01-1988:03

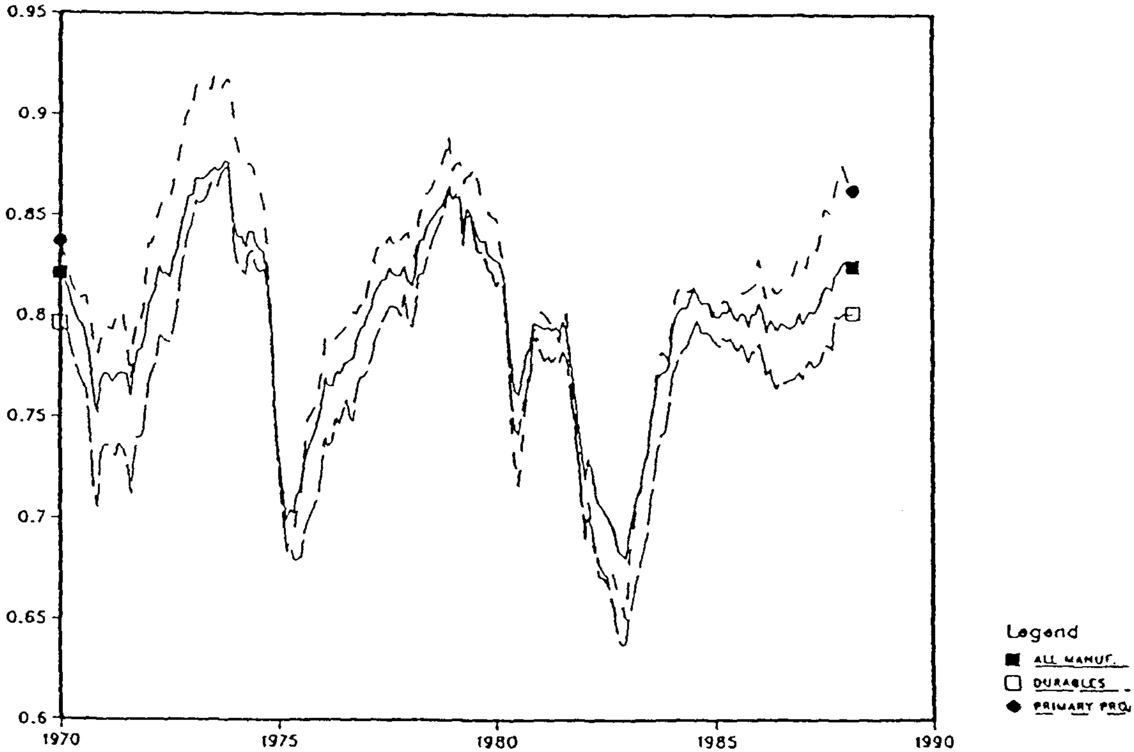
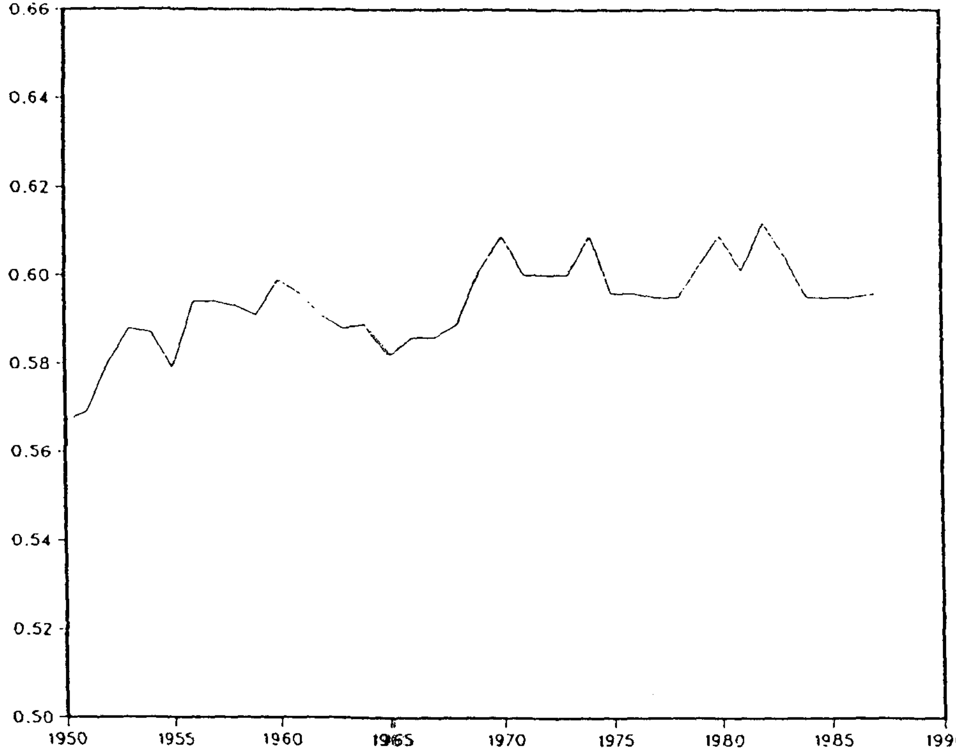


