Two Concepts of the Output Gap

Tim Congdon

The concept of the 'output gap' is among the most prominent in modern macroeconomics. The relationship between inflation and the output gap is one of the three equations in the so-called 'New Consensus Macroeconomics', while central banks, finance ministries and private forecasting units devote considerable effort to the gap's measurement. (The three-equation system is sometimes also called 'New Keynesianism', but the legitimacy of this label is questioned later in the paper.)

It may therefore seem surprising to propose that the gap takes two distinct forms and that the two notions originate in rival systems of thought. However, that will be the contention of the present paper. To anticipate and simplify, one concept of the gap was first advanced by Arthur Okun in 1962 and may be termed 'Keynesian', whereas the alternative concept stems from Milton Friedman's presidential address to the American Economic Association in 1967 and may be regarded as 'monetarist'. The argument here will be that over time the monetarist concept of the gap has ousted the Keynesian and that the consequent refurbishment of economists' understanding of the 'gap' notion has made a vital contribution to the so-called 'Great Moderation'. (The Great Moderation is of course to be understood as the marked improvement in macroeconomic outcomes across the industrial world since the early 1990s.)

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I

In his 1936 *General Theory of Employment, Interest and Money*, John Maynard Keynes ventured a number of remarks on the relationship between the level of unemployment and the rate of wage inflation. As will emerge shortly, they are pertinent to the evolution of thinking about the output gap.[1] But the remarks were not central to Keynes's purpose and the first extensive discussion of the topic, with supporting statistics, came in A. W. Phillips's 1958 paper in *Economica* on 'The relation between unemployment and the rate of change of money wage rates in the UK, 1861–1957'. As is well-known, this paper's summary of almost a century of experience was that the rate of change of wages was inversely related to the level of unemployment. An essential attribute of the resulting 'Phillips curve' was that, although the rate of change of wages varied with the unemployment rate, the rate of change of wages was stable at *any* particular unemployment rate.

Phillips was a professor at the London School of Economics when collecting the data from which his curve was derived. One of his colleagues at the LSE, Frank Paish, saw that the ideas could be generalised from the labour market to the whole economy. A 1961 paper on 'Output, inflation and growth' appeared in his 1966 collection *Studies in an Inflationary Economy* and included a theoretical section which referred in a footnote to Phillips's work. This section noted that

> The most important factor in determining the rate of rise in money wages is the proportion of productive capacity currently employed. If we accept this assumption, it follows that...there must be a margin of unused capacity at which money incomes will rise at an annual rate equal to that of the growth of productive capacity. If the margin of unused capacity can be permanently stabilised at just this level...we have...the necessary conditions for long-term price stability.[2]

Paish went on to differentiate between short-term and long-term pressures on inflation, and noted one perhaps surprising possibility. This was that—because of lags in the inflationary process—demand expansion might reduce the margin of productive capacity beneath that associated with price stability *in the long run* and yet still be associated with stable prices *in the short run*. In his words, any equivalence

> ...between a rise in incomes and a rise in output obtained by reducing the margin of unused capacity below the long-term equilibrium level is inevitably unstable and temporary.[3]

This might sound like an anticipation of Friedman's 1967 presidential address, but the interpretation is not justified by the rest of Paish's paper. Although Paish's 'margin of productive capacity' is indeed a concept of the output gap, he was writing within the confines of the Phillips curve framework. He believed that in the long run, after all the lags had worked their way through the system, there was a stable relationship between the rate of inflation and his margin of productive capacity. Paish's work nevertheless deserves more attention than it has subsequently received. In particular, he noticed in the UK context the phenomenon on which Okun was soon to place so much emphasis on the other side of the Atlantic. After drawing a chart with one axis showing the percentage of capacity utilised and the other axis the percentage of the labour force employed in the 1951–55 period, he said

> It is at once clear that the fluctuations in the employment of labour are very much smaller than in the employment of total capacity, and in [the chart he had drawn] the labour employment percentages are given on a scale five times as large as that used for the percentages of total capacity employed.[4]

However, he doubted that the five-to-one ratio would 'hold good indefinitely as unemployment rises'. In fact, one of his key conclusions was that price stability could be maintained only with a margin of unused capacity of 5 to 7 per cent, 'corresponding to between 2 and 2½ per cent of unemployment', which he took to be in accordance with 'Professor Phillips' estimate that just over 2 per cent of unemployment is consistent with a rise in wage-rates of 2½ per cent a year'.[5] The lowness of the unemployment rate on which policy-makers might safely concentrate their attention may seem extraordinary by later standards. But Paish and Phillips were viewed in the 1960s as being pessimistic about the inflationary risks inherent in Keynesian demand-management policies. Indeed, their quantification of the dynamics of UK inflation was resented by some of their contemporaries in the British economics profession. At the time most economists took full employment to be defined as an unemployment rate of under 1½ per cent.

II

American economists recognised the significance of Phillips's work soon after its publication. For example, Paul Samuelson saw its relevance to what he, and others with Keynesian inclinations, regarded as the key policy problem facing the newly-elected President Kennedy in January 1961. This problem was to assess how much fiscal stimulus might be administered in order 'to get the economy moving' without raising inflation too much.[6] But—as in the UK—there was a case for analysing the determination of inflation within the context of product markets and not merely that of the labour market. In 1962 Okun published his analysis of 'Potential GNP: its measurement and significance' in the *Proceedings of the American Statistical Association*. The analysis proposed a concept of 'the GNP gap', which was obtained by distinguishing between potential and actual GNP. In his words, 'Potential GNP is a supply concept, a measure of productive capacity.' Nevertheless,

> ...it is not a measure of how much output could be generated by unlimited amounts of aggregate demand...The full employment goal must be understood as a striving for maximum production without inflationary pressure.

Potential output differs from actual output because aggregate demand may not be sufficient to deliver full employment. It follows that

> If, in fact, aggregate demand is lower, part of potential GNP is not produced; there is unrealised potential or a 'gap' between actual and potential.[7]

Without any particularly clear rationale in the paper itself, he selected an unemployment rate of 4 per cent as that associated with full employment.[8] He said that potential output could be observed only at this unemployment rate and that it had otherwise to be estimated. Indeed, he used the word 'leap' to describe three possible methods of using information on the size of the labour force to arrive at a series for potential output. At any rate, his own 'subjectively weighted average of the relevant coefficients' from all three methods was 3.2, so that (with P denoting potential output, A actual output and U actual unemployment),

$$P = A\,[1 + 0.032\,(U - 4)].$$

This equation was quickly baptised 'Okun's law'. Okun saw his work as helping to quantify the parameters for an expansionary fiscal policy. The 'law' and the related notion of 'the GNP gap' had immense influence over US policy-making in the following decade.[9]

Okun's definition of the gap was stated so as to imply that, except in very unusual circumstances, it took only positive values and that the values of the gap increased with the rate of unemployment.[10] The gap concept was, in a word, 'mono-directional'. At full employment inflation might be high, but—because of the properties of the Phillips curve—it would be stable. Implicitly, over-full employment was to be avoided as too inflationary. Nevertheless, the purpose of Okun's work was not the stabilisation of inflation at a low rate. Instead its aim was to specify the appropriate fiscal policy for the maximisation of employment, subject to the constraint that inflation should not be excessive. With the short-run elasticity of output with respect to employment taking a value of three, any shortfall in employment beneath full employment was deemed hugely costly in terms of lost output. In 1965 a book of papers on *The Battle Against Unemployment*, edited by Okun, was published in New York. As it included a prologue by President Kennedy, most of the papers must have been written two or more years earlier. In his own contribution, Okun deployed his law to justify a high pressure of demand. To quote,

> ...if we are to meet our targets of full utilization, we need expansionary measures that are large in relation to excess unemployment...[T]he demand for goods and services must rise relatively about three times as much as we can expect unemployment to fall.

