

V. REVISED OECD MEASURES OF STRUCTURAL UNEMPLOYMENT

Introduction

An important challenge in setting economic policy is to identify the rate of capacity utilisation that is sustainable, in the sense that it is associated with reasonably stable inflation. There are different ways of measuring capacity utilisation. Looking at perhaps the most common measure, unemployment, this idea of sustainable resource utilisation has been made operational in the concept of the NAIRU – the non-accelerating inflation rate of unemployment, *i.e.* the unemployment rate consistent with stable inflation.¹

The NAIRU is the rate of unemployment consistent with stable inflation...

Views are mixed as to the usefulness of the NAIRU concept. Nevertheless, economists analyse future inflation trends, the sustainability of fiscal positions, and the need to undertake structural reforms to permanently reduce unemployment and for these purposes they need a benchmark to identify and distinguish sustainable and unsustainable trends in output and unemployment. The NAIRU concept provides such a benchmark. Estimates of the NAIRU help to make more transparent the assumptions that lie behind policy analysis and recommendations.

... providing a benchmark to assess the sustainability of macroeconomic policy

The measurement of the NAIRU is also controversial. By its nature, it is non-observable and depends on a wide range of institutional and economic factors. It follows that even if one accepts the concept, it can only be estimated with uncertainty. Moreover, it may well vary over time – European experience suggests that, in general, inflation would rise if unemployment reached the low unemployment rates associated with stable inflation in the 1960s. And at times, such as when there are large fluctuations in oil or raw material prices, it is clear that unemployment would have to rise or fall very steeply to stabilise inflation.

Its measurement is subject to uncertainty, particularly because it is determined by a wide range of factors and varies over time

The OECD has recently reviewed its procedures for deriving estimates of the unemployment rates consistent with stable inflation.² The procedures have been updated and improved in several respects. The new estimates focus on the unemployment rate consistent with stable price inflation, as measured by the private consumption deflator.³ More importantly, the new procedures allow the distinction between and estimation of a slow-moving NAIRU and a more volatile short-term NAIRU, which is affected by temporary factors, such as oil price fluctuations, impacting on inflation in the short term. They also provide a gauge to the measurement of uncertainty surrounding the NAIRU estimates. The current chapter first

The OECD has recently revised its procedures for estimating the NAIRU

1. As noted by others (see, for example, Braun (1984)), the acronym is a misnomer, the concept is correctly defined as a “non-increasing” inflation rate of unemployment.
2. This work is reported in more detail in Richardson, *et al.* (2000).
3. Previous OECD estimates related to wage inflation and the NAWRU, as described in Elmeskov (1993) and elaborated in OECD (1999).

reviews the conceptual background to the new indicators. It then presents the estimates resulting from applying the new procedures. And, finally, it illustrates how these estimates can be used to analyse inflation developments and monetary policy.

Conceptual framework

The existence of a NAIRU implies the absence of any long-run trade-off between inflation and unemployment

The dominant view among economic analysts is that there is not a long-term trade-off between inflation and unemployment: in the long run, unemployment depends on essentially structural variables, whereas inflation is a monetary phenomenon.⁴ In the short term, however, a trade-off exists such that if unemployment falls below the NAIRU, inflation will rise until unemployment returns to the NAIRU, at which time inflation will stabilise at a permanently higher level. The existence of a NAIRU therefore has immediate implications for the conduct of economic policies, in that: macroeconomic stimulus alone cannot permanently reduce unemployment; and any short-term improvements relative to the NAIRU resulting from stimulative policy actions will be reflected in progressively higher rates of inflation. In practice, the situation may be somewhat less clear-cut – the NAIRU may, to some extent, be influenced by the path of actual unemployment – but, conceptually, the notion of a NAIRU determined mainly by structural factors remains important.⁵

Both the level and change of unemployment may have an effect on inflation...

Inflation can usefully be thought of as being determined by three factors: inflation expectations/inertia, the pressure of demand as proxied by unemployment and supply factors.⁶ Inflation expectations are often slow moving, which means that the effects of demand pressures or supply shocks get built into the inflation process only gradually. With regards to demand pressures, unemployment may be important not just in terms of its level, but also its recent movements. For example rapidly falling unemployment may put upward pressure on inflation even at high levels of unemployment; an effect sometimes referred to as a “speed limit”.

... which is also influenced by temporary supply shocks

Taking appropriate account of supply shocks is important in order to distinguish between one-off price changes and ongoing inflation. An important distinction to make here is between temporary and long-lasting supply shocks.⁷ Temporary supply shocks (for example, changes in real import prices or changes in real oil prices) are typically those which are expected to revert to zero over the horizon of one to two years that is particularly relevant to monetary policy. Such temporary shocks may alter the rate of inflation, at any given rate of unemployment, but the NAIRU will be

4. Friedman (1968) and Phelps (1968) are jointly credited with introducing the concept of the structural or natural rate, whilst the term NAIRU was first introduced by Modigliani and Papademos (1975).

