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United Kingdom: Selected Issues

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UNITED KINGDOM

Selected Issues

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Approved by European I Department

February 16, 2000

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United Kingdom: Basic Data

Demographic and other data:

Area	94,247 square miles (244,100 sq. km.)
Population (mid-1996)	59 million
Infant mortality (per 1,000 live births)	6.1
Doctors per 1,000 inhabitants	0.5
GDP per capita (1998)	SDR 16,777

Composition of GDP in 1998, at current prices	In billions of Pounds	Distribution in Percent
Private consumption	545.1	64.6
Public consumption	153.6	18.2
Total investment (including stockbuilding)	151.3	17.9
Total domestic demand	862.2	102.2
Exports of goods and services	224.2	26.6
Imports of goods and services	232.7	27.6
GDP at market prices (average estimate)	843.7	100

Selected economic data	1997	1998	1999	
Output and unemployment:	(Annual percentage change)			
Real GDP (at market prices, average estimate) 1/	3.5	2.2	1.9	1/
Manufacturing production 1/	1.3	0.4	0.2	1/
Average unemployment (in percent) 2/	5.5	4.7	4.3	1/
Earnings and prices:				
Average earnings in manufacturing 1/	4.3	4.5	3.9	1/
Retail price index, excluding mortgage interest 1/	2.8	2.6	2.2	1/
Money and interest rates:				
M0 (end of period) 3/	6.5	5.7	3.1	3/
M4 (end of period) 3/	5.7	8.3	7.3	3/
3-month Interbank rate 4/	6.8	7.3	5.8	3/
10-year government bond yield 4/	7.1	5.5	5.6	3/
	(In billions of pounds sterling)			
Fiscal accounts (In percent of GDP): 6/				
General government balance	-0.9	0.5	0.6	
Public sector balance	-0.9	0.5	0.6	
Public sector net debt	43.3	40.8	38.8	
Balance of payments:				
Current account balance	6.6	0.1	-2.8	1/
(In percent of GDP)	0.8	0.0	-1.3	1/
Trade balance	-11.9	-20.8	-5.9	1/
Exports	171.8	164.1	43.2	1/
Imports	183.7	184.9	49.1	1/
Direct investment (net)	-16.3	-23.3	-77.8	2/
Portfolio investment (net)	-24.8	-14.2	76.2	2/
Short-term capital flows (net)	...	...	...	
Gross reserves, official basis				
(billions of SDRs, end of period)	28.0	27.6	37.0	3/

Source: Central Statistical Office, Economic Trends and Financial Statistics; H.M. Treasury; and staff estimates.

1/ 3rd quarter 1999.

2/ 2nd quarter 1999.

3/ November 1999.

I. Issues Relating to Inflation Targeting and the Bank of England's Framework[1]

A. Introduction

1. This paper addresses several issues relating to the choice between different types of inflation targeting frameworks, with particular interest in evaluating key features of the Bank of England's framework and experience. A question arising from the experience is whether or not interest rates in the United Kingdom have been "too variable" in recent years. A central issue relating to specific features of the United Kingdom concerns the merits of basing policy decisions on a constant-interest-rate forecast of inflation, as opposed to either a Taylor rule or a model-consistent forecast. A third issue is whether macroeconomic performance would be significantly improved if central banks published their policy models to enhance the transparency of the policy framework. Efforts to develop a better understanding of these issues are becoming increasingly relevant to the Fund's policy advice as more countries begin to rely on inflation targets to provide a nominal anchor.

2. Proponents of inflation targeting strategies perceive the advantages to include "more transparent and coherent policymaking, increased accountability, and greater attention to long-run considerations in day-to-day policy debates and decisions."[2] Several of the countries that are pursuing such strategies have taken the approach of targeting an inflation *forecast*, motivated by the fact that changes in monetary policy are only capable of influencing inflation with a lag. The Bank of England's approach is widely regarded as a successful example of inflation-forecast targeting and a role model in transparency.

3. Yet several aspects of the recent U.K. experience and the prevailing policy framework have raised questions. Comparison of the U.K. experience with that in the United States during recent years has provoked the question of whether interest rates in the United Kingdom have been "too variable." And comparison of the policy framework with that of New Zealand, also regarded as having designed a successful approach to inflation-forecast targeting, points to major differences between the two policy frameworks that warrant evaluation.

4. Analysis of these issues requires a formal model of macroeconomic behavior along with a formal description of monetary policy reactions to macroeconomic variables. This paper attempts to present the analysis in a non-technical way, discussing the main features of the model and the sensitivity of the analysis to key assumptions about macroeconomic behavior, and relegating the technical description of the model and simulation analysis to an Appendix. Section B provides perspectives on alternative forms and calibrations of monetary

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[1] Prepared by Peter Isard and Douglas Laxton.

[2] Bernanke and Mishkin (1997), p.114.

policy reaction functions. Section C briefly describes and contrasts the monetary policy frameworks of the Bank of England (BoE) and the Reserve Bank of New Zealand (RBNZ). Sections D-F then address the three main issues: Have U.K. interest rates been too variable? How does macroeconomic performance under a "Constant-Interest-Rate" (CIR) rule compare with performance under a Generalized Taylor (GT) rule or an Inflation-Forecast-Based (IFB) rule? Can significant benefits potentially be achieved from greater transparency about monetary policy?

5. The analysis in Sections D-F is developed with several variants of a small linear model of macroeconomic behavior and abstracts, inter alia, from uncertainty about the level of potential output or the non-accelerating-inflation rate of unemployment (NAIRU). Section G adds additional important perspectives on the dangers of particular types of policy rules in a nonlinear world with a NAIRU that is difficult to estimate precisely and appears to shift over time. Section H provides an example of how uncertainty about exchange rate models can be studied to provide some guidance about what model may be more appropriate for minimizing potential policy errors. Section I provides some concluding remarks.

B. Perspectives on Monetary Policy Rules

6. Countries have defined formal inflation targets in a number of different ways, most of which leave monetary policymakers with scope to react to output or unemployment gaps as well as to deviations from target of either the current rate of inflation or an inflation forecast. The analysis of how countries should implement inflation targeting strategies and explain their policy decisions to the public has focused on different forms of monetary policy rules or reaction functions. Central bankers and academic economists are well aware that it would be dangerous to adhere rigidly to any mechanical policy rule, and many describe the practice of inflation targeting as essentially involving "constrained discretion."[3] At the same time, policymakers have found that quantitative frameworks can be very important in helping them structure their thinking,[4] and monetary policy rules play a central role as benchmarks or guidelines that make those quantitative frameworks internally consistent. Moreover, insofar as macroeconomic behavior depends importantly on the expectations of market participants, monetary policy that is consistent over time and guided by a well-chosen policy rule can have a significant influence on expectations that helps to stabilize the economy.

7. One widely discussed form of reaction function is the Taylor rule, under which the central bank would adjust its official short-term interest rate in response to the most-recently

[3] Bernanke and Mishkin (1997), King (1999), Svensson (1999), Taylor (1999).

[4] Kohn (1999).

reported data on inflation and output (or unemployment).[5] Simulation studies have demonstrated that within the confines of linear macroeconomic models, generalized Taylor rules that reflect an appropriate degree of "interest rate smoothing"—i.e., that adjust interest rates only gradually to changes in economic conditions—are remarkably successful in delivering a relatively low variance of inflation around the target rate. As elaborated below, however, because Taylor rules are essentially backward looking, they have been found to perform quite poorly in nonlinear models with forward-looking expectations.[6]

8. The class of rules used by the BoE and RBNZ has been referred to as inflation-forecast-based (IFB) rules.[7] Under these rules, the policy interest rate setting depends on how much an inflation *forecast* deviates from target, and often depends on the output gap as well. Widely-cited empirical studies suggest that such rules provide reasonably accurate descriptions of monetary policy behavior in the United States, Japan, and Germany in the period since 1979.[8] In macroeconomic models with relatively simple specification forms, such reaction functions for the policy instrument can be formally derived as (approximations to) conditions that are necessary for minimizing the variance of the inflation forecast around the inflation target.[9]

9. Although the policy frameworks employed by the BoE and RBNZ can each be described as analogous to relying on an IFB rule as a guideline, the two central banks have used substantially different types of IFB rules in elaborating and presenting their forecasts. The BoE Inflation Reports have featured inflation forecasts that assume an unchanged policy rate over a two-year horizon, with the forecasts showing 8-quarter-ahead inflation to be at or very near the target rate. By contrast, the approach followed by the RBNZ calculates and announces to the public an *unconstrained* timepath for the policy interest rate that is projected to gradually equilibrate the inflation forecast with the

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[5] Taylor (1933, 1999), has emphasized the importance of calibrating the rule to insure that nominal interest rates are adjusted by more than any change in the inflation rate in order to prevent monetary policy from falling behind "shifts in the Phillips curve."

[6] Isard, Laxton, and Eliasson (1999) show that because these rules are myopic, making a firm commitment to them would not be effective in stabilizing inflation expectations in such models, but would rather result in interest rate adjustments that fell behind "shifts in the Phillips curve" and would risk repeating the types of policy errors that were made in several industrial countries in the 1970s.

[7] Batini and Haldane (1999a), Amano, Coletti, and Macklem (1999).

[8] Clarida, Gali, and Gertler (1998).

[9] Svensson (1999) refers to such (approximate) first-order conditions as "targeting rules" to emphasize their distinction from instrument rules that are simply postulated.

target inflation rate. The particular time path announced by the RBNZ is chosen to be model-consistent in the sense that the model includes a well-calibrated unconstrained IFB rule for the policy interest rate and generates the interest rate forecast endogenously.

10. It should be noted that what is here referred to as a "rule" is referred to by the BoE as an "assumption." It clearly functions as such in the elaboration of the forecast. Moreover, it is viewed as an assumption that has the added virtue of precluding the need to either agree on a rule or to "reveal one's hand" about the likely future course of interest rates. Irrespective of whether it is viewed as an assumption or as a rule, however, the convention has implications for the elaboration of the forecasts that are at odds with the objectives of a forward-looking inflation targeting approach. This is the main focus of this paper, where the issue is cast in terms of the vocabulary of the literature on this subject, namely as a "rule"-the Constant-Interest-Rate (or CIR) rule. For the purpose of studying the consequences of following a CIR rule it is assumed that the CIR rule implies that the monetary authorities would adjust the level of the policy rate sufficiently each quarter to completely eliminate the gap between inflation and the target in the eigth quarter of the inflation forecast.

11. While several of the issues addressed below relate to the form of the monetary policy reaction function, the question of whether U.K. interest rates have been too variable primarily relates to the strength of monetary policy reactions, including in particular the degree of interest rate smoothing. As will be elaborated in Section D, under either a Generalized Taylor (GT) rule or an IFB rule, the optimal calibration of the reaction coefficients—including the optimal degree of interest rate smoothing—can depend importantly on both the nature of the relationship that links aggregate demand to interest rates and the degree of openness of the economy. Thus, the fact that interest rates have been much less variable in the United States than in the United Kingdom does not necessarily imply that U.K. interest rates have been "too variable."

C. Inflation Forecast Targeting at the Bank of England and the Reserve Bank of New Zealand

General Background

12. The United Kingdom adopted a strategy of inflation targeting in October 1992, shortly after the summer exchange market crisis led to its withdrawal from the Exchange Rate Mechanism of the European Monetary System. The present framework for inflation-forecast targeting was established in May 1997, when responsibility for making interest rate decisions was transferred from the Chancellor of the Exchequer to the Monetary Policy Committee (MPC) of the Bank of England.[10] The goals of monetary policy are now spelled

[10] Prior to May 1997, the Chancellor made interest rate decisions, taking into account the views of the Governor of the BoE. Vickers (1999) provides a concise description of the monetary policy framework now in place.

out by statute; the primary objective that the MPC must pursue is price stability, as defined by the 2½ percent target for inflation. In practice, the MPC defines its objective as aiming to keep its two-year-ahead forecast for inflation on target. The target is symmetric; the MPC is expected to respond just as vigorously to prospective undershoots of the target as to prospective overshoots. Transparency and accountability are regarded as central to the system. Minutes of the monthly MPC meetings are now published within two weeks of each meeting and the BoE also publishes a quarterly *Inflation Report* that describes the MPC's analysis of the U.K. economy and explains the factors underlying its policy decisions. If inflation deviates from target by more than 1 percentage point, the Governor of the Bank, as Chairman of the MPC, is required to write an open letter to the Chancellor explaining why and indicating what is being done to rectify the situation.

13. As indicated by Figure 1, long-term inflation expectations in the United Kingdom, based on comparisons of the yields on indexed and non-indexed bonds, dropped markedly following the introduction of the new framework in May 1997. Subsequently, long-term inflation expectations have fluctuated fairly closely around the 2½ percent target, suggesting that market participants have a high degree of confidence that the MPC will remain committed to its basic policy objective.

14. New Zealand was the first country to set an official inflation target and to establish institutional arrangements under which the target could be credible.[11] The Reserve Bank Act of 1989 provided the legislative support for inflation targeting and gave the RBNZ a high degree of independence; and in March 1990, a public Policy Target Agreement between the Governor of the RBNZ and the Minister of Finance created clear and transparent policy targets and well-defined accountability for achieving the targets. Following a decade during which inflation rates in New Zealand had averaged about 10 percent, the policy objective set initially was to bring inflation down to the range of 0 to 2 percent over a period of two or three years, and subsequently to keep inflation within that range. In implementing policy, the RBNZ initially established a horizon of about four quarters for purposes of calibrating the strength of monetary policy actions to offset the effects of shocks. Over time, and after success in reducing inflation sharply, the RBNZ has moved to a more flexible framework, widening its target band to 0 to 3 percent, and now aiming to hit the mid-point of this range at a policy horizon from 1½ to 2 years with willingness to accommodate greater near-term variability of inflation.[12]

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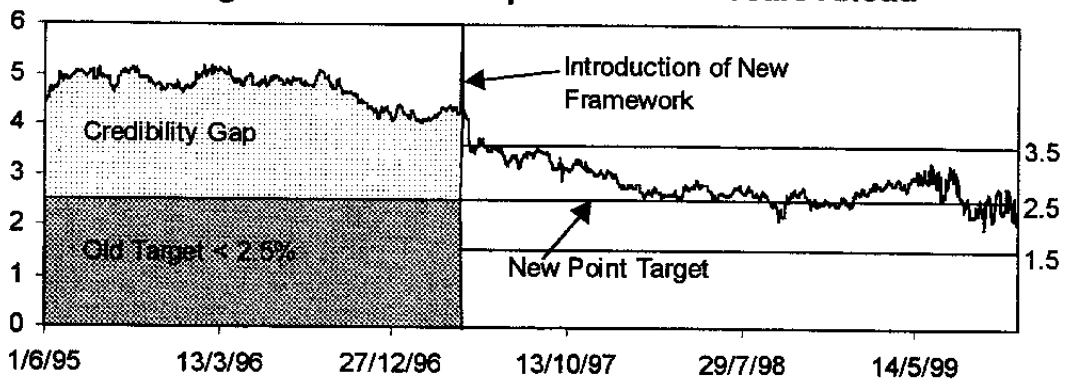
[11] For background, see M. Sarel, 1999, "New Zealand's Evolving Approach to Inflation Targeting," in SM/99/209, *New Zealand—Selected Issues*.

[12] See A. Drew and A. Orr, "The Reserve Bank's role in the recent business cycle: actions and evolutions," *Reserve Bank Bulletin*, March 1999.

Figure 1: Inflation Expectations 10 Years Ahead



The Decision-Making Process and the Inflation Forecast

15. In the United Kingdom, the MPC consists of nine members, including the Governor, two Deputy Governors, and two other members appointed by the BoE after consultation with the Chancellor, along with four external members appointed by the Chancellor. Each member of the MPC has one vote in the decision-making process, but in the event of a tie the Governor, as chair of the Committee, has a second casting vote. The members of the MPC are held accountable through the reporting of their individual votes in the published minutes of the monthly meetings. In New Zealand, the Governor selects his own monetary policy committee to help formulate decisions, but retains full authority to make decisions himself and formally is held solely accountable for achieving the inflation target agreed ex ante with the Minister of Finance.

16. At both monetary policy institutions, the inflation forecast plays a central role in informing policymakers and shaping policy decisions. However, the procedures through which the two institutions prepare their inflation forecasts differ significantly. Although in both cases policymakers "own" the published forecasts, at the RBNZ the professional staff is given a relatively large role in generating the forecast that serves as the starting point for the deliberations of the monetary policy committee, whereas in the United Kingdom the members of the MPC are more extensively involved in the nuts and bolts of putting together the forecast. To the extent that different members of the MPC have different views on how to model certain aspects of macroeconomic behavior, such as exchange rate determination, the U.K. inflation forecast—which is conveyed in terms of subjective confidence ranges—is produced by examining the implications of a number of different model variants in arriving at the central inflation projection and subjective confidence bands.

17. As mentioned earlier, the approaches used to generate inflation forecasts at the two central banks also reflect fundamentally different types of assumptions about the policy interest rate. The BoE sets its policy interest rate on the basis of a forecast for inflation that is conditioned on the assumption that the policy interest rate will be held constant over the first eight quarters of the forecast horizon. The RBNZ also used a constant policy rate assumption prior to June 1997, when it completed the development of a new macroeconomic model designed for policy analysis. Subsequently, the RBNZ has generated its inflation forecast and

a model-consistent interest rate path simultaneously after including in its macro model an appealing specification of an inflation-forecast-based monetary policy rule.[13] The RBNZ's interest rate forecast is described to the public in the form of projected half-year averages for a 90-day interest rate.

18. At both central banks, the process of generating the inflation forecast relies on macroeconomic models that reflect specific views about the monetary policy transmission mechanism; and at both institutions—as at central banks in most other industrialized countries—the macro models are in a constant state of evolution. The BoE has recently published a book that documents the equations and some of the properties of their core forecasting model. The RBNZ has also recently published a series of papers that document their forecasting and policy analysis system and we have been told that they have plans to construct a website to provide the public with access to future versions of the model.

D. Have U.K. Interest Rates Been Too Variable?

Sketch of the Model

19. The appropriate choice between different types and calibrations of monetary policy rules depends critically on the responsiveness of aggregate demand to the policy interest rate and on the extent to which market participants are forward-looking in forming their expectations.[14] Accordingly, most of the analysis in this paper is based on variants of a small linear macroeconomic model with essentially four behavioral equations. The key features of the model (see the Appendix for a detailed description) are as follows.

- The output gap—defined as the difference between actual output (aggregate demand) and potential output—exhibits a high degree of persistence while also declining in response to an increase in the real interest rate or an appreciation of the real exchange rate. Different model variants are analyzed to explore the implications of different views about which

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[13] RBNZ insiders report that the quality of the policy discussions has improved considerably since that time, but that it would be difficult to disentangle how much this is associated with having the new macro model available to structure the policy discussions and how much it reflects the shift away from conditioning the policy discussions on a constant interest rate assumption.

[14] As explained in Section G below, the effectiveness of a policy rule can also depend critically on the nature of the uncertainties about important model parameters, such as the NAIRU, and on whether the model includes nonlinearities—such as a convex Phillips curve, an explicitly-recognized floor on the nominal interest rate, or inflation expectations that respond endogenously and in a nonlinear manner to the track record (credibility) of the authorities in hitting their inflation target. See Isard, Laxton, and Eliasson (1999, 2000).

concept of the interest rate is most relevant for explaining the behavior of aggregate demand, and of different assumptions about the sensitivity of aggregate demand to the real exchange rate.

- The Phillips curve is a linear specification in which the observed rate of inflation depends positively on both the output gap and market expectations of future inflation,[15] where the level of potential output is assumed to be measured with no uncertainty. (The implications of uncertainty about the output gap are discussed in Section G below.)

- Drawing on estimates of a fairly standard specification, the rate of inflation expected by market participants is assumed to reflect a weighted average of an observed (backward-looking) inflation rate and the model-consistent (forward-looking) outcome for future inflation, with the latter component receiving a relatively-low weight (10 percent in the base-case specification). This specification provides a way of reconciling the notion that market participants are rational and forward-looking with the fact that many wages and prices are adjusted infrequently, in part reflecting the influence of contractual arrangements.

- The exchange rate satisfies a generalized interest rate parity condition, with the expected future spot rate assumed to behave as a weighted average of an observed (backward-looking) spot rate and the model-consistent future spot rate. This specification is motivated in part by substantial econometric evidence that the short-run behavior of exchange rates cannot be explained very well by macroeconomic fundamentals alone. It is also consistent with survey evidence that participants in foreign exchange markets rely heavily on "technical analysis," which essentially establishes a strong link between their short-run forecasts of (or expectations about) future exchange rates and the recent past behavior of exchange rates.

20. The model can be used to explore how well different monetary policy rules would succeed over time in keeping inflation close to target and the output gap close to zero when the economy is subject to different types of shocks. For any general type of policy rule, the "optimal" calibration of the reaction parameters can be approximated by searching over a range of possible parameter values and identifying those values for which the rule performs best. Moreover, by varying certain properties of the macroeconomic model—such as the degree of openness and the nature of the linkage between aggregate demand and interest rates—the analysis can shed light on why the "optimally" calibrated rule for the United Kingdom is likely to involve a different degree of interest rate variability than the optimally calibrated rule for the United States.

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[15] The observed rate of inflation also depends positively on the rate of import-price inflation, and the coefficients of the Phillips curve are constrained to be consistent with the long-run natural rate hypothesis.

Optimal Calibration of Generalized Taylor Rules

21. Table 1 reports the "optimal values" of the parameters of a generalized Taylor rule under sixteen different combinations of assumptions about the behavior of aggregate demand and the nature of the "shocks" to which policy must react. The formulation of the generalized Taylor rule is shown by the equation at the top of the table; in each period, the setting of the short-term nominal interest rate (the policy instrument) is determined by the previous period's interest rate—the interest rate smoothing component of the rule—as well as by the inflation rate (implicitly as a deviation from target) and the output gap. The parameter λ represents the degree of interest rate smoothing, while the parameters α and β characterize the strength of the reactions to inflation and the output gap.[16]

22. The results in the table are organized into four panels, corresponding to the various combinations of two different assumptions about the responsiveness of the output gap to the real exchange rate and two different representations of the "shocks" that the economy is assumed to experience. Within each of these four panels, the four sets of results correspond to different specifications of the interest rate measure in the output gap (aggregate demand) equation. The top row in each panel corresponds to the case in which the output gap is perceived to depend on the short-term (90-day) nominal interest rate, mimicking a key property of the BoE's core forecasting model, in which aggregate demand is assumed to depend on the short-term nominal interest rate.[17] The fourth row assumes that aggregate demand depends on the two-year real market interest rate, based on estimation results

[16] For each set of assumptions, the optimal values of the parameters in the rule are determined by searching for the calibration that leads to the best summary measure of macroeconomic performance when the model is simulated ten times over a horizon of a hundred quarterly time periods. The simulations are stochastic in the sense that in each time period the levels of the output gap, the inflation rate, and the exchange rate are subject to random shocks or prediction errors. The summary measure of macroeconomic performance—the minimum value of which determines the optimal calibration of (λ, α, β)—is the average (over the ten simulations and a hundred quarters per simulation) of a "conventional" quadratic policy loss measure that corresponds to a weighted sum of the squared deviation of the inflation rate from its target, the squared value of the output gap, and the squared value of the change in the policy interest rate. Additional details are provided in the Appendix.

[17] In the BoE core forecasting model the main direct effects of interest rates on aggregate demand is based on an assumption that the short-term nominal interest rate affects aggregate real consumption expenditures.

Table 1. Optimal Strength of Policy Reactions Under Different Assumptions
(Based on a Generalized Taylor Rule)

Generalized Taylor Rule1/ $rs_t = \lambda rs_{t-1} + \alpha \pi 4_t + \beta y_t$

Notation

rs	=	policy interest rate
$\pi 4$	=	rate of inflation over previous four quarters
y	=	output gap
x	=	interest rate on which aggregate demand is assumed to depend
z	=	real exchange rate

Case 1: Low Exchange Rate Sensitivity
Output gap equation: $y_t = 0.8y_{t-1} - 0.20x_{t-1} - (0.20/2.5)z_{t-1}$

	With Exchange Rate Shocks			Without Exchange Rate Shocks		
x_t	λ	α	β	λ	α	β
90-day nominal	0.25	1.70	0.75	0.40	1.10	0.60
90-day real	0.30	1.65	0.75	0.40	1.10	0.60
2-year nominal	0.60	1.30	0.45	0.60	0.95	0.40
2-year real	0.55	1.40	0.55	0.55	1.05	0.45

Case 2: High Exchange Rate Sensitivity
Output gap equation: $y_t = 0.8y_{t-1} - 0.20x_{t-1} - 0.20z_{t-1}$

	With Exchange Rate Shocks			Without Exchange Rate Shocks		
x_t	λ	α	β	λ	α	β
90-day nominal	0.10	1.95	1.00	0.30	1.10	0.60
90-day real	0.10	2.05	1.00	0.30	1.10	0.55
2-year nominal	0.20	1.90	0.90	0.35	1.00	0.45
2-year real	0.25	1.85	0.90	0.35	1.05	0.45

1/This formulation can be derived from the more general specification:

$$rs_t = \lambda rs_{t-1} + (1-\lambda) rs_t^*$$

$$rs_t^* = (rr^{eq} + \pi 4_t) + [(\alpha/(1-\lambda)) - 1]\ (\pi 4_t - \pi^*) + [\beta/(1-\lambda)] y_t$$

where rs_t^* is the level at which interest rate would be set in the absence of smoothing, rr^{eq} is the equilibrium level of the real interest rate, and π^* is the inflation target. Since the model is linear, the parameter estimates are independent of the levels of rr^{eq} and π^*, which for purposes of the simulations are set at zero.

summarized in the Appendix.[18] The middle two rows consider intermediate cases in which aggregate demand depends on the short-term real interest rate and the two-year nominal interest rate. The first case of the output gap equation assumes that the ratio between the interest rate and exchange rate coefficients is 2.5 to 1, as in a model calibrated to U.K. data by BoE staff.[19] For comparison, the second case assumes that a change in the real exchange rate has a stronger effect on aggregate demand. For each of these two cases, the results in the left panel are based on simulations in which the economy experiences three kinds of shocks or prediction errors: shocks to the output gap, (supply) shocks to inflation, and shocks to the exchange rate. The results in the right panels are based on simulations that suppress the effects of the shocks to the exchange rate.

23. The first interesting result is that the optimal degree of smoothing (persistence) in the policy interest rate is higher when the output gap depends on a medium-term (eight-quarter) interest rate than when it depends on the short-term interest rate. This can be seen by comparing the values of λ in the top two rows of each panel with those in the bottom two rows. Intuition for this result comes from recognizing that a greater degree of persistence implies that a given change in the policy interest rate will have a greater effect on medium-term and long-term interest rates. Thus, the greater is the extent to which monetary policy is transmitted to aggregate demand through medium-term or long-term interest rates rather than through the short-term policy interest rate directly, the smaller are the adjustments in the policy rate that are required, other things equal, to stabilize the economy in response to a given distribution of shocks, and hence the greater is the optimal degree of inertia in the level of the policy interest rate.

24. The table also provides two perspectives suggesting that the optimal degree of interest rate smoothing is probably inversely related to the degree of openness of the economy. One perspective is visible from comparing the results for the case 1 output gap equation with the results for case 2. Case 2, which is characterized by a stronger effect of the exchange rate on the output gap, can be taken to represent a more open economy than case 1; and the table indicates that the optimal degree of interest rate smoothing is lower in case 2. The second perspective comes from comparing the results in the left panels with those for analogous cases in which the economy is insulated from shocks that are transmitted through the exchange rate (right panels). These comparisons show that the optimal degree of interest rate

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[18] The basic form of the aggregate demand specification is taken from Batini and Haldane, as publised in BoE Quarterly Bulletin, Feb 99. We estimated variants of this specification exploring the relationship between aggregate demand and the real interest rate (based on indexed-bond yields) at different horizons, and found that the specification based on the two-year real rate fit better than specifications with longer-horizon real rates. We also found significantly smaller point estimates of the effects of real exchange rates on the output gap although there was considerable uncertainty in these estimates.

[19] Batini and Haldane (1999b).

smoothing is generally lower and policy is more aggressive in responding to inflation and output when exchange rate shocks represent a significant source of macroeconomic disturbances. This is because exchange rate shocks, as characterized in the model, have a large persistent component, implying that monetary policy should respond more promptly when exchange rate shocks are prominent.

25. The degree of policy credibility is another factor that is likely to influence the optimal degree of interest rate smoothing, with greater credibility implying less need to adjust interest rates quickly in reaction to changes in economic conditions. The implications of credibility are difficult to capture in the simple model employed here,[20] but one way of addressing the issue is to interpret the degree of credibility as synonymous with the extent to which inflation expectations are based on the model-consistent inflation forecast.[21] In this connection, simulation results (not shown in the table) with different specifications of the inflation expectations equation confirm that the optimal degree of interest rate smoothing is positively related to the weight on the forward-looking model-consistent component of those expectations.

26. These simulation results provide several relevant perspectives on the issue of whether interest rates in the United Kingdom have been "too variable." In general, they emphasize that the optimal degree of interest rate variability depends importantly on factors that can differ across countries, such as the channels through which monetary policy is transmitted to aggregate demand, the degree of openness of the economy, and the degree of policy credibility. Moreover, each of these three factors appears to support the view that, other things equal, sound monetary policy in the United Kingdom is likely to be characterized by greater interest rate variability than sound monetary policy in the United States. In particular: empirical work on aggregate demand functions has found that aggregate demand appears to depend on longer-term interest rates in the United States than in the United Kingdom; the United Kingdom is a more open economy than the United States; and the performance of U.S. monetary policy in recent years appears to have earned the Federal Reserve a remarkably high degree of credibility.

Inflation-Forecast-Based Rules Versus Backward-Looking Taylor Rules

27. The previous section examined the implications of different assumptions about the structure of the U.K. economy for the optimal calibration of Generalized-Taylor (GT) rules. In this section we extend that analysis to consider rules that are, in principle, much more forward-looking because they assume that the monetary authority chooses the policy rate on

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[20] See Isard, Laxton, and Eliasson (2000) for a more ambitious effort to model the credibility component of inflation expectations as an endogenous variable that responds asymmetrically to the track record of policymakers in keeping inflation on target.

[21] For example, see Amano, Coletti, and Macklem (1999).

the basis its own model-consistent forecast of future inflation. These types of IFB rules have been studied extensively at the Fund, the Bank of Canada, the Reserve Bank of New Zealand, and more recently at the Bank of England and other central banks that have adopted inflation-forecast targeting frameworks.[22]

28. There are several advantages that IFB rules have over GT rules. First, they contain much more information about nonlinear macroeconomic dynamics. This advantage will obviously be important in the presence of significant nonlinearities that result from zero nominal interest rate floors or nonlinearities inherent in the output-inflation process.[23] However, even in some linear models it has been shown that IFB rules deliver significantly better macroeconomic performance when these models are subjected to a large enough array of shocks because the entire information set of the monetary authorities cannot be summarized completely by the observed values for inflation, the output gap and the past level of the policy rate.[24] Indeed, as we will show below this may be the case in open economy models that are subjected to large portfolio preference shocks that affect the value of a country's exchange rate.

29. It is sometimes argued that one disadvantage of IFB rules is that unless the monetary authority makes its policy model, rule and assumptions available to the public, it will obviously be more difficult for market participants to infer the future path of the policy rate relative to a situation where it follows a simple rule like the Taylor rule. We do not find this argument very convincing because we doubt that any central bank would ever attempt to follow a Taylor rule in practice.

30. Table 2 reports the staff's preferred IFB rule for the staff's model of the U.K. economy. Under this rule the monetary authority is assumed to adjust the policy rate in response to the output gap, the lagged policy rate and its own forecast of future inflation four-quarters into the future. As can be seen in the table there are considerably larger weights on the inflation-forecast term than on the inflation term in a backward-looking Taylor rule

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[22] The exact form of the IFB rule used in this paper is a simplification of a more complicated rule that also includes information on the private sector's forecast of future inflation. The basic argument for including information on the private sector's forecast of future inflation in IFB rules is that the private sector's expectation of inflation and real short-term interest rates are critical in many models for determining the appropriate level and time path for real monetary conditions. The IFB rule used at the Reserve Bank of New Zealand and the Bank of Canada includes long-term interest rates because aggregate demand in their models depends on the slope of term structure rather than market-based real interest rates.

[23] For examples see Clark, Laxton and Rose (1995, 2000), Isard, Laxton and Eliasson (1999, 2000), Laxton, Rose and Tambakis (1999) and the discussion in section G.

[24] See Batini and Haldane (1999b).