In his paper in the same volume, looking forward to 'The tax-cut harvest', James Tobin noted that the difference between an unemployment rate of 5½ per cent of the labour force and a rate of 4 per cent 'corresponds to a deficiency of...5 percent in total national spending for goods and services', a calculation which obviously appealed to Okun's law.[11]

The fact that, in Okun's own work, his gap took only positive values—or, in a phrase, the mono-directionality of the Okun 'GNP gap'—recalled the structure of Keynes's argument in *The General Theory*. The analytical core of *The General Theory* was in books II to IV, in which the wage unit (i.e., wages per worker) was assumed to be constant. With this assumption in place, an increase in aggregate demand led to the same proportionate

increase in employment. This was a useful simplification for any theory intended to determine the level of employment. For example, it enabled Keynes to say that the effect of a rise in the quantity of money was to reduce the rate of interest and stimulate investment. He could postpone until book V the awkward possibility that a rise in the quantity of money might affect the wage unit and the price level.

Okun, Tobin and Samuelson did not see the GNP gap in exactly the same way as Keynes. The *General Theory* model applied to the Marshallian short run, with the capital stock given, and was expressed in terms of levels (i.e., the quantity of money affected the rate of interest and the price level), whereas Okun and his contemporaries were prescribing for a growing economy and thought in terms of rates of changes. In particular, they viewed different rates of inflation, not different price levels, as being associated with differing degrees of demand intensity. But, because they viewed inflation as stable at any particular degree of demand intensity and any particular level of the GNP gap, the question of the determination of inflation was subordinate in their thinking to the determination of output and employment, in just the same way that the determination of the wage unit was a secondary matter in books II to IV of *The General Theory*.

In book V of *The General Theory* Keynes accepted that—once unemployment falls beneath a 'critical level'—an increase in the quantity of 'effective demand produces no further increase in output and entirely spends itself on an increase in the cost-unit fully proportionate to the increase in effective demand'.[12] A cut-off point is implied, between a zone of spare capacity in which the existence of unemployment allows extra demand to boost employment and output, and a zone of full employment in which extra demand affects only prices. An abrupt cut-off point on these lines is analytically consistent with the mono-directionality of the Okun gap. As in Keynes's book V, the gap applies to the zone of spare capacity and not to the zone of full employment. (Keynes acknowledged that the model of *The General Theory* contained an 'asymmetry' between inflation and deflation, and even that there was 'perhaps, something a little perplexing' in it.)[13]

In short, the Okun GNP gap was a construct that made sense when policy-makers believed in a stable trade-off between inflation and unemployment (i.e., a Phillips curve), and in a direct responsiveness of employment to demand (i.e., as described in books II to IV of *The General Theory*). The Okun gap concept can be fairly characterised as 'Keynesian' in origin.

III

In the 1960s and 1970s most criticism of Okun's work was directed to the value of the coefficient in his output/employment relationship. One such paper, on 'Economic growth and unemployment: a reappraisal of the conventional view' by John Tatom in the October 1978 *Federal Reserve Bank of St. Louis Review*, used the phrase 'the output gap' in preference to Okun's GNP gap.[14] But the main purpose of Tatom's 1978 paper was statistical, with the central conclusion being that the unemployment rate was more responsive to the growth of output and demand than Okun had allowed. Although Tatom's recommendation—like that of other authors—was 'increased caution in attempts to guide the economy by activist demand policies', he did not question the conceptual validity of the Okun framework.

The fundamental theoretical challenge had in fact come earlier, from Friedman's 1967 presidential address to the American Economic Association and the related Edmund Phelps 1967 paper. These two contributions together called into question the stability of the inflation/unemployment trade-off enshrined in the Phillips curve.[15] Their punch-line was that the rate of wage increases was stable at one, and only one, rate of unemployment, which Friedman termed 'the natural rate'. If unemployment were held beneath the natural rate, the entrenchment of expectations of rising prices in pay bargaining would cause inflation to accelerate without limit. The Friedman and Phelps critiques of the Philips curve had clear significance for analysis of the labour market, and the threat to the viability of full employment as a policy target was soon understood. However, the extension of the ideas to the entire economy took surprisingly long. Whereas Paish and Okun had translated the Phillips curve ideas into a whole-economy gap concept in little more than three years, the full development of the whole-economy gap concept implied in the Friedman and Phelps contributions took over a decade. Robert Lucas carried out path-breaking empirical work on the international experience of inflation in an attempt to test the natural rate hypothesis. His article, 'Some international evidence on output–inflation tradeoffs', in the June 1973 issue of the *American Economic Review* considered the whole-economy inflationary behaviour of 18 countries. But in his 1972 paper on 'Econometric testing of the natural rate hypothesis' Lucas had remarked

that the process of translating the natural rate hypothesis into 'explicit' theory had 'scarcely begun' and was 'certain to involve much controversy'.[16] The 1972 paper used the phrase, 'the natural rate of output', probably for the first time, but not the phrase 'the output gap'.

Throughout the 1970s economists at the Brookings Institution continued to calculate a GNP gap, using much the same methods as Okun, as if the natural rate hypothesis had not been proposed. The main technical advance in the Brookings' work was to estimate the gap using a multi-factor production function instead of the single-factor output/employment relationship in the 1962 paper. Perhaps because of the structure of the Okun approach, with the mono-directionality of its values, calculations of the gap in the 1970s invariably found that output was beneath its potential. At a conference organized by Brookings in April 1977, George Perry gave a paper on 'Potential output and productivity', and accompanied it by a call for large-scale fiscal stimulus. It was heavily criticised in separate comments by Robert Gordon and Michael Wachter as over-estimating the margin of spare capacity in the economy and, in Wachter's words, as having 'major inflationary risks'.[17]

A year later, at the Carnegie-Rochester April 1978 conference on public policy, Wachter was joined by Jeffrey Perloff in the presentation of a paper on 'A production function-nonaccelerating inflation approach to potential output: is measured potential output too high?'. Perloff and Wachter went to some lengths to claim that they were working in the Okun tradition, saying in the main text that his 1962 paper 'stated that potential output should be defined in terms of nonaccelerating inflation' and repeating the remark in a footnote. In fact, the Perloff and Wachter paper was a radical departure. They defined potential output as

> that output which society could produce with the labor supply which is consistent with nonaccelerating rates of inflation. Thus, to provide estimates of potential output we need, besides the aggregate production function, an equation which determines the natural rate [of unemployment, denoted as U*].[18]

They proposed three ways of calculating U*, which they also referred to as 'equilibrium unemployment', and tried out no fewer than six types of production function. The wide-ranging, rather protean character of the Perloff and Wachter paper may have been partly responsible for its later neglect. At any rate, it rejected—quite explicitly—the results of earlier

work in the area. Previous estimates of potential output were, in their judgement, 'almost certainly higher than the nonaccelerating inflation rate of potential output'. After all it was 'difficult to reconcile accelerating inflation between 1965 and 1977 with an estimated potential which shows deep and long periods of excess supply and shallow and brief periods of excess demand'. In addition to the criticism of the inflationary dangers of the existing body of analysis, the Perloff and Wachter paper foreshadowed later approaches by noting that their series

> ...generates the kind of alternating supply and demand gaps that could be consistent with periods of rising and falling inflation.[19]

Earlier studies had fitted trend lines which tended 'to hit only the peaks of the actual output series'. The clear suggestion was that calculations of the gap should not take only positive values and be mono-directional, but take both positive and negative values, and so be bi-directional. However, Perloff and Wachter were loyal to Okun in one sense. They took positive values of the gap to denote beneath-potential levels of output, just as he had done.