5. This “orthodox” view contrasts with the alternative of “full hysteresis”, whereby the level of unemployment exerts no influence on inflation, although inflation is affected by the rate of change in unemployment. In this extreme case, unemployment is not anchored by structural variables, but will instead reflect the cumulative effect of all past shocks to the economy, including those to demand. A further implication is that unemployment can be maintained indefinitely at any level with stable inflation, which undermines the NAIRU concept. However, there is considerable empirical evidence against the hysteresis model in this extreme form; in particular, a substantial number of empirical studies suggest that the level of unemployment does have an effect on inflation, see for example the recent survey by Nickell (1998).

6. This follows Gordon’s (1992) description of the Phillips curve as a “triangle model” explaining inflation in terms of the same three factors.

7. The latter may include, potentially, a fairly wide range of influences affecting pricing policies (changes in mark-ups, input prices, etc.), the transformation and distribution process (competition, regulation, price controls, etc.), and wage determination (tax wedges, unionisation, income policies, etc.).

largely unchanged once they have passed.⁸ By contrast, a long-lasting supply shock (caused by factors such as the level of real interest rates, the tax wedge, demographics, etc.) may permanently alter the NAIRU, so that inflation will rise or fall until unemployment adjusts.

Within such a framework, it is useful to identify three distinct concepts: the NAIRU (with no qualifying adjective), the short-term NAIRU and the long-term equilibrium rate of unemployment.⁹ Each of these relate to the same basic idea of an “unemployment rate consistent with stable inflation”, but differ according to the time horizon to which they refer:

Three different NAIRU concepts are defined each relating to a different time horizon

- The NAIRU is defined as the rate towards which unemployment converges in the absence of temporary supply influences once the dynamic adjustment of inflation is completed (*i.e.* in the medium term or when the effects of temporary supply shocks dissipate).
- The short-term NAIRU is defined as that rate of unemployment consistent with stabilising the inflation rate at its current level in the next period (where the precise time frame is defined by the specific frequency used in the inflation analysis, for example, the next quarter, the next semester, or the next year). It depends on the NAIRU (as defined above) but is a priori more volatile because it is affected by all supply influences, including temporary ones, expectations and inertia in the dynamic process of inflation adjustment and possible related speed-limit effects. It follows that the short-term NAIRU concept will be influenced also by the level of actual unemployment.
- The long-term equilibrium unemployment rate corresponds to a long-term steady state, once the NAIRU has fully adjusted to all supply and policy influences, including those having long-lasting effects.

Of these three concepts, the first two play clearly defined roles in macroeconomic analysis and policy assessments and give rise to relationships that, in principle, make it possible to provide empirical estimates. Because of difficulties in identifying the effects of individual long-lasting supply influences, the long-term equilibrium rate of unemployment is less easy to quantify empirically. However, while important for structural policies, the long-term equilibrium rate may be of limited relevance to macro policy, especially if the complete adjustment of the NAIRU towards the long-run equilibrium is very protracted.

Revised OECD estimates of the NAIRU

Recently the OECD has revised its estimates of the NAIRU for OECD countries (see Table V.1 for revised estimates and the appendix for detail of the methods used in revision).¹⁰ These new estimates suggest that the extent and direction of changes in the NAIRU over the 1990s is distinctly mixed across OECD countries, although this might be favourably contrasted with the 1980s during which the NAIRU rose across virtually all of them (the United States and Portugal being exceptions).

New NAIRU estimates suggest a mixed performance across OECD countries during the 1990s

8. It is possible that factors, which permanently change the level of the wedge between the real product wage and the real consumption wage, may also affect the NAIRU.

9. For more formal definitions of these NAIRU concepts see the appendix to Richardson *et al.* (2000).

10. For most countries, the NAIRU estimates correspond to commonly used, national definitions of unemployment. For Belgium and Denmark, the OECD standardised rate is used.