Table 2. Optimal Strength of Policy Reactions Under Different Assumptions

(Based on a inflation-forecast-based rule)

Inflation-forecast-based rule $rs_t = \lambda rs_{t-1} + \alpha\pi 4_{t+4} + \beta y_t$

Notation

rs	=	policy interest rate
$\pi 4$	=	rate of inflation over previous four quarters
y	=	output gap
x	=	interest rate on which aggregate demand is assumed to depend
z	=	real exchange rate

Output gap equation: $y_t = 0.8y_{t-1} - 0.20x_{t-1} - (0.20/2.5)z_{t-1}$

Optimized weights on an inflation-forecast-based rule

	With Exchange Rate Shocks			Without Exchange Rate Shocks		
x_t	λ	α	β	λ	α	β
90-day nominal	0.75	3.40	0.25	0.60	2.55	0.30
90-day real	0.80	3.70	0.30	0.60	2.65	0.30
2-year nominal	1.45	5.80	0.00	1.05	3.50	0.05
2-year real	1.35	6.45	0.00	0.95	3.65	0.00

and smaller weights on the output gap (compare results in Table 1 and Table 2). This is because information about the output gap is already summarized in the inflation forecast, and indeed for the staff's preferred model where the output gap is a function of the real two-year market rate, the optimal weight on the output gap is zero.

31. Table 3 measures the improvement in the loss function from following the optimally calibrated IFB rule relative to the optimally calibrated Generalized Taylor rules reported in Table 1. As can be seen in the table, the IFB rule has a significant advantage over the GT rule in the presence of shocks that directly affect the value of the exchange rate but this advantage becomes smaller when exchange rate shocks are eliminated from the analysis. This is consistent with some findings that suggest that there are only small benefits (or no advantages) of IFB rules over GT rules in linear closed economy models.[25]

E. How does the "Constant-Interest-Rate (CIR) Rule Compared with Alternatives?

32. This section illustrates some of the implications of the CIR rule. In contrast with the stochastic simulation results reported in the previous section, the focus here is on the implications of the assumption for getting inflation back to the target level following a shock to aggregate demand. For comparison, the analysis also considers the outcomes under a generalized Taylor rule and under the type of unconstrained IFB rule that guides the policy reactions of the Reserve Bank of New Zealand.

33. In most models of the monetary policy transmission mechanism for open economies, including the model that underlies the analysis in this paper, an increase in interest rates has a direct negative effect on aggregate demand and output and leads to exchange rate appreciation that also affects output negatively, with the output effects tending to be persistent. In addition, through the decline in output, the increase in the interest rate reduces inflation and thereby also reduces expected future inflation, which contributes to continuing reductions in observed inflation. These ongoing effects of interest rate changes on aggregate demand and inflation have implications for the stabilizing properties of the CIR rule.

34. Figures 2 and 3 reveal some interesting perspectives under the base-case output gap equation specified in terms of the two-year real interest rate. The figures show the quarter-to-quarter behavior of the policy interest rate, the rate of inflation, and the output gap following an unanticipated increase in aggregate demand.[26] Figure 2 shows the amount by which the

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[25] See Levin, Wieland and Williams (1999).

[26] The residual of the output gap equation is set equal to 0.5 in period 1, 1.0 in period 2 and 0.5 in period 3.

Table 3. Comparison of the Values of Loss Functions for the Optimal Calibration of a Generalized Taylor (GT) Rule and an Inflation-Forecast-Based (IFB) Rule

Generalized Taylor rule $rs_t = \lambda rs_{t-1} + \alpha\pi 4_t + \beta y_t$

Inflation-forecast-based rule $rs_t = \lambda rs_{t-1} + \alpha\pi 4_{t+4} + \beta y_t$

Notation

rs	=	policy interest rate
$\pi 4$	=	rate of inflation over previous four quarters
y	=	output gap
x	=	interest rate on which aggregate demand is assumed to depend
z	=	real exchange rate

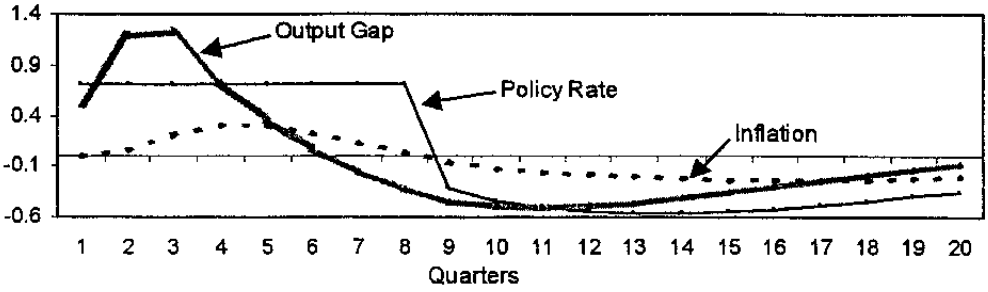
Output gap equation: $y_t = 0.8y_{t-1} - 0.20x_{t-1} - (0.20/2.5)z_{t-1}$

Values of the loss function

x_t	GT Rule	IFB Rule	Percent Improvement Over GT Rule	GT Rule	IFB Rule	Percent Improvement Over GT Rule
90-day nominal	3.64	3.09	15.24%	2.31	2.28	1.51%
90-day real	3.26	2.74	15.84%	2.08	2.04	1.77%
2-year nominal	3.01	2.70	10.36%	2.12	2.10	0.63%
2-year real	2.94	2.63	10.63%	2.00	1.98	0.78%

policy interest rate would be raised initially under the CIR's rule, along with the path that inflation would follow, given the policy objective of bringing inflation back down to target over an eight-quarter horizon and subject to the intent of holding the interest rate constant at its new level over that horizon. Beyond the eight-quarter horizon, and consistent with the practice used by the BoE staff in its own simulations, another interest rate rule is imposed in order to gradually stabilize the economy.[27]

Figure 2. Responses to Aggregate Demand Shocks Based on the CIR Rule : Forecast in Period One (Deviation from baseline)



35. Note that this type of policy response reduces inflation back to its target level in eight-quarters, but pushes inflation below target thereafter. Accordingly, the intent of holding the interest rate constant for eight-quarters would not remain consistent with the policy objective, and when the MPC met in the second period to review its policy stance, its objective of hitting the 2½ percent inflation target under the constraint of a constant interest rate rule would call for a reduction in the level of the "constant interest rate." For similar reasons, further gradual reductions in the policy interest rate would be called for in subsequent quarters. Thus, the intent of holding the interest rate constant for eight quarters is not time consistent.

36. Figure 3 shows the implications of such period-to-period revisions in the level of the "constant interest rate." Note that as a result of these period-to-period interest rate adjustments, it would actually take much longer than eight quarters to get inflation back down to target.

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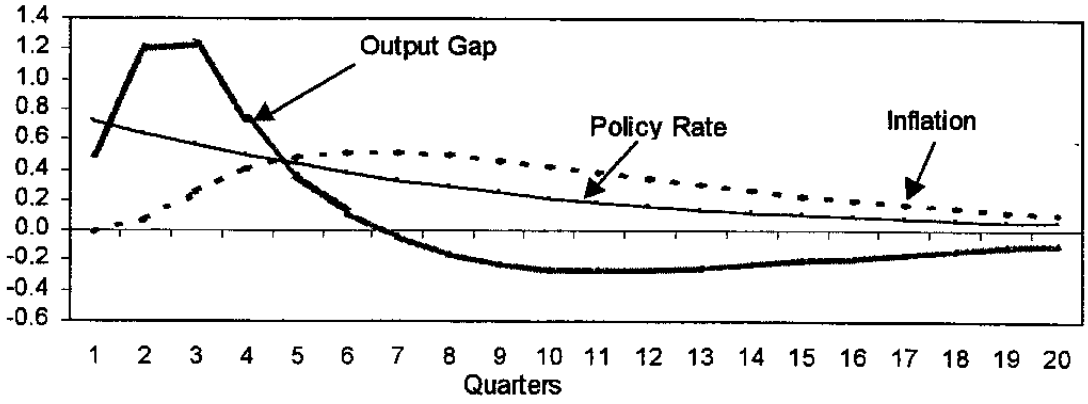
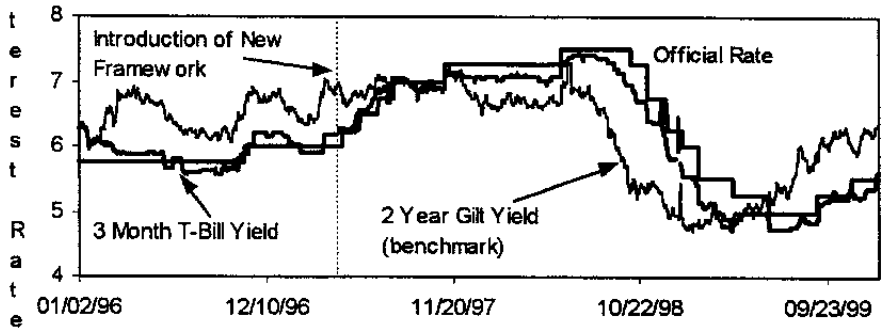
[27] In constructing the inflation forecast, the BoE staff assume that the CIR rule reverts to a Taylor rule after the eighth quarter of the forecast horizon while the staff assume that it reverts back to an IFB rule.

Figure 3. Cumulative Responses to Aggregate Demand Shocks Given Repeated Application of the CIR Rule (Deviation from baseline)



37. The lack of credibility (time consistency) of the constant-interest-rate forecasts appears to be reflected in the recent history of two-year market interest rates (Figure 4). Indeed, market interest rates have provided a fairly accurate leading indicator of the policy rate over the past year and a half.

Figure 4. Official and Market Interest Rates



38. For comparison, Figures 5 and 6 show the paths that inflation and the interest rate would follow under a generalized Taylor rule and under a model-consistent inflation-forecast-based rule that broadly resembles the RBNZ's reaction function.[28] Both of these alternative rules would call for higher real interest rates in the first year than the CIR rule, and would succeed in steering the inflation rate much closer to the target level within eight quarters. Another important difference is that the IFB rule results in a more preemptive tightening in real monetary conditions than the GT rule reflecting the fact that it is a more forward-looking rule.

[28] The specific calibrations of the two rules are the optimal base-case calibrations shown in Tables 1 and Table 2.

Figure 5. Inflation-Forecast-Based Rule
(Deviation from baseline)

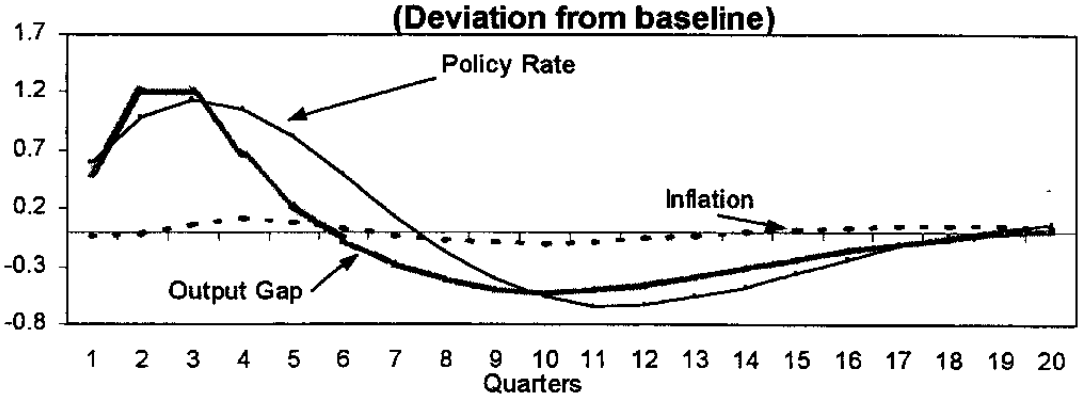
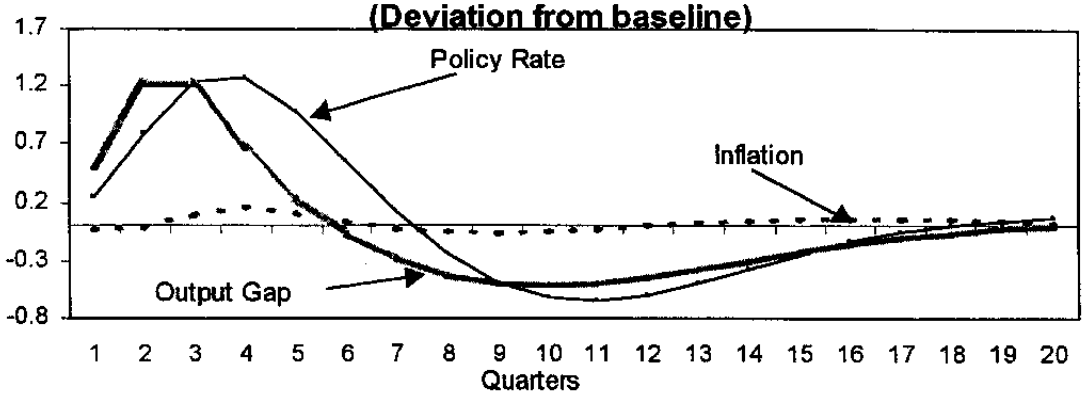


Figure 6. Generalized-Taylor Rule
(Deviation from baseline)



F. Potential Gains from a Transparent and Forward-looking Framework

Pros and Cons of Policy Transparency

39. This section uses stochastic simulation analysis to compare the degree of macroeconomic variability that is generated under different assumptions about the policy framework and the information or procedures on which market participants base their expectations.

40. Before discussing the simulation results, it is relevant to note that a number of considerations argue against being transparent.[29] Transparency about policy decisions can be

[29] This paper abstracts from the possibility that the policy objective function may motivate the authorities to pursue time-inconsistent policies, as suggested by Barro and Gordon

(continued...)

destabilizing when the analytic foundations for the decisions are weak; and by analogy, transparency about the central bank's policy model might not help anchor expectations on the inflation target if the properties of the model were not sufficiently plausible. In the case of the BoE, moreover, significant differences of opinion among members of the Monetary Policy Committee make it difficult to reach a consensus on which, if any, of the BoE models could serve as an official policy model. It has also been argued that market participants can read too much into, and can react counterproductively to, the announcement of a non-constant path for the interest rate.[30] Furthermore, when central banks become more transparent about their forecasts ex ante, they almost inevitably confront additional questioning about why their forecasts were not fully realized ex post, which can consume significant amounts of time.

41. On the other side of the coin, some key points in favor of increased transparency about the policy framework are that it can strengthen incentives for central banks to pursue their announced goals and can increase the effectiveness of monetary policy through enhancing its predictability by market participants. Indeed, this will be the case if the monetary authority's main informational advantage over market participants is that it has a greater awareness about how it is likely to respond to new information. It has been argued, in addition, that subjecting policy models to public scrutiny and criticism is likely to catalyze significant improvements in the policy framework over time.[31]

42. In weighing these considerations, it may be noted that the RBNZ did not make their model transparent and begin announcing a model-consistent interest rate forecast until mid-1997, seven years after New Zealand adopted an inflation targeting strategy for monetary policy. Prior to that, the RBNZ invested significant resources in developing a policy model that better reflected policymakers' views about the monetary policy transmission mechanism and the manner in which the economy responded to standard shocks. It may also be noted, in the New Zealand context, that it is difficult to separate the benefits of making the policy model transparent to the public from the benefits of simply

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(1983). See Faust and Svensson (1999) for perspectives on the tradeoffs between transparency and control in such a framework.

[30] Market reactions to the "biases" announced by the Federal Reserve's Open Market Committee during 1999 illustrate this possibility.

[31] This may be particularly the case in countries where there is significant interest and expertise outside the central bank in developing macro models to support inflation targeting. In this case, making an up-to-date version of the model available on the central bank's web site may result in more constructive suggestions by outsiders if they have a more precise understanding about how the policymakers view the economy and the nature of the monetary transmission mechanism.

having a macro model that policymakers accept as a basis for framing their analysis and that thus contributes to the coherence of internal policy discussions.

Illustrative Simulation Results

43. Given the various potential costs and benefits just described, any attempt to quantify the potential gains from policy transparency and an improved forecasting and decisionmaking framework requires strong qualification. It is instructive, nevertheless, to illustrate the potential benefits by simulating the performance of the basic model variant under different assumptions about the policy framework and the information, or procedures, on which market participants base their expectations. For this purpose we consider a benchmark case in which the policy interest rate is based on an optimally calibrated unconstrained inflation-forecast-based (IFB) rule (the rule reported in Table 2) and the policy framework is made fully transparent to informed market participants. The alternative policy frameworks include cases in which the policy interest rate is based on a constant-interest-rate (CIR) forecast of inflation, as well as cases in which the policy interest rate is based on the benchmark IFB rule, but the policy framework is not fully transparent to market participants. The simulations suggest that there are potential gains from shifting from a CIR rule to an IFB rule even in the absence of full transparency, and that there are further potential gains from making the IFB framework transparent.

44. The simulation analysis emphasizes that the degree of macroeconomic variability depends on market participants' perceptions about how the policy interest rate will be adjusted over time. Under the CIR rule, the forecast may be published and "fully transparent" in that sense, but the prospect of a "constant" interest rate will generally not be regarded as credible. Thus, under either a "transparent" CIR rule or an IFB rule without full transparency, market participants must somehow form expectations based on limited information. To the extent that market participants draw inferences from the observed behavior of the policy interest rate and other macroeconomic variables and refine their inferences over time, efforts by the monetary authority to develop a coherent view of the monetary transmission mechanism and adopt a forward-looking policy reaction function may have significant benefits for the economy if it allows market participants to better predict the systematic component of monetary policy. Indeed, increasing the predictability of the systematic component of monetary policy by following a forward-looking IFB rule may be particularly important if the staff's model of the UK economy is correct in presuming that aggregate demand depends not just on past movements in the policy rate, but also on movements in the expected future policy rate.[32]

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[32] The main advantage of complete openness, where the central bank releases its model as well as all of the judgmental add-factors that are used to construct the forecast, is that it would allow outsiders to more effectively analyze their performance and the relative contributions of the model and the judgement. This presumably would make it easier to

(continued...)

45. These points are illustrated under alternative assumptions about the way that market participants form their expectations. In each case the basic model variant is simulated 100 times over 20 quarters, starting from an initial position with inflation at the target and the level of output at potential. Market expectations during the first 10 quarters are assumed to be based on one of three sets of initial beliefs about how monetary policy is likely to respond to new information about inflation and the output gap. Beginning in the 11th quarter, it is assumed that market participants start to base their expectations on an estimated Generalized Taylor (GT) rule that depends on the observed history of inflation, the output gap, and the policy rate. The estimated parameters of the GT rule are updated each quarter as the "historical" sample period gets larger.

46. The first set of experiments illustrate the potential benefits of basing monetary policy on an unconstrained IFB rule relative to a CIR rule. In this first set of experiments monetary policy is assumed to be completely transparent to informed bond market participants under the IFB rule; in particular it is assumed that the monetary authority publishes both its IFB rule and its model. However, because the CIR rule is not time consistent, market participants in this case have to infer how the "constant" interest rate is likely to be changed over time based on the observed historical data. The direct benefits of publishing an IFB rule and the model are estimated by comparing macroeconomic performance under situations where the monetary authority's IFB rule and model are known to the public with situations where they are not known and informed market participants have to infer the parameters of the GT rule. An interesting result that emerges is that the gains from policy transparency are potentially greater when market participants are faced with a limited track record from which to infer how aggressively the monetary authority is likely to respond to inflationary pressures.

47. The left column of Table 4 reports standard deviations for the year-on-year RPIX inflation rate, the output gap, a 90-day interest rate, and a 2-year interest rate, for the benchmark case where the monetary authority follows an IFB rule and policy is fully transparent. The other columns represent cases in which market participants are assumed to infer how the policy interest rate will be adjusted over time under three alternative assumptions about their initial beliefs. As can be seen in the left column, an aggressive IFB rule delivers a fairly low level of variability in inflation , the output gap, and the 2-year market rate, but it produces significantly greater variability in the 90-day rate.[33] The lower variability in the 2-year rate relative to the variability in the 90-day rate is a direct consequence of the assumption that policy is fully transparent. In this case informed bond

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distinguish between policy errors that arise from bad luck (large shocks that do not offset each other) and policy errors that arise because of weaknesses in the framework.

[33] In the model there is no distinction between the 90-day market rate and the MPC's policy rate and the former is assumed to move one-for-one with the latter.

Table 4. Estimates of Short-Run Macroeconomic Variability Under Different Policy Frameworks and Different Initial Beliefs by Market Participants

(Standard deviations of selected variables in percentage points)

		Market Participants' Initial Beliefs About How the Policy Interest Rate Will be Adjusted Over Time[1]		
	IFB Rule With Full Transparency (Benchmark)	a. Simple Unaggressive Taylor Rule	b. Conventional Taylor Rule	c. Approx. Optimal Generalized Taylor Rule
		Monetary Authority Bases the Policy Interest Rate on a CIR Rule		
Inflation	0.59	0.93	0.87	0.85
Output gap	0.99	0.97	0.98	0.98
90-day interest rate	1.79	1.18	1.14	1.12
2-year interest rate	0.93	1.12	1.16	1.14
		Monetary Authority Bases the Policy Interest Rate on an IFB Rule But is Not Transparent About the Policy Framework		
Inflation	0.59	0.76	0.67	0.61
Output gap	0.99	1.01	0.99	0.99
90-day interest rate	1.79	2.39	2.10	1.85
2-year interest rate	0.93	1.17	1.05	0.95

1/The different cases are defined as:
a. Simple unaggresive rule ($rs_t = 1.10\pi 4_t$);
b. Conventional Taylor Rule ($rs_t = 1.50\pi 4_t + .50y_t$);
c. Approximately Optimal Generalized Taylor Rule ($rs_t = 55\ rs_{t-1} + 1.40\pi 4_t + .55y_t$);
where rs denotes the policy interest rate, $\pi 4$ is the year on year inflation rate, and y is the output gap.

market participants know that the policy rate will have a tendency to converge back to a more neutral stance over time in situations where the MPC is working against a potential inflationary shock by aggressively adjusting the policy rate. Figure 4 above, which plots the 90-day rate and the 2-year yield on gilts, provides some indications that bond market participants do not extrapolate very high policy rates (rates above 7 percent) into the future, but it is obviously too soon to tell if the "excess relative volatility" in 2-year rates that has been observed since the new regime was introduced is related to imperfect policy transparency.

48. The benefit of announcing a forward-looking IFB rule that is consistent with the monetary authority's views about the structure of the economy and its underlying objectives, is that it may serve to anchor expectations about the future evolution of the policy rate and, on average, this may result in a better level for market-based real interest rates. This may be particularly important when the track record is rather limited because it will be more difficult in such circumstances for informed bond market participants to understand how aggressively the MPC is likely to respond to potential inflationary pressures.

49. The top panel of Table 4 also reports estimates of variability in the macroeconomic indicators when the policy rate is determined by a CIR rule and market participants attempt to infer the parameters of the GT rule. The bottom panel present the results for similar experiments except in this case the monetary authority is assumed to follow an IFB rule but not to make its rule and model available to the public. Because the results of these experiments will be sensitive to assumptions about "initial beliefs" of market participants, when insufficient data are available to estimate the parameters of the GT rule, three cases are considered. The first case assumes that for the first 10 quarters of the simulation horizon the market believes that the monetary authority will follow a simple unaggressive Taylor rule that has a small weight of 1.1 on observed inflation and zero weights both the lagged policy rate and the output gap. The parameters of this rule were chosen because they imply a policy response that returns the inflation forecast back to the target very slowly, a result that roughly mimics the slow convergence properties for both inflation and the policy rate that is consistent with the "logical updating process" of the CIR rule (see Figure 3). The other two cases provide assumptions for initial beliefs that assume that the monetary authority will respond much more aggressively to inflation and the output gap.

50. The estimates of short-run variability reported in Table 4 indicate that there may be significant benefits in terms of reduced variability in inflation from adopting an IFB rule and making the policy framework fully transparent. Indeed, relative to both a CIR rule and an imperfectly transparent IFB rule, there can be significantly lower variability in inflation under the IFB rule with full transparency. These results suggest that when a monetary policy regime is new, or there has been a significant revision in the monetary authority's objectives or views about the monetary policy transmission mechanism, that there may be significant benefits from making these changes in views as transparent as possible in order to reduce uncertainty in the monetary transmission mechanism. This basic intuition is confirmed by an additional simulation experiment reported in Table 5, which extends the simulation horizon by a further 80 quarters in order to compute longer-term measures of variability in these

Table 5. Estimates of Long-Run Macroeconomic Variability Under Different Policy Frameworks and Different Initial Beliefs by Market Participants

(Standard deviations of selected variables in percentage points)

		Market Participants' Initial Beliefs About How the Policy Interest Rate Will be Adjusted Over Time[1]		
	IFB Rule With Full Transparency (Benchmark)	a. Simple Unaggressive Taylor Rule	b. Conventional Taylor Rule	c. Approx. Optimal Generalized Taylor Rule
		Monetary Authority Bases the Policy Interest Rate on a CIR Rule		
Inflation	0.77	3.48	3.32	3.07
Output gap	1.19	1.25	1.24	1.23
90-day interest rate	2.58	3.66	3.50	3.26
2-year interest rate	1.23	3.85	3.68	3.42
		Monetary Authority Bases the Policy Interest Rate on an IFB Rule But is Not Transparent About the Policy Framework		
Inflation	0.77	0.80	0.80	0.80
Output gap	1.19	1.21	1.20	1.19
90-day interest rate	2.58	2.73	2.67	2.63
2-year interest rate	1.23	1.29	1.27	1.26

1/The different cases are defined as:
a. Simple unaggresive rule ($rs_t = 1.10\pi 4_t$);
b. Conventional Taylor Rule ($rs_t = 1.50\pi 4_t + .50y_t$);
c. Approximately Optimal Generalized Taylor Rule ($rs_t = 55\ rs_{t-1} + 1.40\pi 4_t + .55y_t$);
where rs denotes the policy interest rate, $\pi 4$ is the year on year inflation rate, and y is the output gap.

macroeconomic indicators. Note, first, from the lower panel, that in this case there are smaller benefits from announcing the IFB rule and making policy fully transparent because simply following the rule over a long enough period of time provides sufficient guidance to market participants about the systematic component of monetary policy.

51. Comparison of the upper panels of Tables 4 and 5 provides additional perspectives on the credibility problems that would likely develop under the CIR rule. Indeed, when we repeat the same experiments reported in Table 4 but consider a case where the CIR rule is assumed to be followed for an additional 80 quarters (Table 5) it becomes apparent that the CIR rule would be abandoned at some point because the higher inflation persistence that would develop as market participants more accurately inferred the rule would result in enormously high levels of variability in inflation, output, and interest rates.

G. The Dangers of Interest Rate Smoothing and Taylor Rules

52. The analysis in the previous sections has been based on a very simple model of macroeconomic behavior. One major simplification is the implicit assumption that the monetary authorities do not make serially-correlated errors in estimating the output gap. Such an assumption is extremely unrealistic. Potential output is not an observable variable, so its level needs to be inferred from other observable information and assumptions about the economy, and experience suggests that policymakers and their staffs periodically conclude that they have been making serially-correlated errors in estimating potential output and need to significantly revise their historical data series. This contributes to the phenomenon of policymakers occasionally coming to realize that their assessments of the strength or weakness of the economy have gone badly off track, and that they have allowed a state of significant excess demand or supply to develop.

53. A second major simplification of the previous analysis is the assumption that the world is linear. This abstracts, inter alia, from the possible relevance of convex Phillips curves, floors on nominal interest rates, and inflation expectations that respond endogenously and in an asymmetric manner to the track record (credibility) of the authorities in hitting their inflation target.

54. Analysis that avoids these two types of simplifications points to the dangers of the types of myopic policy reactions that are prescribed by backward-looking Taylor rules or rules with high degrees of interest rate smoothing.[34] In a nonlinear world in which serially-correlated errors in estimating output gaps create a significant probability that states of significant excess demand will sometimes develop, monetary authorities who remained committed to a policy rule that called for myopic reactions would run the risk of inflation

[34] Isard, Laxton, and Eliasson (1999).

expectations skyrocketing, particularly if market participants were (partially) forward-looking in forming their inflation expectations.

55. These considerations imply that forward-looking inflation-forecast based (IFB) rules are inherently superior to backward-looking Taylor rules as guidelines for monetary policy.[35]

H. Some Implications of Uncertainty in the Monetary Transmission Mechanism

56. The success and credibility of an inflation-targeting framework ultimately depends on the abilities and systematic judgements of the policymakers. One of the potential advantages of an open and transparent inflation targeting framework is that it will foster debate about uncertainties in the forecast process and this over time will improve the decision making process.

The Exchange Rate-Interest Rate Nexus

57. One important issue on which policymakers can disagree on the basis of econometric evidence is the question of how exchange rates are likely to respond to policy actions. This is illustrated in the November 1999 *Inflation Report*, which indicates that there was considerable disagreement within the MPC about the choice of the exchange rate model. Some members believed that this uncertainty was so large that they favored replacing the exchange rate equation in the BoE's core forecasting model, which was based on uncovered-interest-parity (UIP), with the assumption that the exchange rate will remain constant. The argument for doing this is reported succinctly in the Box on page 48 of the November *Inflation Report*: "Some statistical tests on past data indicate that the random walk hypothesis performed no worse than—indeed often better than—the uncovered interest parity theory...and for this reason and given the merit in a simple approach some Committee members were inclined toward this benchmark."

58. As shown below, such differences in model specifications can have significantly different implications for how monetary policy should respond to inflation and output gaps. The UIP equation implies that an increase in the policy interest rate will lead to an exchange rate appreciation, other things being equal. By contrast, a random walk view is tantamount to saying that policymakers do not know the expected sign of the reaction of the exchange rate to a policy-induced change in short-term interest rates. In the end, the MPC decided to take an average of these two approaches—a wise decision from the standpoint of the staff's model.

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[35] The same considerations pose a serious challenge to the common practice of basing the analysis of monetary policy issues on linear models of macroeconomic behavior.

59. The staff's exchange rate model is based on an extended risk-adjusted theory of UIP where market expectations are assumed to be generated by a linear combination of last period's exchange rate and the model-consistent solution; see equation in Table 6.[36] By varying the weights on the forward-looking and backward-looking components in the equation that determines the private sector's forecast of next period's exchange rate, it is possible to capture the range of views that members of the MPC had leading up to the November 1999 *Inflation Report*.[37] In terms of the equation in the table, some members on the MPC preferred a model where Φ was 0 (an unchanged exchange rate assumption) and some other members preferred a model where Φ was 1 (pure UIP).

60. To illustrate the implications for the behavior of monetary policy of these various approaches, the weights for the Generalized Taylor rule were optimally recalibrated for different specifications of the weight on the forward-looking component of expectations in the exchange rate equation; the weights for Φ that are considered vary between 0 and 1 in increments of 0.2. As can be seen from Table 6, the policy rate must be adjusted more aggressively in the short run in response to changes in inflation when interest rates have smaller short-run effects on the exchange rate (the values of α in Table 6 are generally larger when Φ is smaller). This is because the lags in the monetary transmission mechanism become longer for smaller values of Φ as the exchange rate adjusts more gradually in response to a change in the policy interest rate. Note, that in the special case where Φ is zero the exchange rate is assumed to be completely unresponsive to a change in the policy rate. By contrast, when there is a weight of one on the model-consistent solution in the exchange rate equation, monetary policy works much more through expectational effects in the foreign exchange market and as a consequence can react more gradually and less aggressively in the short run to changes in inflation.

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[36] This model of expectations is sometimes referred to as a backward-and-forward-looking components model. It is regarded in several central banks as a useful way to specify expectations in models that are designed to do both forecasting and policy analysis. The development of macro models that have these features has proceeded considerably faster at central banks that have had access to more efficient and robust and solution algorithms.

[37] In the staff's model the lagged exchange rate term is combined with an additional term that reflects a possible inflation differential with other countries, so setting the weight on the model-consistent forecast to zero does not exactly deliver a random walk exchange rate—see the Appendix for a description of the staff's model. The inflation differential term is necessary in the staff's model to prevent a super non-neutrality from creeping into the model's structure. The experiments reported in this section, however, were generated by excluding the inflation differential term in order to produce something closer to the random walk assumption when the weight on the model-consistent forecast is imposed to be zero.

Table 6. Optimal Generalized Taylor Rule Parameters under Different Assumptions of Exchange Rate Expectations

Interest parity equation: $s_t = s^e_{t+1} + (rs_t - rs^f_t)/4 + \varepsilon^s_t$

Exchange rate expectations: $s^e_{t+1} = \Phi\, s_{t+1} + (1-\Phi)\, s_{t-1}$

Generalized Taylor rule: $rs_t = \lambda rs_{t-1} + \alpha\pi 4_t + \beta y_t$

Optimized Weights in Generalized Taylor Rule

Φ	λ	α	β
0.0	0.70	1.10	0.65
0.2	0.65	1.15	0.65
0.4	0.60	0.95	0.65
0.6	0.80	0.60	0.45
0.8	0.90	0.55	0.50
1.0	0.90	0.60	0.55

What are the implications of basing the forecast and interest rate setting on an incorrect degree of forward lookingness in the foreign exchange market?

61. To illustrate the implications of basing monetary policy on an incorrect degree of forwardlookingness in the foreign exchange market we compute the additional losses that would be imposed on the economy if the MPC were to base its interest rate reactions on an incorrect value of Φ. The specific loss function that is chosen is explained in the Appendix and places a weight of one half on interest rate volatility and weights of one on both variability in inflation and the output gap.

62. Table 7 reports the percent increase in the value of the loss function when the MPC's interest rate reaction is based on an incorrect assumption about the degree of forwardlookingness in foreign exchange markets. In the experiments the MPC is assumed to follow the generalized Taylor rule that is optimally calibrated given their views on Φ.