The Perloff and Wachter paper provoked two immediate sharp responses. In his contribution to the 1978 Carnegie-Rochester conference, Gordon praised their contribution as 'innovative', but disputed that the association of potential output with non-accelerating inflation had roots in Okun's work. In the early 1960s there was—in his words—'no natural rate hypothesis'. Instead, 'the stable Phillips tradeoff curve reigned supreme'. Indeed, he deprecated Okun's selection of 4 per cent unemployment as 'full employment', since this was 'entirely arbitrary'. Gordon further remarked that the hypothesis of a natural rate of unemployment, which he took to be 5½ per cent in the USA, constituted a 'macroeconomic revolution'. He also found the use of the phrase 'potential output' misleading, since in the Perloff and Wachter framework potential output was not a ceiling imposed by the technical ability to produce. As an alternative he suggested, following Lucas's earlier practice, that the level of output associated with neither rising nor falling inflation should be called the 'natural rate of output'.[20]

The second significant critique at the 1978 conference came from Charles Plosser and G. W. Schwert. Neither Perloff and Wachter nor Gordon used the phrase 'output gap' in their published contributions.

But—in addition to commenting on some methodological weaknesses in the Perloff and Wachter paper—Plosser and Schwert both used the phrase and appreciated its ambiguity. To quote, the Okun approach produces 'an "output gap" which is always positive, implying a continual need for stimulative government policies', whereas the new Perloff and Wachter approach 'implies that the "output gap" can be both positive and negative'. Plosser and Schwert also attacked Okun's law as 'infamous' and suggested that the short-run elasticity of output with respect to unemployment was much lower than Okun claimed, perhaps having a value of only two.[21]

One final comment needs to be made on the proceedings of the 1978 Carnegie-Rochester conference. There is little question that the Perloff and Wachter paper pointed towards a radical shift in thinking and terminology about the relationship between demand pressure and inflation. Gordon straightaway saw that this shift was a generalisation of the natural rate hypothesis, and Plosser and Schwert remarked that two distinct concepts of the output gap were implied. But not one of the conference participants referred to Friedman's 1967 presidential address.[22] Arguably, the obvious affinity between the natural rate hypothesis and the new understanding of the gap justifies terming it a 'monetarist' gap concept. Table 1 illustrates how—in the setting of the USA in the 1960s and 1970s—the

Table 1: Two different concepts of the output gap

The table shows values of 'output gap' implied by the two different approaches to its estimation. The short-run elasticity of output with respect to employment is assumed to be three with the Keynesian concept and two with the alternative, 'monetarist' concept. High levels of employment are associated with negative values of the gap, as in Perloff and Wachter 1979, but the numbering scheme was inverted in later work.

Unemployment rate, as % of workforce	Keynesian concept of the output gap, originating in Okun 1962	Monetarist concept of the output gap, with roots in Friedman 1967, but first developed in Perloff and Wachter 1979
4	0	–3
4½	1.6	–2
5	3.2	–1
5½	4.8	0
6	6.4	1
6½	8	2
7	9.6	3

two approaches would generate different values of the gap for the same unemployment rate.

IV

In the 1960s and 1970s, the Okun-originated (or Keynesian) concept of the output gap was estimated, in particular, by economists linked with the USA's Council of Economic Advisers and the Brookings Institution. By contrast, in the 1980s work on the Friedman-originated (or monetarist) concept of the gap was centred in leading supranational institutions, particularly the International Monetary Fund and the Organization for Economic Co-operation and Development. A fair comment is that in both locales the task of estimation was carried out almost entirely by practitioner economists and not by economists affiliated to universities. Typically a policy prescription was implied by the estimates. The rise in inflation during the 1960s and 1970s had caused widespread disillusionment with 'full employment' policies. Two important advantages of the monetarist concept of the output gap were that it helped to quantify both the degree of demand restraint needed to curb inflation, and the likely consequences for unemployment and lost output. Officials at the IMF and the OECD had regularly to prepare assessments of the future course of inflation, output and unemployment in many countries. They found from experience that what has been termed here the monetarist concept of the gap was useful in their work. They dropped estimation procedures based on Okun's 1962 paper. The eventual result was that the monetarist concept of the output gap superseded the Keynesian and has now become dominant.

In 1987 three economists at the IMF published a paper on 'Potential output in major industrial countries' in its *Staff Studies for the 'World Economic Outlook'*. These authors, Charles Adams, P. R. Fenton and Flemming Larsen, acknowledged that the Perloff and Wachter paper was the basis of their methodology.[23] One of these authors also contributed to an October 1989 paper in the *IMF Working Paper* series on 'A systems approach to estimating the natural rate of unemployment and potential output for the United States'.[24] The replacement of the full employment rate of unemployment by the natural rate of unemployment as the fulcrum of the analysis is clear. The OECD—like the IMF with its *World Economic*

Outlook—has to produce regular documents on the international economic prospect. In the words of the IMF's 1987 staff study, 'the Fund's need for economy-wide estimates of potential output should be seen in the light of its surveillance function'.[25] At some point in the late 1980s the teams at the IMF and the OECD started to exchange information and data. In May 1989, Raymond Torres and John Martin published 'Measuring potential output in the seven major OECD countries' in the *OECD Working Paper* series, and expressed thanks to Adams, Fenton and Larsen 'for supplying us with the IMF data on output gaps'.[26]

Several more papers in this area of macroeconomics were published under IMF and OECD auspices in the early 1990s. Finally, the June 1995 issue of the OECD's *Economic Outlook* contained an Annex Table 11 on 'Output gaps', with data from 1980 to 1994 (and projections to 1995 and 1996) for 20 OECD countries. The numbers were drawn from a paper by four authors in the first 1995 issue of the OECD's *Economic Studies*. According to the notes on sources and methods in the June 1995 *Economic Outlook*,

> The output gap is measured as the percentage difference between actual GDP in constant prices, and estimated potential GDP. The latter is based on a production function approach...and underlying non-accelerating wage rates of unemployment or the NAWRU for each Member country. It should be stressed that the estimated levels of potential are subject to significant margins of error.[27]

The only significant difference in presentation from the Perloff and Wachter paper of 1979 was in the system of numbering. Perloff and Wachter claimed—very debatably, according to the analysis in this paper—to be working in the Okun tradition. They therefore had positive values of the gap for unemployment levels higher than the natural rate of unemployment. The approach is counterintuitive, in that high levels of demand intensity and utilisation have a negative output gap value, and low levels a positive. The OECD kept the bi-directional system of numbering, but inverted it. So above-potential output was associated with a positive value of the output gap and beneath-potential output with a negative value. The data now produced regularly in the OECD's *Economic Outlook* are probably used by several hundred economists around the world. As they have become the most quoted estimates of the output gap, the OECD has acted as a kind of Académie Française to the economics

profession. Its definition of the gap is increasingly recognised as standard.[28]

Two further points need to be made here. First, although the modern approach to estimating the output gap is particularly popular at central banks where it serves as one guide to monetary policy decisions, its calculation is also important in the measurement of fiscal policy. In the years when the Keynesians regarded themselves as predominant in policy-making (say, roughly, from the mid-1940s to the mid-1970s), the idea of a full-employment budget balance was a commonplace. A familiar idea is that tax revenues are inversely related and public expenditure positively related to the level of unemployment. So—for the same levels of tax rates and underlying public expenditure—a budget deficit is lower at full employment than at less than full employment. However, the concept of the full-employment budget balance is subject to the same critique as that of full employment itself. If the full employment rate of unemployment is arbitrarily set at a figure lower than the natural rate of unemployment, the full-employment budget balance is unsustainable because it is accompanied by accelerating inflation. If a budget balance figure is calculated as that which would obtain at the natural rate of unemployment, it is not open to the same objection. The calculation of budget balances on these lines is now carried out regularly at the OECD and the IMF, and allows the two organizations to distinguish in their *Outlook* publications between the 'cyclical' and 'structural' components of any particular deficit or surplus number.