Table V.1. NAIRU estimates and standard errors^a

	1980	1985	1990	1995	1999	Standard errors ^b	
						Average	Final year
Australia	5.1	6.0	6.5	7.1	6.8	1.0	1.6
Austria	1.9	3.2	4.6	5.0	4.9	0.2	0.3
Belgium	5.5	6.8	8.4	8.0	8.2	1.3	1.3
Canada	8.9	10.1	9.0	8.8	7.7	0.6	0.9
Denmark	5.8	5.9	6.9	7.1	6.3	1.0	1.3
Finland	4.3	3.9	5.6	10.6	9.0	1.4	1.8
France	5.8	6.5	9.3	10.3	9.5	1.1	1.7
Germany	3.3	4.4	5.3	6.7	6.9	0.9	1.2
Greece	4.6	6.5	8.4	8.8	9.5	0.8	1.1
Ireland	12.8	13.2	14.1	10.8	7.1	1.2	2.0
Italy	6.8	7.8	9.1	10.0	10.4	0.8	1.1
Japan	1.9	2.7	2.2	2.9	4.0	0.2	0.3
Netherlands	4.7	7.5	7.5	6.1	4.7	1.0	1.3
New Zealand	1.6	5.1	7.0	7.5	6.1	0.6	0.8
Norway	2.2	2.6	4.6	4.9	3.7	0.5	0.6
Portugal	6.1	5.4	4.8	4.2	3.9	1.0	1.4
Spain	7.8	14.4	17.4	16.5	15.1	1.2	1.2
Sweden	2.4	2.1	3.8	5.8	5.8	0.8	1.0
Switzerland	2.3	2.9	3.0	3.3	2.4	0.8	1.0
United Kingdom	4.4	8.1	8.6	6.9	7.0	1.1	1.5
United States	6.1	5.6	5.4	5.3	5.2	0.9	1.2
Euro area	5.5	7.1	8.8	9.2	8.8		
Weighted average of above countries ^c	5.0	5.9	6.3	6.5	6.5		

a) Correspond to commonly used national definitions of unemployment except for Belgium and Denmark where the correspondance is with the standardised unemployment rates.

b) Estimated standard errors around initial econometric estimates.

c) Weighted by size of labour force.

Source: OECD.

Countries where the estimated NAIRU has risen by about 2 percentage points or more during the 1990s include Finland, Germany, Japan and Sweden, while Italy and Greece experienced a rise of just over 1 percentage point. Conversely, countries where the NAIRU has fallen by about a percentage point or more – Canada, Netherlands, New Zealand, the United Kingdom, Spain, Portugal, Ireland and Norway – include many of those where labour market reforms have been most extensive.¹¹ Nevertheless, the experience of these countries suggests that even following major reforms the estimated NAIRU may only fall gradually (typically by less than ½ percentage point per year) and with considerable lags. A striking exception is Ireland for which the NAIRU appears to have fallen by a remarkable 7 percentage points over the past decade.

Estimated NAIRUs fell in many countries in the second half of the 1990s...

There does appear to be a more uniform improvement in labour market performance across many countries in the second half of the 1990s with two-thirds of the countries examined having experienced some fall in the estimated NAIRU over the past five years. For example, Denmark, Finland, France, New Zealand and Norway

11. Previous analysis has found that there is a correlation between falling structural unemployment and the extent to which OECD *Job Study* recommendations have been implemented, see OECD (1999).

have all had substantial falls in the NAIRU (of at least a percentage point) over the second half despite it rising earlier in the decade. Moreover, there are other countries (Canada, Ireland and Spain) for which the NAIRU has fallen more steeply in the second half of the 1990s. A major exception is Japan where the NAIRU has risen steeply, by over a percentage point, in the second half of the decade. Overall, while there do seem to be signs of recent progress, there remains considerable scope for further improvement: a weighted average of the NAIRUs across all the countries examined (which cover about 82 per cent of the total OECD labour force) suggests that structural unemployment in the OECD is significantly higher now than in 1980 (let alone in earlier decades). Moreover, while disparities have narrowed marginally, large differences across countries remain.

At the same time, the revised estimates imply that for most OECD countries actual unemployment has been well in excess of the NAIRU for much of the 1990s, consistent with the substantial reduction in area-wide inflation. This is particularly the case for the euro area; the average gap between unemployment and the estimated NAIRU since 1993 is about 1¾ percentage points (Figure V.1). Much of this gap is accounted for by the three largest euro area economies, for which unemployment was still between 1 and 1½ percentage points higher than the estimated NAIRU in the second half of 1999, although the gap was narrowing. Conversely, for some of the smaller euro area countries the unemployment gap has just closed (Austria and Spain) or unemployment has been below the NAIRU for a year or more (Ireland and Netherlands). On this basis, recovery is even more advanced in both the United Kingdom and United States, where unemployment has been below the estimated NAIRU for three and four years, respectively. In order to reconcile inflation outcomes with these differing profiles of the gap between unemployment and the NAIRU, it is necessary to consider the role of short-term supply shocks, embedded in the short-run NAIRU.