63. As can be seen in the Table there can be significant benefits from knowing the true weight and large costs from assuming an unduly large weight of 1 for Φ if it is possible that the weight might be smaller. In this sense the assumption that was agreed upon by the MPC may be a useful step in the right direction because not only did it represent an "averaging" of the range of views in the MPC, it also may represent a more judicious choice from the strategic perspective of eliminating potentially large errors when there is uncertainty about the magnitude of the response of the exchange rate to a change in the policy rate. Indeed, an interesting aspect of the results in Table 7 is that the costs of overestimating and underestimating the value of Φ are not symmetric. For example, there can be greater costs from overestimating the degree of forwardlookingness (and not adjusting the policy rate sufficiently in response to a change in inflation) than underestimating the degree of forwardlookingness (and adjusting the policy rate too aggressively): the additional losses in the shaded area in the top right-side part of the table are considerably larger than the losses in the shaded area in the bottom left side of the table.

I. Concluding Remarks

64. This paper has addressed several issues that arise in designing a framework for inflation targeting, with particular attention to features of the Bank of England's approach and experience. Because it takes time for monetary policy to affect inflation and economic activity, central banks generally strive to make forward-looking decisions. Most policymakers are well aware of the perils of adhering rigidly to any particular monetary policy rule, as opposed to exercising constrained discretion; but there is considerable interest in identifying the types and calibrations of policy rules that can provide the most effective guidelines or benchmarks. In part this interest reflects the usefulness of quantitative frameworks for helping policymakers structure their thinking in a forward-looking context; monetary policy rules or assumptions are required to make those frameworks complete and

Table 7. Percent Increase in Value of the Loss Function when MPC's Model has the Wrong Φ Value

	MPC's Assumption About Φ					
True Φ	0.0	0.2	0.4	0.6	0.8	1.0
0.0	No Loss	0.3	4.4	13.6	30.3	25.8
0.2	0.7	No Loss	2.2	16.9	44.0	38.2
0.4	2.9	1.6	No Loss	8.9	27.5	26.4
0.6	5.4	5.9	5.0	No Loss	1.5	2.4
0.8	5.4	6.6	8.7	1.5	No Loss	0.3
1.0	4.6	6.1	10.0	2.5	0.1	No Loss

internally consistent. Moreover, to the extent that macroeconomic behavior depends importantly on the expectations of market participants, monetary policy that is guided by a well-chosen policy rule, and that therefore tends to be relatively consistent and transparent over time, can induce market expectations to evolve in a manner that helps stabilize the economy.

65. Comparison of the U.K. experience in recent years with that of the United States has provoked suggestions that the Bank of England's policy framework gives rise to excessive interest rate variability. The analysis in this paper, however, does not support that assessment. Rather, it has emphasized that the optimal strength of monetary policy reactions—including the optimal degree of interest rate smoothing—depends importantly on, among other things, both the nature of the direct linkages between aggregate demand and interest rates and the sensitivity of aggregate demand to the real exchange rate. Both of these factors would appear to imply a need for greater interest rate variability in the United Kingdom than in the United States.

66. The Bank of England Inflation Report features an inflation forecast based on a constant interest rate assumption.[38] While this approach may simplify internal policy discussions and external communication in certain ways, the constant-interest-rate assumption underlying the forecast in the *Inflation Report* has not been regarded as credible, as can be inferred from the term structure of market interest rates. Indeed, under many plausible models of how monetary policy is transmitted to aggregate demand and inflation, the "constant-interest-rate" framework is not time consistent since it tends to induce periodic changes in the policy interest rate. Moreover, the pattern of these changes operates to substantially lengthen the time required to return inflation to the target level following a shock.

67. The main alternatives to constant-interest-rate IFB rules are generalized Taylor rules and model-consistent IFB rules. The latter *unconstrained* form of IFB rule plays a central role in the monetary policy framework of the Reserve Bank of New Zealand.

68. Unlike IFB rules, Taylor rules have the undesirable feature of being backward-looking; they call for policy to respond to the deviation from target of the most recently observed rate of inflation rather than the deviation from target of an inflation forecast. Various simulation studies have found that Taylor rules have remarkably good stabilization properties in linear macroeconomic models, but most of these studies have abstracted from the fact that economists tend to make serially correlated errors in estimating the level of potential output. In general, myopic policy reaction functions—such as Taylor rules or rules

[38] The Bank of England also publishes inflation forecasts based on the market's expectations of future policy rates. The path of policy rates is imposed exogenously rather than being derived endogenously within the forecast to change real monetary conditions as needed for inflation to converge on the target.

with a high degree of interest rate smoothing—do not provide desirable or credible guidelines for policy in a world in which monetary policy credibility can quickly be lost and only slowly regained, and in which policymakers are sometimes confronted with substantial revisions in macroeconomic indicators of the state of the economy. In such a world, it can be very costly to follow myopic policy rules that risk falling systematically behind shifts in the Phillips curve.

69. The New Zealand experience suggests that there are large potential gains from developing a macroeconomic model that succeeds in capturing policymakers' views of the monetary policy transmission mechanism and embodies a well-chosen IFB rule. Quantitative models that are broadly consistent with policymakers' views, and the model-consistent interest rate paths that are generated from those models, can add significantly to the coherence of the central bank's internal discussions and policy decisions. Developing such a model takes time, but considerable payoffs can potentially be gained in a relatively short period by keeping the model small and concentrating initially on capturing policymakers' views about a few key relationships, such as the aggregate demand function.

70. To succeed in developing a model on which policymakers will feel comfortable relying, it is important to draw them into the process of specifying the model and determining the values of its key parameters. Econometric studies have proposed and estimated different specifications of most macroeconomic relationships, and the choice among them can rarely be based on statistical tests alone. To make responsible policy decisions, policymakers need to be involved, for example, in making judgments about whether to view aggregate demand as responsive to the short-term nominal interest rate, a medium- to long-term real interest rate, or some combination or other alternative. In times of rising inflation expectations, such judgments about the aggregate demand function are critical for coming to a view on how much monetary policy is being tightened or allowed to ease.

71. The analysis in this paper suggests that once a central bank has developed a macroeconomic model that conforms with policymakers' views, there can be significant potential gains from basing policy on unconstrained model-consistent forecasts, and from making both the model and the interest rate forecasts transparent. That conclusion abstracts from a number of arguments against model transparency and remains controversial. It would be difficult, however, to dispute the case for developing better policy models, and for continuing to strengthen those models over time.

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The Staff's Quarterly Model of the U.K. Economy

72. Table A1 presents the equations of the model and Table A2 defines notation; time periods correspond to calendar quarters. Four of the equations in Table A1 reflect behavioral assumptions; the others amount to definitions or arbitrage conditions.

Table A1: A Small Model of the U.K. Economy

(1) $\pi 4_t = .05\pi 4_t^m + .95E_t^P\pi 4_{t+4} + .20y_{t-1} + \varepsilon_t^\pi$

(2) $E_t^P\pi 4_{t+4} = \lambda\pi 4_{t+4}^{mc} + (1-\lambda)\pi 4_{t-1}$

(3) $y_t = .80y_{t-1} - .20rr8_{t-1} - [.20/2.5]z_{t-1} + \varepsilon_t^y$

(4) $rr8_t = rs8_t - \pi 8_t^e$

(5) $\pi 8_t^e = \lambda(\pi 4_{t+4}^{mc} + \pi 4_{t+8}^{mc})/2 + (1-\lambda)\pi 4_{t-1}$

(6) $z_t = s_t + p_t - p_t^f$

(7) $s_t = E_t^P s_{t+1} + (rs_t - rs_t^f)/4 + \varepsilon_t^s$

(8) $E_t^P s_{t+1} = \phi s_{t+1}^{mc} + (1-\phi)\left[s_{t-1} - (E_t^P\pi_{t+1} - E_t^P\pi_{t+1}^f)/2\right]$

(9) $rs8_t = \sum_{i=0}^{8} rs_{t+i}/8$

(10) $\pi 4_t = p_t - p_{t-4}$

(11) $\pi 4_t^m = (p_t^f - p_{t-4}^f) - (s_t - s_{t-4})$

73. Equation (1) is a linear Phillips curve that describes the behavior of the inflation rate, where inflation in period t is measured as the change in the price level over the year from period t-4 through period t. The specification allows for a significant influence of the contemporaneous change in import prices but otherwise corresponds to a linear specification of an expectations-augmented Phillips curve estimated on U.K. data by Fisher, MahadEva, and Whitley (1996). Note that the coefficients of the first two right-hand-side terms sum to unity, consistent with the long-run natural rate hypothesis. The coefficient on the output gap was derived (before rounding).

Table A2. Notation; Time Periods Correspond to Calendar Quarters

$\pi 4$	:	Year-on-year change in the log of the RPIX.
$\pi 4_t^m$	:	Year-on-year change in the log of the import price deflator.
$E_t^P \pi 4_{t+4}$	:	Expected inflation over next four quarters.
$\pi 8_t^e$	:	Expected inflation over next eight quarters.
$\pi 1_t^e$	:	Expected inflation over next quarters.
y	:	Output gap.
ε^{π}	:	Shock in inflation equation.
ε^{y}	:	Shock in output gap equation.
ε^{s}	:	Shock in exchange rate equation.
rr8	:	Real interest rate on eight-quarter bonds.
z	:	Log of the real exchange rate
s	:	Log of the nominal exchange rate.
p	:	Log of RPIX deflator.
pf	:	Log of foreign price level.
rs	:	Short-term interest rate.
rsf	:	Foreign short-term interest rate.
mc	:	Model consistent expectation.
$E_t^p \pi_{t+1}$	:	Expected inflation one quarter ahead.
$E_t^p \pi_{t+1}^f$		:Expected foreign inflation one quarter ahead.
rs8	:	Nominal interest rate on eight-quarter bond.

by first estimating a convex Phillips curve for the United Kingdom and then calculating the corresponding value of the coefficient in the associated linear approximation.

74. Equation (2) is a fairly standard forward- and backward-looking representation of the private sector's inflation expectations. In line with other work on empirical Phillips curves, it features a small weight on the forward-looking model-consistent component.(Φ = in the base-case model). The large weight on the backward-looking component is consistent with the view that wages and prices are sticky, reflecting in part the influence of contractual arrangements, but in addition the presence of a large proportion of the population that is uninformed. This estimated weight is roughly consistent with reduced-form evidence on Phillips curves for other countries, which also suggests a very small weight on the forward-looking component.[1]

75. Equation (3) relates the output gap to its own lagged value, the eight-quarter real interest rate, and the real exchange rate. The basic form of the output gap specification in the staff's model has some similarities with the one employed by Batini and Haldane (B-H 1999 b) to study optimal monetary policy rules in the United Kingdom. However, there are two important differences. One that concerns whether or not *expected* changes in the real policy rate also affect the output gap. In the B-H model changes in the output gap depend on lagged movements in the policy interest rate and are independent of what the market expects the policy rate to do in the future. By contrast, in the staff's model the output gap depends on an eight-quarter real interest rate that in turn reflects market participants' expectations of future levels of the policy rate. This is a substantive difference insofar as the staff's model provides a channel where the systematic component of monetary policy can influence the market's expectations of future changes in the policy rate.

76. The other main difference between the B-H output gap model and the staff's model involves the absolute and relative sizes of the effects of real interest rates and the real exchange rate on the output gap. The specification in the B-H model has an output gap coefficient of 0.5 on the 90-day real short-term interest rate and a coefficient of 0.2 on the real exchange rate. Based on the staff's empirical work with reduced-form output gap equations, we posit a much smaller coefficient on the real interest rate term; and given uncertainties about the estimated effects of real exchange rates, we consider the implications of two possible calibrations of the real exchange rate term. In the first case, we assume that the coefficient is the same as in the B-H model (0.2), while in the second case we assume the same relative importance that the B-H model attaches to the real interest rate and the real exchange rate. This implies a coefficient on the real exchange rate of slightly less than 0.1 (0.2 / 2.5) and is more consistent with our reduced-form empirical evidence on the relative and absolute importance of the real exchange rate. These estimates suggest that the effects of a 100 basis point increase in the real interest rate on the output gap is equivalent to a 2.5 percent appreciation in the real exchange rate.

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[1] For example, see J. Fuhrer, 1997, "The (Un)Importance of Forward-Looking Behavior in Price Specifications," *Journal of Money Credit and Banking*, Vol. 29, No. [ ] (August), pp. 338-50.

77. Equations (4) and (5) define the two-year (eight-quarter) real interest rate in a manner consistent with the behavior of inflation expectations, as described in equation (2). The first term on the right-hand-side of equation (5) is the model-consistent component of the annualized inflation rate expected over the eight quarters ahead, which receives a weight of λ, while the backward looking component receives a weight of $(1-\lambda)$. In our base case model we assume that λ is 0.1 but we consider alternatives where we increase it to 0.5. It has been quite common to interpret this parameter as an index of policy credibility because higher values imply that market participants are provided with more information about the monetary policy rule.

78. Equation (6) defines the real exchange rate; an increase represents a real appreciation of the domestic currency. Equation (7), which includes an error term, can be regarded as a generalized form of the interest rate-parity arbitrage condition. Equation (8) assumes that the future spot rate expected by the private sector is a weighted average of the forward-looking model-consistent expectation and a component that is essentially backward-looking. The latter component is simply the lagged spot rate adjusted for the expected inflation differential.[2] This specification provides a way of reconciling the notion that market participants are rational and forward looking with econometric evidence that exchange rates cannot be explained very well by macroeconomic fundamentals alone. It is also motivated by survey evidence that participants in foreign exchange markets rely heavily on "technical analysis," which essentially links their exchange rate forecasts (expectations) to the level of exchange rates in the recent past.[3]

79. Equation (9) is the expectations theory of the term-structure, which relates the yield on eight-period maturities to the cumulative yield on a sequence of one-period contracts. Equation (10) simply defines the inflation rate as the change in the price level over four quarters, and equation (11) is an analogous definition of the rate of inflation of import prices (i.e., of foreign prices converted into domestic currency units).

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[2] Adjustment for the expected inflation differential is necessary for ensuring that the behavior of the real exchange rate is independent of the target rate of inflation.

[3] See Isard (1995).

The Stochastic Simulation Framework Without Learning

80. The assumptions underlying the stochastic simulation experiments are as follows. The model of macroeconomic behavior is assumed to consist of the equations in Table A1 (with other vari ants of the output gap equation in some cases), along with an equation for the policy interest rate. In some of the simulations the interest rate is determined by a generalized Taylor rule, as described in Table 1. In other simulations the interest rate follows an IFB rule, as described in Table 2. As discussed later, the set up is somewhat more complicated for cases in which the MPC relies on a constant-interest-rate forecast that market participants deem to not be credible.

81. Unless otherwise indicated the simulations extend over a horizon of 100 periods (calendar quarters). In each period the economy experiences three types of exogenous shocks: a shock to the output gap, a supply shock to the inflation rate, and a shock to the exchange rate. These exogenous shocks are drawn randomly from independent normal distributions with zero means and standard deviations of 0.8, 0.4 and 1.9 percentage points respectively.

82. The initial state of the economy is characterized by a steady state where all variables are zero. Following the realizations of the shocks in the first period, the authorities use their prespecified policy rule—along with the assumption that the realizations of random shocks in future periods will coincide with their expected values of zero—to determine the interest rate setting for that period and to generate forecasts, over a horizon of 50 periods, of the future time-paths of all of the endogenous macroeconomic variables in the model, including interest rates.[4] The shocks for the second period are then realized, after which the authorities update their forecasts and adjust their policy settings. And so forth until the end of period 100.

83. Unless otherwise indicated the 100-period simulation is repeated 10 times, each time drawing a different sequence of the random shocks, but saving the shocks and subjecting each different form and calibration of policy rule to the same sequences of shocks. For each specified policy rule, the process of generating 10 simulations over 100 quarters results in 1000 observations on the outcomes for inflation, output, and the policy interest rate. The performances of the different rules are characterized by a set of five summary statistics: the standard deviations of the inflation rate, the output gap, the 90-day interest rate, and the two-year interest rate, as well as the value of a policy loss function.

[4] The only exogenous variables in the model are the foreign price level and the foreign interest rate. These variables are held constant in the simulation experiments.

The Policy Loss Function

84. The literature on optimal policy rules has traditionally relied on quadratic loss functions that are separably additive in the deviation of inflation from target, the output gap, and sometimes also the change in the nominal interest rate; see, for example, Rudebusch and Svensson (1998) and Wieland (1998). To remain consistent with this literature, we adopt an objective function in which the period-t loss has the following general form

$$L_t = (\pi 4_t - \pi^{TAR})^2 + \theta[y_t]^2 + \upsilon(rs1_t - rs1_{t-1})^2$$

where $\pi 4$ is year-on-year RPIX inflation, y is the output gap, rs1 is the one-quarter interest rate, and $[\theta, \upsilon]$ are the relative weights of output gap variability and interest rate volatility. These relative weights have been set at 1 and 0.5 to be consistent with other studies on monetary policy rules. The optimal parameters for the reaction functions reported in Table 1 and Table 2 have been derived numerically by searching over a grid of policy-rule parameter values for the calibration that minimizes the value of the loss function averaged over the 1000 observations generated by the stochastic simulations.

The Stochastic Simulation Framework with Learning

85. For cases where the MPC projects a path for the policy interest rate that is either unobserable or deemed to be noncredible—such as the "constant" interest rate forecast—market participants are forced to use some other behavioral rule to forecast the future path of the policy rate. In such cases market participants are assumed to efficiently use historical information about past movements in inflation, output, and the policy rate to infer the parameters of a Generalized Taylor rule. Note, that one of the conditions for stability in this class of linear models is that the asymptotic response to inflation under the Generalized Taylor rule must exceed one. Otherwise the real interest rate would not rise sufficiently in response to an inflationary shock to ensure that there is an anchor for inflation expectations. This necessary restriction for stability is imposed whenever the estimated parameters from the historical data would suggest that this asymptotic response is less than one. This biases the results in the sense that it rules out either explosiveness or indeterminacy and the associated policy errors that John Taylor and others have attributed to falling systematically behind shifts in the Phillips curve. In order to initialize the start of the stochastic simulations when the data set is too short to estimate the parameters of the reaction function, it is assumed during the first 10 periods that market participants base their expectations of future changes in the policy rate on an optimally calibrated GT rule. We have experimented with different assumptions about "initial beliefs" in order to evaluate how sensitive the results are to different assumptions. In one case a simple Taylor rule is specified that has a zero weight on the output gap and a small weight of 1.1 on inflation. These parameters were chosen to illustrate the implications of a perceived policy rule that does not respond aggressively to inflationary shocks. In addition, an intermediate case is considered that imposes weights of 1.5 on inflation and 0.5 on the output gap.

II. Welfare and Labor Market Reform in the United Kingdom: Evidence from the International Experience[1]

A. Introduction

1. **The United Kingdom has undertaken a series of welfare and labor market reforms aimed at increasing labor market participation among current welfare recipients and reducing income inequality and the prevalence of poverty, especially among children.** This paper examines these issues from an international perspective, using the experience of other countries to inform the analysis of the measures taken in the United Kingdom. This is possible because the U.K. reforms in large part draw on practices that have been found to lead to increased employment among welfare recipients in other countries, especially the United States, but in all cases adapted to U.K. circumstances and priorities. A principal focus of this paper is on the tradeoff between program costs, efficiency in terms of increased labor supply and thus output, and concerns about equity such as reduced poverty and improved income distribution.

2. **The measures taken in the United Kingdom appear to have somewhat of an emphasis on reducing poverty and inequality over raising overall employment or labor force participation.** This is because a central element of the welfare reform provides an incentive for one member of a household to work but discourages the second. But this is a reasonable choice for the United Kingdom, which faces the particular problem that unemployment is concentrated in households where no adult is employed rather than more evenly dispersed throughout households, a phenomenon that likewise results in a concentration of poverty, including child poverty, within these workless households. Having one adult in the workforce can break the intergenerational cycle of poverty and welfare dependence that results from children growing up in households in which there has never been a working adult. The net increase in labor supply and thus the macroeconomic benefits in terms of increased output and productivity might be fairly small in the near term, but this does not detract from the promise welfare reform holds for reducing inequality and joblessness among affected households, and breaking the United Kingdom's intergenerational pattern of poverty and welfare dependence. And macroeconomic gains are still possible over a longer horizon, as current welfare recipients gain work experience that leads to increased productivity, earnings, and output.

3. **An important aspect of the reforms in the United Kingdom is that they are largely based on enhanced *in-work* benefits**—support **that enriches the reward to employment and is thus available only to those who leave welfare.** This includes both financial incentives and training and other personal assistance for welfare recipients who seek to move into employment. This contrasts with measures in countries such as Denmark and New Zealand that have sought to encourage participation by reducing benefits to the unemployed. Although initially expensive, use of the in-work benefit may prove socially more acceptable and thus more effective over the long term. It must be recognized, however, that in-work benefits leave behind those who do not take advantage of the new opportunities, and that there will remain a core of those at the very bottom who are not able to take

[1] Prepared by Phillip Swagel.

advantage of the additional assistance; for this group, welfare reform in the United Kingdom leaves the social safety net largely unchanged.

4. The paper next examines the recent performance of the U.K. labor market in comparison with other advanced economies. Reforms in the United Kingdom are discussed in Section III, after which Section IV explores the implications of other countries' experiences. Section V concludes.

B. Labor Markets in the United Kingdom

5. **Welfare reform in the United Kingdom is being undertaken in the context of a booming economy and strong labor market**—possibly the only circumstance when programs that feature higher benefits could be fiscally possible as a means to entice the economically disenfranchised into the labor market. The unemployment rate has fallen to historical low levels (Figure 1), while employment growth since the 1992 recession has been faster than in the other large industrial economies in Europe, behind only Ireland and the Netherlands (Figure 2). Note, however, that the youth unemployment rate remains higher in all countries than the overall unemployment rate, with only Germany coming close to parity. And reduced unemployment has not come through increased retirement as a means to remove older workers from the labor force, as the labor force participation rate has remained stable in the United Kingdom in recent years at a rate higher than in the other large economies in Europe, behind only Sweden and Denmark (Figure 3).

6. **Underlying the aggregate gains in employment has been a secular shift in the composition of the U.K. economy**, as the process of deindustrialization and skill-biased technological change has led to an increase in the demand for skills at the expense of less-skilled workers.[2] This process has meant worsened job market prospects for less-educated workers, including the large group of older workers displaced by the long decline of the U.K. mining and manufacturing sectors. For example, HM Treasury (1998) notes that in 1997 only 5 percent of prime age men with a degree were not in work, compared to one-third of those with no educational qualification—a remarkable change from the figures of 3 percent and 10 percent, respectively, in 1979. A further stylized fact of the U.K. labor market is that while the unemployment rate has declined, average duration on unemployment has increased—those who do not move out of unemployment quickly tend to remain jobless.[3]

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[2] See Berman and Machin (1999) and World Economic Outlook (1997).

[3] HM Treasury (1997).

Figure 1: Unemployment Rate, October 1999
(In percent)

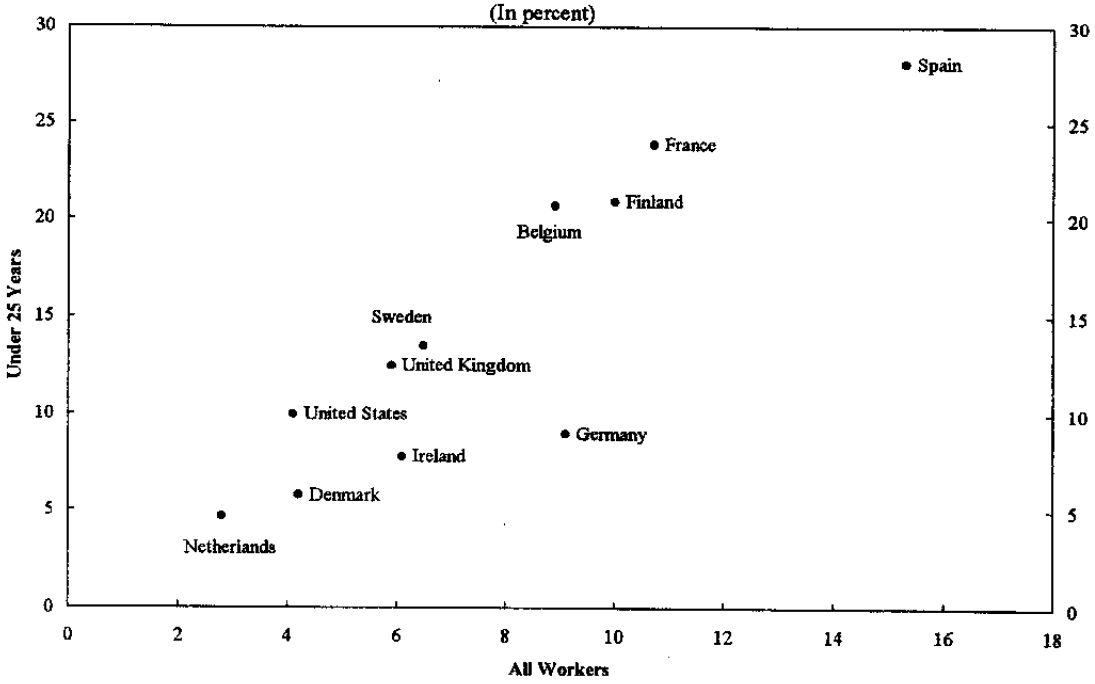
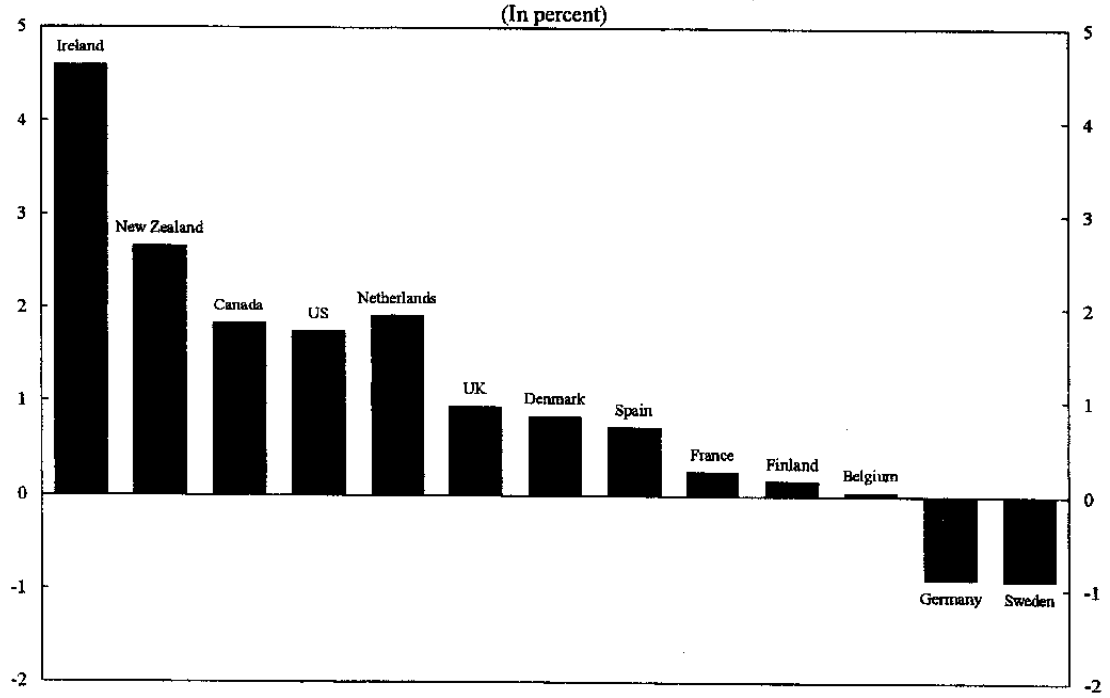
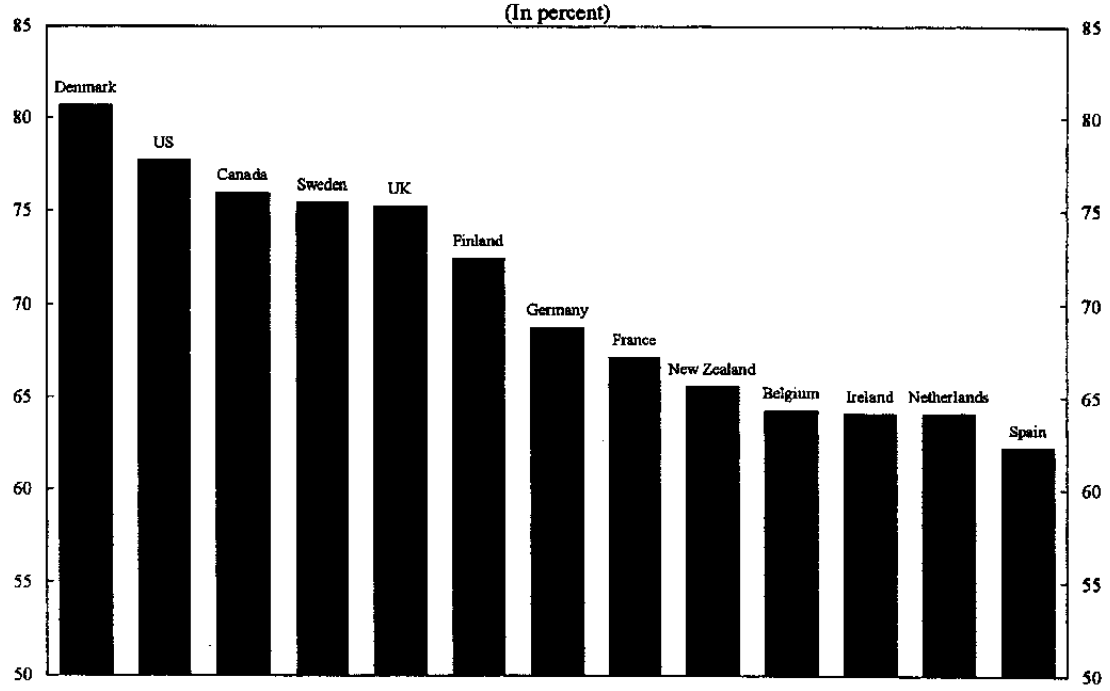


Figure 2: Employment Growth, 1993-98 average
(In percent)



Source: OECD and Eurostat

Figure 3: Labor Force Participation Rate, 1997
(In percent)



Source: OECD

7. **A feature of the United Kingdom welfare state crucial for understanding the design of recent reforms is that inactivity is concentrated in jobless households rather than more evenly dispersed throughout the population as would be the case were one adult in a couple working and the other unemployed.** In 1998, 17 percent of U.K. households had no adult working, up from only 9 percent in 1979, while 18 percent of the population lived in a workless household in 1998. Some of these workless households are of course not of working age, but as recently as 1991, when 16 percent of households were workless, only 7 percent were pensioners. Of particular concern is that 19 percent of children in the United Kingdom in 1998 were in workless households, compared with less than 10 percent in France, less than 5 percent in Germany, and 10 to 12 percent in Belgium and Spain. An important aspect of the concentration of worklessness in jobless households is that single parents are less likely to work in the U.K. than in other advanced economies: in 1997, only about 40 percent of lone parents were employed, compared to 82 percent in France and 60 percent in the United States.[4] And the 40 percent employment rate for single parents in the United Kingdom is 8 percentage points lower than in 1979, even as overall female labor force participation in the United Kingdom rose from 57 percent to 66 percent over this period. The phenomenon of workless households leads to an intergenerational cycle of poverty and welfare dependence, in which children grow up in an environment with no employed adult as a role model, including both parents and grandparents. This has led to an emphasis on ensuring that one adult in each household is employed even at the risk of

[4] Figures taken from HM Treasury (1 97, 1999).

providing disincentives for participation by the second adult in couples. This is discussed in the next section, which examines the specific programs enacted in the United Kingdom.

C. Tax and Welfare Reforms in the United Kingdom

8. **Extensive changes to the structure of the tax system, labor markets, and the social welfare system began in the United Kingdom in the late 1970's, following two decades in which the welfare state had grown in the United Kingdom as in other advanced economies.** The tax system underwent fundamental reform in 1979, with the establishment of individual rather than household taxation, and the lowering of tax brackets as revenue moved to indirect taxation. The current system features an individual tax allowance large enough to exclude part-time low wage earners (largely married women), with earnings above the exemption facing progressively higher tax rates of 10, 22, and 40 percent—the 10 percent band was instituted in April 1999 as an incentive for labor force entry for low earners, while the middle rate falls from 23 percent as of April 2000. National Income Contributions are paid by employees at a rate of 10 percent on all earnings above a lower earnings limit.