Secondly, output gap estimation in a policy-making environment can be very difficult. To estimate the gap at present it is necessary to have at least three reliable figures,

- the level of the gap in the recent past
- the actual rate of growth of output in the latest period (or periods), and
- an understanding of the trend rate of growth also in latest period (or periods).

In practice, analysts rarely agree on any of these three numbers. The actual rate of growth in the latest periods may appear uncontroversial, since it is published as part of the national accounts. But in all countries the national accounts are published with a lag and are subject to revision. One way of overcoming these problems has been to harness business

survey information in an attempt to quantify the gap. A typical procedure is to compare historical series of the output gap with those for labour shortages and capacity utilization in business surveys, and so obtain benchmark values of survey answers associated with the potential level of output (or 'the natural rate of output', in Lucas's and Gordon's terminology). As business surveys are published with hardly any lag at all, the latest values of the answers to labour shortage and capacity utilization questions provide a quick-and-dirty, but quite reliable guide to the output gap.

The cross-checking of business survey series against output gap estimates based on the national accounts was not possible in most industrial countries in the 1950s, because most business surveys commenced after the Second World War and had only a short life. Not much significance could be attached to the numbers. But by the 1980s, the business surveys typically had been in existence for over 20 or even 30 years, and satisfactory levels of statistical significance were achieved when their data were compared with other macroeconomic information. In the USA, the Federal Reserve started preparing a series on capacity utilization in 1967 and it gradually became recognised among analysts that a capacity utilization level of about 81 to 83 per cent was associated with stable inflation. Business economists and investment analysts also paid close attention to the monthly numbers in the National Association of Purchasing Managers' intentions survey, which was found from experience to be a good guide to the current state of the economy. Similar developments occurred in other countries. In the UK, the Confederation of British Industry introduced a survey in 1958, but most of the series date from 1961 or later. Every quarter, questions about the intensity of labour shortages and plant capacity utilization are asked, and over time it has become possible to obtain benchmarks of the economy's 'normal' degree of operation.[29] In Germany, the Ifo survey, conducted by the Institut für Wirtschaftsforschung in Munich, has served a similar purpose, also since the 1950s.

Nowadays a monthly survey of business intentions and experience, called the 'PMI' (or 'purchasing managers index') is released by Henley-based NTC Economics Ltd for all the major economies. The PMI results often have an important effect on financial markets, because they tend to anticipate accurately the data in government-based statistical releases. At any rate, once a long series of business survey results is available, it is a simple matter to work out which values of machine capacity and labour

shortage series are associated with an output gap of approximately zero. The calculation of the gap from official GDP and other statistics is still necessary for completeness, but business survey results are timelier and easier to interpret than national accounts data. The abundance of business survey information today is in marked contrast to the situation in the 1950s and even the 1960s. The techniques of estimating the output gap from business survey data are similar to those used in business cycle identification, as pioneered by Arthur Burns and Wesley Mitchell in their work for the New York-based National Bureau of Economic Research.[30]

V

The account so far demonstrates that by the early 1990s approaches for estimating the output gap were being increasingly standardized on the monetarist, natural-rate-based definition at the two international organizations which are leaders in the preparation of economic data, the IMF and the OECD. Further, attempts were being made in many countries to relate output gap estimates to business survey information. Such attempts may have started in the survey organizations themselves, but they spread quickly to financial markets.[31] Because of the sensitivity of bond prices (and at a further remove the prices of all securities) to movements in central bank interest rates, and because central banks were known to react to actual and expected deviations of output from its trend level, investment banks and other financial institutions devoted large resources to the calculation of output gaps, the comparison of output gap estimates with business survey results and the preparation of composite leading indicator series for economic activity.[32]

The next two stages in the absorption of the natural-rate-based output gap concept into the bloodstream of economics were agreement on the concept's meaning at academic conferences, and frequent mentions in government and central bank documents. On the first of these, the usual reference in academic literature to the endorsement of the output gap idea is to John Taylor's 1993 paper on 'Discretion versus policy rules in practice', published in the Carnegie-Rochester Series on Public Policy.[33] Taylor's paper proposed a central bank reaction function with the key property that nominal interest rates were adjusted proportionately more than any change in inflation. The deviation of real GDP from 'a target' was

one term in his 'quite straightforward' policy rule.[34] In the paragraphs surrounding the statement of his rule, Taylor clearly intended that 'trend GDP' was to be the 'target' notion of GDP. But he neither used the phrase 'the output gap' nor made any general statement about the relationship between departures of output from trend and either the level or the change in inflation.

However, Taylor's paper did stimulate a large body of work in which the monetarist version of the gap was vital. A conference in Florida Keys was held under the auspices of the National Bureau of Economic Research to bring together the various researchers, and its proceedings were edited by Taylor and published in a book on *Monetary Policy Rules* in 1999. (Most of the papers must have been written in 1997 or earlier, as they had been discussed by 'students in Economics 234 at Stanford University' in spring 1998.) In their paper on 'Performance of operational policy rules in an estimated semiclassical structural model', Bennett T. McCallum and Edward Nelson were concerned to ensure that their account of price level adjustment, including the concept of the output gap embedded in it, was consistent with the natural rate hypothesis. Two papers in the *Monetary Policy Rules* volume—one by Glenn Rudebusch and Lars Svensson, and the other by three economists at the Federal Reserve Board (Andrew Levin, Volker Wieland and John Williams)—appealed to the natural rate framework and used the associated concept of the output gap.[35]

The Levin, Wieland and Williams paper also concluded that, 'even in large models with hundreds of state variables, three variables (the current output gap, the current four-quarter average inflation rate, and the lagged funds rate) summarize nearly all the information relevant to setting the federal funds rate efficiently'.[36] This was provocative, not least because it implied that the American central bank did not need to rely on money supply data to make decisions on interest rates. The suggestion that policy-makers had the option to dispense with information on money supply was in itself anti-monetarist, even though Levin, Wieland and Williams endorsed an output gap concept which pivoted on the natural rate of unemployment. Shortly afterwards Richard Clarida, Jordi Galí and Mark Gertler published their classic review article on 'The science of monetary policy: a New Keynesian perspective' in the December 1999 issue of the *Journal of Economic Literature*. Its opening paragraph acknowledged that

Taylor's rule for interest-rate setting was part of the motivation for their work, while the paper later said that its aim was to develop an avowedly 'simple' macroeconomic framework. The framework set out the three equations of the New Consensus Macroeconomics, which were discussed in the first paragraph of this paper. The authors' justification for appending 'New Keynesian' to the paper's title was 'we wish to make clear that we adopt the Keynesian approach of stressing nominal price rigidities, but at the same time base our analysis on frameworks that incorporate recent methodological advances in macroeconomic modelling (hence the term "New")'.[37] By this means the Keynesian label was attached to a set of ideas in which the natural-rate-based concept of the output gap was crucial.