... while unemployment has been well above the NAIRU in many countries, especially in Europe, during most of the 1990s

Monetary policy and inflation

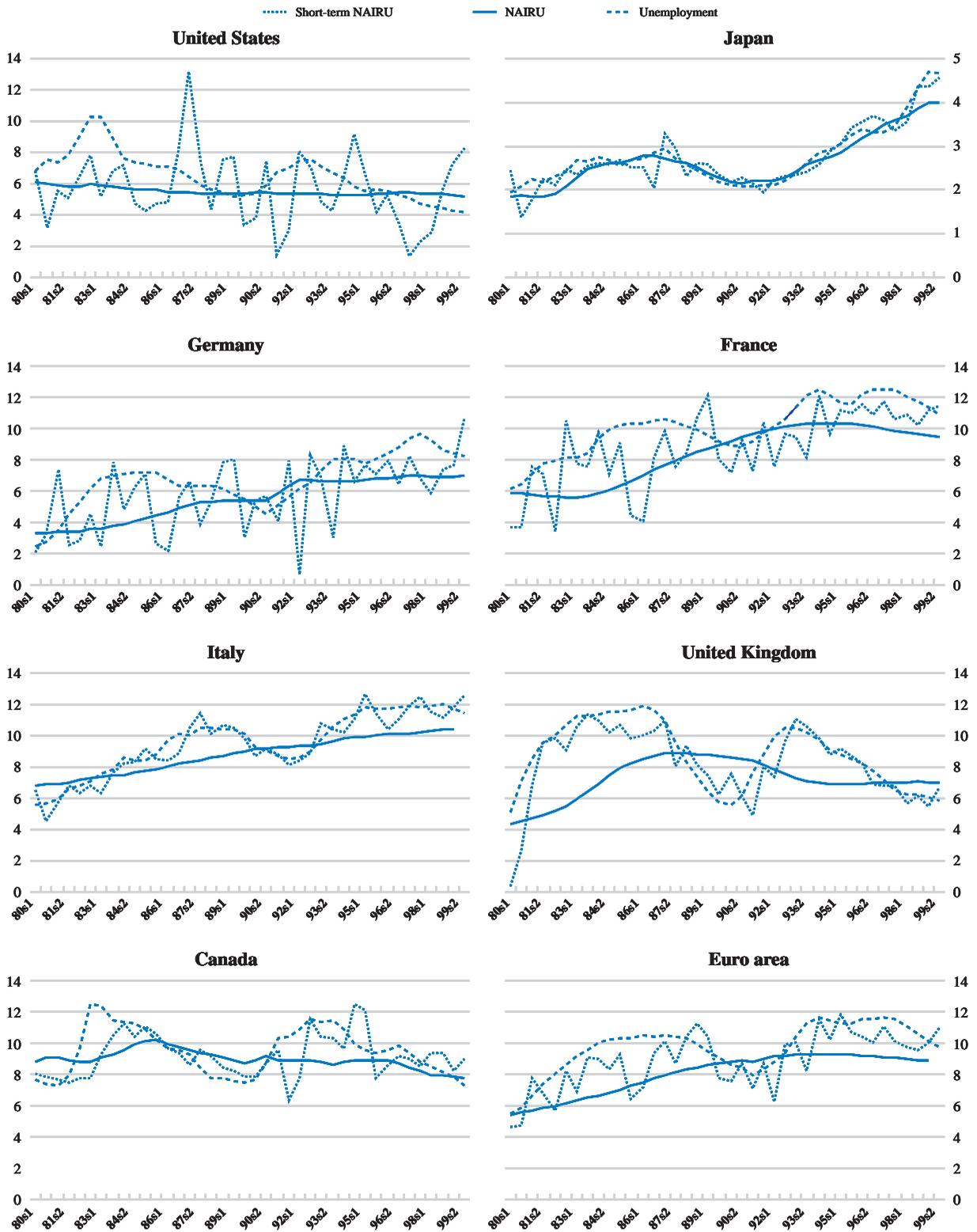
Indicators of structural unemployment provide a useful input to the setting of monetary policy if they help in assessing inflationary developments in the short term.¹² In this respect, the short-term NAIRU concept may be a useful synthesis of information concerning current inflationary pressures (see Estrella and Mishkin, 1998 and King, 1999) even though its inherent volatility means that it is unsuitable as a target. Indeed, fluctuations in the short-run NAIRU provide an indication of which inflationary shocks policy-makers can ignore. For example, the effect of adverse temporary supply shocks that may dissipate in the near future should not be seen as necessitating a permanent rise in unemployment. In this situation, policy-makers need to assess, before taking action, whether or not inflation is likely to be consistent with policy objectives when the shock wears off.¹³

The short-run NAIRU indicates how seriously to take the presence or absence of inflation pressures

12. Here and in the following paragraphs discussing the policy usefulness of the NAIRU, it should be noted that to avoid confusion the terms "NAIRU" (*i.e.* without qualifying adjective) and "short-run NAIRU" are used strictly according to the definitions of the previous section.

13. See King (1999) for a discussion of how the appreciation of sterling in 1996 and 1997 was assessed by the Bank of England's Monetary Policy Committee in broadly these terms, and also Meyer (2000) in the context of recent US monetary policies.