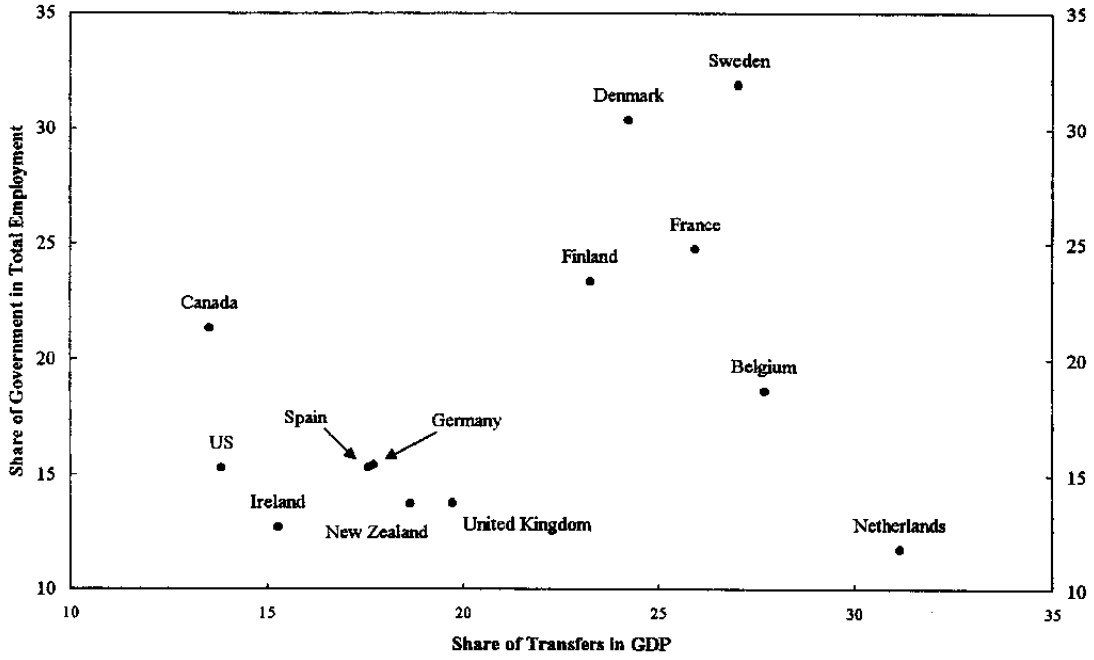
9. **Despite the individual basis of taxation, the welfare system features means tests on earnings and assets for the entire household, so that earnings by the second partner can reduce benefits that accrue from the first adult being unemployed.** Income Support (IS) is provided to individuals who are not expected to work, such as lone parents, carers, and those over 50 years old; this provides a small income disregard (£5-15/week)—the amount of earnings allowed before benefits are reduced—after which benefits are "tapered" at a rate of 100 percent, meaning that the amount of the benefit is reduced by one-to-one with earnings for an effective 100 percent tax rate. The Job Seekers' Allowance (JSA) program of unemployment insurance is available for an initial 6 month period only to those who have previously paid contributions, and then to all unemployed after six months. Working 16 hours per week eliminates eligibility for JSA and IS, and triggers reductions in associated benefits such as subsidized meals for schoolchildren and prescription drug benefits. Other benefits, such as rental subsidies under the Housing Benefit and rebates on property and local tax under the Council Tax Benefit are reduced at rates of 65 percent and 20 percent once net income after taxes and the disregard exceeds the level provided by Income Support.

10. **The social welfare system is less extensive in the United Kingdom than in most other industrialized economies in Europe**, with the share of transfers out of GDP lower than all but Ireland, Germany, and Spain (though, again, above the United States, Canada, and New Zealand), and the share of government workers out of employment the lowest in Europe except the Netherlands (Figure 4). Lower replacement rates—the value of welfare benefits relative to earnings from full-time employment at the minimum wage—similarly indicate the less generous nature of welfare in the United Kingdom than in the rest of Europe.[5] The major new programs of the past three years constitute an expansion of the system, but in ways that are targeted to provide incentives for welfare recipients to move into employment rather than as general assistance for the jobless. The new programs include financial incentives for moving into employment in the Working Families Tax Credit, the

[5] See France, *Selected Issues* Paper, SM/98/132, December 1998.

National Minimum Wage, and other reforms to tax and benefit programs, and the active labor market program of the New Deal for Young People and the other New Deals. These are examined in turn.

Figure 4: Size of the Welfare State. Shares of Transfers and Government Employment, 1997
(In percent)



Source: OECD

Working families tax credit

11. **The Working Families Tax Credit (WFTC), introduced in October 1999, is at the center of the reforms to the tax and benefit system.** It provides a refundable tax credit for families with children where at least one adult works 16 hours per week or more, an additional benefit for full-time work of 30 hours, and a generous child care subsidy for single parents and couples where both partners work. The use of the in-work benefit is meant to provide an incentive for individuals to take low wage jobs that would otherwise provide only a small boost in income over welfare. The credit is after-tax income, but reduced at a rate of 55 percent for weekly after-tax earnings above a specified threshold.[6] The WFTC effectively

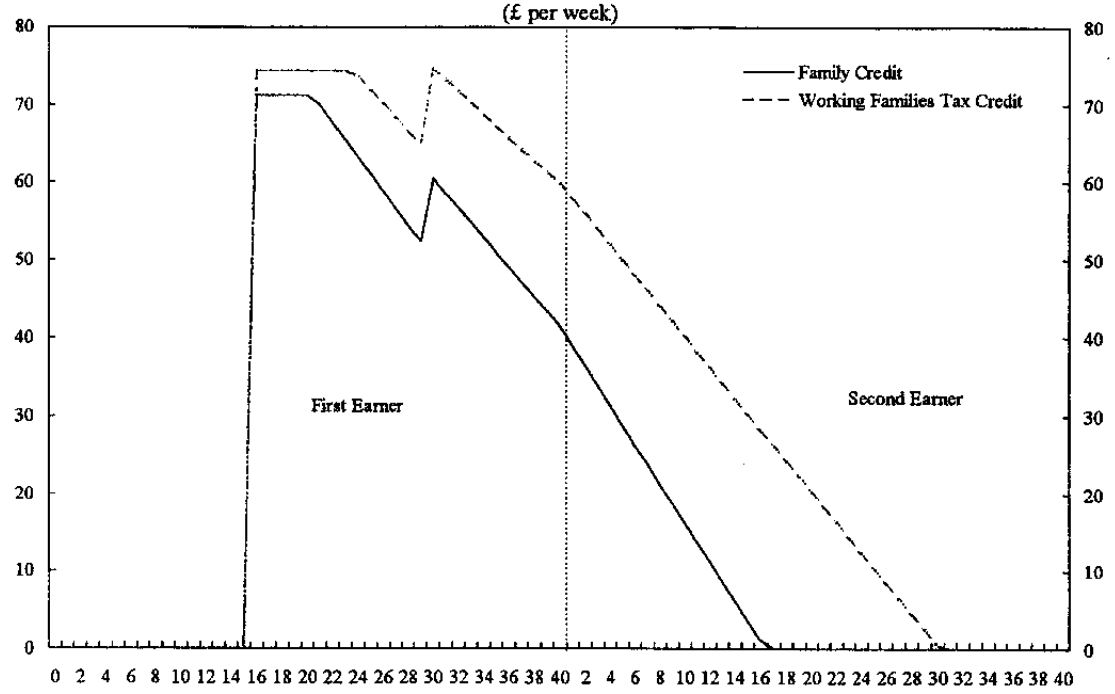
[6] For the tax year starting April 2000, the WFTC consists of £53.15 per week for a household with an adult working 16 hours, an additional £11.25 for working 30 hours, and another £20-25 per child (the precise amount varies with the age of each child). The child care subsidy reimburses 70 percent of weekly expenses up to £100 for one child or £150 for two or more children. The income threshold above which benefits are reduced is £91.45 per week after income tax and National Insurance contributions.

guarantees a weekly income of just above £200 for a family with one child and one adult working full-time, enriching the minimum hourly wage of £3.60 by nearly 40 percent. Nearly all of the benefits are obtained even for part-time work, suggesting a belief that it is worthwhile for at least one person in each household to maintain some labor market attachment rather than for a family to depend completely on welfare. The WFTC is expected to be taken up by around 1.4 million households, 40 percent more than the less generous Family Credit (FC) that it replaced (the Family Credit involved smaller benefits and a 70 percent withdrawal rate for all components).

12. **A side-effect of the increased benefit and lower taper compared to the FC is that the WFTC provides a disincentive for work over a larger range of hours than was the case under the FC.** This can be seen in Figure 5, which shows the 2000-2001 tax year WFTC benefit received by a couple with one pre-teenage child and contrasts this with the amount previously received under the Family Credit.[7] The figure is drawn to first show the benefit with only one earner at £4 per hour, and then for the household as the second adult earns the minimum wage of £3.60 with the first earner at 40 hours. For the first adult, the WFTC provides a larger incentive for participation at 16 hours than was the case with the less generous FC, and because of the 15 percentage point reduction in the taper rate, a smaller disincentive for additional hours beyond the 16 and 30. The biggest gains accrue to a household with the second earner working part-time that was previously just beyond receiving any FC benefit, since this household is eligible for the WFTC. However, the 55 percent effective tax rate from the taper affects the second earner all the way until 30 hours, whereas the FC benefit goes to zero—and thus the effective tax rate of 70 percent disappears—at 8 hours. This is an unavoidable dilemma, since a reduction in the taper rate increases the reward to working, but extends the disincentive of benefit withdrawal over a larger range of hours. The net effect on hours and participation thus depends on the distribution of earners over the range of hours and differences in various earners' responses to changes in taxes and benefits—the comparison is between a tax rate of 55 percent on a wide range of hours or a tax rate of 70 percent on fewer hours.

[7] The base amount of the FC from 1999 has been adjusted to account for inflation and thus make the amount comparable with the 2000-01 WFTC benefit. See Blundell *et. al.* (1999) and Dilnot and McCrae (1999) for a complete comparison of WFTC and FC.

Figure 5: Working Families Tax Credit vs. Family Credit
(£ per week)



Source: Author's calculations

13. **Another consideration in assessing the incentive effects of WFTC is that even though the WFTC itself is not subject to income tax, it is not well-coordinated with other means-tested benefits.** With the withdrawal rate for the Housing Benefit at 65 percent, a family receiving a rent subsidy—as would be typical for those who qualify for WFTC—has a net gain of only 35 percent of the WFTC benefit until the housing subsidy is exhausted. This can be seen in Figure 6, which shows weekly gross earnings and after-tax household income, including the WFTC, unemployment benefits for 0 to 15 hours of work, income tax, national insurance contributions, and a £45 weekly housing subsidy (around the median rent for public housing). The WFTC provides an incentive for a part-time work of 16 hours, but the boost in household income shown in Figure 6 is much smaller than the gross amount of the WFTC in Figure 5—this stems from the elimination of unemployment benefits with receipt of WFTC at 16 hours and the sharp withdrawal rate of the housing benefit, which is tapered precisely as the WFTC kicks in (the housing benefit goes to zero here at 23 hours). Indeed, the replacement rate for this example family—the ratio of welfare benefits received for zero hours to after-tax income at 40 hours with one earner—is nearly 72 percent, but only 53 percent excluding the Housing Benefit. Figure 6 shows that the tax and benefit system provides a subsidy to this household so long as the second earner works part-time or less, after which income net of taxes and benefits falls below gross earnings.

Figure 6. Household Income Before and After Taxes
(£ per week)

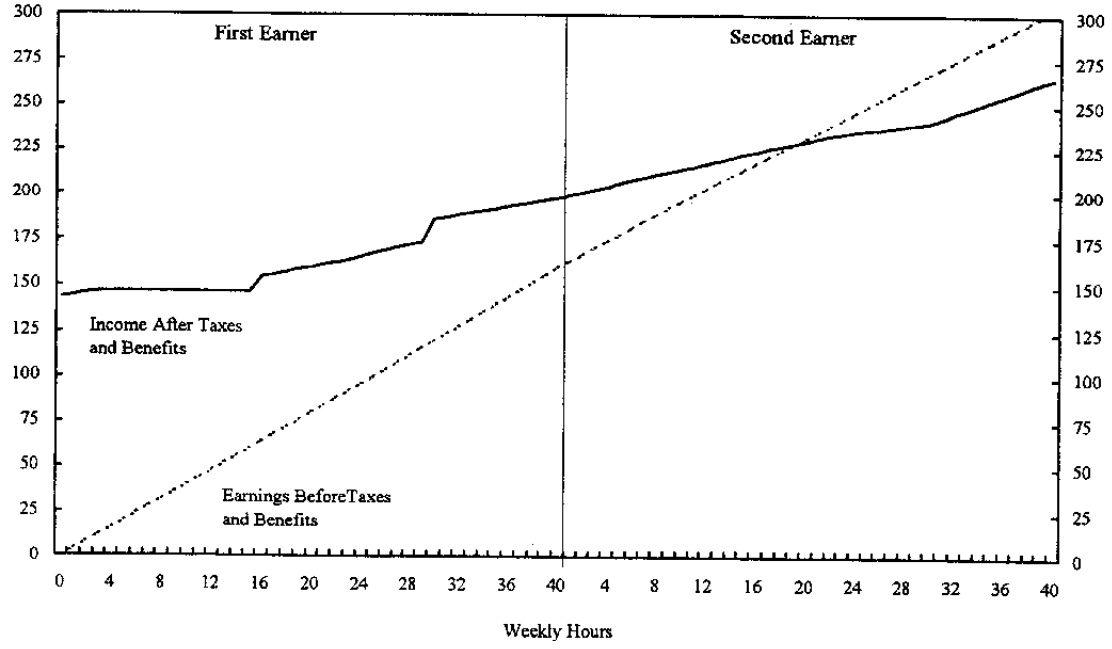
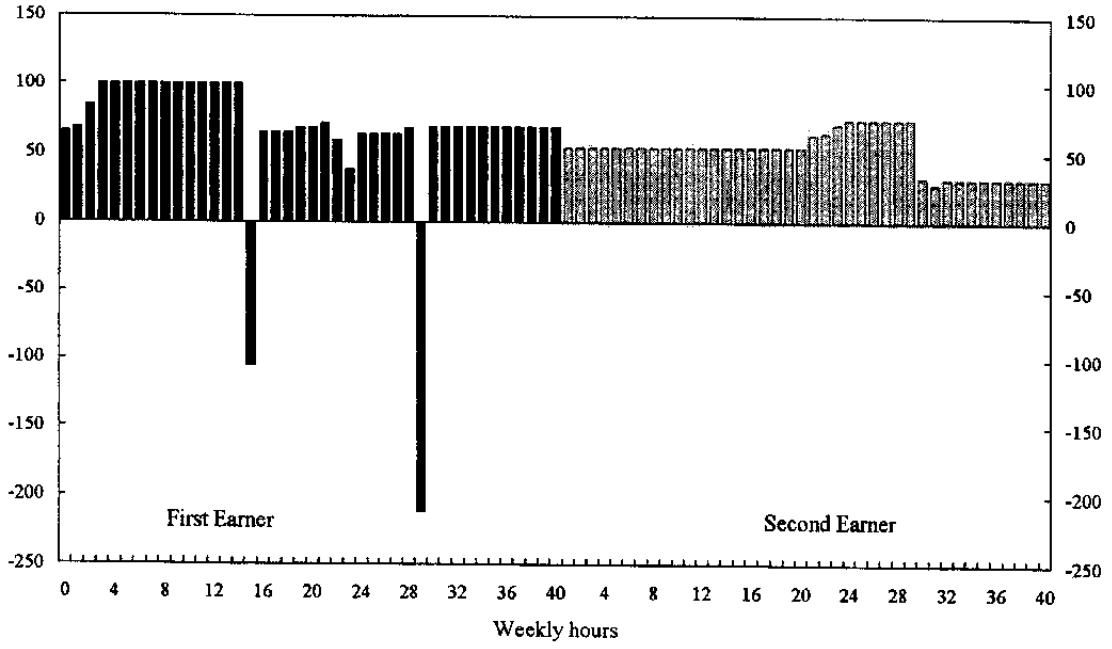


Figure 7. Marginal Effective Tax Rate
(In percent)



Source: Author's calculations

14. **For a jobless household, the WFTC provides a financial incentive for one adult to enter the labor force, but the positive incentives are concentrated entirely at 16 and 30 hours, with extremely high effective tax rates for nearly all other hours.** Figure 7 shows the marginal effective tax rates faced by this household; this is the percentage of income from an additional hour of work that is lost to taxes and benefit withdrawals. The tax rate becomes sharply negative at 15 and 29 hours, as working another hour provides WFTC benefits and thus a tax subsidy. It makes little sense to work fewer than 15 hours, since after-tax household income is the same for 3 hours of work as for 15 hours—the 100 percent tax rate results from the one-for-one withdrawal of unemployment benefits for earnings above £10 per week (thus at the third hour). National Insurance at a rate of 10 percent is paid by the first earner starting at 20 hours per week, income tax at the 10 percent rate with 22 hours, and at the 22 percent rate starting with 29 hours. The effective tax rate rises to 64 percent at 24 hours as the 55 percent WFTC taper kicks in on top of income tax and National Insurance. The full-time supplement of the WFTC again provides an incentive for 30 hours of work, but the effective tax rate faced by the first earner then goes back to just under 70 percent from the combination of the WFTC taper, income tax at 22 percent, and National Insurance.

15. **The effects of the WFTC are more complicated for households that qualify for the WFTC but already have one adult in the labor force.** Blank, Card, and Robins (1999) refer to such households as "windfall beneficiaries" since they were employed without the benefit enhancement of the WFTC (though possibly not before the previous FC); a cost-benefit analysis of a program like the WFTC depends on the number of people who enter the labor force as a result of the benefit compared to the number who get benefits but would have been working anyway. Of course, benefits received by windfall beneficiaries also mean a larger anti-poverty effect, since the additional transfer payments are still going to the working poor even if these households did not need an incentive for one adult to enter the labor force. However, the benefit could lead to a reduction in hours by these workers compared to the case with no tax credit and accompanying benefits withdrawal. This is because the WFTC entails both income and substitution effects for households with one earner already working. In choosing between labor and leisure, the substitution effect comes about from the steep effective tax rate that reduces the reward to work—as discussed above, the reduction in the taper rate over the Family Credit reduces the magnitude of this negative incentive effect on hours but expands its scope.[8] But the income effect would also be expected to lead to reduced hours, because leisure is typically considered a "normal" good, the demand for which rises with income. The financial bonus of the WFTC that increases household income would thus be expected to increase the demand for leisure and reduce hours.

16. **The WFTC provides the same two-fold disincentive for participation by the second earner.** First, the withdrawal of WFTC benefits paid to the household means that the second adult considering even part-time work faces a 55 percent marginal effective tax rate for the first 20 hours and then as high as 75 percent until 30 hours, including income tax and

[8] Before introduction of the WFTC, 5 percent of working families—around 750,000—faced marginal effective tax rates of 70 percent or more; this has now been reduced to around 250,000 families, though many of these still face marginal effective tax rates of 60 percent or more from the combination of the WFTC, income tax, and National Insurance.

National Insurance (Figure 7). And the income effect again goes in the direction of fewer hours, with the increase in household income from WFTC benefits accrued on the basis of the first earner expected to lead the second partner to work less. Considering the different effects by various demographic groups such as single parents, men in couples, and women in couples, Blundell *et. al.* (1999) predict an overall net increase in labor force participation of only around 45,000 workers, compared to total U.K. employment of around 27 million.[9]

17. **Even if the net effect on overall labor supply is modest, the WFTC has considerable potential for encouraging labor market participation in households where no adults are currently employed.** And this is a worthwhile objective, since labor market inactivity and child poverty in the United Kingdom are concentrated in households with no employed working age adult. Policies aimed at moving at least one of the adults in such households into employment could bring substantial long-term benefits by breaking the intergenerational pattern of joblessness that results from children growing up in households in which neither parent has ever been employed. Moreover, the large rise in the number of recipients and the increased generosity of benefits over the FC gives the possibility of alleviating poverty among the working poor, even if these added benefits are not delivered in a way that strictly increases work incentives.

18. **Attenuating the disincentives for second earners and for primary earners who would have worked without the WFTC presents a difficult challenge, since it requires balancing the generosity of the program against its scope and cost.** A smaller taper rate would reduce the disincentive via the substitution effect, but this is offset by increased consumption of leisure through the income effect; moreover, a smaller taper rate would extend higher benefits to a larger number of recipients and could thus substantially raise the cost of the program. Two possible avenues for change are:

- **Use of a proportional rather than flat benefit to provide incentives over a range of hours rather than concentrating the tax subsidy solely at 16 and 30 hours.** The WFTC would match a certain share of workers' earnings subject to a threshold and taper; for example, a 30 percent earnings match would result in an effective tax rate of only 2 percent for a worker who pays 22 percent income tax and contributes to National Insurance at the 10 percent rate.

- **Improve the coordination of the WFTC with other means-tested welfare benefits**, notably the Housing Benefit and Council Tax Benefit (the latter is similar to a property

[9] Blundell *et. al.* (1999) use data on 50,000 households from the British Family Resources Survey to estimate structural equations that capture the response of different groups to changes in tax rates and benefits, and then use the estimated relationships in simulations that predict the effect of the WFTC. The effect on single parents and unemployed men in couples is strongly positive in terms of labor force participation, but of households eligible for WFTC, these two groups together are only about half as numerous as couples with the man in employment, for which the WFTC provides disincentives for both the first earner already in the workforce and for potential or existing second earners.

tax). If this were done, a reduction in the gross amount of the WFTC benefit could actually result in increased net income for those at the bottom of the working poor, since this is the income range over which the phaseout of other benefits most reduces the value of the WFTC.

19. A proportional benefit, which is the arrangement used for a similar tax credit in the United States, was specifically rejected by the Taylor report (HM Treasury, 1998) that recommended the expansion of the FC that became the WFTC. The present system and the reluctance to implement a proportional benefit in part reflects the fact that most workers in the United Kingdom do not file end-of-year tax returns, so that the flat rather than proportional benefit reduces the administrative burden in providing benefits—the benefit is extended every six months on the basis of a simple application rather than paid retroactively on the basis of a complete tax return.[10] However, as of April 2000 the WFTC will be paid by firms as part of workers' paychecks rather than by Inland Revenue as is now the case, possibly providing an opportunity to make such a switch without the complication of added income tax returns since firms will have information on hours for at least one worker. A reason for maintaining the 16 hours requirement would be to target the benefit only to those who work enough to acquire enough work experience to have the opportunity for an increasing wage profile. However, this might be an argument in favoring of extending the work requirement back to 24 hours, as was the case before a 1992 reform of the Family Credit. Improved coordination of the WFTC with other benefits could also involve administrative difficulties, since the Housing Benefit and Council Tax are administered at the local level.

National Minimum Wage, and changes to Income Tax and National Insurance

20. **Several other measures seek to raise the returns to work for low-income earners, again with the possibly contradictory aims of alleviating poverty and providing an incentive for the currently inactive to move into employment.** These include the National Minimum Wage (NMW), introduced in April 1999, and changes to tax rates and the structure of National Insurance contributions being introduced gradually over 1999 to 2001. The National Minimum Wage restores an institution absent in the U.K. since the 1993 abolition of the Wages Council that set wages by industry. The minimum wage is set at £3.60 per hour for adults and £3.20 per hour for youth up to 21 years of age—a relatively low level in comparison with other European countries (about 35 percent of median wages). At introduction, this was expected to cover 8½ percent of labor force and result in a 0.6 percent rise in the wage bill. Although it is too early to undertake a complete examination of the labor market effects of the NMW, there so far appears to have been no appreciable negative employment effects. However, this may reflect the fact that the NMW has been introduced at a time of unusually strong economic expansion. Evidence on the effects of the minimum wage under the Wages Councils from 1975 to 1992 suggests that the system led to wage

[10] See Holtzblatt and Liebman (1998) for a discussion of administrative issues relating to the WFTC and other in-work benefits.

compression but no adverse effect on employment, though this finding remains controversial.[11]

21. **Changes in taxes and social contributions have focused on increasing take home pay for low income earners and reducing hiring disincentives faced by employers.** A reform of the income tax system in April 1999 established a 10 percent tax rate on low income earners, and reduced the basic tax rate by one percentage point to 22 percent effective April 2000. Changes in the structure of National Insurance contributions will phase in over the period 1999 to 2001. These include an increase in the starting point at which employers pay their component of National Insurance, with a zero rate for wages below this lower limit; firms paying wages above the lower limit were previously required to pay National Insurance on wages below it, effectively providing a fix entry fee for workers whose wages rose above the threshold. Administration of payments has also been switched to Inland Revenue so that employers need to deal with only one agency in making tax payments and National Insurance contributions. As of April 2001, the threshold at which individuals contribute to national insurance will be raised to correspond to the income tax exclusion, so that low-income earners will not pay any tax on income below the minimum income threshold.

New Deal for young people and New Deals for other groups

22. **The New Deals encompass a number of initiatives that use active labor market programs to help the long-term unemployed move into private sector jobs.** Unlike the WFTC, NMW, and tax reforms that provide financial incentives, the New Deals mainly provide assistance and encouragement. Although the target groups do not fully overlap, these might be seen as a complement to the financial incentives of the other programs, since recipients of unemployment and welfare benefits may need these other services to successfully move into employment. Separate New Deals are aimed at a number of groups, including the New Deal for Young People that began in April 1998, and New Deals for single ("lone") parents, partners of the unemployed, and the disabled. A New Deal is available for those age 25 to 50 who have been unemployed for at least two years, though the benefits are not as extensive as for youth; an enhancement for this New Deal as well as a separate New Deal for long-term unemployed over age 50 is being tested in several regions with the aim of national rollouts in Spring 2000 and 2001. The particulars of each New Deal varies with the target group, but all share common elements such as opportunities for training, subsidized employment, and intensive career advising and job market assistance from a "New Deal Personal Advisor" in the Employment Service.

23. **The current flagship program is the New Deal for Young People, which as of November 1999 had enrolled nearly 350,00 young people aged 18 to 24, of whom 145,000 had subsequently found jobs.** For those who have collected unemployment benefits for six months, the New Deal provides financial support previously available through the unemployment benefit, but with eligibility for these benefits contingent on participation. After the initial six month period on unemployment, the New Deal begins with a four month "gateway" period of intensive advising and monitoring. Those who are still unemployed after the gateway then choose among four options: (1) full-time education or

[11] See Dickens, Machin, and Manning (1999).

training; (2) subsidized employment; (3) work for a nonprofit organization; (4) participation in an environmental task force. Remaining passively on the unemployment role is not an option. Failure to cooperate with the Employment Service advisor at any stage can lead to financial sanctions, but participants who cooperate can, in principle, keep renewing any of the four options indefinitely without actually taking an unsubsidized job. Anecdotal evidence suggests that the education and training options are being used by some as shelters through which to avoid employment.

24. **Initial results of the New Deal for Young People have been encouraging, although it is too early to say conclusively whether these are due to the program or to the United Kingdom's strong overall macroeconomic performance and robust job market.** More people than anticipated have taken the education and training option rather than the subsidized job option lowering fiscal costs below initial projections—only 16 percent of participants have taken subsidized jobs, versus about 40 percent each for unsubsidized jobs and training. It is still unclear whether the low number of New Dealers going into subsidized jobs has been due to the lack of demand by employers (because the subsidy is not adequate and firms are required to provide subsidized workers with at least one day per week of formal training or education) or a lack of interest in subsidized jobs by the unemployed. A possible explanation is that the high proportion going into education and training reflects the strong job market, since those with skills either do not require the assistance from the New Deal or exit the program within the initial four month gateway, leaving the New Deal options to be utilized by those who are least prepared for employment. This hypothesis is supported by feedback from employers that suggests that many who were hired through the program and subsequently laid off lacked basic employability skills (e.g., reliability, punctuality). This has led to some rethinking by the authorities on the type of training programs that need to be provided, with increased attention now being devoted to "soft skills" as a precursor to specific job-specific education.

25. **The New Deal has been found to have reduced long-term youth unemployment by nearly 40 percent, with little adverse effect on the job market prospects of other groups receiving less assistance such as workers older than 25.**[12] About one-half of the individuals moving from the New Deal into jobs are found to do so as the result of the active labor market assistance, while the other half would have found employment without the extra help. Of course, it is not yet clear how permanent or large the employment effects will eventually be. Gaining skills through education or in-work training will be essential for new labor market entrants to hold onto their jobs and benefit from rising productivity and wage profiles. Bell, Blundell, and Van Reenen (1999) find quite small returns to experience for the low-skilled workers most likely to be aided by the New Deal, suggesting that even with the subsidy to employers, a cyclical reversal could throw the newly-employed out of work before they are able to acquire a more permanent labor market attachment. A complementary policy to the New Deals would be to enhance the quality and availability of intermediate level education, including technical and vocational training, which is most likely to provide the skills necessary for employment of those moving out of welfare.

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[12] See National Institute of Economic and Social Research (1999).

26. **Buoyed by initial success with the New Deal for Youth, the United Kingdom has outlined plans to provide similarly extensive support to the much larger group of long-term unemployed over 25 years.** The existing New Deal for Older Workers provides employees with subsidies to be used toward training, arranges tryout opportunities with participating employers, and provides firms with a generous six month hiring subsidy. An enriched New Deal for Older Workers is now available on a voluntary basis in a number of pilot regions; as with the New Deal for Youth, it provides more extensive services from a personal advisor, but without the compulsory nature of the four required options. Expansion of the full-fledged New Deal to the larger group of older long-term unemployed workers will likely prove more challenging and more costly than the New Deal for Young People, which addressed a smaller target group and one likely to be more easily moved into employment. In particular, a six month subsidy might not be sufficient to entice firms into hiring workers with few skills or to keep them on after the subsidy ends.

27. **A common feature of the New Deals is the central role of the New Deal Personal Advisor, who acts as counselor, advisor, cheerleader, and, if needed, disciplinarian.** As the pool of job-ready workers shrinks, a further challenge for the success of the New Deals will be for the Employment Service to evolve from a role of placing workers into vacancies to enhancing the employability of those who seek to leave welfare. There is anecdotal evidence that the providing the enhanced attention mandated under the New Deal for Youth has stretched the capabilities of the Employment Service, suggesting a possible need for additional resources. Moreover, the role of the Employment Service is likely to become even more central with the future rollout of the "Single Work-Focused Gateway for benefits," in pilot tests since October 1998, which concentrates both job assistance and welfare benefits at a single point of contact for each individual.

28. **Finally, an additional undertaking related to the New Deals are a series of reforms of the disability benefit system that have been ongoing since 1995.** Among the steps taken are increases in contribution requirements while in employment before disability coverage becomes available, and a medical test for disability has replaced the previous criterion of "employability," under which workers in industries undergoing restructuring (e.g., the coal industry in the 1980s) were often put on disability and thus out of the labor force rather than into the unemployment roll. The medical test alone appears to have reduced the rate of entry into disability by around 30 percent. A New Deal for the Disabled complements these measures with additional resources for training and employment subsidies that are meant to help those on disability return to the workforce.

Future plans

29. **The 1999 Pre-Budget Report proposes a number of measures to expand the tax and welfare reforms, though the WFTC and New Deal remain at the heart of the policy initiatives.**[13] Among the proposals are to extend the benefits of the WFTC to families with no children, and combine benefits for families with children into an Integrated Child Credit that would encompass Income Support (the main benefit received by single parents), WFTC,

[13] See Institute for Fiscal Studies (2000) for a complete discussion and analysis of current plans, including those not involving welfare and labor markets.

and a Children's Tax Credit currently slated to go into effect in April 2001 which would provide an additional tax credit for low-income families with children. This would effectively split the WFTC into two components: one received by adults for being in employment, and another meant in support of children; the first component would be labeled as an Employment Credit and extended to all households including those without children. This reorganization does not fundamentally affect the incentives for participation discussed in the preceding sections. An important consideration, however, is that the employment tax credit paid to households with no children could present administrative problems, since it further muddies the distinction between the individual basis for taxation and the household basis for the receipt of benefits. Consultations on these issues are now underway.

D. International Evidence

30. **This section examines welfare and labor market reforms in other advanced economies that are most closely related to programs in the United Kingdom, and draws out evidence on the possible outcome of reforms in the United Kingdom.** It does not provide a complete discussion of welfare and labor market reforms across the advanced economies but focuses only on cases most relevant for the United Kingdom.

United States

31. **The reforms in the United Kingdom most closely mirror those in the United States, with the WFTC, NMW, and New Deals all finding counterparts in U.S. programs.** These include the expansion of the in-work tax benefit of the Earned Income Tax Credit, increases in minimum wages, and wholesale revisions of the welfare system in the 1990's that emphasized personal responsibility and added work requirements for welfare recipients and time limits for the receipt of benefits. These are discussed in turn.

Earned Income Tax Credit

32. **The Working Families Tax Credit is similar in many respects to the Earned Income Tax Credit (EITC) in the United States.** Like the WFTC, the EITC provides a refundable in-work tax credit for families with children, but the credit is proportional to earnings rather than a flat rate at 16 and 30 hours, providing a 40 percent match for before-tax earnings until the maximum benefit is reached, and then a 20 percent withdrawal rate.[14] Since low income wage earners in the United States pay only the 7.65 percent employee share of Social Security tax, the 40 percent match to earnings under the EITC provides a net tax subsidy of 32.35 percent until the maximum is reached; moreover, unlike in the United Kingdom, EITC benefits do not count as income for most means-test programs.