The use of the phrase 'New Keynesianism' to describe the now dominant approach to central bank decision-taking has become a commonplace.[38] Of course, people are free to employ words in any way they wish, as long as they explain what they are doing. However, several economists have protested that the incorporation of the natural-rate-based concept of the output gap in a self-styled 'Keynesian' policy prescription is peculiar. These protests have come in particular from post-Keynesian writers who wish to maintain a degree of consistency between 'what Keynes said' and the theories that have annexed his name as a branding exercise. According to Wendy Cornwall in *The Elgar Companion to Post-Keynesian Economics*, an 'underlying assumption' of New Keynesianism is that

> the economy is self-regulating in the... sense that it hovers around a macroeconomic equilibrium at the NAIRU (non-accelerating inflation rate of unemployment). Given this characteristic, New Keynesian models cannot be regarded as Keynesian: they are special cases of the neoclassical model.[39]

Also from a post-Keynesian perspective, Marc Lavoie has argued that the consensus three-equation model is 'monetarism without money, since it is totally consistent with Milton Friedman's view of macroeconomics'.[40] Given the rather questionable character of the 'New Keynesian' label, it has been suggested that the three-equation policy-making model should instead be given a more neutral title, such as 'the New Normative Economics' or (as in the opening paragraph of this paper) 'the New Consensus Macroeconomics'. The selection of an uncontroversial label of this kind allows an interpretation of events in which the achievement of

the benign macroeconomic outcomes of the 1990s was largely due to the replacement of Keynesian ideas by their monetarist alternatives. The validity of that interpretation is, of course, a matter of debate. But it is surely wrong to try to close down the debate by giving a misleading name to the current policy-making framework.

VI

As the natural-rate-based concept of the output gap superseded the Okun-originated gap in thinking about economic policy, views on the structure of policy-making also changed. For the proponents of the New Economics in the USA in the 1960s, and indeed for many economists around the world for at least another 20 years, macroeconomics was a highly political subject. Since they believed in the Phillips curve and a long-run trade-off between unemployment and inflation, and since they accepted that economists had no right to prescribe a particular point in that trade-off, the choice between unemployment and inflation had to be given to politicians. In the Keynesian scheme there was an obvious logic here. It made sense both to place the onus for deciding on the unemployment–inflation mix on the government, with its powers of taxing and spending, and to assert the superiority of fiscal to monetary policy. But the denial of a long-run unemployment/inflation trade-off, as implied by the accelerationist hypothesis, argued that the task of macroeconomic policy-making could be properly entrusted to technicians.

These technicians—whether they were in the finance ministry pulling the levers of fiscal policy or in the central bank setting interest rates—had of course ultimately to be accountable to democratic institutions. However, they could be granted operational independence and made subject to only occasional strategic oversight by the legislature (or the executive in some nations). In practice, most countries found that monetary policy was a more effective weapon in managing demand than fiscal policy, even though experience of money supply targeting was mixed. By the mid-1990s, the consensus among economists in most industrial nations was that macroeconomic policy could be reduced, more or less, to the setting of the short-term interest rate by the central bank, while the central bank was likely to be most efficient in its task if its operations were

cocooned from day-to-day political pressures. In short, macroeconomic policy became synonymous with monetary policy, and it was deemed to be a technical and not a political matter. Indeed, in those countries where politicians had for decades been actively involved in interest-rate setting (such as the UK, Italy and Spain), the shift in the 1990s to non-political, technical procedures under the auspices of an independent central bank was seen as a major step forward. But—if the original Phillips curve and the Okun-originated gap concept had continued to dominate macroeconomic thinking—this shift could not have occurred. The expectations-augmented Phillips curve and the natural-rate-based concept of the output gap were, and remain, logical allies of central bank independence.

This account of the development of the output gap concept leaves unresolved such major issues as the place of monetary aggregates in the conduct of policy. However, no inconsistency arises in believing both that the change in inflation over the next few quarters is a function of the output gap and that the underlying cause of inflation over periods of several years is excessive money supply growth.[41] The use of output gaps in the specification of anti-inflation policy is not, logically and necessarily, associated with the advocacy of incomes policy. By contrast, Okun and a number of American Keynesian colleagues were articulate supporters of incomes policy; they defended the implied interference with market mechanisms on the grounds that product and labour markets suffered from imperfections, rigidities and other flaws. In the 1990s and more recently, New Keynesian economists may have agreed with the American Keynesians of the 1960s and 1970s that product and labour markets had such weaknesses, but on the whole they have not expressed support for incomes policy. (Exceptions include Richard Layard, Stephen Nickell and Richard Jackman in their book on *Unemployment*. The first edition in 1991 set out the case for a tax-based incomes policy. This was retained when the book was reissued in 2005. Okun had favoured a tax-based incomes policy in the 1970s.)[42]

Box 1 summarizes the differences between the two concepts of the output gap identified in this paper and tries to position the concepts in the wider debates.

BOX 1
Two concepts of the output gap

	Keynesian concept of gap	**Monetarist concept of gap**
Concept of output relative to which the gap is measured	Full employment level of output	Level of output associated with natural rate of unemployment, or "natural rate of output"
Scale of numbers by which gap is measured	Only positive values, taking value of zero at full employment and rising with unemployment	Positive and negative values, taking value of zero at natural rate of output and positive with output above natural rate
Seminal paper(s)	Okun in 1962 American Statistical Association *Proceedings*/Paish in the 1950s, in association with Phillips, although both Paish and Phillips sceptical about "full employment" as goal	Friedman 1967 AEA presidential address, published in 1968, and Phelps 1967*, if from an otherwise Keynesian perspective. Very debatably, Paish in the 1950s in association with Phillips
View on the inflation process	Level of inflation a function of level of gap, and change in inflation a function of change in gap	Change in inflation a function of the level of the gap **
Name of associated hypothesis on wage formation	Phillips curve	Accelerationist hypothesis
View on output as a policy objective	To be maximised (implicitly at lowest previously attained unemployment rate), as any shortfall is very expensive because of Okun's Law	Output to be kept at natural rate, even if this is less than the maximum "in an engineering sense"
View on inflation as a policy objective	Old "Keynesian", i.e., to be controlled by incomes policy, and control of inflation is secondary to achieving full employment, although with many variations among "New Keynesians" and others	Meeting inflation target is paramount objective of policy and takes precedence over full employment
View on money and inflation	Monetary policy (e.g., behaviour of bank deposits) not relevant to inflation; labour market critical instead	Output gap most reliable guide to direction of inflation in short run, but relationship between money and prices holds in the long run, and short-run fluctuations in real money affect asset prices, demand and employment
Terminology	Initially "GNP gap", following Okun; now "output gap" in so-called "New Keynesian" policy framework, with Taylor rules etc., but 1993 Taylor paper did not use output gap phrase or refer to link with inflation	First use of "output gap" phrase in monetarist sense uncertain, but probably in Plosser and Schwert's comment on the Perloff and Wachter paper at the April 1978 Carnegie-Rochester conference. Later the IMF and particularly the OECD developed the concept
Implied position of macro decision-taking in the wider polity	Political, government to decide on right mix of inflation and unemployment	Technical, decision on interest rates can be delegated to committee of experts

* Edmund S. Phelps, 'Phillips curves, expectations of inflation and optimal unemployment over time', *Economica*, vol. 34 (August 1967).
** In Friedman (1967) the rate of change of real wages is a function of the divergence of unemployment from its natural rate, but in practice changes in real and nominal wages are closely correlated.