FIGURE 6
ADJUSTED US LABOR SHARE (1950-87)*



* Adjusted for self-employment. 1982 value equals actual share of the total compensation in total value-added.

FIGURE 7
LD, LC, LS, AND LT EMPLOYMENT SERIES,
1955-86 (MILLIONS)

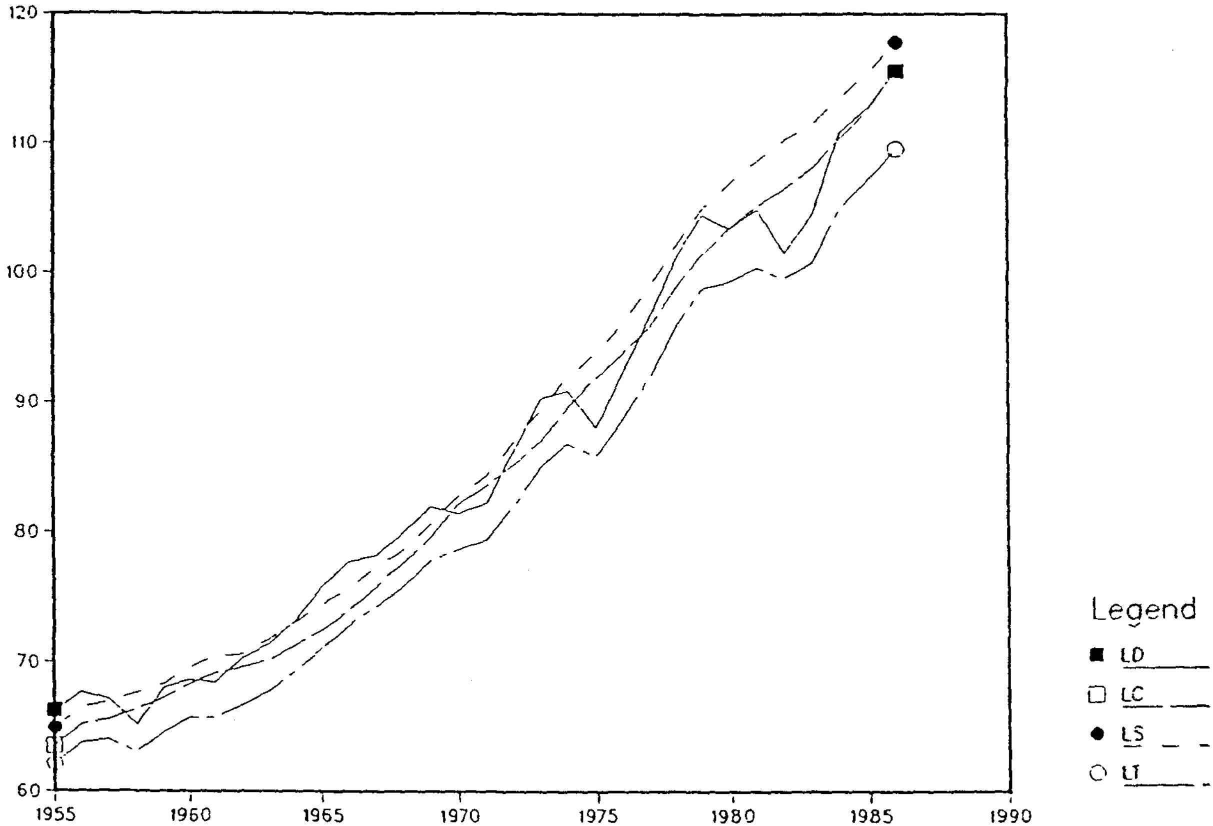
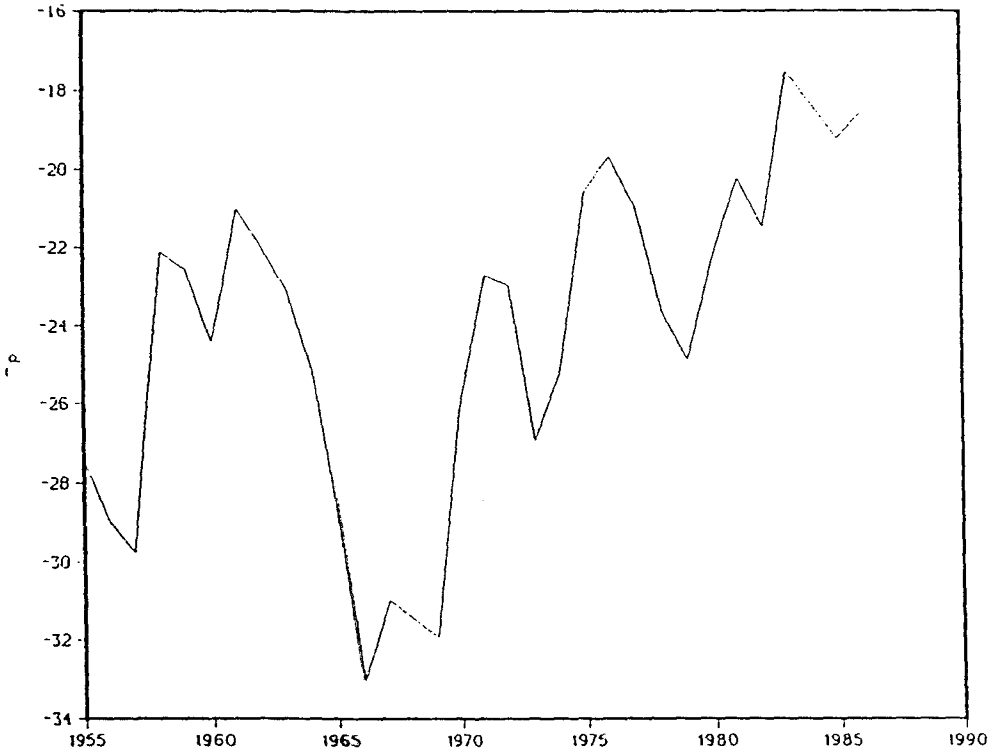