Figure V.1. NAIRU and short-term NAIRU¹



1. Japan is shown on a different scale.
Source: OECD.

The importance of the distinction between the NAIRU and short-run NAIRU is illustrated in Figure V.1, which shows estimates for the G7 and euro-area economies: periods when unemployment is higher (lower) than the short-run NAIRU generally signal periods of falling (rising) inflation, even though the short-run NAIRU gap is sometimes of the opposite sign to that of the NAIRU gap. For the United States, the top left-hand panel of Figure V.1 shows that the unemployment rate was consistently above the short-run NAIRU over the period 1996 to 1998, a period during which inflation fell, even though the unemployment rate was below the NAIRU.

Since 1996 unemployment has tended to exceed both the NAIRU and the short run NAIRU for the three largest euro-area economies, implying that demand pressures have been an important influence behind the fall in inflation, at least until the end of 1998. Over the same period, favourable movements in the short-run NAIRU in the United Kingdom and United States relative to euro-area economies are explained by the relative strength of exchange rates and their effects on imported inflation. However, since 1999 the rise in oil prices has become a major factor explaining the upturn in inflation and the corresponding increases in the short-run NAIRU across most OECD countries.

For Japan the rise in inflation during 1996 and 1997 can be related to unemployment falling below the NAIRU combined with pressure from import prices following depreciation of the yen. However, since 1997 the relatively rapid rise in unemployment, to levels in excess of the rising NAIRU has played an important role in driving inflation down to negative rates. Indeed, the relatively large unemployment gap coupled with the strengthening of the yen led to a further fall in inflation in 1999, despite the sharp rise in oil prices.

If speed-limit effects are strong then the short-run NAIRU will show a tendency to track the actual unemployment rate because pronounced changes in unemployment will generate considerable changes in inflation in the short-run. In these circumstances, a rapid closing of a positive gap between actual unemployment and the NAIRU may generate unacceptable short-term inflationary effects. Among the G7 economies, such effects are found to be particularly important for Italy and the United Kingdom as reflected in the path of the short-run NAIRU estimates, which for these countries tend to fluctuate around the actual unemployment rate rather than around the NAIRU (Figure V.1). Thus, for both countries there have been prolonged periods during the 1980s and 1990s when the actual unemployment rate has exceeded the NAIRU, but the profile of the short-run NAIRU suggests that the scope for reducing unemployment without (temporarily) increasing inflation was limited. Such speed limits may be less pronounced in other countries, but nevertheless have represented a constraint in reducing unemployment quickly, even while it has remained well in excess of the NAIRU during most of the 1990s.

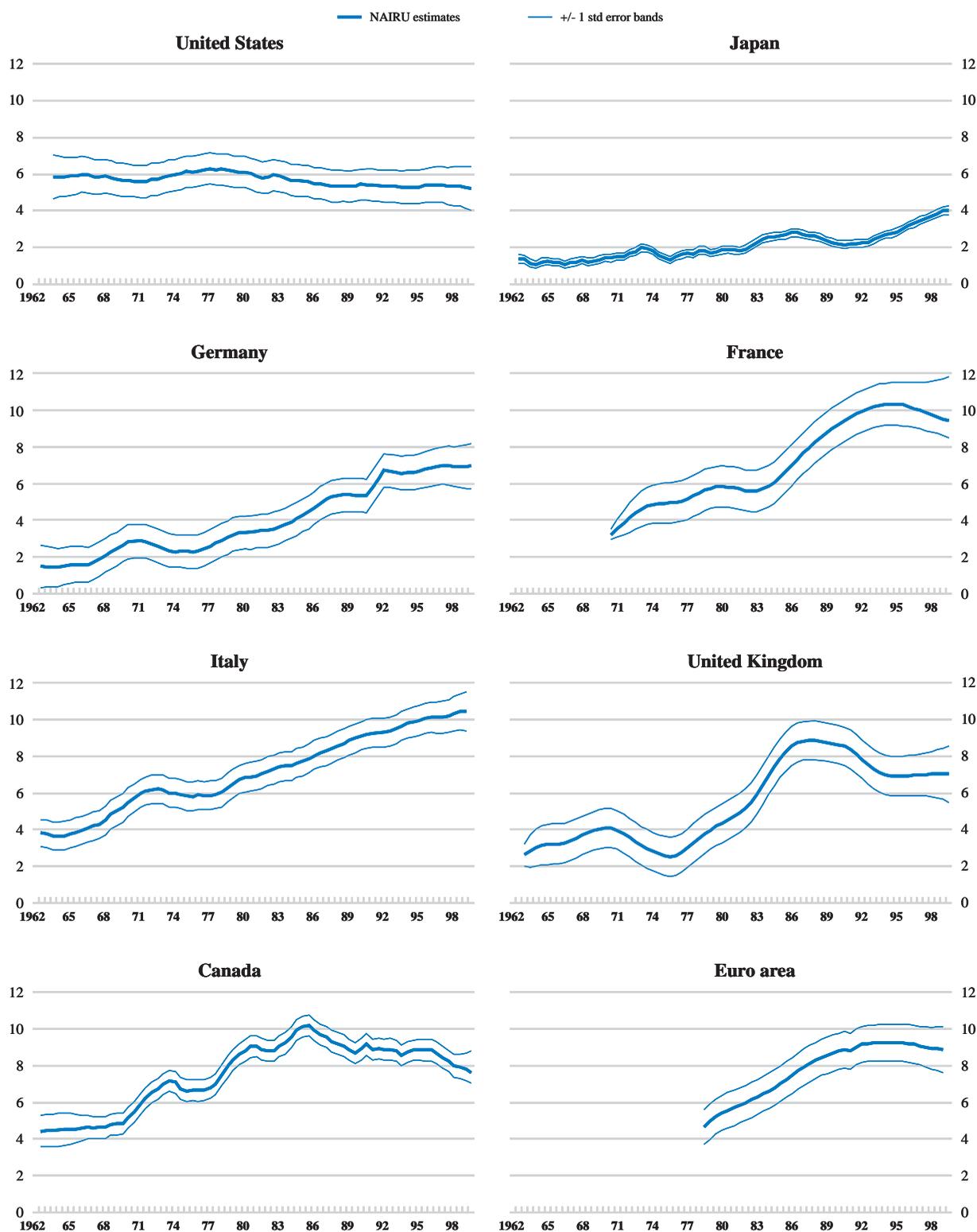
Finally, the limitations of any analysis based on the NAIRU and short-run NAIRU should be emphasised, particularly that they depend on estimated econometric relationships that explain inflation developments imperfectly, and are sometimes subject to large margins of error. As illustrated in Table V.1 and Figure V.2, standard errors surrounding the NAIRU estimates are on average about $\frac{3}{4}$ of a percentage point across all countries, but rise above 1 percentage point at the end of the estimation period.¹⁴ Moreover, different specification choices may lead to different policy