VII

In a number of widely-cited papers, Athanasios Orphanides argues that the rapid inflation of the 1970s was to be explained by unsatisfactory contemporary calculations of the output gap.[43] According to Orphanides, policymakers in the 1970s behaved in accordance with the Taylor rule prescription, but had faulty numbers on the size of the gap. He sees difficulties in estimating the output gap as being inherent in the exercise and as undermining the concept's usefulness in real-time policy-making. In another analysis, Nelson endorses Orphanides' assessment that policymaking suffered from incorrect output gap measurement, but also indicts the contemporary emphasis on cost-push factors rather than high money growth as the cause of inflation.[44] The Great Moderation of the 1990s therefore becomes attributable partly to economists' greater success in estimating the output gap, a concept taken to be unchanging over the last 40 years. Neither Orphanides nor Nelson notices the ambiguity of the output gap notion.

A quite different view of the Great Moderation is implied by the discussion in this paper. Economics has two concepts of the output gap, which—to repeat—are the Okun-originated, Keynesian concept and the Friedman-originated, monetarist concept. The Keynesian concept was formulated and refined in the 1960s, in association with active fiscal policies intended to deliver full employment. The critical step of reformulating the gap so that it turned on the natural rate of unemployment was taken in a paper given by Perloff and Wachter at the Rochester-Carnegie conference in April 1978. Gordon's comment on this paper at the 1978 conference was both pointed and correct. When Okun prepared his gap estimates in the early 1960s, economics did not have the two key notions in Friedman's 1967 presidential address to the AEA, namely the accelerationist hypothesis and the natural rate of unemployment. Despite Perloff and Wachter's insistence that they were working within the Okun tradition, their paper was a clear departure from previous approaches, including Okun's. The natural-rate-based concept of the gap has now replaced Okun's gap and provided a better guide to macro decision-taking. An underlying premise of the natural rate framework is that neither labour nor product markets are characterised by abrupt discontinuities in agents' price-setting behaviour. In this respect the framework rejects the 'asymmetry' between inflation and deflation postulated by Keynes in *The*

General Theory and the mono-directional output gap ideas associated with the Keynesian 'New Economics' of the 1960s.

As the monetarist, natural-rate-based gap notion has superseded the Keynesian concept of the gap, major shifts have occurred in other aspects of policy-making over the last 30 years. Reliance on monetary policy has increased at the expense of fiscal policy, governments have shifted the focus of policy away from full employment towards low inflation and, almost universally, central banks have been granted greater independence in the setting of interest rates. These changes were often discussed and prescribed in monetarist writings in the 1970s and 1980s. In other words, the Great Moderation is due to changes in the focus of policy and the prioritisation of instruments, as monetarist ideas have supplanted Keynesian in policy-making praxis. Better outcomes have not been due to economists' greater skill in estimating an unchanged output gap concept.

Ironically, Friedman himself did not in his 1967 address see the potential for improved policy-making that it contained and never gave explicit blessing to the natural-rate-based concept of the gap that is now standard.[45] A fair comment is that economists disagree not only about how the economy works, but also about the best labels for their favourite ideas. The evolution of the modern notion of the output gap owes much to demands from policy-makers and business clients, and to the attempts of practitioners (in supranational organizations, central banks, finance ministries and commercial organizations) to answer these demands. Like most of the key advances in economics, it has come neither from pure theory nor from unreflecting practice. Instead it has resulted from a rather messy *tâtonnement* between the two.

Notes

1. In chapter 20 of *The General Theory*, Keynes discussed the responsiveness of employment to demand and, in particular, proposed the notion of the elasticity of output with respect to the number of wage-units (i.e., employment, if wages per worker were constant). He said that 'ordinarily' the elasticity of output in this sense 'will have a value intermediate between zero and unity'. (See Donald Moggridge and Elizabeth Johnson [eds.] *The Collected Writings of John Maynard Keynes*, vol. VII, *The General Theory of Employment, Interest and Money* [London and Basingstoke: Macmillan Press, 1973, originally published 1936], p. 284.) It followed that real wages—which depended in this chapter of *The General Theory* on the marginal productivity of labour—would fall or at best remain constant as

output rose. Two labour market economists—John Dunlop and Lorie Tarshis—quickly challenged the empirical validity of Keynes's remarks, by showing that real wages did not change in a counter-cyclical fashion. (John Dunlop, 'The movement of real and money wage rates', *The Economic Journal*, 1938, and Lorie Tarshis, 'Changes in real and money wages', *The Economic Journal*, 1939.) By implying that the short-run elasticity of output with respect to employment is above one, the 'Dunlop–Tarshis observation' anticipated the work on this topic by Paish in the 1950s and Okun in the early 1960s. But Dunlop and Tarshis were concerned with the effect of cyclical fluctuations in output and prices on the real wage level, not with the effect of different levels of demand intensity (as measured by unemployment) on the rate of change of nominal wages.

2. Frank Paish, *Studies in an Inflationary Economy* (London: Macmillan, 1966), pp. 310–11.

3. Paish, *Studies*, p. 312.

4. Paish, *Studies*, p. 319.

5. Paish, *Studies*, p. 327.

6. The 'New Economics' of the early 1960s was motivated partly by a view that high demand pressure would boost the USA's trend growth rate as well as eliminate the cyclical waste of resources. According to Heller in a book published in 1966, 'Gone is the countercyclical syndrome of the 1950s. Policy now centres on gap closing and growth, on realizing and enlarging the nation's non-inflationary potential.' (Walter Heller, *New Dimensions of Political Economy* [Cambridge, Mass.: Harvard University Press, 1966], pp. vii–viii.)

7. Arthur Okun's paper, 'Potential GNP: its measurement and significance', appeared in pp. 98–103 of the American Statistical Association's 1962 *Proceedings of the Business and Economics Statistics Section* (Washington DC: American Statistical Association). It was reprinted in pp. 145–58 of Joseph A. Pechman (ed.), *Economics for Policymaking: Selected Essays of Arthur M. Okun* (Cambridge, Mass.: MIT Press, 1983). The two quoted sections in the text appeared on p. 146 and p. 147 of the Pechman volume.

8. Indeed, Okun himself noted the skimpiness of attempts to justify the 4 per cent figure (Pechman, *Economics for Policy-making*, p. 146). The point may seem trivial, but it has some importance in the development of ideas and, in particular, in casting doubt on the Perloff and Wachter's claims that their 1979 paper was in the Okun tradition. See note 20 below.

9. See pp. 426–9 of Richard Parker, *John Kenneth Galbraith: his life, his politics, his economics* (New York: Farrar, Straus and Giroux, 2005) for a discussion of how the 'New Economists' saw their work in the 1960s. Apparently, in a retrospective

appraisal of the effects of the 1964 tax cut, Okun was 'troubled' by some of his earlier conclusions and 'worried privately whether he'd accounted for the effect of monetary policy' (p. 428). Indeed, 'Having assumed an invariant 1.5 per cent inflation rate following the tax cut, Okun's model surprised him when inflation burst upward soon after' (p. 429).

10. The period under discussion in Okun's 1962 paper was from 1947 to 1962. The unemployment rate was beneath 4 per cent in 1948 and, for a period of almost two years, from January 1951 to November 1953. It recorded a trough of 2.5 per cent in mid-1953. But Okun did *not* in his 1962 paper allow these periods of very low unemployment to justify a bi-directional gap concept, with negative values of the gap for 'over-full employment'. Textbook writers did later adopt this procedure. (See, for example, p. 188 of Paul Samuelson and William D. Nordhaus, *Economics* [New York: McGrawHill, 1985], which was the 12th edition of Samuelson's celebrated textbook.) The textbook practice—which encourages the idea that Okun's GNP gap was bi-directional—is part of the explanation for widespread confusion about the gap concept.