33. **Expansions of the EITC have been found to account for as much as 60 percent of the increased employment of single** women **with children between 1984 and 1996.** This evidence is obtained by comparing changes in the labor supply of poor single women with

[14] In 1999, a household with one child receives the maximum benefit of $2,312 for earnings of $6,800 to $12,500; the 20 percent withdrawal rate means that the credit reaches zero at an income of $26,928.

children—the principal group eligible for the EITC—with changes in the labor supply of poor single women with no children, who are not eligible for the benefit. Additional research has focused on the effects on men and women in couples, again comparing the response of those with children who are eligible for EITC to that of those without children. The expansions of EITC have been found to have had a statistically positive effect on the labor force participation of single mothers with children, but with a reduction in hours and labor force participation among married women.[15] This suggests that the WFTC is likely to be effective in bringing the currently inactive into the labor force, but the offsetting effects are likely to result in only a small net gain in labor supply and thus output.

34. **The design of welfare programs appears to be important, with the in-work benefit having the important advantage that it reduces the stigma attached to receiving welfare, since in-work benefits such as the WFTC and EITC are received as a tax credit rather than a welfare check.** In the United States, in-work benefits have been found to have a higher take-up rate than programs that provide subsidies directly to employers—for example, 80 to 86 percent of workers eligible for EITC received the credit in recent years.[16] As discussed by Dickert-Conlin and Holtz-Eakin (1999), a further advantage of employee-based subsidies such as the WFTC and EITC is that they better target the population of low-income earners, since eligibility for the benefit is based precisely on having low income. In contrast, employer-based subsidies typically provide firms with incentives to hire particular types of workers or increase employment in targeted occupations or industries, but providing benefits to low-skilled workers is not necessarily the same as to low-income households that are the target of programs with redistributive aims. Moreover, evidence from changes in the U.S. program that supports disabled recipients of welfare suggests that earnings subsidies have a larger favorable effect on labor force participation than reforms that reduce the effective tax rates from benefits withdrawal.[17]

Increases in the Minimum Wage

35. **The experience of the United States suggests that the WFTC will be more effective than the National Minimum Wage as a means by which to reduce poverty.**[18] Neumark and Wascher (1999) compare the effect of the minimum wage with that of the

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[15] See Eissa and Liebman (1996), Eissa and Hoynes (1998), and Meyer and Rosenbaum (1999).

[16] See Scholz (1994) and Meyer and Rosenbaum (1999).

[17] See Hoynes and Moffit (1997).

[18] A substantial and controversial literature (not surveyed in this paper) examines the effects on employment of recent increases in the minimum wage in the United States. There is no serious dispute that there is some level at which a minimum wage would be high enough to have an adverse effect on employment, but substantial disagreement as to whether the increases in the United States have met this threshold. As mentioned above, this issue is similarly controversial in the United Kingdom, where the minimum wage is set a fairly low level.

EITC in increasing earnings for low-income families and moving families above the poverty line. They conclude that the EITC had a more substantial effect on raising the earnings of the lowest-income families, because it led to labor force participation in families with no workers, and these households tended to be relatively low in the income distribution before the reforms. In contrast, the minimum wage provided more assistance to those already in work, who tend to be the working poor just at or below the poverty line rather than at the very bottom. Given the incidence of workless households in the U.K., the experience of the United States thus suggests that future initiatives that seek to reduce poverty might best include refinements of the WFTC rather than increases in the minimum wage.

Changes in the Institutional Structure of Welfare

36. **The experience in the United States with welfare reform suggests that the cost of the New Deals could rise considerably as the program expands.** In the early 1990's, welfare reforms were carried out principally by individual states that received waivers from federal welfare guidelines. Probably the best known of these is the pioneering Wisconsin Works program, which had its beginnings as a small pilot program in 1993 and was implemented statewide starting in Spring 1996.[19] As with the New Deal for Youth, welfare recipients in Wisconsin program are required to participate in active labor market programs to receive benefits, and are assigned a personal advisor, many of whom were themselves former welfare recipients. A booming state economy with unemployment rates in many locations substantially below the national average has meant that many of those left in welfare need substantial assistance in enhancing their employability. This assistance is delivered in Wisconsin by a more comprehensive system of subsidized and state-run employment than in the New Deal. Welfare recipients in Wisconsin are assessed and placed in categories that reflect their employability, with the generosity of benefits increasing as participants move up through the categories toward private sector employment. Those who are not ready for any employment are provided solely with education and training (with emphasis on "soft skills"), after which they are graduated into work programs run under the rubric of the welfare system, then into subsidized private sector employment, and finally into unsubsidized employment. The program, in principle, includes financial sanctions for non-participation, though in practice this has been left to the discretion of individual advisors and generally enforced in a fairly relaxed manner. As in the United Kingdom, the strong labor market in Wisconsin makes it difficult to distinguish the effects of the program from the macroeconomic environment; welfare caseloads at the end of 1997 were half those of a year earlier, but this was the culmination of a decade-long decline. It is clear, however, that Wisconsin Works is quite expensive, with costs per welfare recipient as much as triple of that before the program. This stems not only from the extensive support including childcare offered under the program and startup costs associated with developing appropriate jobs for participants in the intermediate tier of the system, but also from the strong economy itself, which has left behind only those in need of extensive help. The implication for the New Deals is clear, that costs could rise considerably as the program increasingly serves those in

[19] See Kaplan (1998) among many others for a complete discussion of Wisconsin Works and comparison with other state waiver programs.

need of extensive assistance, including older workers on long-term unemployment whose skills and labor market attachment are considerably out of date.

37. **A key feature that distinguishes welfare reform in the United States from that in the United Kingdom or other countries in Europe is the use of time limits on the receipt of welfare benefits.** Welfare reform at the national level in the United States came under the 1996 Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA). This replaced a number of individual federally mandated programs with the single program of Temporary Assistance to Needy Families (TANF). Individuals states were given substantial leeway to adapt welfare programs to local needs, with funding provided by a block transfer from the federal government to states. Under TANF, welfare benefits are seen as temporary, with a five year time limit on the receipt of federally-fund benefits, and shorter limits in states that had such programs in place before 1996. With time limits, welfare benefits become, in effect, an endowment—an asset to be hoarded against an undiversifiable shock that forces a recipient out of employment. Time limits have been found to be effective in reducing welfare caseloads, with families leaving the welfare roll well before benefits are exhausted, suggesting that recipients are forward-looking and seek to preserve part of their benefits endowment for precautionary use.[20] However, time limits are controversial, since by their nature they fall most decisively on families with young children, as simple arithmetic means that families with older children are closer to graduating from welfare programs that provide benefits to household with dependent children.

38. **The decline in the number of welfare recipients in the United States has been "unprecedented,** widespread, **and continuous," with the welfare caseload falling from 14.1 million in January 1993 to 7.3 million by March 1999.**[21] The difficulty, of course, is in separating out the effects of the reforms from those of the strong macroeconomic environment. The most complete evidence is available for the period before 1996; this suggests that reforms in individual states that received waivers from federal guidelines account for about one-sixth of the increase in employment of single mothers between 1984 and 1996, making it likely that there has been a corresponding reduce in welfare caseloads.[22] Other evidence suggests that at least one-third and perhaps as much as one-half to three-quarters of the reduction in welfare caseloads over 1993-96 resulted from the macroeconomic factors of the strong economy and declining unemployment rate. There is less evidence for the period since 1996, but one study suggests that as much as one-third of the decline in welfare caseloads can be attributed to reforms undertaken as part of PRWORA.[23]

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[20] See Bloom (1999) and Grogger and Michalopoulos (1999).

[21] Council of Economic Advisors (1999).

[22] See Meyer and Rosenbaum (1999).

[23] See Council of Economic Advisors (1999), Ziliak *et. al.* (1997), and Figlio and Ziliak (1998).

39. **Although welfare reform in the United States appears to have reduced caseloads, it is not clear that it has reduced overall poverty.** The use of time limits and in-work benefits means that those at the very bottom who are not able to enter employment both do not benefit from the enhancement of the EITC and face the prospect of losing their benefits entirely. The absence of time limits in the United Kingdom implies that the coercive aspect of welfare reform may be less than in the United States, most likely reflecting societal preferences.

Canada

40. **Further evidence that welfare recipients respond to programs such as the WFTC that enrich the reward to work is obtained from the results of the Canada Self-Sufficiency Program (SSP).** The SSP is an in-work welfare supplement run under an experimental basis in which single parents who have received welfare for at least 12 months are randomly divided in two groups: one in which those who work 30 hours or more receive substantially enhanced benefits for three years, and a second which is given only normal welfare benefits.[24] The experimental design thus allows for a comparison of the employment performance of each group that not only controls for common macroeconomic developments, but also has the feature that the group receiving extra benefits shares the observable characteristics of the control group. This improves on the studies of the EITC, which of necessity relied on comparisons between groups with possibly differing characteristics—for example, single parents vs. individuals without children.

41. **The results of the SSP strongly confirm that welfare recipients respond to financial incentives that enrich the reward to work, as the employment rate (the flow into employment) doubled for the experimental group compared to those receiving the standard benefits, with a correspondingly larger increase in average income.**[25] Although the empirical evidence is not entirely comparable, the effect of the SSP in increasing employment appears to be greater than that of the less generous EITC, confirming the expected effect of the larger financial incentive. Moreover, the SSP's focus on unemployed single parents appears to be successful at targeting only those who most need assistance, with the absence of a statistically significant increase in the duration of unemployment in the experimental group suggesting that the waiting period was long enough so that individuals do not wait a year to receive the greater benefits. Although generous, the cost of SSP so far appears to be somewhat less than expected (and possibly close to self-funding over some periods), as the success in generating employment has led to increased tax revenues that offset program expenditures. Finally, an SSP+ program that provides some individuals with additional services such as employment counseling and job search assistance has been found to have a small additional effect in increasing employment and earnings.

42. **The results of the Self-Sufficiency Program in Canada provide substantial encouragement for the WFTC, though there are important differences between the two**

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[24] See Canada *Selected Issues* Paper, SM/99/14, March 1999, for a comprehensive discussion of Canada's social welfare system.

[25] See Social Research and Demonstration Corporation (1999).

programs. In particular, the SSP is more narrowly targeted with a focus only on single parents and a 1 year waiting period for benefits that prevents those who are already employed from receiving assistance. Adding similar restrictions to the WFTC would eliminate the effect by which windfall recipients who are already in jobs reduce their hours in response to the benefit; this would also lower the cost of the WFTC. On the other hand, such a change would favor welfare recipients over the working poor, who have nearly the same income and job prospects, and raise thus serious questions of horizontal equity, and would take away from the redistributive component of the WFTC. Nonetheless, if future changes are required to WFTC—for example, to reduce the cost—the SSP points to one possible direction for such efforts.

Other Countries

43. **In contrast to the United Kingdom, Canada, and the United States, reforms in many other countries have involved reductions in benefits given to the inactive as a means to encourage labor market participation.** Many of these countries, including Denmark, the Netherlands, and New Zealand undertook reforms in response to economic difficulties, and as a necessity concentrated on cost-saving reforms rather than in-work benefits that increase the reward to working. In contrast, the United Kingdom has had the luxury of being able to expand benefits for the employed rather than cut those for the inactive. Evidence on the difference between the two approaches is discussed below.

Denmark

44. **Welfare reform in Denmark took place in the context of a macroeconomic stabilization in the early 1980's, which included a change in the exchange rate regime, fiscal consolidation, and incomes policies aimed at improving competitiveness.**[26] Welfare and labor market reforms began in the early 1990's when the unemployment rate reached double digits—above 12 percent in 1993. To motivate the inactive, the duration of unemployment benefits was reduced from 9 years to 5 years in 1993, and participation in active labor market programs made compulsory after 2 years out of work; agreements among social partners in 1994 and 1995 led to further reductions in benefits and the strengthening of active labor market programs. This was combined with incentives for early retirement from 1992-96 that sought to free up jobs for new workers, and rules that increased eligibility for work sabbaticals for child care, education, and personal enrichment, all of which served to reduce participation. The unemployment rate has fallen by nearly half since 1993 as growth recovered, leading to a partial reversal of some measures aimed at reducing participation. Welfare reforms have clearly played a role, but there is not yet definitive evidence that distinguishes the effects of reforms from the contribution of the cyclical recovery.

New Zealand

45. **Better evidence on this point is available for New Zealand, which undertook extensive reforms to product and labor markets starting in the early 1980's, in response**

[26] See Barrell and Genre (1999) for a comprehensive discussion.

to economic stagnation and declining competitiveness. As discussed by Evans and Wilkinson (1996), the first wave of reforms centered on efforts to improve competition among domestic firms by removing import protection and industrial subsidies, with labor market reforms announced at the end of 1990 and taking effect in the first half of 1991. New Zealand's approach to welfare reform focused mainly on reducing benefits with the aim of providing a lower replacement ratio and thus increased work incentives. Measures taken in New Zealand to tighten eligibility for benefits include an increase in the minimum age for the receipt of welfare from 16 to 18, an increase in the waiting period before receipt of unemployment benefits from 6 weeks to 52 weeks, and gradual increases in the retirement age. Benefits were reduced by as much as 25 percent for single welfare recipients, but by much less for married couples—only 3 percent for a married couple with no children. Of considerable interest for the reforms in the United Kingdom is that a $100 reduction in the average value of weekly benefits is found to have led to an 11.3 percent increase in the labor force participation rate, nearly twice the effect of a $100 increase in earnings for full-time work, which led to a 6.4 percent increase.[27] The increase in the age of eligibility for retirement benefits is found to have had a substantial effect in encouraging participation, accounting for nearly 1 percentage point of the 3.15 percent increase in participation from 1990 to 1995, with the decline in benefits accounting for 2.74 percentage points (these were then somewhat offset by reductions in benefits available to full-time workers that reduced participation). This is not to say that the opposite course taken by the United Kingdom in enhancing the value of employment will not work, but the experience of New Zealand suggests that this approach likely sacrifices some efficiency in terms of an increased labor force response. Maloney also finds that eliminating unemployment benefits for 16 and 17 year olds led to a sharp increase in the take-up of education for this age group rather than higher employment; this corresponds with the large share taking up the education and training option under the New Deal for Young People.

Netherlands

46. **Reforms in the Netherlands have been successful in creating jobs, but not in lowering unemployment.** Changes in the Netherlands began in the face of the 1982 recession, and were of necessity far more comprehensive than in the United Kingdom, including not only welfare and labor market reforms, but also major changes in the macroeconomic framework such as fiscal consolidation and the abandonment of an active monetary policy in favor of a link to the deutsche mark.[28] Labor market reforms in the Netherlands included cuts in the minimum wage and unemployment benefits, but also placed an important emphasis on coordination between employers and workers to bring about wage moderation. Labor market regulations were relaxed to allow for increased use of part-time employment, and older workers were encouraged to retire (often under the guise of disability) rather than to compete for jobs with less experienced workers. The results of these policies can be seen in Figures 1 to 3: the unemployment rate at the end of 1999 was the

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[27] See Maloney (1997).

[28] See Watson *et. al.* (1999) for an extensive review of the experience of the Netherlands, and Hartog (1999) for evidence focused on labor market reforms.

lowest of the advanced economies and employment growth has been quite strong (Figures 1 and 2), but labor force participation is above only that of Spain. Indeed, Watson *et. al.* (1999) conclude that despite a strong performance in terms of employment creation, once the rise of disability is taken into account, the Netherlands has not performed particularly well in terms of lowered unemployment. In a sense, the aim in the United Kingdom is for the opposite outcome, for reduced unemployment among primary earners such as prime-aged men, even if this means only a small net gain in employment. In part, this reflects the robust economy in the United Kingdom, since the strong labor market appears to be generating jobs without government intervention. The experience of the Netherlands may thus not hold lessons for the United Kingdom, but a comparison of the two approaches will be useful for other advanced economies contemplating welfare and labor market reforms.

Sweden

47. **Sweden presents an interesting comparison with the United Kingdom in the possibilities of encouraging labor force participation, especially by female second earners.** As shown in Figures 3 and 4, labor force participation in Sweden is only slightly higher than in the United Kingdom, but the government sector comprises a far larger share of the workforce in Sweden—substantially higher than in any advanced country other than Denmark. Rosen (1996) shows that employment by local governments accounts for essentially all employment growth in Sweden since the 1960's, with most of this comprising women taking jobs as social service providers employed by local governments, in positions such as day care providers or elder care. These positions are made possible by generous child care subsidies that enable women to enter the labor force in the first place. However, Rosen points out that Sweden has effectively brought into the market economy activities that would otherwise have taken place without cost, creating a sort of cross-hauling: person 1 is employed to take care of person 2's elderly parents, while person 2 minds the child of person 1. This commercialization of family care is a matter of societal preferences, but one with substantial economic consequences, since as much as half of government expenditure in Sweden is devoted to supporting these activities, requiring substantially higher tax rates than would otherwise be the case. There is a deadweight loss involved with government taxation, so that the cost to society of paying for these service providers is larger than the wages they receive. The loss from "excess" provision of paid family services is found to be quite substantial in Sweden—as much as $4,000 per child (in nominal terms at the 1996 exchange rate).

48. **An implication of this finding for the United Kingdom relates to the generous childcare subsidy offered as part of the WFTC.** The subsidy in the WFTC is available only to parents whose children are cared for by licensed providers, but the requirements for obtaining a license are, in principle, fairly straightforward. The availability of the subsidy might thus be expected to encourage current providers of unpaid childcare—parents or grandparents taking care of their own children—to formalize the arrangement and take in additional children. A high take up rate of the child care subsidy would allow for additional labor force participation as sought by the WFTC, but the economic benefits from this would be dissipated to the extent that the resulting higher fiscal costs of the WFTC require higher tax rates than would otherwise be the case and thus entails a deadweight loss to society. Moreover, the approach to child care in the United Kingdom is purely market-based, with no provisions to date for encouraging increased supply of child care other than the subsidy to

parents. It will thus be important to observe the take-up of the child care subsidy and subsequent changes in the market for childcare—some possibly induced by the generosity of the benefit itself—in order to fully assess the fiscal consequences of the WFTC.

E. Conclusions and Implications

49. **This comparison of welfare reform in the United Kingdom with similar efforts in other countries highlights the importance of considering the differing incentive effects of welfare programs on various groups, as benefits given to some individuals can lead to decreased participation by others.** This suggests an important role for measures that carefully target benefits to the intended recipients, including the use of waiting periods and hours requirements for benefits. The targeting of WFTC is fairly imprecise, with the provision of most benefits at 16 hours meaning that benefits go to some who would have worked two days per week without the incentive. With the New Deals, however, the 6 month waiting period for youth and the 2 year wait for older workers appear to be sufficiently lengthy to screen out those workers who would have gone back into jobs without help. Any future cyclical slowdown in the U.K. will create short-term unemployed with different needs than the long-term unemployed who are the focus of welfare reform, and it will be necessary to ensure that programs are able to separate the two groups so that benefits to the cyclically unemployed do not inadvertently provide incentives for the long-term inactive to remain out of the labor force.

50. **An important question still to be resolved is the relative effectiveness of positive incentives to work versus measures that reduce the benefits given to the inactive.** The experience of the United States and Canada shows that increasing the reward to work has a favorable effect on labor force participation, but evidence from New Zealand suggests that the stick is possibly more potent than the carrot. It remains to be seen the extent to which either result generalizes to other countries.

51. **Overall, the experience of other countries, especially the EITC in the United States and the SSP in Canada, points to the great promise of the WFTC in providing an incentive for one adult in jobless households to enter employment and thus alleviating poverty among those who take advantage of the benefit.** But the international evidence likewise highlights the main pitfall, that improvements in net labor supply and thus macroeconomic gains in output will be fairly small in the short run. Economy-wide productivity could actually fall as a result of welfare reform, as those brought into employment will have skill levels below current workers, while unemployment rates could rise temporarily, as the currently inactive reenter the labor force but take some time before their job search is successful. And startup costs could be substantial, especially as the New Deal is extended to larger groups.

52. **In conclusion, recent welfare and labor market reforms in the United Kingdom appear to hold much promise.** In the near term, welfare reform could play an important role in arresting the trend toward increased income inequality by boosting the rewards to working at the low end of the earnings distribution. The real gains, however, will be measured over a longer horizon, first as the new workers acquire skills and increase their productivity and thus wages and incomes, and eventually, as the children and grandchildren of current welfare recipients escape from the intergenerational cycle of poverty and dependence.

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III. Costs and Benefits of Joining the EMU [1]

A. Introduction

1. The policy of the United Kingdom towards EMU membership was stated by the Chancellor in his October 1997 speech and has remained substantially unchanged since then.[2] Under this policy, the key factor for the United Kingdom to join the single currency is that the economic case for membership be "clear and unambiguous"—as further laid out by five economic tests. Once the Government decides to join on that basis, the decision would need to be approved by referendum. At the time, the Government did not envisage that the five tests would be met during the current Parliament and opted to remain out of the EMU, while aiming for a reassessment of the decision on EMU membership early in the next Parliament. (The next parliamentary general elections are expected in 2001.)

2. The five entry tests, as stated by the Chancellor, can be summarized as follows. *First, the U.K. economic cycle must have sustainably converged with the cycle of the euro area.* Synchronization of the economic cycle is deemed essential to maintain the stability and growth prospects of the U.K. economy under a common monetary policy, and hence convergence must be likely to be sustained. The authorities' assessment coincides with the broadly held view that, until now, the U.K. economic cycle has not been synchronized with that of the main euro area economies for long periods of time. This convergence test is considered the most critical, as meeting many of the other tests hinges on convergence. *Second, there must be sufficient flexibility to cope with asymmetries among the euro economies*—such as asymmetric shocks and transmission mechanisms—as well as increased competition. Flexibility in labor markets is considered necessary since otherwise, absorption of economic shocks in the absence of monetary policy and exchange rate buffers could result in unacceptable levels of unemployment. *Third, joining the single currency should enhance the prospects for increased investment.* Increased long-term investment would result from macroeconomic stability and deeper and more competitive markets offering new opportunities for private investment—hence, the prospects of higher investment are considered contingent on the likelihood of these outcomes. *Fourth, joining the EMU should be judged beneficial for the financial services industry, particularly the City's wholesale markets.* This industry could be expected to be most directly affected by the replacement of the national currency by the euro and all preparations for this change should be in place. *And fifth, joining the euro should have a positive effect on employment and growth.* This positive effect would, in turn, require sufficient convergence and market flexibility.

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[1] Prepared by Julio Escolano.

[2] See "Statement on EMU by the Chancellor of the Exchequer" to the House of Commons (27 October 1997), and the associated publication HM Treasury (1997).

3. These five tests have been criticized for being vague and insufficiently clear-cut to provide, as intended, a "clear and unambiguous" signal for joining the euro. It is apparent, however, that it would be impossible (and arguably, even ill advised) to define and pre-commit to a set of black and white tests that would mechanistically trigger EMU entry. Thus, the five tests are considered here as policy guidelines or criteria specifying the factors that, in the Government's view, should be the focus of analysis and discussion in order to make a decision regarding EMU entry. The Government's approach, epitomized by the five tests, explicitly circumscribes the relevant factors for this decision to the economic area. This stems from the authorities' view that there are no overriding obstacles to U.K. membership from a constitutional standpoint and that if the single currency is successful, and the economic case is clear and unambiguous, then the United Kingdom should be part of it. This Government's approach has also been disputed—from what could be considered the converse viewpoint of the previous criticism—for being too narrow and specific, since it abstracts from the political dimensions of joining EMU. This political aspect of the EMU undertaking has played a central role in the debate in many of the countries currently in EMU and has been emphasized in the United Kingdom by many sides in this debate (including those opposing U.K. membership). The discussion in this paper will be confined to the economic advantages and disadvantages of EMU membership, without prejudging the relative importance of these economic considerations vis-à-vis the political dimension.

4. This paper is organized as follows. Section B discusses the main analytical framework to assess the gains and losses associated with joining the EMU: the theory of optimal currency areas (TOCA), which indicates that the net benefits from joining are directly correlated with the level of economic integration of the United Kingdom with the EMU. Some limitations of this framework for assessing U.K. membership in the EMU are presented in Section C. Section D discusses the microeconomic basis of the potential gains from joining the EMU. The level of integration between the U.K. economy and the euro area is discussed in Section E and Section F devotes specific attention to the synchronization of fluctuations in economic activity between the United Kingdom and the EMU. Section G discusses other considerations suggested by the TOCA: wage and price flexibility, and factor mobility. Finally, the last section draws some conclusions.

B. The Theory of Optimal Currency Areas: A Framework forAnalyzing the Costs and Benefits of Joining EMU

5. The analysis of the cost and benefits associated with joining a monetary union is typically cast in relation to the TOCA, which aims to identify the factors that minimize the costs and maximize the benefits of creating or joining a common currency area.[3] In summary, the TOCA suggests that joining a monetary union is beneficial if the gains stemming from lower transaction costs and exchange risk, and greater price transparency exceed the

[3] See Krugman (1990), Masson and Taylor (1992), and Bayoumi and Eichengreen (1996 and 1997).

additional costs of adjusting to asymmetric shocks and asynchronous business cycles incurred by the loss of monetary and exchange rate policy instruments. The more an economy is integrated with the intended currency area, the higher are the benefits of joining and the lower are the costs.

6. Microeconomic savings in transaction costs and risk premium will increase with the significance of trade among members of the currency area (see section D below). Although the traditional formulations of the TOCA place most of the weight on trade patterns, intense intra-area capital flows also increase the benefits of a common currency. The costs of joining a common currency area result from the loss of an independent domestic monetary policy and a flexible exchange rate as instruments of macroeconomic management. Entry into the EMU would imply the loss of an independent monetary policy geared toward the specific circumstances of the U.K. economy. Although, of course, the United Kingdom would be appropriately represented in the EMU decision-making institutions, the monetary policy stance would be tailored to the circumstances of the euro area as a whole. In particular, interest rates would follow those in the euro area (except for the country-specific risk premium) and there would be no independent exchange rate, which would be fixed with respect to the EMU economies. This could result in output losses when the domestic monetary policy stance and exchange rate are inappropriate to the circumstances of the U.K. economy. The lack of a flexible exchange rate would place the burden of absorbing eventual terms of trade shocks on the adjustment of domestic wages and prices—if the latter move sluggishly, the economy could undergo episodes of unemployment and excess capacity that might have been avoided through a flexible exchange rate.[4]

7. The magnitude of these costs is inversely related to the level of integration with the common currency area. Close integration implies that shocks to one economy will spread quickly to other economies in the currency area making it likely that the common policy stance will be simultaneously appropriate for all of them. At the same time, when the volume of trade and capital flows among a set of economies is large relative to their size, a monetary policy pursued independently by a single country is less likely to be effective as its impact would be diluted by spillovers through the balance of payments—thus, the opportunity cost associated to losing the instruments of an independent monetary policy would be lower. The degree of synchronization of output fluctuations between the United Kingdom and the EMU is, in this context, a particularly relevant aspect of economic integration: asynchronous business cycles and asymmetric shocks would magnify the costs of losing a flexible exchange rate and being subject a common monetary policy.

8. On the basis of the TOCA, the main traditional criteria for a region to constitute an optimal currency area are openness and regional interdependence, production diversification within the individual countries, factor mobility, and wage and price flexibility (Masson and

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[4] For a discussion of wage flexibility in the United Kingdom, see the *Selected Issues* paper on "Wage Flexibility and EMU" in this volume.

Taylor (1992)). Some of these criteria measure economic integration and aim to ensure that asymmetric or unsynchronized movements in economic activity, demanding differential monetary policy stances, are unlikely to develop. Other criteria point to the existence of sufficient flexibility to adapt to asymmetric developments, should these occur, without exchange rate adjustments or differentials in interest rates. The considerations suggested by the TOCA can be recognized in the "five tests" formulated by the Chancellor—particularly those regarding the synchronization of the U.K. business cycle with the euro area and the need for flexible markets to absorb asymmetric shocks.

C. Limitations of the TOCA

9. The TOCA does not cover all the potentially relevant criteria for U.K. membership, even on purely economic grounds. This theory is typically formulated under strong assumptions of exogeneity of behavioral parameters which, in fact, can be expected to change as a reaction to policies and the institutional environment—including the decision to join the euro.[5] More fundamentally, Buiter (1997, 1999a, and 1999b) argues that the TOCA fails to distinguish consistently between (typically short-term) nominal rigidities and long-term real rigidities or structural distortions. As a result, it exaggerates the costs of relinquishing an independent monetary policy—which cannot palliate the negative consequences of the latter type of rigidities. Thus, for example, a nominal depreciation is often assumed to translate into a real depreciation, not only in the short run when nominal rigidities may be expected to be present, but even in the long run—hence, magnifying the stabilization value of monetary policy and therefore, the cost of joining a monetary union.[6]

10. Further, as Buiter points out, the TOCA abstracts from capital mobility and capital account openness—arguably, more important factors than trade in determining short term movements in exchange rates—which could turn an independent currency into a source of disruptions rather than an instrument of stability. Flexible exchange rates are preferable, from the standpoint of macroeconomic stability, to cushion the effect of idiosyncratic supply shocks and non-monetary demand shocks. In contrast, a common currency is preferable to fence off monetary and financial market shocks—many of which would not even arise in a common currency area. Canzoneri *et al.* (1996) analyze how much of the variation in relative national outputs among potential EMU participants can be explained by monetary and financial shocks (as opposed to supply and real demand shocks) and whether the variations in nominal exchange rates are correlated with the shocks that explain output variations. Their empirical results show that while most of the variation in relative national outputs can be explained by aggregate supply and non-monetary, non-financial demand shocks, these shocks play a very limited role in explaining movements in nominal exchange rates. They conclude that, since nominal exchange rates are relatively unresponsive to the shocks that cause real

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[5] See, for instance, paragraphs 19 and 24 below.

[6] These issues are discussed further in paragraphs in Section G below.

macroeconomic imbalances, the cost to macroeconomic stability of relinquishing a floating exchange rate is possibly exaggerated by the traditional TOCA analysis. Specifically, starting with a hypothetical currency union among Germany, the Netherlands, and Austria, they find that the stability of output in France, Spain, and the United Kingdom would not be much affected by joining that union.[7]

11. Finally, the TOCA abstracts from credibility issues associated with monetary policy. Whether the loss of an independent domestic monetary policy would be a cost depends in part on the credibility of monetary policy in an individual country relative to that in the common currency area. In the early stages of EMU, much weight was placed on the gains for countries such as the United Kingdom from enhanced credibility of monetary policy and lower inflation expectations.[8] These gains, however, are not necessarily associated with joining the euro, but rather, with the consistently good conduct of monetary policy. With the increased credibility of the U.K. monetary policy framework following the adoption of inflation targeting and the granting of operational independence to the Bank of England, inflation expectations and the inflation premium in long-term U.K. interest rates have declined to levels comparable to those of the euro area.[9] Thus, this credibility factor may not play an important role in the future for the United Kingdom, although for some other prospective members the gains in monetary policy credibility may more than offset the loss of an independent monetary policy.

D. The Microeconomic Bases of the Potential Gains from Joining EMU

12. The gains postulated by the TOCA that would stem from greater integration are mostly based on microeconomic externalities associated with the wider use of a common currency. Money, as a medium of exchange and store of value, is subject to network externalities: the more extended is the use of a given currency, the more likely it is to be accepted as payment by other economic agents in return for real goods and services. In fact, fiat money—as opposed to real money, such as gold—derives its value exclusively from

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[7] Canzoneri et al. (1996) take 1970:Q1 to 1985:Q4 as the sample period (the period between the end of the Bretton Woods System and the beginning of the hardening of the ERM), in order to observe a regime of reasonably flexible exchange rates.

[8] For example, Currie (1997) singles out this argument as one of the most significant in the view of many EMU proponents.

[9] See "United Kingdom—Staff Report for the 1999 Article IV Consultation," and the *Selected Issues* paper "Issues Relating to Inflation Targeting and the Bank of England's Framework" in this volume.

these network externalities.[10] In the case of a hypothetical U.K. entry in the EMU, these gains would take the form of deeper markets and elimination of transaction costs and exchange risk. Although it is impossible to estimate with any precision the potential savings from these factors, the direct transaction costs associated with maintaining independent national currencies were estimated by the EC Commission (1990) at 0.5 percent of GDP per year for the EU as a whole. This estimate only included the bid-offer spreads and bank commissions on foreign currency transactions, as well as some "in-house" costs incurred by nonbanks. A comprehensive estimate would have to include also, as a minimum, the costs associated with taking foreign currency positions in euros through nonbank instruments, such as euro-denominated bonds and other financial instruments, and the costs of hedging positions in euros. On the other hand, the EC commission estimate may overestimate the savings to the United Kingdom from joining the euro since it was based on a hypothetical scenario in which the 12 currencies of the members at the time were abolished simultaneously: some of the costs previously associated with holding positions in the 11 euro currencies may have already been eliminated by the consolidation of these currencies into a single one.

13. The elimination of exchange rate risk and transaction costs can be expected to increase the net rate of return to investment and, with it, the underlying growth rate of the economy, at least in the medium term. The EC Commission (1990) study considers an increase of ½ percentage point in the rate of return due to the elimination of exchange rate risk as moderate, and estimates that such an increase would lift GDP by 5 percent over the long run (the estimate corresponds to the EU as a whole).[11] It could be argued that in the case of the United Kingdom, this positive impact on growth via higher investment is likely to be larger than in other EU countries due to the key role that investment, and in particular foreign direct investment, plays in economy-wide productivity improvements. Low levels of capital stock are among the main causes of comparatively low productivity in the United Kingdom; and foreign direct investment has played a crucial positive role in increasing labor and total factor productivity.[12] Although foreign direct investment was strong in 1999 despite the U.K. decision to remain out of the EMU, inward investment could suffer if this position were seen as permanent. The gains from joining the EMU could be greater for small- and medium-size

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[10] Buiter (1997) compares the network externality associated with the use of a common currency to the externalities from adopting a common language, measurement system, or compatible software.