The relative strength of exchange rates has been important in explaining the short-run NAIRU, although most recently the oil price rise has been dominant

“Speed limit” effects may represent a constraint in reducing unemployment even if it is above the NAIRU

The limitations of any analysis based on the NAIRU suggest that it is only one of a range of indicators that may be useful for assessing inflation

14. See Richardson *et al.* (2000) and Boone (2000) for a description of the Monte Carlo methods used to calculate these standard errors.

Figure V.2. NAIRU estimates and standard error bands¹

1. Estimated standard errors are centred around the initial econometric estimates. For France and Canada, where these initial estimates are judgementally revised (see appendix) the NAIRU is not in the centre of the band.

Source: OECD.

conclusions. For example, the choice of which temporary supply shocks to consider (oil and import price inflation in the current analysis) is based on what variables explain inflation consistently well across most OECD countries, but other choices are possible.¹⁵ These factors all suggest that the NAIRU and short-term NAIRU can only serve as elements in a range of possible indicators that are useful for assessing inflationary pressures.

Appendix: Estimation and adjustment of the NAIRU

The current OECD NAIRU estimates are based on the methodology presented and discussed in Richardson *et al.* (2000). Preliminary estimates are obtained from a Phillips curve relationship using a Kalman filter. In some cases, these estimates are subsequently adjusted for possible biases, particularly to allow for the effect of recent policy reforms given the uncertainty surrounding the empirical estimates. This appendix describes this procedure and the specific nature of the adjustments made in the case of individual OECD countries.

The NAIRU estimates are based on recent empirical work adjusted for a number of factors

Estimation procedure for preliminary estimates

In preliminary estimation, the Phillips curve specification found to be most robust across all the countries examined was based on consumer price inflation and included both imported inflation and oil prices as measures of temporary supply shocks. Although the theoretical framework underlying the Phillips curve gives little guidance as to the choice between wage or price inflation as the dependent variable, a measure of consumer price inflation has been used on the grounds that such a variable is close to broad measures of inflation of most relevance to policy makers and because the results were typically better determined econometrically.¹⁶

Preliminary estimates are based on estimated Phillips curves

The Kalman filter generates a time-varying NAIRU from its ability to explain inflationary developments subject to constraints relating to the movement of the NAIRU through time.¹⁷ The first constraint specifies movement in the NAIRU either as a random walk or, more commonly for the European countries, as an autoregressive process. A second constraint concerns the smoothness/volatility of the estimated NAIRU. The degree of variation is, in principle, arbitrary but the choice of assumption is conditioned by the facts that too little variation in the NAIRU will result in mis-specified and unreliable inflation equations, while too much variation undermines the concept and makes the NAIRU difficult to project and of limited use for policy analysis.

The NAIRU is estimated to vary smoothly over time using a Kalman filter...