11. Arthur Okun's paper, 'The gap between actual and potential output', on pp. 13–22 of Arthur Okun (ed.), *The Battle Against Unemployment* (New York: W. W. Norton & Co., 1965) was based on his 1962 paper in the American Statistical Association's *Proceedings*. But—as shown by the quotation here, which is from p. 22 of the paper—the 1965 version was more explicitly a charter for expansion. The Tobin quotation is from p. 154 of the book in his paper (pp. 153–9) on 'The tax-cut harvest'.

12. Moggridge and Johnson (eds.), *Collected Writings of Keynes*, vol. VII. *General Theory*, p. 303.

13. Keynes, *General Theory*, p. 291.

14. John A. Tatom, 'Economic growth and unemployment: a reappraisal of the conventional view', *Federal Reserve Bank of St. Louis Review* (St. Louis: Federal Reserve Bank of St. Louis), October 1978 issue, pp. 16–22. The phrase 'output gap' is used on p. 19. One flaw in Okun's phrase 'the GNP gap' was the reference to GNP. Gross national product—unlike gross domestic product—includes income payments to and from abroad, which plainly do *not* affect domestic supply potential. The phrase 'the output gap' is, in the author's opinion, simpler and more accurate. The phrase 'the output gap' seems to have surfaced at academic conferences in the late 1970s, when it began to replace Okun's 'GNP gap'. As far as the author is aware, the alternative phrase 'the GDP gap' has never had currency. For an isolated example, see Paul McCracken and others, *Towards Full Employment and Price Stability* (Paris: OECD, 1977), p. 41.

15. The two celebrated papers were Edmund S. Phelps, 'Phillips curves, expectations of inflation and optimal unemployment over time', *Economica*, vol. 34 (August 1967) and Milton Friedman, 'The role of monetary policy',

American Economic Review, vol. 58, no. 1 (March 1968). The Friedman article was the presidential address to the 80th annual meeting of the AEA and was given on 29th December 1967. Friedman had been developing the points in the 1967 presidential address in seminars for a year or two beforehand. In his words, the 'basic ideas' in the address were 'already present in a comment that I made at a conference on guidelines, the proceedings of which were published in a 1966 book edited by George Shultz and Robert Aliber'. (John B. Taylor, 'An interview with Milton Friedman', pp. 110–42, in Paul A. Samuelson and William A. Barnett [eds.], *Inside the Economist's Mind* [Malden, Maine, USA, and Oxford, UK: Blackwell, 2007]. The quotation is from p. 136.)

16. Robert E. Lucas Jr., 'Some international evidence on output–inflation tradeoffs', *American Economic Review*, vol. 63, no. 2 (June 1973), pp. 326–34; and 'Econometric testing of the natural rate hypothesis', pp. 50–59, in Otto Eckstein (ed.), *The Econometrics of Price Determination Conference* (Washington, D. C.: Board of Governors of the Federal Reserve System, 1972).

17. George L. Perry, 'Potential output and productivity', *Brookings Papers in Economic Activity* (Washington, D. C.: Brookings Institution, 1977), pp. 11–47. Wachter's comment appeared on p. 52 of this publication.

18. Jeffrey M. Perloff and Michael L. Wachter, 'A production function nonaccelerating inflation approach to potential output: is measured potential output too high?', pp. 115–60, in Karl Brunner and Allan Meltzer (eds.), *Three Aspects of Policy and Policymaking* (North-Holland: Amsterdam, 1979). The quotation is from p. 131.

19. Perloff and Wachter, in Brunner and Meltzer (eds.), *Three Aspects*, p. 147.

20. Robert Gordon, 'A comment on the Perloff and Wachter paper', pp. 187–94, in Brunner and Meltzer (eds.), *Three Aspects*. Most of the quotations in the paragraph are from p. 187, but Gordon mentioned the phrase 'the natural rate of output' on p. 188. To quote, 'It is by now well understood that the word "natural" means equilibrium, in the sense of an absence of pressures for an acceleration or deceleration of inflation...I will apply the short and simple phrase "natural rate of output" to the real GNP series derived from the procedures Perloff and Wachter adopt...' (p. 188). Friedman used the phrase 'natural rate of unemployment' in his 1967 presidential address, but not the phrase 'natural rate of output'.

21. Charles I. Plosser and G. W. Schwert, 'Potential GNP: its measurement and significance', pp. 179–86, in Brunner and Meltzer (eds.), *Three Aspects*. In his last book-length work, Okun accepted that his law had broken down. (Arthur Okun, *Prices and Quantities: a Macroeconomic Analysis* [Oxford: Basil Blackwell, 1981], p. 228.)

22. Perloff and Wachter did refer to one of Friedman's contributions, the address delivered in Stockholm in 1976 when he received the Nobel Prize and

republished as 'Inflation and unemployment: the new dimension of politics', pp. 87–112, in Milton Friedman, *Monetarist Economics* (London: Basil Blackwell for the Institute of Economic Affairs, 1991).

23. Charles Adams, P. R. Fenton and Flemming Larsen, 'Potential output in major industrial countries', *Staff Studies for the 'World Economic Outlook'* (Washington, D. C.: International Monetary Fund), August 1987, pp. 1–36.

24. C. Adams and D. T. Coe, 'A systems approach to estimating the natural rate of unemployment and potential output for the USA', *IMF Staff Papers* (Washington, D. C.: International Monetary Fund), June 1990. The paper had appeared in the *IMF Working Papers* series in October 1989.

25. Charles Adams, P. R. Fenton and Flemming Larsen, 'Potential output in major industrial countries', p.11.

26. Raymond Torres and John P. Martin, 'Potential output in the seven major OECD countries', no. 66, *OECD Working Papers* (Paris: Organization for Economic Co-operation and Development), May 1989.

27. See p. A74 of *OECD Economic Outlook* (Paris: Organization for Economic Co-operation and Development), June 1995, with a discussion of the data on 'Supply potential and output gaps'. The table of output gap estimates appeared on p. A14. The NAWRU in the quotation was 'the non-accelerating wages rate of unemployment' which had been referred to on p. 6 of the May 1989 *OECD Working Paper*. The NAWRU may not be precisely a synonym for 'the natural rate of unemployment', since Friedman intended that the natural rate be associated with stability of the rate of increase in *real* wages rather than in *nominal* wages, but in practice it comes to much the same thing. Torres and Martin made no reference to Friedman and his 1967 presidential address, but it did mention Okun's 1962 'seminal work'.

28. But its definition is not always adhered to. In the spring of 1996 the Treasury Panel of Independent Forecasters in the UK prepared a report on *How Fast Can the Economy Grow?: A Special Report on the Output Gap.* (It was published by the Treasury in London on 4th June 1996.) On p. 5 the report noted, 'There is no universal convention about the sign of the output gap, which itself can be a source of confusion. Here we take the output gap as positive when output is below potential, and negative when output is above potential.' In other words, they followed the approach of Perloff and Wachter in their 1979 paper rather than that of the OECD and IMF in these organizations' estimates in the late 1980s and early 1990s.

29. The idea of using business survey results to draw conclusions, on a systematic basis, about the economy's position in the cycle must have occurred to many people in the 1960s and 1970s, and it may be impossible to identify the pioneers

of the method. According to Norman Record, in the UK the CBI survey could and should have been used for crosschecking the output gap from the 1970s onwards. (Norman Record, 'Stability, growth and the output gap', pp. 10–25, *The Business Economist* [Harrow: Society of Business Economists], vol. 35, no. 3, 2004. See, in particular, pp. 18–19.) Record goes so far as to claim, although without supporting references, that 'The concept of the output gap had been put forward by Professor Frank Paish of the LSE in the 1950s, was raised again at the Confederation of British Industry in the early 1970s, and by the mid-1980s it was widely accepted and became the government's chosen indicator of cyclical movements in output' (pp. 14–15). As noted earlier in the main text of this paper, Paish did have a notion of the 'gap' in the late 1950s, but his gap was really a precursor of the Okun gap, not the natural-rate-based output gap. The author has been unable to find a reference to the natural-rate-based output gap in a British government paper before 1995.