[11] The increase in the net rate of return to investment would result from both increased gross return to business activities and lower borrowing rates, due to the elimination of transaction costs and the risk premium associated to exchange rate variability and other risks.

[12] See O'Mahony (1999), Griffith (1999a, 1999b), McKinsey Global Institute (1998), and Oulton (1998a, 1998b).

businesses, which currently may find barriers, due to their size, to engage in foreign currency transactions and that after joining EMU could tap larger product and financial markets.

14. Additional microeconomic gains from joining the euro would result from enhanced market transparency and competition. Consumers and other market participants—as well as consumer protection and competition authorities—would be able to compare more easily domestic prices with prices in foreign markets for similar products. As a consequence, discriminatory pricing practices that exploit cross-country differentials in monopolistic power would be hindered or, at least, would become easier to identify.[13] Some cross-border price differentials (particularly in final consumer prices) would remain, however, as a result of differentials in the price of nontradable inputs and other domestic cost components in the prices of tradables.

15. Another source of potential gain (or loss) would be the net effect on seigniorage revenue. If the United Kingdom joined the euro, it would lose the seigniorage revenue derived from the issuance of pounds, but would receive transfers from the ECB corresponding to its share in the seigniorage from the issuance of euros.[14] Although seigniorage is currently a minor source of fiscal revenue in most advanced economies and arguably should not be a substantial factor in the decision to join the euro, it is generally estimated that the United Kingdom would gain from the switch in currencies. The U.K. contribution to the assets of the ECB would be roughly proportional to its share in the joint (EU-11 plus the United Kingdom) monetary base, while the U.K. share of the ECB profits would be determined by its share in the ECB capital, which in turn is determined on the basis of GDP and population. The former share is lower than the latter as the U.K. monetary base represents a relatively small proportion of GDP—estimated by Buiter (1999a) at about 3 percent of GDP—due, inter alia, to highly developed payments and banking systems and minimal reserve requirements. Sinn and Feist (1997) estimate that the U.K. contribution to ECB assets would be roughly about 9 percent of total assets, while the United Kingdom

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[13] Discriminatory pricing of some products (e.g., cars) between the United Kingdom and other EU countries has recently raised concerns among consumer organizations and the authorities in the United Kingdom.

[14] Buiter (1999a) estimates seigniorage revenue in the United Kingdom—defined as either the value of the annual increase in base money or the notional annual interest foregone on the stock of base money—at about 0.2 percent of GDP per annum. This estimate of both the average annual increase in the monetary base and the interest bill foregone corresponds to the average of the period 1994-1998.

would receive about 14.7 percent of the ECB income derived from its assets, as well as from new assets associated with the future expansion of the euro monetary base.[15]

E. The Overall Level of Integration Between the United Kingdom and EMU Economies

16. As part of the EU, the U.K. economy is highly integrated with the economies of the EMU. Nevertheless, the U.K. economy also has closer links to the North American economies than most other European economies—partly due to historical and institutional factors such as a common language and similar legal frameworks. As Table 1 shows, the trade links with North America are significantly higher for the United Kingdom than for other economies in EMU and trade with the euro area is lower. This mismatch in the relative weight of trade partners has been recognized as a potential obstacle to integration in the EMU, since it makes it possible for trade shocks to have an asymmetric impact in the United Kingdom relative to the euro area.[16] A similar opportunity for idiosyncratic shocks arises from the importance of the oil-producing sector in the United Kingdom.

Table 1. Trade Direction in the United Kingdom and Selected EMU Economies. 1998 1/

(In percent of GDP)

	United Kingdom	France	Germany	Italy
Trade partners:				
World total	41.4	40.9	46.7	39.1
EMU plus the United Kingdom	19.4	24.2	23.8	21.7
North America	6.3	3.7	4.5	3.1
Other	15.7	13.0	18.4	14.3

Sources: Direction of Trade Statistics (IMF); and International Financial Statistics (IMF).
1/ Goods exports plus goods imports for each country as percent of the country's GDP.

17. The special significance of the economic links with North America are also apparent in the area of foreign direct investment (see Table 2). For example, the value of outward and inward investment flows with North America was four and ten times higher, respectively,

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[15] Updated estimates based only on the EU-11 countries plus the United Kingdom indicate that the U.K. monetary base also represents about 9 percent of the joint amount and that the U.K. capital share in the ECB would be 15.7 of its joint capital.

[16] HM Treasury (1997) draws similar conclusions based on 1995 data. Weaker trade integration with EMU also diminishes the potential gains from lower transaction costs and exchange rate variability.

than with the euro area. Thus, the evidence would indicate that U.K. foreign investment, and a fortiori the U.K. economy, could be more sensitive to investment shocks originating in the North American economic area than to those originating in the EMU. It should be noted, however, that the implication for an eventual U.K. entry into EMU from the evidence on inward foreign direct investment is not unequivocal. Although according to the TOCA, the relatively stronger link with North America would indicate a misalignment of fundamentals for the purposes of EMU entry, it could also point in the opposite direction. In particular, there is some evidence that some foreign investors may consider the United Kingdom, at least partly, as a bridgehead into the EU markets—most of which are part of the euro area. To the extent that this is the case, foreign investment could be negatively affected by a U.K. decision to stay out of the EMU for an extended period—the prospect of reduced transaction and exchange risk costs might divert some of this investment away from the U.K. economy.

Table 2. United Kingdom: Foreign Direct Investment and Assets. 1998
(In percent of GDP)

	U.K. Investment Abroad		Foreign Investment in the U.K.	
	Net flows	Assets	Net flows	Assets
World total	8.5	35.0	4.6	21.8
EMU	1.3	11.1	0.2	5.3
North America	5.5	15.1	2.5	11.1
Other	1.7	8.8	1.8	5.3

Source: Office for National Statistics (ONS).

18. An additional potential source of asymmetry between the U.K. economy and its EMU counterparts is the transmission mechanism of monetary policy. Even if the U.K. economy were hit only by EMU-wide common shocks and its fundamentals were in line with other EMU economies, a common monetary policy could have asymmetric effects in the United Kingdom and in the EMU economies due to different lags and sources of output response to a common monetary stance. HM Treasury (1997) and Bean (1999) find evidence of dissimilar transmission mechanisms between the U.K. and EMU economies. Although the econometric evidence on the speed and magnitude of the impact of monetary policy is inconclusive,[17] there is some consensus that the transmission mechanism in the United Kingdom has probably a shorter lag and a larger impact than in most EMU economies. This opinion is mainly based on the relatively higher weight of variable-rate financing in both the

[17] Bean (1999).

household and corporate sectors. Owner-occupied housing is higher in the United Kingdom than in the EMU, as is household indebtedness (partly due to mortgages).[18] Interest payments on most of this debt in the United Kingdom is closely linked to short-term rates, while in most EMU economies, household debt at fixed rates is more prevalent. U.K. corporations rely more on bond and equity finance than in the EMU economies where bank financing at relatively stable—if not completely fixed—rates is more common. Recent developments, however, indicate that this gap might be closing as fixed-rate mortgages are expanding in the United Kingdom owing to stable inflation expectations and EMU corporations are increasingly resorting to securities markets for their financing.

19. Trade patterns, financial links, and the overall level of integration of the U.K. economy with the EMU, however, are dynamic features susceptible to change over time, particularly after an eventual entry into EMU (see Frankel and Rose (1998)). Entry into the common currency area could significantly raise international trade and financial linkages with the EMU and, in turn, these tighter ties may increase the symmetry of economic shocks and strengthen co-movements in economic activity. In theory, the effect of strengthening trade ties (and a fortiori of EMU membership) is ambiguous: If the increase in cross-country trade leads to more specialized economies, the opportunities for idiosyncratic or asymmetric shocks, dissimilar transmission mechanisms, and out-of-step business cycles could all widen.[19] On the other hand, if intra-industry trade, financial links, and demand shocks dominate, cross-country economic coherence can be expected to strengthen in a currency union. Most of the empirical evidence appears to back unambiguously (at least for OECD countries) the hypothesis that higher levels of bilateral trade lead to closer business cycle integration. Frankel and Rose (1997 and 1998) review this issue and find a strong positive relationship between these two developments. Angeloni and Dedola (1999) also report evidence of closer correlation of industrial production and GDP in recent times with the EMU as a whole for France, Spain, and the United Kingdom—even though the latter stayed out of the EMU. The analysis performed in OECD (1999) finds closer integration of actual and potential EMU economies, including the United Kingdom, in recent years—closer, in fact, for the United Kingdom than for some EMU participants.[20] The authors report that "the results support the view that the creation of the single market and the conditions for participation in EMU have led to higher convergence in economic performance across EU countries in recent years." Artis (1999), using industrial production—proxying for tradable output—finds that the VAR analysis of demand and supply shocks buttresses the conclusions of Frankel and Rose (1997 and 1998) of closer integration owing to stronger trade links for

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[18] In 1995, 66 percent of U.K. households owned their own homes compared to an EU average of 56 percent; mortgage debt in the United Kingdom was 57 percent of GDP compared to an EU average of 33 percent of GDP (HM Treasury (1997)).

[19] For a discussion of this possible outcome of a currency union, see Krugman (1993).

[20] This study is discussed below in greater detail.

most EMU countries, but not for the United Kingdom. Tradable-based demand shocks in the United Kingdom appear much more correlated with those of the EMU, while supply shocks place the United Kingdom farther away from the EMU core.

F. Cyclical Convergence and Symmetry of Economic Disturbances

20. There is a growing body of literature aiming to test empirically the degree of synchronicity of the fluctuations in economic activity among actual or potential member countries of the EMU. This body of literature can be classified into three broad categories. First, countries can be divided in clusters that are defined to maximize the degree of compliance with TOCA criteria within each cluster on the basis of a set of observable variables such as bilateral trade, inflation differentials, market flexibility, etc. Second, cross-country cyclical co-movements in output can be measured directly aiming to identify the cyclical affiliation of each country and, possibly, the existence and country composition of a common European economic cycle. And third, the cross-country symmetry of the underlying demand and supply disturbances experienced by the economies can be investigated using structural VAR models.

21. On the whole, the empirical studies tend to conclude that the United Kingdom is among the less likely countries to be part of a core optimal currency area centered around the EMU. Thus, as part of a review of this research, Artis (1999) concluded that "overall assessments of the optimality of EMU for its potential members virtually always place the United Kingdom in an 'outsider' category." Typically, the U.K. economy appears in a peripheral group with some Nordic countries. Nevertheless, it should be emphasized that these statistical analyses measure the degree of commonalties between the United Kingdom (or other countries) and a conventionally defined EMU center (typically the German economy). They do not provide a pass-fail grade but a relative ranking based on past evidence. In particular, the United Kingdom appears often in the same group as some of the countries that have joined the EMU.

22. The first set of studies mentioned above applies the TOCA criteria to a set of European and other countries in order to construct an optimal currency area index, summarizing the information contained in those criteria. In the analysis of Bayoumi and Eichengreen (1997), the proposed index measures the agreement with TOCA criteria versus Germany—which is considered the center of the optimal currency area—in three different years: 1987, 1991, and 1995. They conclude that the countries analyzed fall in three broad groups: prime candidates for EMU (Austria, Belgium, the Netherlands, Ireland, and Switzerland), countries gradually converging toward EMU (Sweden, Italy, Greece, Portugal, and Spain), and countries exhibiting little convergence (the United Kingdom,[21] Denmark,

[21] In the last sample year (1995), the United Kingdom shows the lowest level of agreement with the TOCA criteria among the European economies.

Finland, Norway, and France[22]). In another contribution to this literature, Artis and Zhang (1998b) apply cluster analysis to a set of variables suggested by the TOCA for actual and prospective member countries of EMU.[23] They conclude[24] that the countries analyzed cluster around three groups: the core (Germany, France, Austria, Belgium, and the Netherlands), a Northern periphery (Denmark, Ireland, the United Kingdom, Switzerland, Sweden, Norway, and Finland), and a Southern periphery (Italy, Spain, Portugal, and Greece).[25] OECD (1999) also applies cluster analysis to the set of member countries of the EU to assess their degree of convergence over time. The analysis is performed independently for a sequence of years in the period 1980-1996 on the basis of output growth, current account balance as a percent of GDP, private-sector employment growth, long-term interest rates, government budget balance as a percent of GDP, and inflation. The results indicate that, from 1994 to 1996, there is a group of six countries (Germany, France, Austria, Belgium, Netherlands, and Sweden) which always fall in one of two closely related clusters, with the additional frequent inclusion of the United Kingdom, Italy and Finland in specific years. Spain and Portugal approach these clusters over the time period of the sample.

23. The second approach attempts to measure directly the degree of coincidence of output fluctuations in a set of potential members of an optimal currency area: ultimately, whether output fluctuations in the United Kingdom have been synchronized with those in the EMU—independently of whether other TOCA criteria are met—is an empirical question susceptible of direct measurement and can be addressed separately. Research along these lines reported in Kontolemis and Samiei (1999) found that the U.K. economic cycle had been more correlated with those of the United States and Canada than with those of Germany, France,

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[22] Bayoumi and Eichengreen (1997) explain away the surprising and counter-intuitive result for France on the grounds that this country is large and relatively close by European standards, with trade representing a comparatively low share of its GDP.

[23] In Artis and Zhang (1998b), this implies defining for each country a "distance" from Germany (or dissimilarity coefficient) measuring the degree by which their bilateral economic relation with Germany deviates from the TOCA criteria. The variables used to proxy the TOCA criteria are correlation in business cycle, volatility of bilateral exchange rate, correlation in interest rate cycle, bilateral trade (as percent of total trade), inflation differential, and labor market flexibility (measured by the relative ranking of a country's employment protection legislation).

[24] Artis, M. and W. Zhang (1998a) reaches very similar conclusions using fuzzy clustering analysis—a related, but different methodology.

[25] Artis and Zhang (1998b) also finds evidence of two other non-European clusters in their sample: one comprises the United States and Canada, and the other only Japan.

Italy, or the euro area as a whole.[26] These results were the same under two methodologies, based on cross-correlations of detrended output and business cycle turning points, respectively. Lumsdaine and Prasad (1999) find evidence of both a world-wide and a European business cycle, but conclude that France and the United Kingdom show higher correlations with the world common component than with the European common component. Artis (1999) and Artis, Krolzig, and Toro (1999), building on earlier work, employ a variety of statistical techniques to identify co-movements in the business cycles. They find evidence of an increasingly coherent European business cycle, although the affiliation of the U.K. business cycle to both the European and U.S. business cycles diminishes during the ERM period (see Table 3). Still, in the two sample periods, the U.K. business cycle shows higher correlation with the U.S. cycle than with the German cycle.

Table 3. Business Cycle Correlations

	Pre-ERM 1/		ERM Period 1/	
	With Germany	With the US	With Germany	With the US
Canada	0.51	0.86	0.26	0.92
France	0.65	0.72	0.69	0.34
Italy	0.37	0.58	0.43	0.30
The Netherlands	0.79	0.43	0.48	0.31
Austria	0.63	0.44	0.73	0.22
Belgium	0.69	0.63	0.56	0.18
Spain	0.48	0.64	0.38	0.17
Portugal	0.41	0.52	0.30	-0.18
United Kingdom	0.64	0.75	0.16	0.35

Source: Artis (1999).

1/ The pre-ERM and ERM periods are defined to cover 1965-1979 and 1980-1997, respectively.

24. Finally, the third methodological variant attempts to estimate the correlation among the underlying shocks across economies, rather than the correlations among levels of economic activity themselves. This is because output (or other indicators) are endogenous variables and their profile may reflect—in addition to the fundamental structure of the economy—the behavioral response of economic agents, policies, and policy transmission mechanisms. All of these factors are likely to change as a result of membership in a common currency area. Under this methodology, the initiating disturbances are identified separately from the transmission process which, incorporating the public and private policy responses, mediates the passage of the shock through the economy. Typically, the shocks are identified

[26] In this study, the sample period for quarterly output data was 1960:1-1997:4 and the countries and economic areas considered were the United Kingdom, United States, Canada, France, Germany, Italy, the euro area, and North America.

as belonging to the demand side (occasionally distinguishing those stemming from monetary policy) or to the supply side and estimated for each country separately by means of a structural VAR model. This requires the a priori imposition of structural restrictions, which have been subject to some criticism.[27] This line of research was initiated by Bayoumi and Eichengreen (1993) and, in an update of their results, Artis(1999) concludes that an EMU core and a periphery can be identified—the former comprises Germany (defined as the center), France, Denmark, Austria, Belgium, and Luxembourg, as well as perhaps the Netherlands and Italy; the latter includes the United Kingdom (see Table 4). These results are, however, inconclusive as to how much of an obstacle to monetary union is the asymmetry of shocks. The analysis conducted in Kontolemis and Samiei (1999) indicated that an important source of shocks in the U.K. economy was monetary policy itself and shocks to the exchange rate. An eventual entry into EMU would eliminate asymmetry in these two sources of disturbances with respect to other EMU economies.

Table 4. Shock Correlations with Germany. 1960-1995.

	Supply	Demand
EU-15	0.37	0.57
Germany	1.00	1.00
France	0.40	0.28
Denmark	0.46	0.25
United Kingdom	0.24	0.14
Italy	0.25	0.29
Netherlands	0.34	0.18
Belgium and Luxembourg	0.53	0.28
Austria	0.39	0.32
Spain	0.24	-0.03
Portugal	0.20	0.16
Greece	0.04	0.09
United States	-0.01	-0.22
Canada	0.19	0.03
Norway	0.24	0.22
Sweden	0.19	0.19
Finland	0.19	0.02

Source: Artis (1999).

[27] See Bayoumi and Eichengreen (1996) and Buiter (1997). The latter, for example, points out that the standard identifying restriction that demand shocks have no long-run effects only makes sense for monetary policy shocks and not for (permanent) fiscal policy shocks. OECD (1999) also contains a discussion of VAR methods used in connection with defining criteria for EMU membership.

G. Flexibility and Factor Mobility

25. Some market rigidities can exacerbate the negative consequences of joining a currency area. The main advantage of having an independent exchange rate is that it provides a flexible instrument capable of moving relative prices between currency areas in the short term. To the extent that an independent monetary policy acts as a cushion of economic disturbances, joining a currency area, and therefore losing that policy instrument, requires sufficient market flexibility to respond to fluctuations in activity and economic shocks without an unacceptable level of unemployment and output losses. These considerations apply most directly to economic disturbances that are country specific. Nevertheless they may also apply to disturbances affecting simultaneously the whole currency area if different economies have different transmission mechanisms. Most of the early versions of the TOCA were developed under the assumption that wages and domestic prices were fixed.[28] Under these assumptions, the value of the exchange rate for restoring internal and external balance can be overstated as nominal exchange rate changes translate immediately into a permanent change of the real exchange rate. In assessing their relevance for the purposes of joining a currency area, it is important to distinguish between two types of price and wage rigidities: nominal and real. Real rigidities (as in the case of wide-spread wage indexation or structural distortions) may impair the stability and growth prospects of the economy, but they will be equally crippling under a currency union as under an independent monetary policy.[29] Thus, the relevant issue for EMU membership is the existence of (typically short-term) nominal stickiness in either wages or output prices or both. The existence of nominal rigidities in wages and prices increases the value for a country of an independent and flexible exchange rate and, correspondingly, the cost of joining the EMU. Under a single currency, nominal wage stickiness would prevent or delay the adjustment of real wages or the real exchange rate to an economic shock, with adverse consequences for employment and output. Whatever the exchange rate regime, adjustment costs would, of course, be greater if structural distortions made real wages unresponsive to the increase of unemployment.

26. Unfortunately, evidence on cross-country market flexibility is scarce or inconclusive. The relative paucity of empirical evidence on this issue is compounded by the difficulties in measuring the specific phenomenon of relevance for EMU membership. Staff analysis of wage flexibility in the United Kingdom concludes that the institutional changes that have taken place in its labor markets during the last two decades have significantly increased the responsiveness of nominal and real wages to changes in economic conditions—as evidenced

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[28] See Masson and Taylor (1992).

[29] See Buiter (1999b) and Bayoumi and Eichengreen (1996).

by the current low unemployment and high participation rates.[30] Also, Bayoumi and Eichengreen (1996) report evidence indicating that wage behavior might be contingent on the exchange rate regime, showing a higher degree of flexibility when the exchange rate regime is more rigid. Studies on the flexibility of retail and product prices typically find that, on balance, price flexibility in the EU, and specifically in the United Kingdom, is in the middle range among industrialized countries and well below the typical relative price flexibility observed within a country. Masson and Taylor (1992) and Bayoumi and Eichengreen (1996) report that the dispersion of CPIs (measured in a common currency) across European countries is significantly higher than across cities or regions within a country, which is interpreted as evidence that European countries need flexible exchange rates. The evidence, however, could also be interpreted as indicating that the nominal exchange rate has not in fact responded to real exchange rate misalignments and, consequently, flexible exchange rates have not been effective instruments to avoid misalignments in cross-country relative prices. A related argument is presented by Buiter (1997, 1999a, and 1999b) who posits that nominal exchange rate flexibility causes financial and nominal shocks to result in misalignments of international relative prices rather than contribute to their stabilization in line with fundamentals.

27. Under the TOCA, factor mobility is considered a precondition for currency unions as a mechanism for adjusting to shocks unmitigated by an independent monetary policy and flexible prices. The attention has generally focused on labor mobility, as capital is highly mobile within the EU. Bayoumi and Eichengreen (1996) report that regional labor mobility in the United States plays a more important role in adjustment to shocks than wage flexibility or labor force participation. Much of the literature on this area finds that international labor mobility in Europe is significantly lower than within the United States or individual European countries and cross-country labor mobility is higher in Northern Europe than in the South.[31] This evidence is interpreted as indicating an obstacle to the success of EMU and to U.K. membership. The relevance of labor mobility, however, is highly debatable as a shock-absorber in lieu of a flexible exchange rate or an independent monetary policy. The empirical evidence indicates that in Europe, even within national boundaries where legal barriers are absent, labor migration starts taking place only about four years after a shock has occurred—moreover, casual observation indicates that, in addition, the shock has to be perceived as permanent to trigger significant labor migration. This implies that labor migration, however valuable as a long-term adjustment mechanism, cannot be a means for short-term counter-cyclical stabilization.[32] That is, even when labor mobility is unrestricted, such as within country, it cannot be counted upon to stabilize in any significant extent the type of economic fluctuations that are relevant to monetary policy.

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[30] See the *Selected Issues* paper "Wage Flexibility and EMU" in this volume.

[31] See Bayoumi and Eichengreen (1996) and Masson and Taylor (1992).

[32] A similar conclusion is presented in Bean (1992) and Buiter (1997).

H. Conclusions

28. This paper has reviewed the recent literature and empirical evidence on the main economic considerations influencing possible U.K. entry into EMU. The current state of economic analysis and empirical evidence on this area do not provide grounds for an overriding case in favor or against U.K. membership at this time. The main gains from joining EMU would be savings in the transaction costs and risk premium associated to exchange rate variability, as well as enhanced market transparency, with positive effects on investment, productivity, and growth. Although these gains are difficult to measure, they could be significant, particularly in the medium term.

29. On the negative side, joining the EMU would imply relinquishing an independent monetary policy and a flexible exchange rate. Thus, the main costs of joining the EMU would be associated with the possibility of monetary conditions that may not always be optimally tailored to the economic conditions in the United Kingdom. Since monetary policy in the EMU is tuned to the euro area as a whole, the likelihood that monetary conditions will be out of step with the U.K. economy, and the severity of the consequences, depends on the level of integration of the U.K. economy with the euro area. The balance of empirical evidence suggests that, currently, although the economic integration of the United Kingdom with the euro area is high, it is significantly lower than that of other countries in the EMU. Also, the level of integration with the North-American economic area is higher for the United Kingdom than for the euro area. As a result, output fluctuations in the United Kingdom are less correlated with the common euro area cycle than they are in the case of most EMU economies.

30. The five tests established by the authorities as criteria for taking a decision to join the EMU are broadly consistent with the main issues that are at the center of the debate in the economic literature. Particularly, the objective of achieving a higher degree of cyclical convergence and integration with the EMU economies on a sustained basis is well founded. As mentioned, the fluctuations in U.K. economic activity are not fully synchronized at present with those of the main EMU economies—although this is the case for some EMU members as well. Looking forward, there are indications of a trend to closer synchronization among European economies, including the United Kingdom—the dynamic patterns of co-movements in economic activity appear to be evolving, not the least because the creation of the EMU itself. Staff analysis also suggests that wage flexibility has increased in the 1990s. While many of the uncertainties regarding factors influencing EMU entry are likely to lessen over time, more evidence will be required before an overriding case for or against entry can be made on economic grounds.

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IV. Wage Flexibility and EMU[1]

A. Wage Rigidity and the Exchange Rate Regime

1. An important consideration in the United Kingdom's participation in EMU focuses on the potential cost of losing the nominal exchange rate as a tool for macroeconomic stabilization. In the face of wage rigidities, a flexible exchange rate can potentially reduce unemployment and output loss from real asymmetric shocks, both by buffering the economy in response to temporary shocks and by speeding adjustment in the case of permanent shocks. One of the five "tests" on EMU entry stated by the Chancellor relates to the U.K. economy having sufficient flexibility to cope with asymmetric shocks among the euro area economies. Flexibility in labor markets is considered essential in this regard because of the implications for employment and output growth.[2]

2. The flexible or fixed nature of a country's exchange rate regime can significantly influence the costs of adjustment to a shock in the presence of nominal and real wage rigidities. In a flexible exchange rate regime, if the United Kingdom suffers a permanent real shock and nominal wages are sticky, a depreciation of the exchange rate will reduce real wages through higher inflation and, in principle, mitigate negative effects on unemployment and output.[3] Under a fixed exchange rate regime or a single currency, nominal wage inertia will initially lead to unemployment and output loss, and the resulting adjustment costs will be higher the less responsive are real wages to unemployment. The costs of giving up exchange rate flexibility under EMU would thus depend in part on how flexibly both nominal and real wages respond to changes in output and labor demand.

3. Against this background, this paper surveys a broad range of indicators of wage flexibility, both macroeconomic and microeconomic. The paper argues that a number of institutional and structural changes in U.K. labor markets during 1980s may have played a role in increasing both aggregate and relative wage flexibility. In particular, deunionization has led to increasingly decentralized wage bargaining which, together with welfare reform, appears to have intensified competition at the lower end of the wage distribution and may

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[1] Prepared by Brian Aitken.

[2] For a broader survey of these issues, see *Selected Issues* paper "The Costs and Benefits of Joining EMU" in this volume.

[3] It should be noted that depreciation is an effective option only to the extent that nominal stickiness is the source of the real wage rigidity. If nominal wages rise with the depreciation—that is to say, if there is real wage rigidity and nominal wage flexibility—then there is no alternative to a lengthy period of unemployment for bringing down real wages. In this case, the costs of adjustment will be high regardless of the exchange rage regime. This point is discussed in Buiter (1999) and Obstfeld and Peri (1998).

have contributed to the better cyclical adjustment of labor markets in the 1990s. The accompanying rise in wage dispersion and income inequality, while indicative of relative wage flexibility, raises concerns about equity, and has prompted measures to strengthen incentives and social safety nets and raise the skill levels of low-income workers.

B. Labor Market Performance in the 1980s

4. Much of the concern over wage rigidity in the United Kingdom arises from the labor market experiences of the 1980s. Following the recession in the early 1980s, real wages in the United Kingdom rose rapidly despite high and rising unemployment; between 1979 and 1984 real wages rose by about 8 percent, while total employment fell by a similar amount. Unemployment rose from 5 percent to 11 percent. The resilience of real wages, given the deepest recession in the post-war period, was surprising. In their 1985 annual report, the OECD noted:

> The perceived rigidity of the labor market in the United Kingdom has been held to be one of the major impediments to the solution of the unemployment problem. In particular, the Government sees the failure of real wages to adjust sufficiently to deteriorating employment conditions as the most important reason why more jobs have not been created during the last five years.

5. Consistent with this, cross-country estimates of the response of aggregate real and nominal wages to unemployment showed the United Kingdom to have a high degree of wage rigidity relative to other OECD countries. In a frequently cited study, Layard, Nickell, and Jackman (1991) estimated structural wage and price equations based on data through the mid-1980s and found that real wage rigidity in the United Kingdom exceeded that in Japan, the United States, and all of the other eleven European countries included in the study. Likewise, Coe (1985) estimated that the responsiveness of nominal wages to unemployment was significantly lower for the United Kingdom than for the United States, Japan, Australia, Canada, and the six other European countries examined.

6. The resilience of wages in the 1980s was attributed in a large part to the industrial relations system and the monopoly power of the trade unions. It was sometimes argued that the United Kingdom's wage formation process was the least desirable from a macroeconomic perspective; with much of the wage bargaining in the early 1980s taking place at the industry level, the United Kingdom's labor market lacked both the coordination of highly-centralized wage bargaining systems (as in Austria, Belgium, and some Scandinavian countries) and the market-clearing aspects of a highly-decentralized bargaining system (as in the United States). Weakening the power of unions in the UK was seen as one way of achieving greater wage flexibility. An alternative view held that as long as unions played an important role in wage formation, centrally-coordinated wage bargaining (namely through centralized positions

adopted by the unions and employers) could secure a greater degree of aggregate wage moderation.[4]

7. In addition to institutional factors, the increase in the share of long-term unemployed was thought to explain partly why wages were unresponsive to high levels of total unemployment. Long-term unemployment, which had been rising for some time, increased sharply during the recession of the early 1980s; the number of men unemployed for more than a year rose from about 50,000 in the mid-60s, to around 250,000 by the late-70s, and exceeded 1 million by 1985 (OECD, 1986). Since the long-term unemployed are generally less active in looking for work, they are thought to exert less downward pressure on wages than short-term unemployed. The absolute number of short-term unemployed was actually falling by the mid-80s, which might partly explain the lack of wage moderation during the recovery despite persistently high total unemployment (Figure1)

C. Structural and Institutional Changes in Labor Markets

8. Since the early 1980s labor market institutions have undergone a number of changes which, along with structural shifts in the United Kingdom economy, may have increased wage flexibility. Two changes in particular—the weakening of trade unions and, to a lesser extent, the weakening of Wages Councils—are thought to have had a significant impact on wage formation.

9. A series of legislative acts during the 1980s and early 1990s limited picketing rights, substantially weakened closed shop rules, imposed greater legal responsibility on unions for their actions, and required pre-strike ballots. With these changes, employers could choose not to recognize unions and bargain directly with individuals. The resulting shift in bargaining power substantially weakened the monopoly power of trade unions (Machin and Stewart, 1996), and led to a sharp decline in union density during that period (Table 1).[5]

10. The role of unions in wage formation was further reduced in the 1980s by the significant shift in the structure of employment away from manufacturing towards the service sector. In some sectors, the relocation has been quite large; between 1975 and 1995, the engineering sector experienced a decline of nearly 1.6 million workers, or nearly 50 percent, while the banking sector nearly doubled, expanding by 1.7 million workers (Greenaway *et al*, 1999). Reduced union powers and the shift away from manufacturing contributed to

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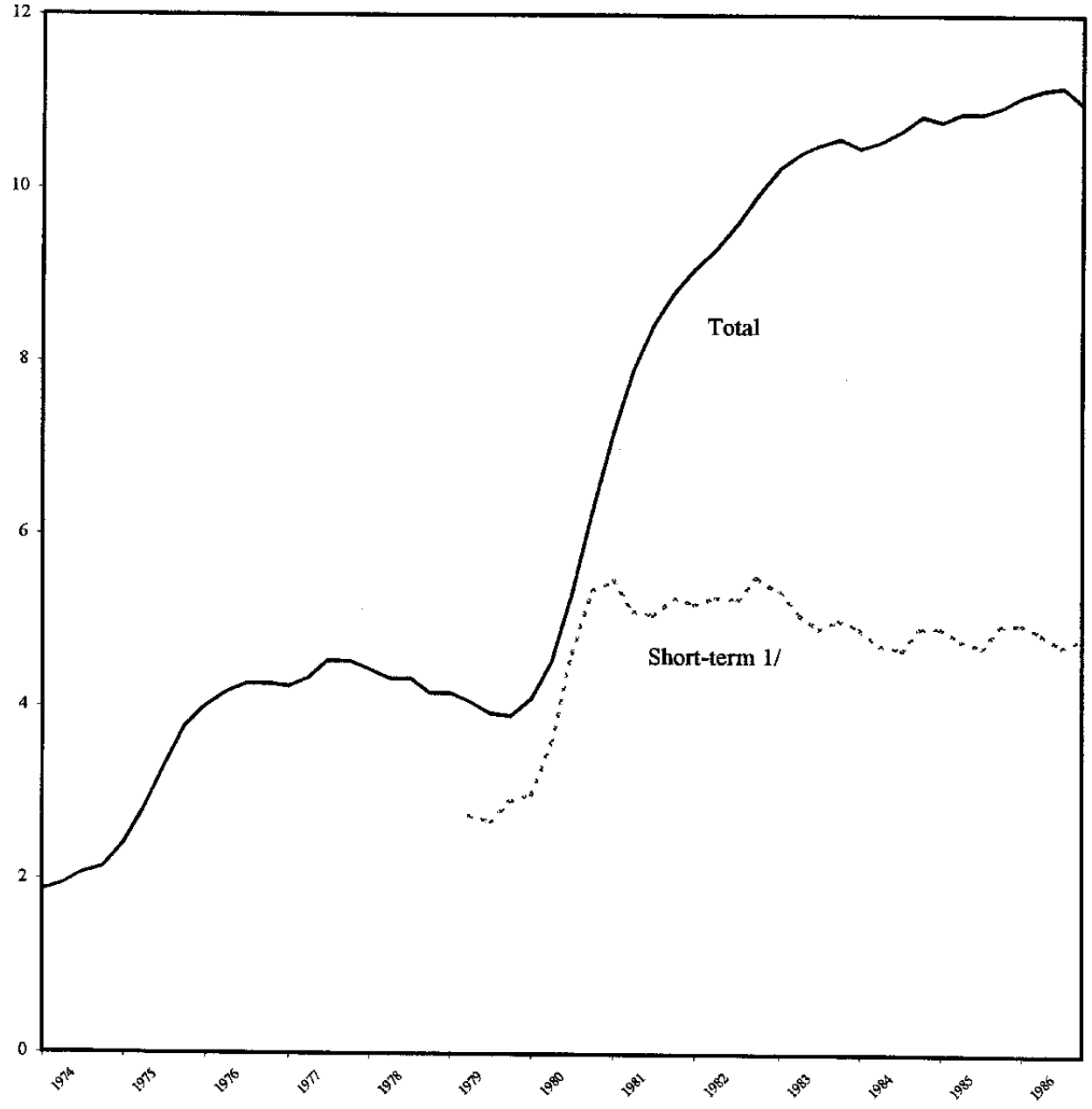
[4] See Calmfors (1993), Soskice (1990), Jackman *et al* (1996), and Nickell (1996) for views on the role of coordination in aggregate wage flexibility. See also Box 4.2 in IMF (1999a) for a summary of the debate over wage coordination and aggregate wage flexibility.