Applying the above framework to 21 OECD countries generated results in which the unemployment gap was significant in explaining inflation across all countries (for the G7

... for 21 OECD countries

15. For example Brayton *et al.* (1999) suggest that variations in the mark-up of prices over unit labour costs explain low inflation in the United States in recent years. Similarly, Meyer (2000) suggests that the temporary effects of productivity acceleration on inflation dynamics are especially relevant in the case of the United States.

16. In practice, the choice between wage or price inflation does not appear to radically alter the results, although the use of price inflation represents a change from previous OECD estimates which relate to wage inflation and hence the NAWRU. For most countries the chosen inflation indicator was based on the private consumption deflator.

17. The use of the Kalman filter to estimate the NAIRU follows a proliferation of recent studies including Gordon (1997 and 1998), King *et al.* (1995), Staiger *et al.* (1997a) where it is applied to the United States, Bank of England (1999) to the United Kingdom, Gruen *et al.* (1999) to Australia, Irac (1999) to France, Meyler (1999) to Ireland, Apel and Jansson (1998, 1999) to Sweden, Rasi and Viikari (1998) to Finland, Orlani and Pichelman (2000) for the European Union and Fabiani and Mestre (1999) to the euro area. There are fewer studies where the approach is applied consistently across a number of countries, although Laxton *et al.* (1998b) and Laubach (1999) both apply it to all the G7 countries.

economies typically explaining a quarter of inflation variation); temporary supply shocks represented by changes in real non-oil import prices and real oil prices were found to have significant effects across virtually all countries; and the corresponding Phillips curves performed well in terms of a standard range of diagnostic tests.

Revisions to preliminary estimates

These estimates are subject to statistical uncertainty and are adjusted for...

The NAIRU estimates generated by the econometric procedure described above have subsequently been scrutinised by OECD country experts and sometimes revised to take account of specific biases, particularly to allow for the effect of recent reforms. These revisions also take into account the uncertainty surrounding the econometric estimates, as measured by the standard errors reported in Table V.1. In some cases these revisions simply involved using a more appropriate definition of inflation or unemployment in the Phillips curve estimation, which led to a better fitting Phillips curve and a profile for the NAIRU that was judged to be more plausible.¹⁸

... three main sources of bias

For two countries (Canada and Greece) a more fundamental change of specification to the Phillips curve involved more explicit modelling of inflation expectations. For a further three countries (Australia, France and Switzerland) the preliminary estimates appeared to contradict other information, particularly relating to the likely effect of recent labour market reforms, and so were judgementally adjusted. These latter revisions occur at the end of the estimation period where uncertainty surrounding any filter-based estimates of the NAIRU is greatest.¹⁹ Two countries (Finland and Ireland) were considered as special cases in so far as the basic estimation framework was considered inadequate for explaining recent episodes.²⁰ These revisions are discussed in further detail below.

More explicit modelling of inflation expectations (Canada and Greece)

For some countries allowance is made for changes in inflation expectations and changes in monetary policy regimes

In the original estimation, inflation expectations in the Phillips curve for most countries are proxied by a distributed lag of past inflation rates. However, this assumption may lead to biased estimates of the NAIRU following a change in policy regime. Canada and Greece are two countries where allowing for such a regime change seemed appropriate and leads to significant changes in the estimated NAIRU.

Canada was one of the first countries to introduce explicit inflation targeting in 1991. Empirical evidence from the Bank of Canada suggests that this has significantly influenced inflation expectations and following this evidence, inflation expectations from 1991 onwards are modelled as a weighted average of the (mid-point of the) inflation target and a distributed lag of past inflation rates (with weights of about half on each component).²¹ The inflation variable used in the Phillips curve is the core measure of consumer price inflation (excluding the effects of food, energy and indirect taxes) that the Bank focuses on for the purposes of monetary policy (although formally the inflation target is formulated in terms of the headline consumer price inflation). The new policy regime may have provided an anchor for inflation expectations. Thus the fact that inflation in recent years has only modestly undershot the official target may reflect its credibility rather than an only small unemployment gap. In consequence, not taking into account the effect of the change in policy regime on expectations is likely to lead to the NAIRU being over-estimated over recent years.

18. In the case of Spain this involved using an inflation rate based on core consumer price index rather than the consumers' expenditure deflator. For Denmark a standardised rate of unemployment was used in place of a register-based definition, because the latter might not be a consistent basis for estimating the NAIRU given recent policy reforms which have eliminated a number of those on the rolls who would not fit within the standardised unemployment definition. In the case of Germany a distinct break in the NAIRU series was introduced to allow for the effect of re-unification (although this change had virtually no effect on the estimated NAIRU at the end of the estimation period).

19. See Table V.1 and Figure V.2.

20. Finland and Ireland are also the two countries with the largest standard errors surrounding the Kalman filter NAIRU estimates.