FIGURE 8
THE EVOLUTION OF MISMATCH, US
1955-86 *



* Numerical solution each year to (1) using values of LK,LP,LS, and LT

FIGURE 9
REGIME PROPORTIONS, US

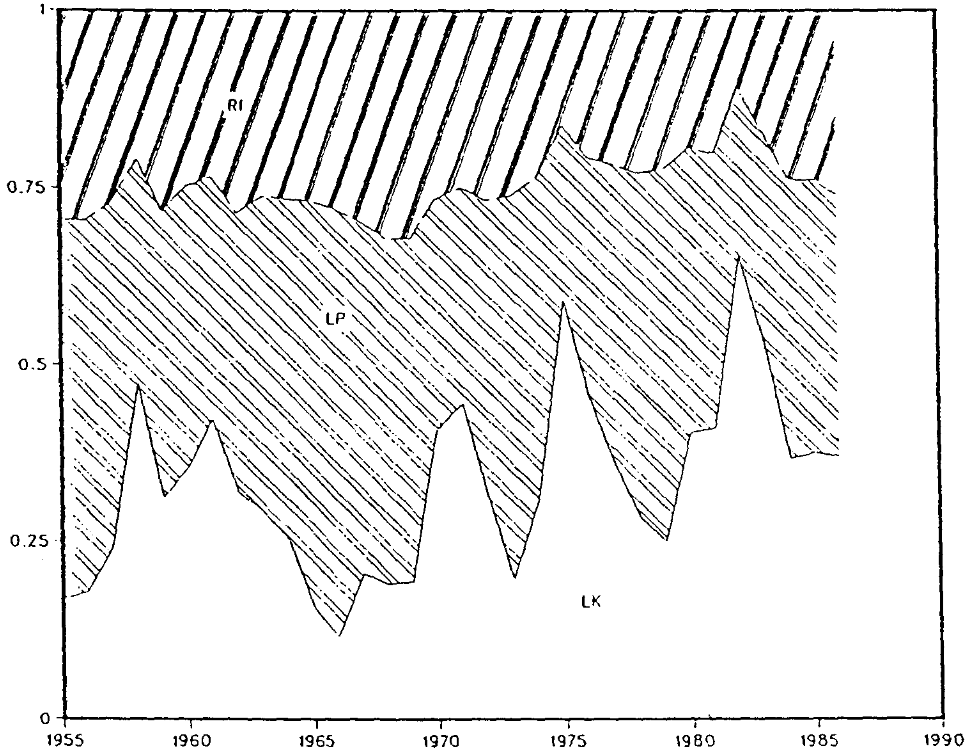


FIGURE 10