[5] See Bird *et al*, 1992 and Disney *et al*, 1994 for discussions of trends in union membership.

Figure 1. United Kingdom: Unemployment Rates
(in percent)



Source: Office for National Statistics

1/ Those unemployed for less than 26 weeks.

Table 1. Union Density by Sector in Britain 1/
(in percent)

	1968	1979	1987
Total	43.9	55.8	46.3
Public Sector	68.0	83.7	81.7
Utilities	73.8	94.9	96.4
Public service	59.7	79.6	78.9
Manufacturing	50.7	72.9	60.1
Manual	62.8	83.4	65.5
Non-manual	15.9	46.7	45.3
Construction	32.0	41.4	29.8
Agriculture, forestry, fishing	25.9	24.1	13.9
Private service	12.8	18.1	14.4

Source: Nickell (1996).

1/ Defined as union membership (excluding retired and unemployed members) divided by employment.

increasingly decentralized pay determination in the United Kingdom, reflected in fewer contracts covered by multi-employer arrangements and a parallel fall in collective bargaining. (OECD, 1996).

11. Another set of reforms aimed at reducing the importance of sectoral minimum wages. Throughout the 1980s the Wages Councils continued to set minimum wages for workers in a number of low-wage industries covering about 2.5 million workers, primarily in clothing manufacture, retail trade, and other services. The importance of the Councils—as measured by the mean ratio of minimum wages to average wages--declined throughout the 1980s from a peak in 1981 (Figure 2); the system was finally abolished in 1993 (Dickens *et al*, 1993). While the impact of the weakening and elimination of Wage Councils on wage formation is not as important as the decline in trade unions, the effect would have been concentrated at the bottom end of the skill distribution. As these workers are most affected during downturns, eliminating wage floors could enable the less-skilled unemployed to exert greater pressure on wages, possibly increasing aggregate wage flexibility.

12. While these changes affect the flexibility of wage formation directly, a number of changes may have also increased wage flexibility by increasing the competitive pressure of unemployment on wages. Perhaps the most significant is the reduction in coverage and generosity of social security benefits. Unemployment benefits in the United Kingdom fell sharply during the 1980s (Figure 2), eligibility requirements were tightened, and the unemployed were put under greater pressure to find work.[6] There is ample evidence that a generous benefit system leads to higher unemployment (Nickell, 1997), but it can also reduce the responsiveness of wages to a given level of unemployment by reducing the incentive for the unemployed to compete for vacancies. Lowering and tightening benefits could increase wage flexibility by intensifying competition for jobs during cyclical downturns.

D. Labor Market Performance in the 1990s

13. While the direct effect of these and other changes is difficult to gauge, labor market outcomes in the 1990s have generally been consistent with greater wage flexibility. Not only has the cyclical performance of the labor market improved, but there is ample evidence that *relative* wages have adjusted flexibly to clear labor markets in response to considerable structural changes in the economy. The two developments are related, and can be attributed in part to changes to labor market institutions which took place in the 1980s.

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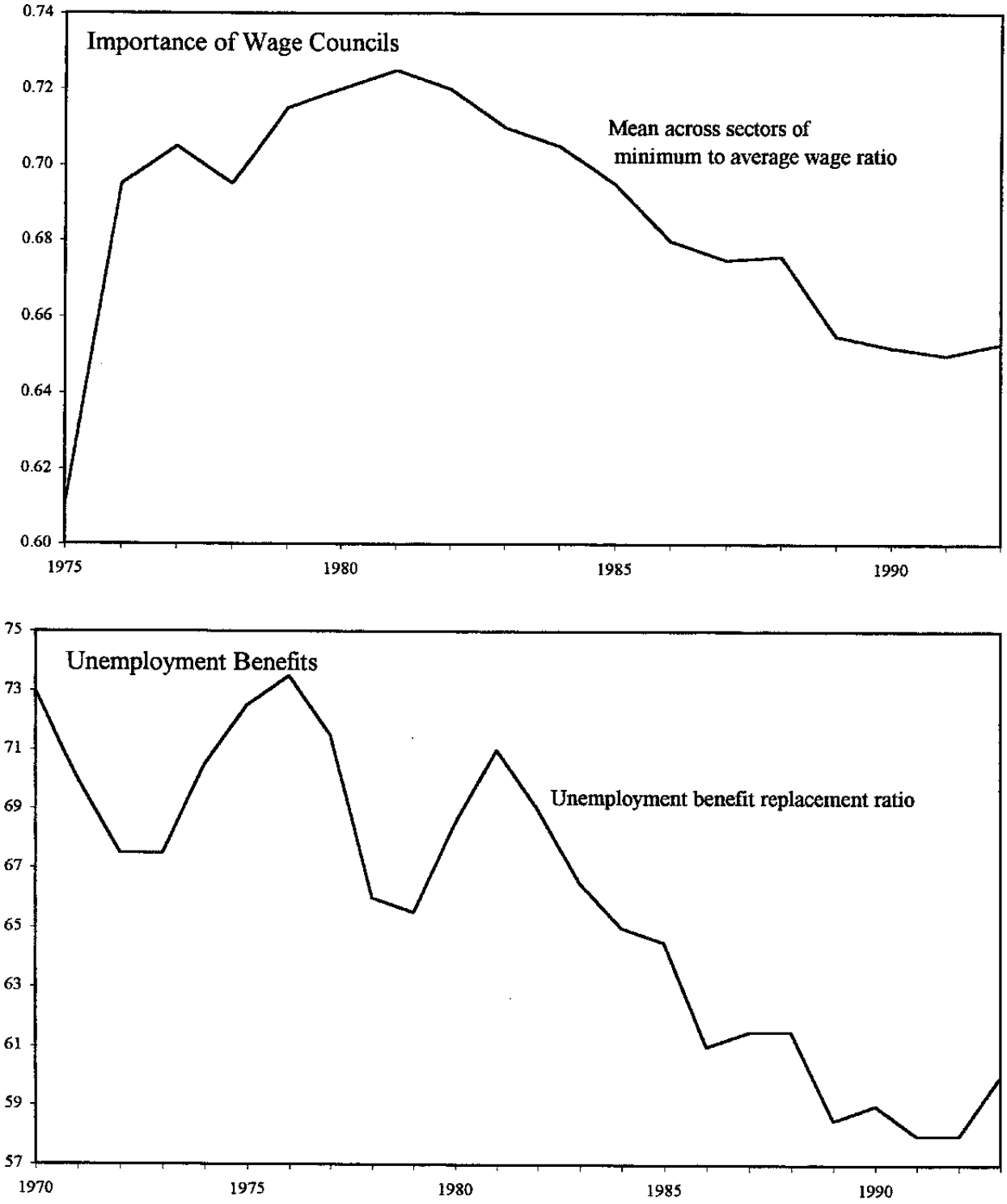
[6] See also *Selected Issues* paper on "Welfare and Labor Market Reform in the United Kingdom: Evidence from the International Experience" in this volume.

Figure 2. United Kingdom: Indicators of Labor Market Institutional Change



Source: Nickell (1996); and Dickens *et al* (1993).

Aggregate labor market performance

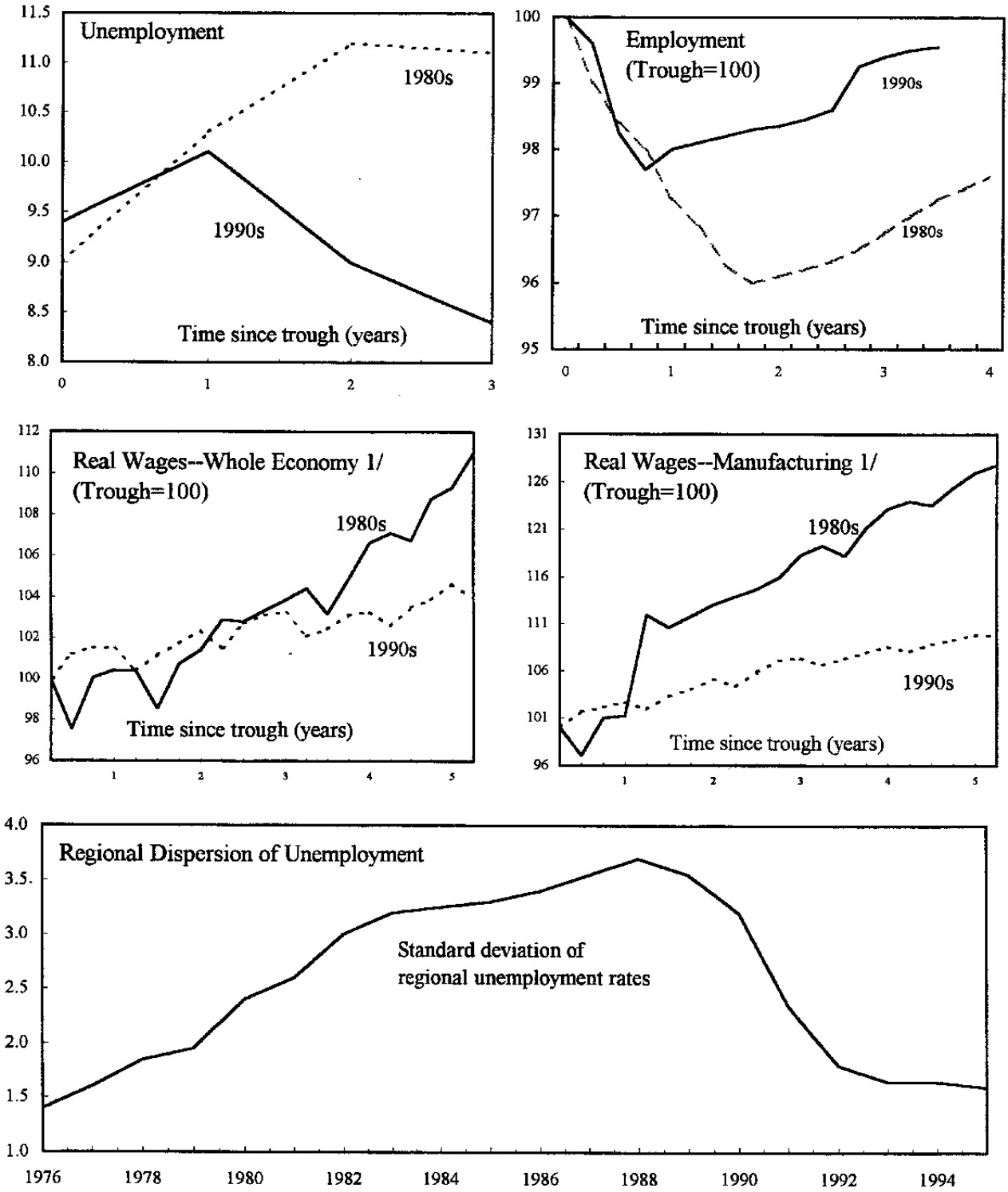
14. Greater wage flexibility may be one reason for the improved cyclical performance of the labor market. The recession of the early 1990s was followed by more moderate real wage growth and a more rapid turnaround in unemployment in comparison with the 1980s (Morgan, 1996). As discussed above, in the 1980s both long- and short-term unemployment continued to grow for a surprisingly long period into the recovery, with the unemployment rate peaking at over 11 percent in 1986. In the 1990s, however, unemployment began falling significantly in the second year of the recovery (Figure 3), and now stands at 4 percent.[7] Nearly ¾ of the improvement in unemployment performance during the initial output recovery came from a faster recovery in employment (Figure 3). In addition to the faster recovery in employment, wage growth has been more moderate in the later recovery. Greater wage moderation is particularly apparent in the manufacturing sector, with wages growing at an annual rate of 2 percent in the first four years of the recovery compared to 5 ½ percent in the earlier recovery (Figure 3).

15. Along with the improved aggregate performance, there has been a marked narrowing of the dispersion of unemployment rates across regions (McCormick, 1997). Most of the narrowing occurred during the first years of the 1990s recovery, when the fall in the unemployment rate tended to be strongest in the regions with above-average unemployment (Figure 3). The fall in the dispersion of unemployment in the latest recovery has been sharper in the United Kingdom than any of the other major European countries, with the result being that the United Kingdom currently ranks among the countries with the lowest regional disparity of unemployment rates (Table 2).

16. Consistent with the better cyclical performance of the labor market in the 1990s, recent estimates of the responsiveness of aggregate real wages to unemployment show a greater degree of real wage flexibility for the United Kingdom than previous estimates. Using data through the mid-90s and employing structural vector autoregression techniques which attempt to address some of the econometric problems of earlier approaches, more recent studies have found the United Kingdom to rank in the top half of European Union countries in terms of real wage flexibility. (Vinals and Jimeno, 1996, Berthold *et al*, 1999). Although highly sensitive to the modeling assumptions, these more recent estimates contrast the relative inflexibility found in the Layard *et al* (1991) study referred to earlier, and are consistent with some increase in wage responsiveness to unemployment. Another indicator of the United Kingdom's wage flexibility in comparison to other countries is the relatively rapid speed of adjustment of real wages. The OECD (1999) estimates that in response to a demand shock, half the labor market adjustment towards long-run equilibrium is completed in

[7] On a claimant count basis. On a labor force survey basis, which is consistent with the ILO definition, the unemployment rate in November 1999 stood at 5.9 percent.

Figure 3. United Kingdom: Labor Market Cyclical Performance



Source: Office for National Statistics; Obstfeld and Peri (1998); and staff calculations.

1/ An index of average earnings deflated by the retail price index excluding mortgage costs.

Table 2. Cross-Country Comparison of Unemployment Disparities by Region

	Standard deviation			Coefficient of variation		
	1985	1990	1995	1985	1990	1995
Belgium	2.3	2.7	3.2	0.19	0.36	0.34
Greece	2.2	2.2	2.5	0.37	0.37	0.33
France	1.8	1.7	2.0	0.17	0.19	0.18
West Germany	2.3	1.9	1.8	0.30	0.36	0.26
Whole Germany	...	...	3.5	...	...	0.42
Italy	3.5	6.5	6.8	0.38	0.64	0.55
Spain	4.8	6.1	5.7	0.23	0.38	0.26
Netherlands	1.7	1.8	1.0	0.16	0.23	0.13
United Kingdom	2.9	3.5	1.6	0.23	0.43	0.18
Europe 1/	5.0	5.1	5.9	0.47	0.59	0.55
United States 2/	1.9	1.1	1.3	0.27	0.21	0.24

Source: Soltwedel et al (1999).

1/ Regions according to the Eurostat regional classification NUTS level 2.
2/ State level.

1¾ years in the United Kingdom, compared to 1¼ years for the United States and 4 ½ years for the euro-area; the finding of relatively rapid adjustment in the United Kingdom, according to the OECD, is robust across different estimates of aggregate wage equations.

Widening earnings dispersion and relative wage flexibility

Widening earnings dispersion

17. In addition to better macroeconomic performance, the dispersion of wages has increased sharply since the early 1980s across skill levels, occupations, sectors, and regions. This has corresponded with greater diversity of work patterns, particularly a wider dispersion of working hours and a greater proportion of short-term jobs (OECD, 1996). These changes are one sign that labor markets are able to respond flexibly to changes in relative demand for different types of workers.

18. One of the consequences of greater wage dispersion has been an increase in income inequality. It should be noted that in principle, greater income inequality by itself is not a sign of greater wage flexibility, nor does an increase in flexibility necessarily require a rise in inequality. However, the sorts of changes in relative labor demand which have raised income inequality in the United Kingdom have also occurred in many other industrial countries. As in Germany's case which will be discussed below, countries that have limited the rise in inequality by preventing relative wages from adjusting have often experienced greater unemployment, particularly for low-skilled workers. In light of this, the rise in inequality, while indicative of relative wage flexibility, underscores the need for strengthening incentives and social safety nets and raising the skill levels of low-income workers.

19. The widening of the income distribution in the United Kingdom since the early 1980s has been particularly striking (Figure 4). [8] Despite rising real earnings, inequality as measured by the dispersion between the lower and upper deciles of the earnings distribution grew sharply, with the most rapid growth occurring between 1983 and 1986. Although a similar increase in inequality has occurred in number of industrial countries in the 1980s (Figure 4), the increase has been significantly greater in the United Kingdom despite the fact that, unlike the United States, real earnings in the United Kingdom increased in absolute terms in the bottom deciles during that period.

20. The growth in earnings inequality has been accompanied by a significant increase in the dispersion of wages across occupational categories, sectors, and regions. There has been a clear decline in relative wages for the lowest paid occupations between the early 1980s and the mid-1990s (right panel, Figure 5), despite real wages for most these groups which have

[8] The rise in wage inequality is documented in Machin (1996) and Jenkins (1996).

Table 3. United Kingdom: Wage Dispersion Across Regions 1/
Coefficient of variation (in percent)

	1975-85	1993-96
All regions		
All workers	5.2	8.9
Manual workers	3.7	3.4
Non-manual workers	5.2	8.3
Excluding South East		
All workers	1.9	2.2
Manual workers	3.3	1.5
Non-manual workers	1.6	2.4

Source: New Earnings Survey; and staff estimates.

1/ Based on Average Weekly Earnings including overtime for full-time adult males.

risen.[9] Moreover, the distribution has become more skewed as relative wages in the upper tail of the distribution have become less compressed. The widening wage dispersion appears to be strongest for manual workers, where the decline in relative wages of the lowest-paid occupations has been particularly pronounced (Figure 6). For non-manual workers, the growth in dispersion has been less pronounced, although the high end of the distribution has grown fairly rapidly (Figure 7); earnings for specialized managers, such as treasurers, marketing and sales managers, computer systems and data processing managers, and investment analysts, have experienced particularly rapid growth in the 1990s.

21. A similar pattern can be seen for wages across sectors. There has been a clear widening of the earnings distribution for manual workers, with relative wages falling for low-wage sectors and rising for high-wage sectors. This widening has occurred despite the fact that the absolute level of real wages for manual workers has risen in the lowest-paying sectors (Figure 8). Within manufacturing, the increase in absolute real wages for manual workers is particularly apparent, although there has been less of an increase in earnings dispersion across manufacturing sectors (Figure 9). For manual workers in non-manufacturing sectors, the increase in dispersion is mainly accounted for by rising relative wages in the high-wage sectors such as transport and communications (Figure 10). The absolute wage increase for non-manual workers across sectors is also quite striking, even though the dispersion has risen only modestly (Figure 11). Rising wages in the non-manufacturing sectors appears to account for a large part of the wage growth for non-manual workers (Figure 12).

22. As with occupations and sectors, earnings dispersion across regions has increased, with the ratio of the standard deviation to mean earnings for males rising from 5 percent in the 1980s to 9 percent in the 1990s (Table 3). This appears to be largely driven by rising dispersion for non-manual workers, with little sign of rising dispersion across regions for manual workers. However, rising regional dispersion is mainly accounted for by a growing earnings differential between the South East and the rest of Great Britain; growth in earnings dispersion excluding the South East has been significantly less than overall growth.

Implications for relative real wage flexibility

23. What do these developments say about wage flexibility? First, they show that U.K. labor markets can flexibly respond to changes in relative demand for different types of

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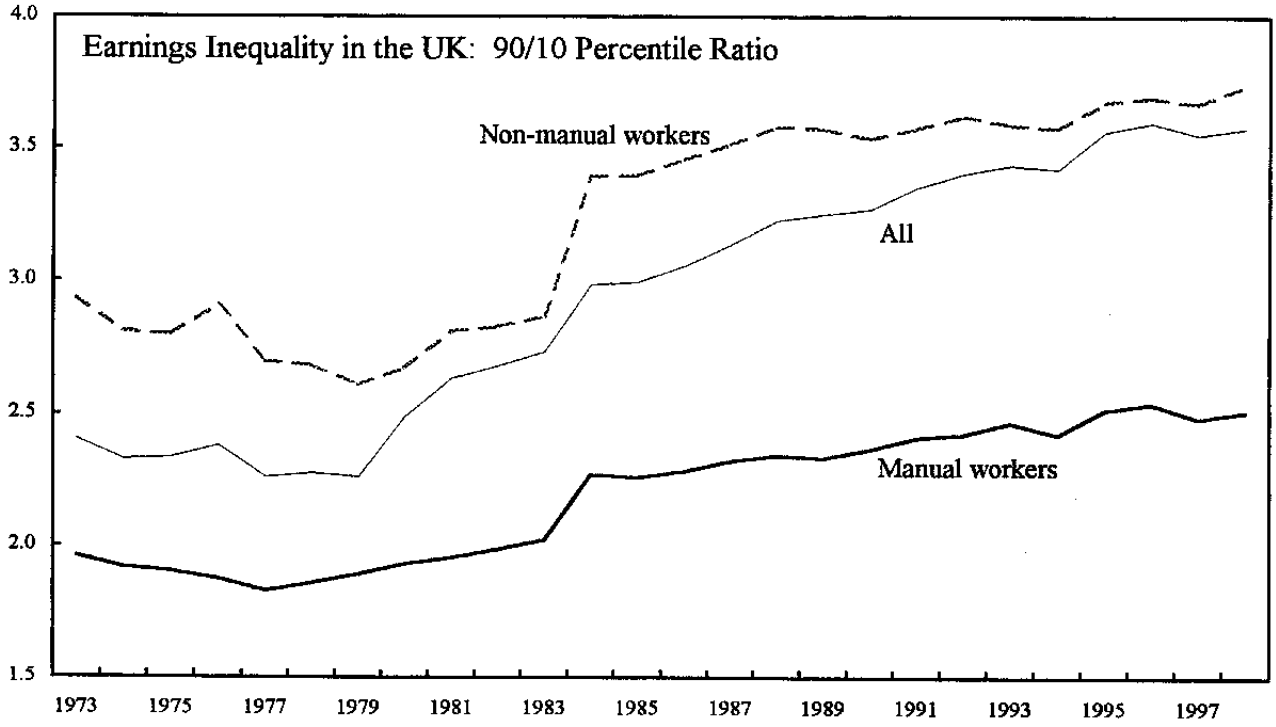
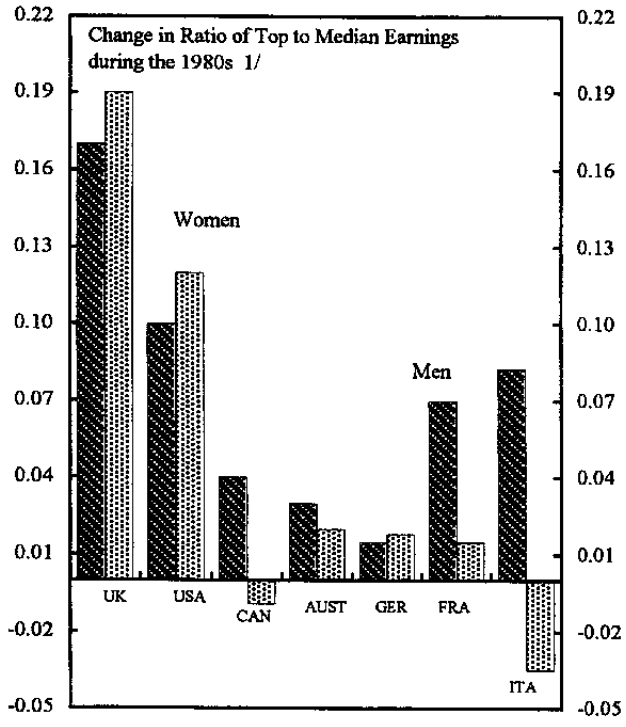
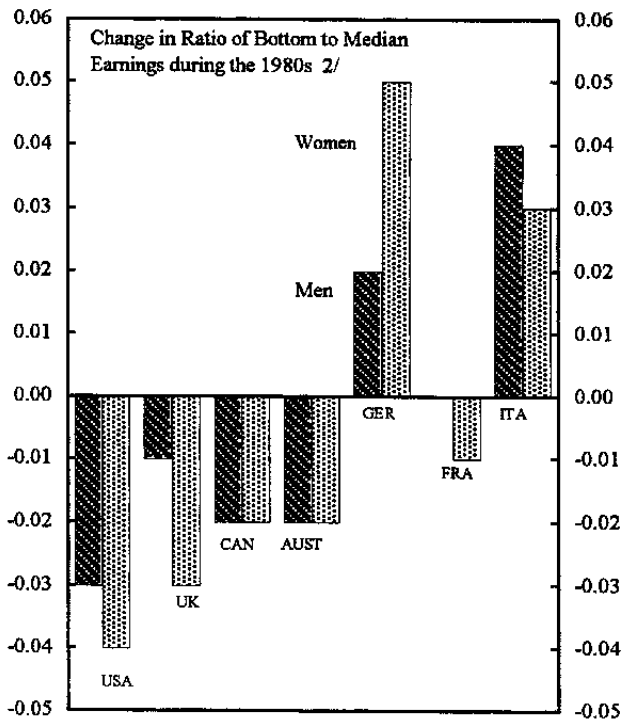
[9] Figures cited here are from the New Earnings Survey, and refer to average gross weekly pay, including overtime, profit-related, and other pay for full-time male employees on adult rates. The relative wage for a given occupation or industry is defined as the absolute wage for that occupation or industry divided by the economy-wide average wage. When manual workers are being considered, the absolute wage is divided by the economy-wide wage for manual workers. Likewise for non-manual workers, and for sub-sectors such as manufacturing.

Figure 4. Growth in Earnings Inequality



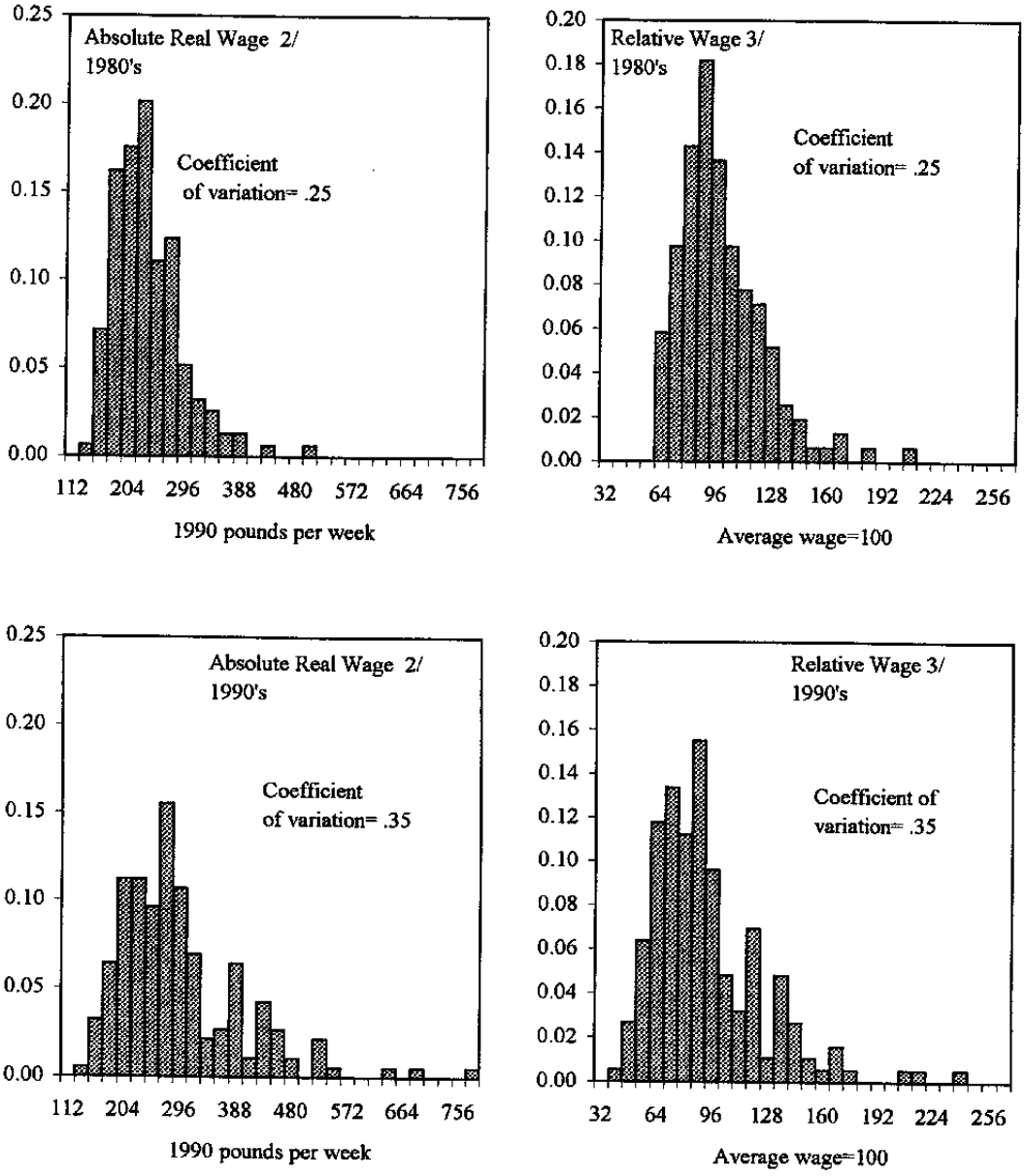




Source: New Earnings Survey; and Morgan (1996).

1/ Five-year change in ratio of the upper limit of the ninth and fifth deciles.
2/ Five-year change in the ratio of the upper limit of the first and fifth deciles.

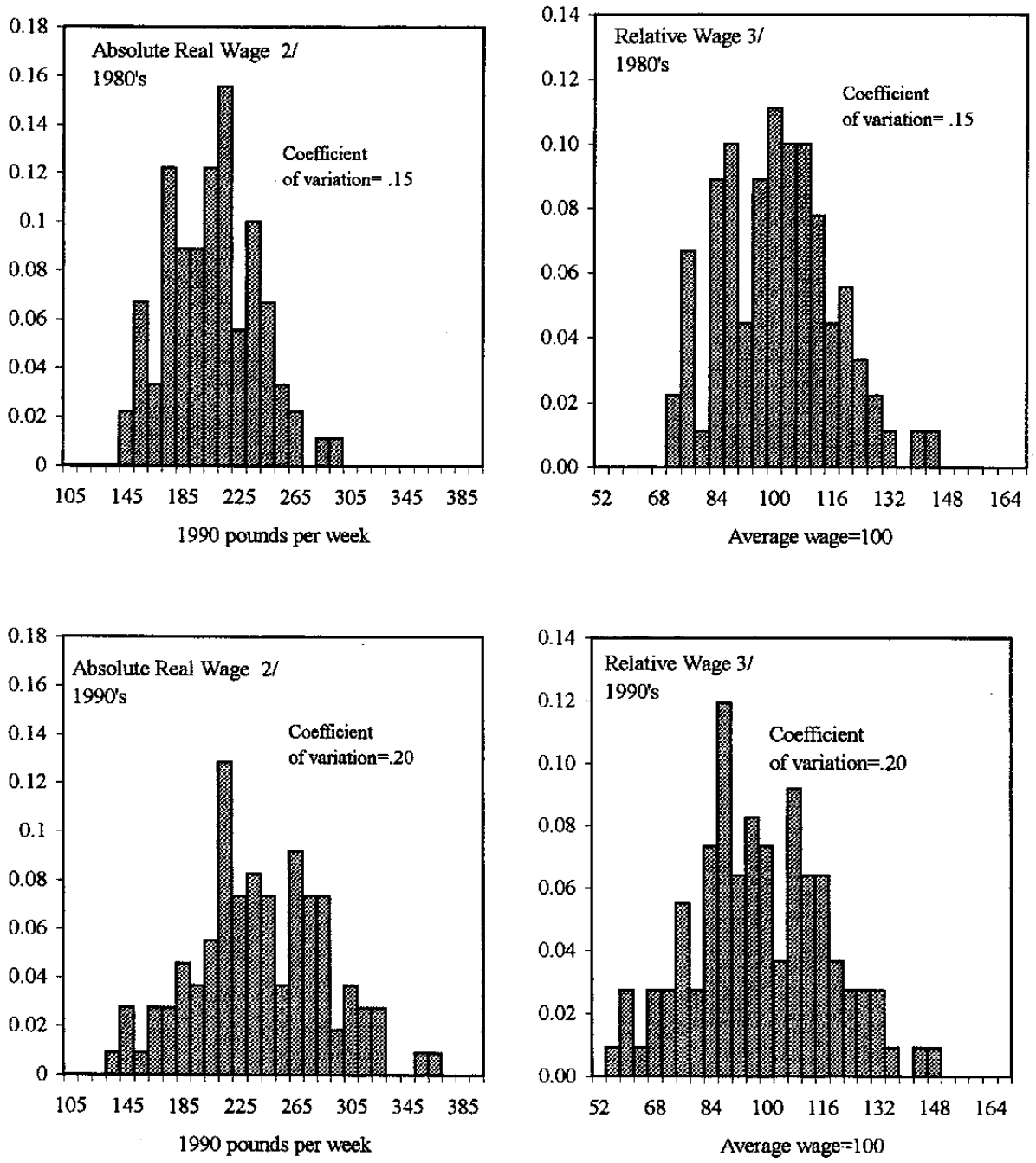
Figure 5. United Kingdom: Earnings Distribution Across Occupations 1/
(All Workers)



Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.
2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.
3/ Absolute wage relative to the wage for all workers.