21. See, for example, Fillion and Léonard (1997); and Perrier (1998).

Indeed, allowing for the change in policy regime lowers the NAIRU estimate on average by 0.3 percentage point over the period since the target has been in operation and by slightly more at the end of the estimation period.²²

Over the course of the 1990s, consumer price inflation in Greece has fallen from 20 to 2½ per cent per annum. One factor underlying this fall, at least over the past several years, may have been the effect that prospective membership of the European Economic and Monetary Union has had on lowering inflation expectations. To allow for this effect in the estimation of the NAIRU, inflation expectations from 1991 onwards are specified as a weighted average of past inflation and average euro area inflation, where the weight is estimated but allowed to increase at a linear rate over time.²³ Allowing for this regime shift implies a systematically higher NAIRU (because some of the disinflation is attributed to an expectations effect rather than the unemployment gap), that is on average nearly a percentage point higher than implied by the standard Phillips curve specification.

Allowing for the impact of recent reforms (Australia, France and Switzerland)

A practical limitation of the estimation method concerns the greater uncertainty at the end of the sample period and, in particular, with respect to the effects of recent and on-going reforms. For those countries where such reforms took place in the late 1980s to mid-1990s (for example: the Netherlands, New Zealand, Spain and the United Kingdom), their impact on the NAIRU is typically found to be substantial but relatively slow to emerge.²⁴ To the extent that a number of other OECD countries are currently undergoing similar reforms, it may be too soon to see any appreciable reduction in the NAIRU reflected in current econometric estimates. In such cases, further adjustments are, therefore, made on the basis of the scale and nature of these recent reforms.²⁵

The effects of labour market reforms can be quite significant, but for some countries reforms may be too recent to show up in the estimates

In Australia there have been significant reforms to both product and labour market institutions since 1996, including changes to the coverage of industrial awards, a move towards more decentralised bargaining and ongoing deregulation and privatisation of utilities. To incorporate the effect of these changes, the NAIRU was progressively revised downwards from 1998 to 6¾ per cent in 1999 (compared with a preliminary estimate of 7¼ per cent).

For France the preliminary econometric estimates suggested that the NAIRU had been broadly stable over the 1990s (at just over 10 per cent), although the standard error surrounding the estimate is among the largest of any country. Such a profile is not easily reconciled with the structural reforms that have been implemented since 1995, in particular large cuts in social security contributions, as well as evidence that the labour market has become more flexible with a growing share of temporary and part-time employment. To reflect these reforms the NAIRU is progressively revised downward from 1995, so that by 1999 it has fallen to 9½ per cent.

Switzerland has recently undergone a major reform of the unemployment insurance system that involved a tightening of unemployment benefit eligibility criteria in 1996 and 1997, with more intensive use of active labour market policies in 1998 and with participation becoming a condition of unemployment benefit eligibility. The tighter eligibility criterion has implied a significant drop in register-based unemployment – an effect which the Kalman filter can pick up only gradually. The preliminary econometric estimates of the NAIRU were adjusted to reflect these changes; a fall of ¾ per cent is imposed from 1997 to give an estimate of the NAIRU of 2½ per cent in 1999.

22. For Canada the econometric NAIRU estimate was also revised down 0.1 percentage point in 1999 to reflect the effect of recent reforms to the unemployment insurance system.

23. By the end of the sample the weights on lagged and euro area inflation are around 85 and 15 per cent, respectively.

24. The fall in NAIRU estimates for these countries since implementing labour market reforms has, on average, been up to ½ per cent per annum, typically over a period of four to five years.

25. For further details of the reforms, see the most recent OECD Survey relating to the country concerned as well as the chapter on “Recent labour-market performance and structural reforms” in *OECD Economic Outlook*, No. 67.

Special cases (Finland and Ireland)

For some countries, special factors make the estimates much less reliable

In two special cases (Finland and Ireland) the specific estimation framework is considered inadequate for explaining past and recent experiences.

Finland has been affected by a number of major shocks in the early 1990s: the bursting of an asset price bubble, a sharp terms-of-trade fall and the collapse of trade with the former Soviet Union. To reflect the impact of these shocks the profile of the estimated NAIRU has been judgementally adjusted in order to give a profile with a more pronounced rise in the early 1990s, that falls in the second half of the 1990s (consistent with supply side improvements in taxes, replacement rates and employment protection legislation) to a level of about 9 per cent in 1999.

The case of Ireland is unusual given the importance of immigration flows, which may mean that the NAIRU is more volatile than for most other countries with a greater tendency to follow the actual unemployment rate. Attempts to allow for this in the estimation process were, however, unsuccessful. Instead the econometric estimate was progressively revised downwards from 1995 to be more in line with the sharp fall in actual unemployment, so that by 1999 it had fallen to 7 per cent (compared with an econometric estimate of 9 per cent).

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