30. Arthur Burns and Wesley C. Mitchell, *Measuring Business Cycles* (New York: National Bureau of Economic Research, 1946).

31. The author of this paper—who has spent most of his career as an analyst in the City of London—proposed in a magazine article in 1983 that Friedman's accelerationist hypothesis in a labour market characterised by excess demand (i.e., unemployment beneath the natural rate) implied a decelerationist hypothesis in a labour market suffering from excess supply (i.e., unemployment above the natural rate). (Tim Congdon ,'Following Friedman', *The Spectator*, 28 May 1983.) In a research note for his stockbroking firm (L. Messel & Co, 'The economy in the 1980s: medium-term prospects for output and inflation', May 1983) he used this idea to forecast, correctly, that in the mid-1980s *the UK economy as a whole* could enjoy above-trend growth with continued low inflation. The generalisation of the accelerationist and decelerationist hypotheses from the labour market to the entire economy was obvious. At some point in the late 1980s the author started to use the phrase 'output gap' in the discussion of a stylised four-phase business cycle, which was presented to investment clients. (The four phases are a phase one with a negative output gap and above-trend growth, a phase two with a positive output gap and above-trend growth, a phase three with a positive output gap and beneath-trend growth or falling output, and a phase four with a negative output gap and beneath-trend growth or falling output. The first phase typically sees good stock market performance and the third poor stock market performance.) Other City analysts—such as Gavyn Davies at Goldman Sachs and Paul Turnbull at Merrill Lynch—had developed similar ideas and also made estimates of the output gap. The author provided a clear definition of the output gap in the natural-rate-based context in a research paper in 1991, without at the time being aware of the Perloff and Wachter 1979 paper or indeed the work in estimating output gaps being carried out contemporaneously at the OECD. (Tim Congdon, 'Potential output and the natural rate of unemployment in the UK', *Gerrard & National Monthly Economic Review*, London, March 1991.) His March 1991 paper did refer to earlier IMF research, although—as far as he is

aware—no IMF authors have developed the output gap framework into a stylised account of the business cycle.

32. Under the leadership of Gavyn Davies (the partner responsible for international economic research), Goldman Sachs in particular devoted large resources in the 1990s to the calculation of both the output gap and leading indicator indices.

33. John B. Taylor, 'Discretion versus policy rules in practice', *Carnegie-Rochester Conference Series on Public Policy* (Amsterdam: Elsevier Science Publishers, 1993), pp. 195–214.

34. John B. Taylor, 'Discretion versus policy rules in practice', p. 202. Curiously, Taylor had used the phrase 'the output gap' in a 1979 paper, although without development ('Staggered wage setting in a macro model', pp. 108–13, *American Economic Review*, vol. 69, no. 2, May 1979). The phrase appears on p. 111. The author owes this reference to Edward Nelson of the Federal Reserve Bank of St. Louis.

35. For these papers, see John B. Taylor (ed.), *Monetary Policy Rules* (Chicago and London: University of Chicago Press, 1999). For McCallum and Nelson's adherence to the natural rate hypothesis, see their paper, Bennett T. McCallum and Edward Nelson, 'Performance of operational policy rules in an estimated semiclassical structural model', pp. 15–56, and particularly pp. 26–8. In their paper 'Policy rules for inflation targeting' on pp. 203–246, Glenn D. Rudebusch and Lars E. O. Svensson say on p. 204 that the natural rate hypothesis 'is assumed'.

36. Andrew Levin, Volker Wieland and John C. Williams, 'Robustness of simple policy rules under model uncertainty', pp. 263–99, in John B. Taylor (ed.), *Monetary Policy Rules*. The quotation is from p. 294.

37. Richard Clarida, Jordi Galí and Mark Gertler, 'The science of monetary policy: a New Keynesian perspective', pp. 1661–1707, *Journal of Economic Literature*, vol. XXXVII, December 1999. The quotation is from p. 1662.

38. For a sympathetic introduction to so-called 'New Keynesianism', see G. Zimmermann, 'Optimal monetary policy: a New Keynesian view', *The Quarterly Journal of Austrian Economics*, vol. 6, no. 4, winter 2003, pp. 61–72.

39. Wendy Cornwall, 'New Keynesian economics', pp. 275–80, in J. E. King (ed.), *The Elgar Companion to Post-Keynesian Economics* (Cheltenham, UK, and Northampton, Mass., USA: Edward Elgar, 2003). The quotation is from p. 279.

40. See Introduction, pp. 1–11, to Marc Lavoie and Matio Seccareccia (eds.), *Central Banking in the Modern World* (Cheltenham, UK, and Northampton, Mass., USA: Edward Elgar, 2004). The quotation is from p. 4.

41. A debate has developed between monetary economists from the USA and the European Central Bank about the relative usefulness of the output gap and money supply data in the conduct of an inflation targeting monetary policy. (See, for example, a box on p. 43 of the February 2005 issue of the *Monthly Bulletin* [Frankfurt: ECB] for a critique of the reliability of output gap estimates.) But this debate does not imply that the estimation of output gaps and the monitoring of money supply data are necessarily rivals in monetary policy-making.

42. Richard Layard, Stephen Nickell and Richard Jackman, *Unemployment: Macroeconomic Performance and the Labour Market* (Oxford: Oxford University Press, 2005; reissue of first edition published in 1991), pp. 489–90.

43. See, for example, Athanasios Orphanides, 'Activist stabilization policy and inflation: the Taylor rule in the 1970s', *Centre for Financial Studies Working Paper no. 2002/15* (Frankfurt am Main: Centre for Financial Studies, 2002). For the late 1970s, Orphanides mentions contemporary estimates of potential output in the 1977, 1978 and 1979 issues of the *Economic Report of the President*. From today's perspective those numbers appear much too high. But the *Economic Report of the President* estimates—prepared under the auspices of the Council of Economic Advisers on which Okun had served—was still based on his (i.e., Okun's) approach in the late 1970s. Orphanides does not cite the Perloff and Wachter paper.

44. Edward Nelson, 'The Great Inflation of the Seventies: what really happened?', *The Federal Reserve Bank of St. Louis Working Paper Series no. 2004/01* (St. Louis: Federal Reserve Bank of St. Louis, 2004).

45. Indeed, at one point the book *Monetary Trends in the United States and the United Kingdom*, co-authored by Friedman and Anna Schwartz, equates the full-employment level of output with the equilibrium level of output. With long-run equilibrium said to be 'determined by the Walrasian conditions of general equilibrium' (p. 60), in the same way as the natural rate of unemployment in Friedman's 1967 presidential address, a plausible interpretation is that Friedman regarded the full employment level of output and the natural-rate-of-unemployment level of output as the same thing. If the interpretation were valid, the tendency to associate the natural-rate-of-unemployment level of output with 'full employment' would cast doubt on the usefulness of the distinction between the two gap concepts made in this paper. But enough has already been said—particularly about the debates in the USA in the 1960s and 1970s—to show that many economists' definition of 'full employment' (with unemployment at 4 per cent of the USA workforce, according to Okun) may in practice be quite different from the natural rate (usually taken to be an unemployment rate of 5½ per cent). (Milton Friedman and Anna Schwartz, *Monetary Trends in the United States and the United Kingdom: their relation to income, price, and interest rates, 1867–1975* [Chicago and London: University of Chicago Press, 1982], pp. 61–2.)