Figure 6. United Kingdom: Earnings Distribution Across Occupations 1/
(Manual Workers)



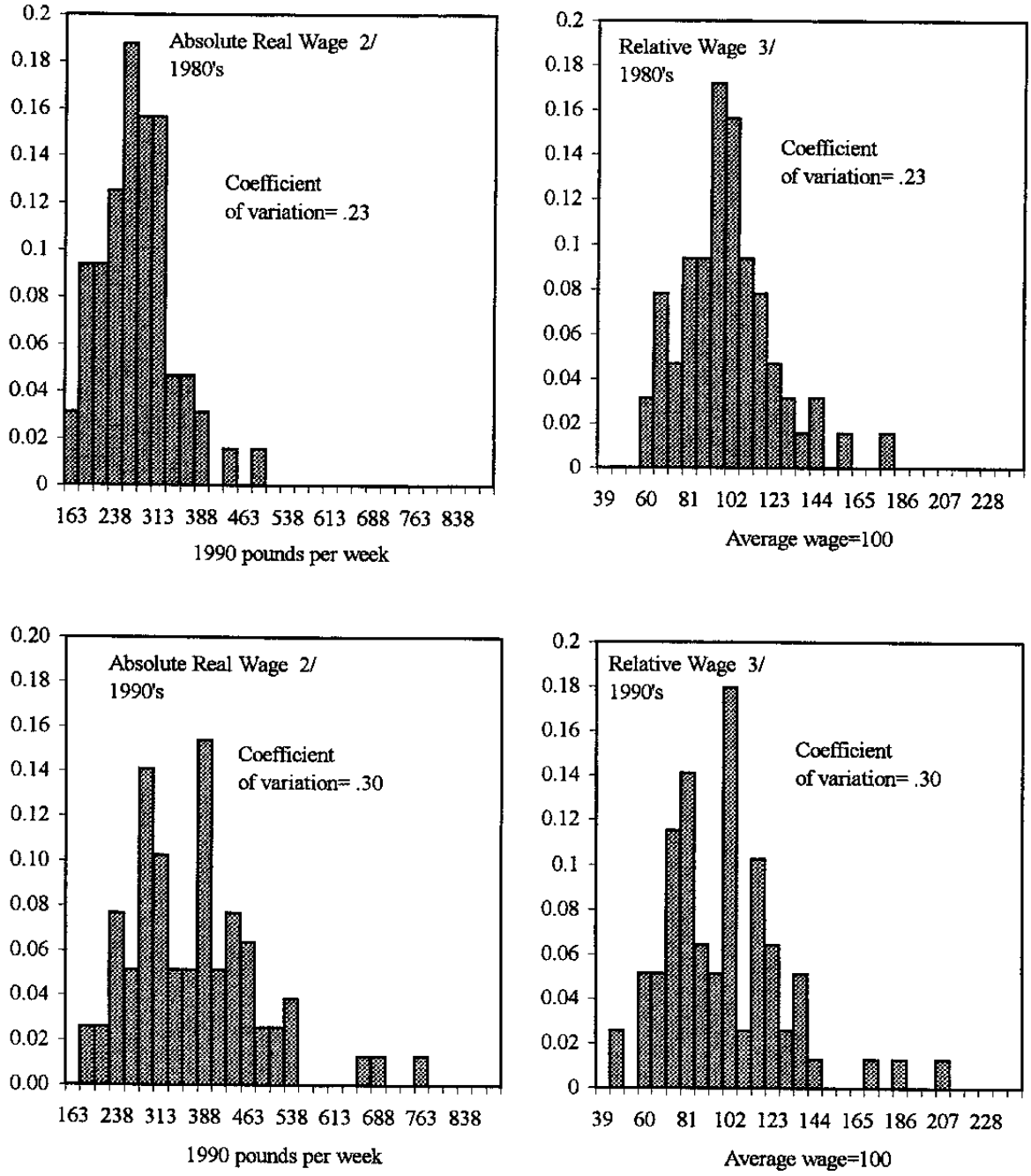
Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.

2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.

3/ Absolute wage relative to the wage for all manual workers.

Figure 7. United Kingdom: Earnings Distribution Across Occupations 1/
(Non-Manual Workers)



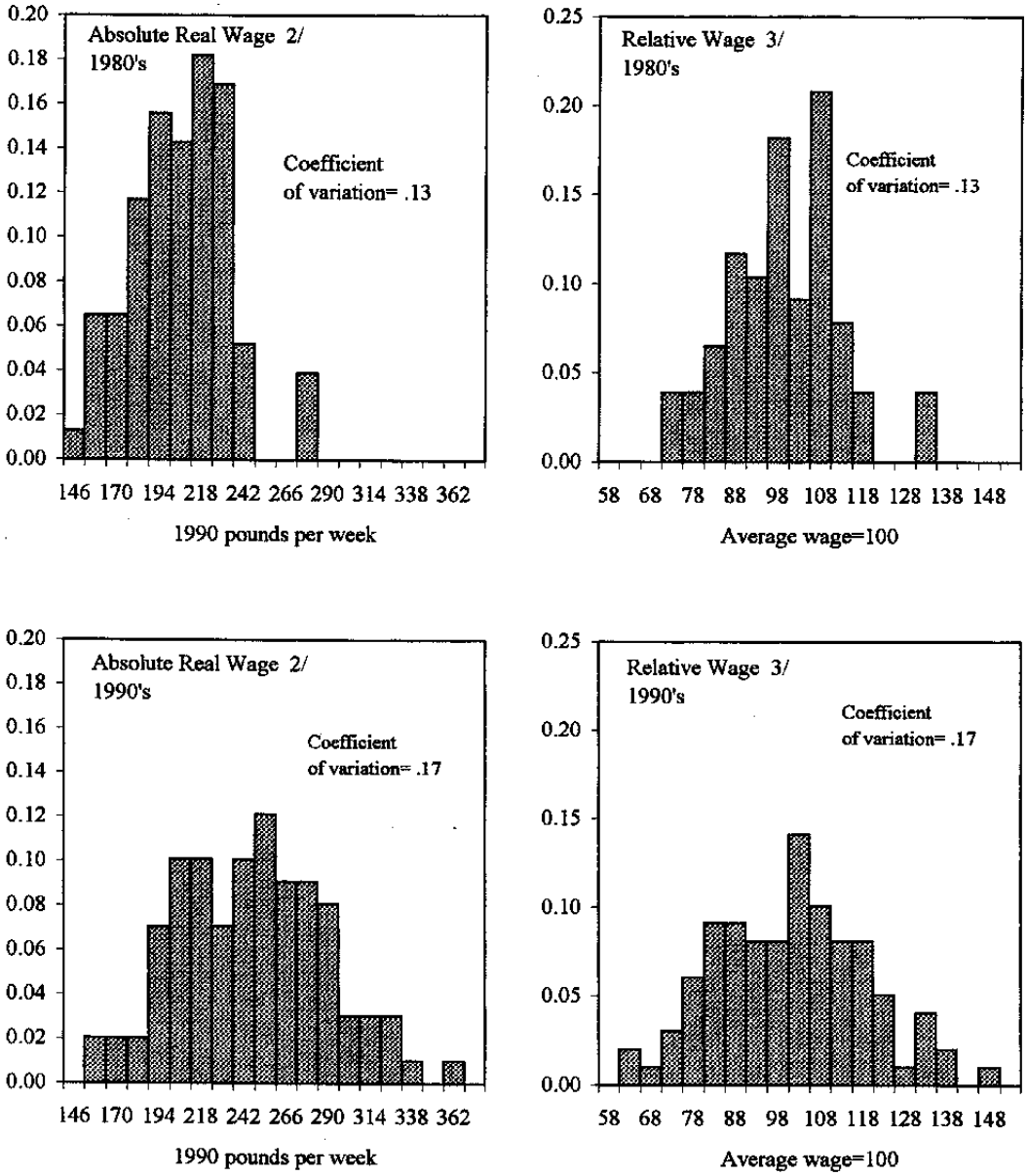
Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.

2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.

3/ Absolute wage relative to the wage for all non-manual workers.

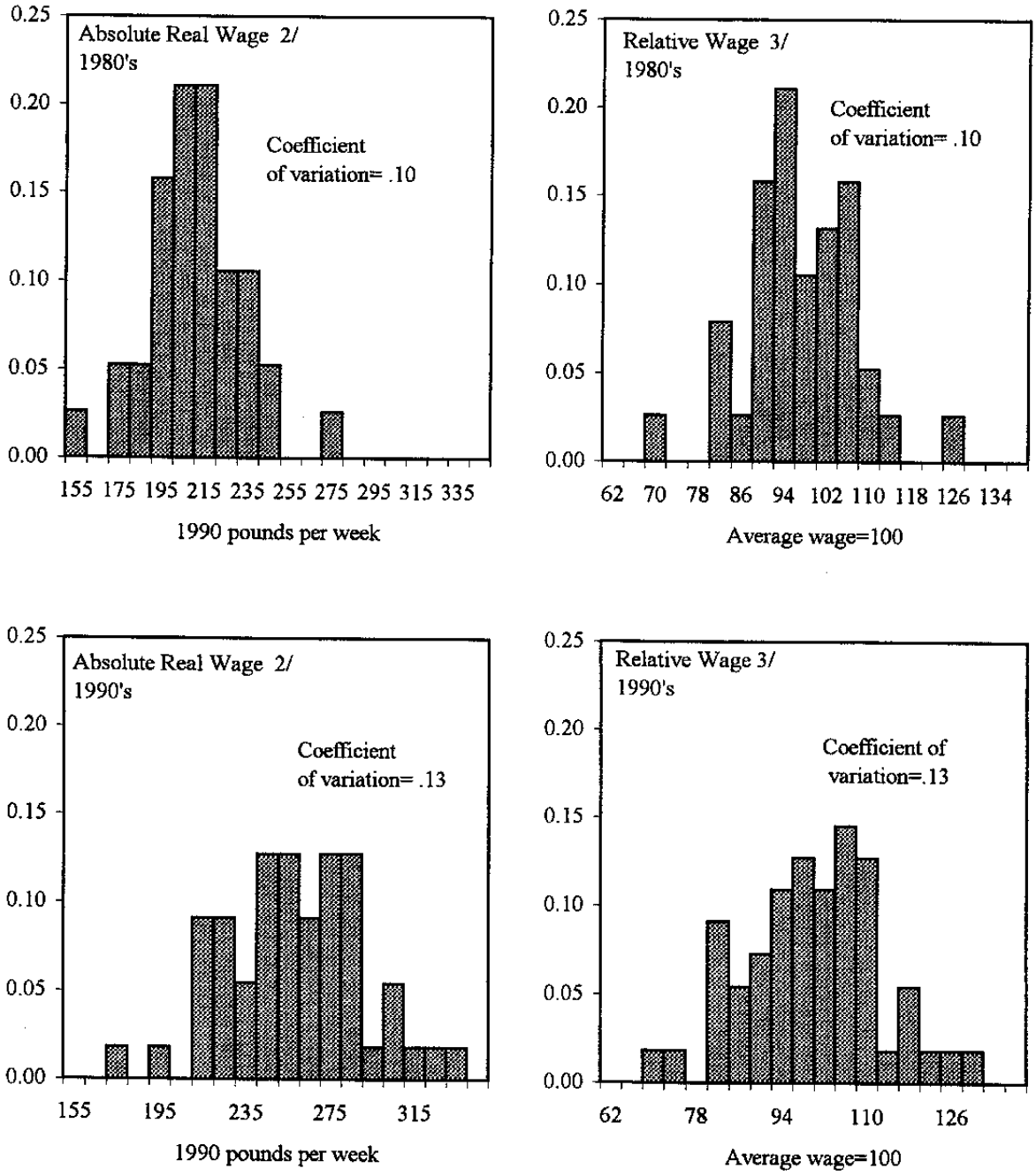
Figure 8. United Kingdom: Earnings Distribution Across Sectors 1/
(Manual Workers/All Sectors)



Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.
2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.
3/ Absolute wage relative to the wage for all manual workers.

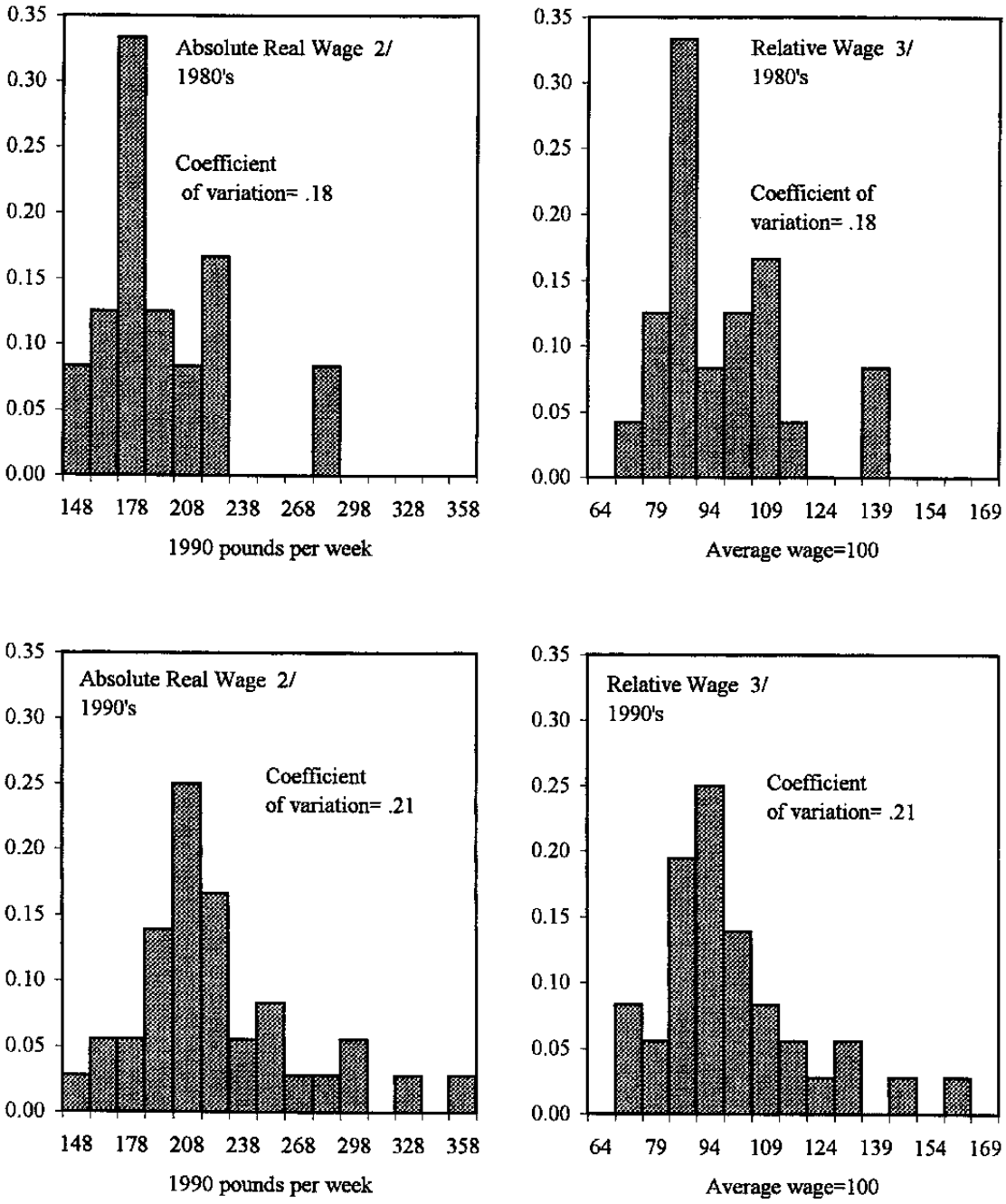
Figure 9. United Kingdom: Earnings Distribution Across Sectors 1/
(Manual Workers/Manufacturing Sectors)



Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.
2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.
3/ Absolute wage relative to the wage for all manual workers in manufacturing.

Figure 10. United Kingdom: Earnings Distribution Across Sectors 1/
(Manual Workers/Non-Manufacturing Sectors)



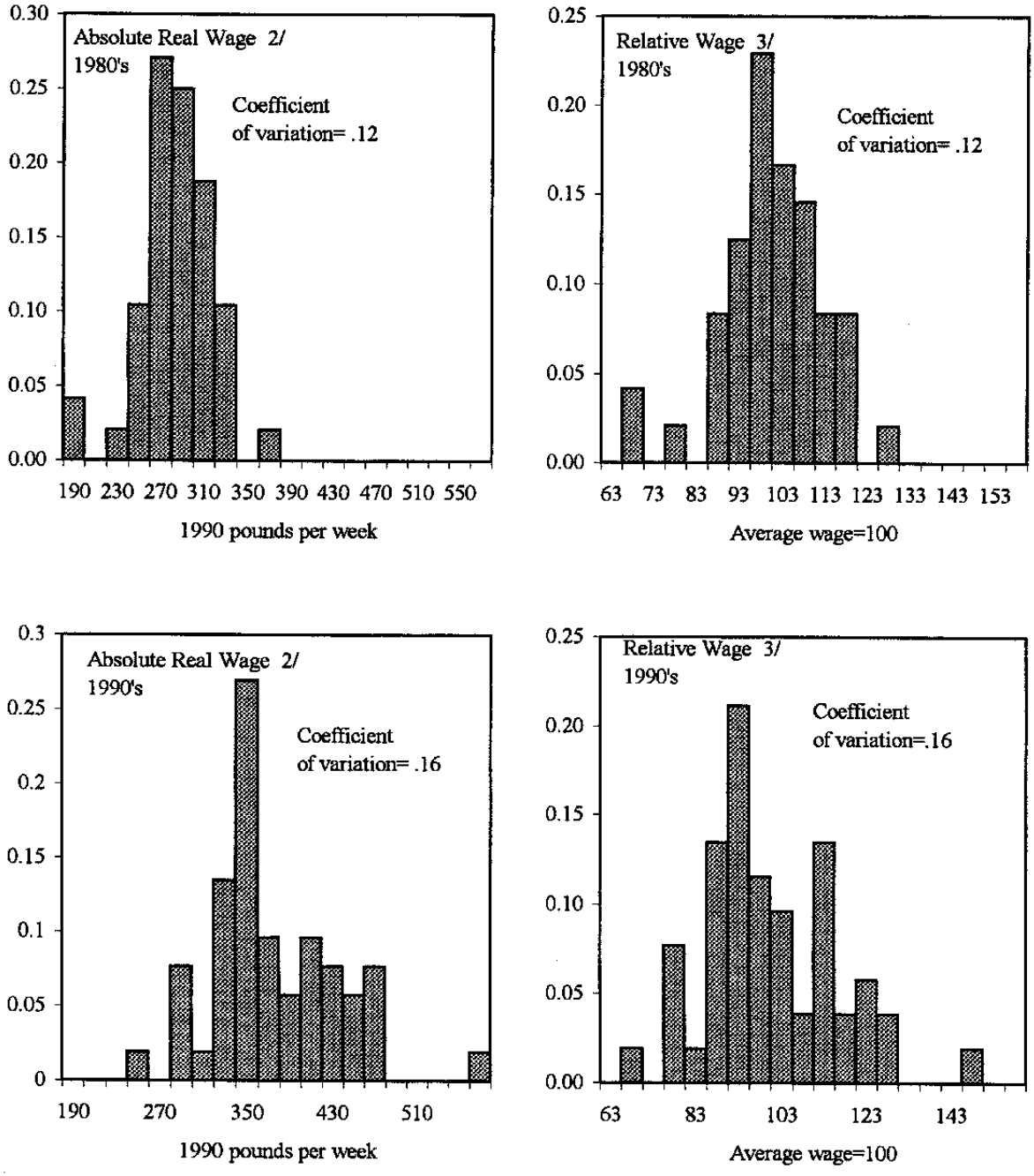
Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.

2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.

3/ Absolute wage relative to the wage for all manual workers in non-manufacturing sectors.

Figure 11. United Kingdom: Earnings Distribution Across Sectors 1/
(Non-Manual Workers/All Sectors)



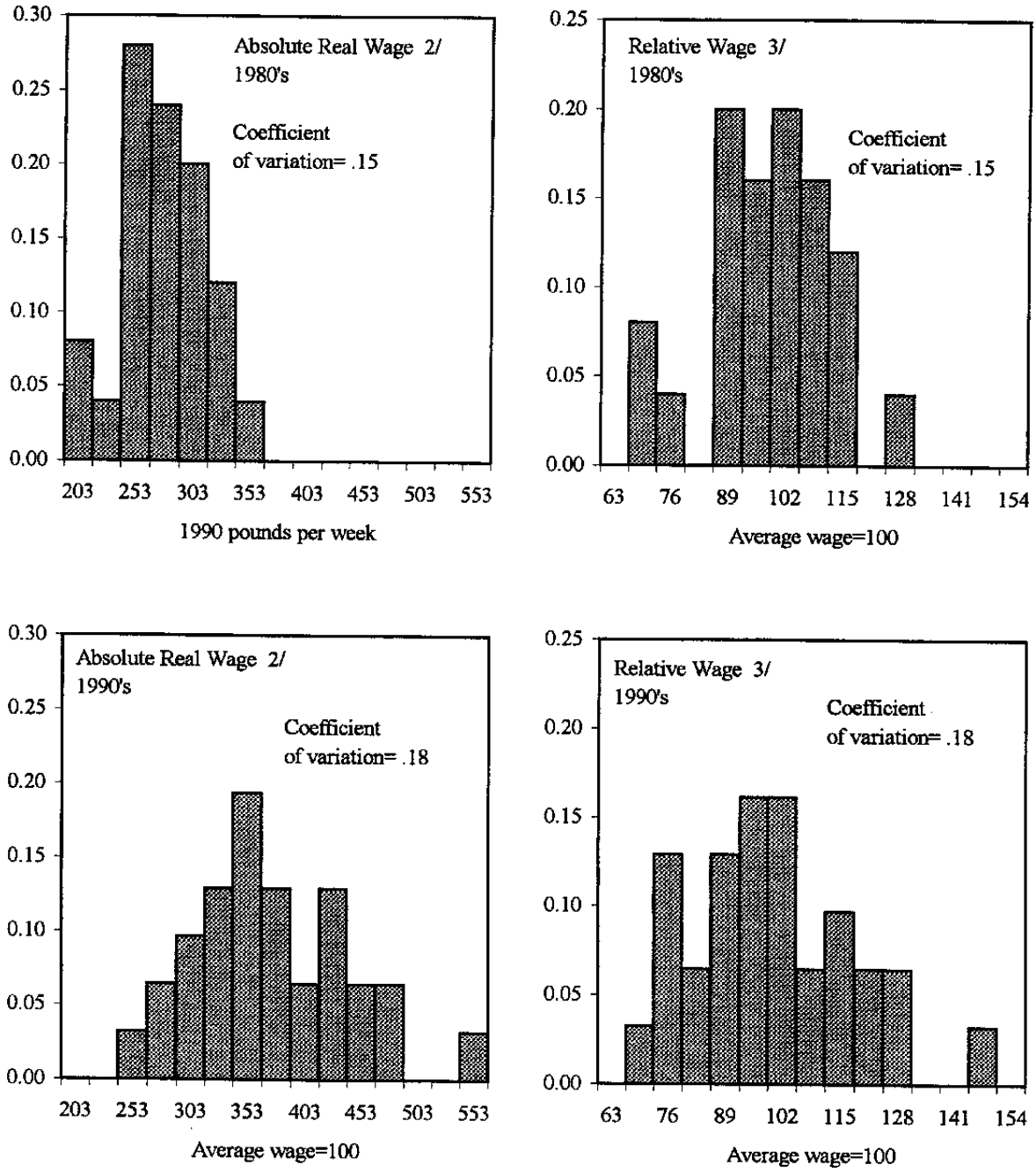
Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.

2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.

3/ Absolute wage relative to the wage for all non-manual workers in all sectors.

Figure 12. United Kingdom: Earnings Distribution Across Sectors 1/
(Non-Manual Workers/Non-Manufacturing Sectors)



Source: New Earnings Survey; and staff calculations.

1/ Earnings distribution for full-time adult males. Wages for the 1980's are the average for the period 1981-1985, and for the 1990's, the average for the period of 1995-1998. Category definitions change between periods, so the figures are not strictly comparable.

2/ Weekly earnings including overtime in 1990 pounds deflated by the RPIX.

3/ Absolute wage relative to the wage for all non-manual workers in non-manufacturing sectors.

workers. Second, changes in labor market institutions which contributed to greater wage dispersion may also account for part of the improved macroeconomic performance in the 1990s.

24. It is generally accepted that the main contributor to the increase in earnings inequality in the United States and other industrial countries is an increase in the relative demand for skilled workers, mainly through skill-biased technical change. Berman *et al* (1998) argue that the shift in demand for skilled workers is pervasive throughout the developed world as similar sectors across countries engage in skill-upgrading related to the use of microprocessors. Evidence on the change in the structure of the U.K. labor market generally supports a shift in demand for skilled workers as an engine for increasing earnings dispersion. Nickell (1996) finds that differences in real wage growth across occupational categories are much larger than across industries, with the real wages of non-manual workers (who are generally more skilled) growing much more rapidly in the 1980s than those of manual workers. Wage growth across occupations is also strongly positively correlated with growth in employment. The widening of wage differentials across skill categories then is one sign that wages have been flexible in response to large changes in relative demand. [10]

25. Changes in labor market institutions in the United Kingdom appear to have also increased relative wage flexibility at the lower end of the distribution, and may partly explain why the increase in income inequality has been larger in the United Kingdom than other industrial countries. Both trade unions and Wage Councils can have a compressing effect on the wage distribution; Wage Councils through sector minimum wages, and unions by organizing lower-paid workers and attempting to standardize pay for given job definitions.[11] Indeed, Gosling and Machin (1994) find earnings dispersion in the United Kingom is lower within the union sector than the non-union sector, and that dispersion is lower within unionized plants than non-unionized plants. That being the case, a decline in unionization should lead to a widening of the earnings distribution; Gosling and Machin estimate that for semi-skilled workers, the fall in unionization accounts for about ¼ of the increase in earnings dispersion between 1984 and 1990. Most of this increase reflects a decline in unionization

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[10] It is striking is that despite the sizable shift out of manufacturing into services which occurred in the United Kingdom during the 1980s, these shifts are not mirrored by an increase in wage changes; that is, there is no tendency for sectors with large positive changes in demand to have higher than average real wage growth (Nickell, 1996), suggesting that adjustment took place without large labor bottlenecks at the sector level. This is not so surprising when one considers that gross flows between sectors are 10 times larger than net flows, and that even declining sectors experienced very large gross inflows when compared to net outflows (Greenaway *et al*, 1999).

[11] Gosling and Machin (1994) summarize the literature on the effects of unions on the income distribution in the United States and the United Kingdom.

rather than rising dispersion within unionized sectors; Machin (1997) finds that dispersion grew much faster in non-unionized plants, and where unions still exist they have much the same effect on earnings distribution as before. Similarly, Machin finds that dispersion rose by less in sectors covered by Wage Council minima than other sectors.

26. These institutional changes, together with welfare reform, may also account for part of the improved macroeconomic performance in the 1990s. As already noted, tightening and reducing benefits could intensify competition for jobs during cyclical downturns, and declining unions and the elimination of sector minimum wages would allow wages at the lower end of the earnings distribution to adjust more flexibly. Flexibility for lower-wage workers is particularly important for aggregate labor market performance, as these workers are likely to be disproportionately affected by cyclical downturns. [12]

27. There is some direct evidence that these institutional changes have led to better labor market performance and contributed to aggregate wage moderation. Anderton (1997) finds evidence that for many sectors the long-term unemployed put more downward pressure on wages from 1986 onward, coinciding with active labor market programs such as "Restart" aimed at integrating the long-term unemployed into the labor market. Gregg and Wadsworth (1995) provide results consistent with intensified competition at the lower end of the wage distribution as they find that the wages for "entry positions" have become concentrated at the lower tail of the aggregate distribution. Also consistent with greater competition, Anderton (1997) reports that since 1986 about 80 percent of the employment growth has been concentrated in jobs paying significantly less than the average wage. Supporting the role of deunionization in increasing wage responsiveness, Nickell and Kong (1992) find that unemployment has a greater impact on wages in industries where union power is weak. Likewise, Blanchflower and Oswald (1994) find that in micro-data-based wage curve estimates, the pay of weak bargaining groups such as the relatively unskilled and non-union workers tend to display the greatest responsiveness to unemployment. In summary, there are reasons to expect that the institutional changes which contributed to the rise in wage dispersion also had the effect of increasing aggregate wage flexibility.

28. It is useful to compare the United Kingdom's experience with wage dispersion and cyclical performance with that of Germany. It is likely there has been the same sort of increase in relative demand for skilled workers in Germany as in the United Kingdom and other industrial countries (Machin and Reenan, 1998). In contrast to the United Kingdom, however, Germany experienced a fairly steep *decline* in the dispersion of wages in the latter

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[12] Most studies using U.S. longitudinal data on individual workers strongly support the claim that the less skilled are disproportionately affected by cyclical downturns (see Solon *et al*, 1994). This gives rise to the so-called composition bias to aggregate measures of wages. One implication of this bias is that the aggregate wage will understate actual wage responsiveness to unemployment, since part of its apparent sluggishness reflects the rising average skill level of employed workers during recessions.

half of the 1980s (Figure 4), and the wage distribution has remained remarkably stable throughout the 1990s. Much of the difference from the U.K. experience appears to be accounted for by differences in wage bargaining structures; wage bargaining in Germany is more coordinated than in the UK at both the employer and the union level, and unions have traditionally set effective wage floors and negotiated uniform relative increases for workers of all skill levels (Nickel, 1997), thereby constraining the flexibility of the wage structure. Indeed, unemployment for unskilled workers has risen sharply in Germany in the 1990s. While some of the rise no doubt reflects the effects of German unification, it is also the case that employment and retention rates for unskilled workers in Germany have continued to fall during the recent recovery, in sharp contrast to the rising employment rate for skilled workers (IMF, 1999b). This is precisely the outcome one would expect if a rigid wage structure prevented labor market adjustment through changes in relative wages.

E. Summary

29. The U.K. labor market has undergone a number of institutional and structural changes since the 1980s, and there are reasons to believe these changes have contributed to increasing both aggregate and relative wage flexibility. Most importantly, wage bargaining has become increasingly decentralized as a result of deunionization which, together with welfare reform, appears to have intensified competition at the lower end of the wage distribution. Consistent with this, labor markets in the 1990s have shown a high degree of flexibility. Relative wages have adjusted flexibly to large changes in demand for different types of workers, and labor markets have shown better cyclical adjustment to the recession in the 1990s in comparison to the 1980s.

30. How much institutional changes in the labor market contributed to this better performance is not clear; much of the narrowing in the regional dispersion of unemployment, for example, may be attributed to a business cycle upturn that was less biased against manufacturing than in the 1980s. Moreover, structural changes in the U.K. economy, such as the shift away from manufacturing, may themselves contribute to better macroeconomic performance to the extent that wages in the service sector are more flexible and the shocks less concentrated. However, both the improved aggregate performance of the 1990s and changes in the structure of relative wages across skills, sectors, occupations and regions are consistent with the view that institutional changes in the 1980s have increased the flexibility of wages in response to changes in demand for output and employment. This suggests that the potential costs of joining EMU stemming from a lack of sufficient wage flexibility in the United Kingdom may have diminished in recent years.

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