STRUCTURAL UNEMPLOYMENT IN EQUILIBRIUM
1955-86

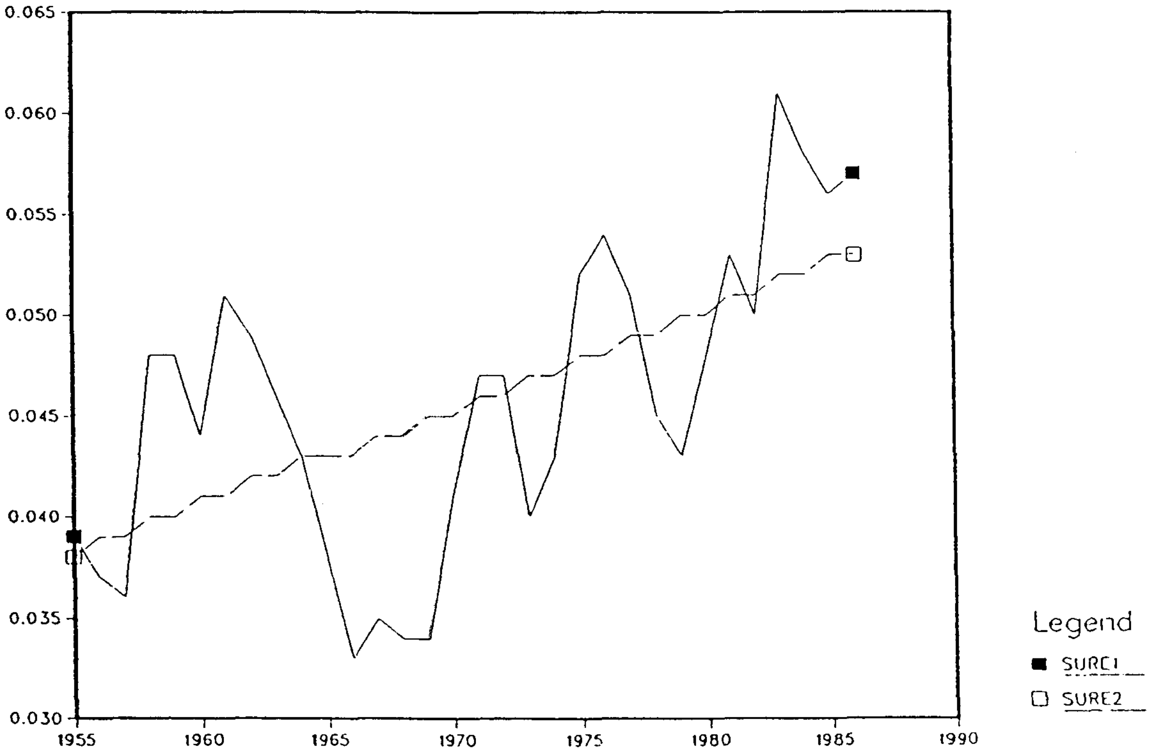
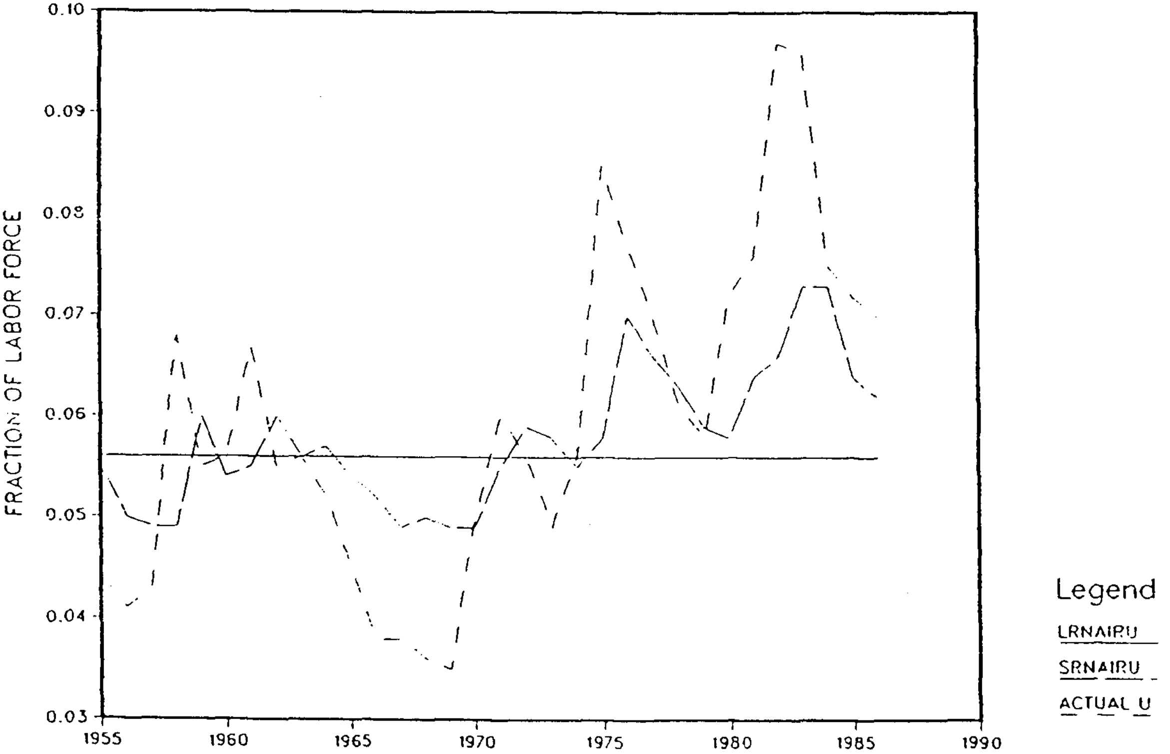


FIGURE 11
UNEMPLOYMENT AND THE NAIRU
1955-86



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