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The art of paradigm maintenance: how the New Keynesian 'Science of Monetary Policy' tries to deal with the inflation of 2021–2023

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The macroeconomic models used by major institutions including the Federal Reserve and the International Monetary Fund (IMF) failed to predict the inflation surge during 2021–2023. The output gap, the unemployment gap, the New Keynesian Phillips curve and inflation expectations did not give timely and relevant signals. The re-emergence of inflation thus threw the 'science of monetary policy' off the rails. Faced with the choice between changing their paradigm and proving that there is no need to do so, the 'scientists of monetary policy' got busy on the proof. As a result, a number of ad hoc *epicycles have been added to the New Keynesian analytical core – with the help of which one can claim to be able to explain the sudden acceleration of inflation* post factum. *This paper critically reviews the theoretical and empirical merits of three recent tweaks to the New Keynesian core: using the vacancy ratio as the appropriate measure of real economic activity; hammering on the considerable risk of an imminent wage–price spiral; and the resurrection of the non-linear Phillips curve. The paper concludes by drawing out sobering lessons concerning the art of paradigm maintenance as practiced by the 'scientists of monetary policy'.*

Keywords: *inflation, science of monetary policy, output gap, unemployment gap, vacancy ratio, inflation expectations, wage–price spiral, non-linear Phillips curve*

JEL codes: *E0, E5, E6, E62, O23, I12, J08*

1 INTRODUCTION

The recent increase in inflation took monetary policy-makers by surprise, at least if we go by the Summary of Economic Projections (SEP) of the Federal Open Market Committee (FOMC) of the Federal Reserve (Figure 1). The FOMC did not anticipate the surge in the core personal consumption expenditure (PCE) inflation that began in 2021 and consistently projected the inflation rate to decline rapidly to its 2 per cent target rate. Instead, inflation continued to increase in the following quarters. The Federal Reserve, other central banks and most observers were wrong in believing that the inflation would be transitory in nature. Why were the members of the FOMC caught flat-footed and why did most professional forecasters have it wrong as well?

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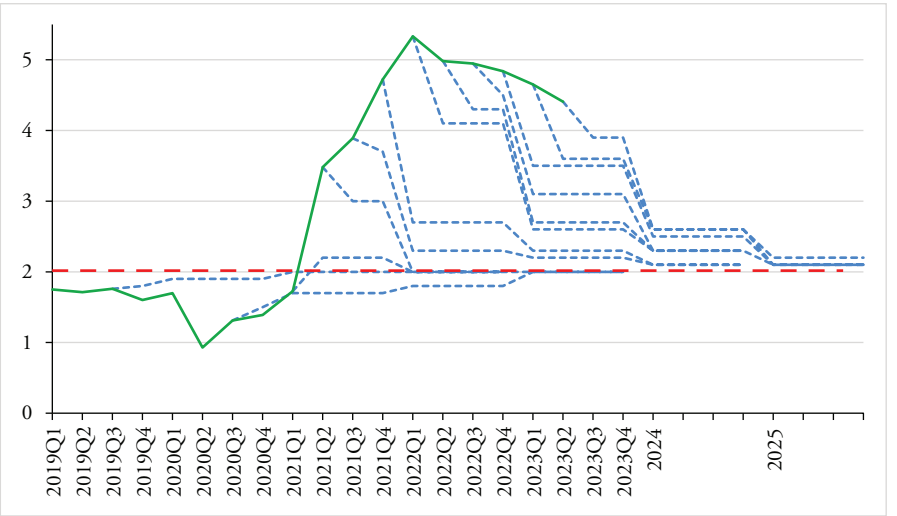


Source: FRED database (*series* PCEPILFE) and Summary of Economic Projections of the Federal Open Market Committee (FOMC) of the Federal Reserve.
Notes: Inflation is measured using the personal consumption expenditures price index (PCEPI) excluding food and energy. The dashed red line is the 2 per cent inflation target.

Figure 1 The U.S. core PCE inflation rate and the inflation forecast of the Summary of Economic Projections (SEP) (dashed lines) of the Federal Reserve up to and during the inflation surge (2019Q1–2023Q2; percentages)

The reason is that the macroeconomic models used by major institutions, including the Federal Reserve and the International Monetary Fund (IMF), failed to predict the inflation surge during 2021–2023 (Gopinath 2023). The failure to forecast the re-emergence of high inflation rates is widely attributed to the empirical inadequacy of the Phillips curve – the much-debated relationship between inflation and some measure of economic activity – which is a relationship at the core of these macro models. A key criticism holds that the conventional measures of economic activity (such as the output gap or the unemployment gap) failed to signal that the economy was overheating and labour markets were becoming extremely tight (Domash/Summers 2022a). As a result, central bankers underestimated the inflationary pressure in the economy. Another criticism holds that most estimates of the slopes of the Phillips curve are rather low across a broad range of output, which led establishment macroeconomic models to predict only a modest inflationary impact of a declining unemployment gap (Benigno/Eggertsson 2023). Finally, conventional macroeconomic wisdom holds that a persistent increase in inflation can only occur when inflation expectations become unanchored. However, standard indicators of long-run inflation expectations did not rise in 2021–2022 and, therefore, the Federal Reserve and other central banks decided to go slow, as it could reasonably be argued that the surge in inflation would be only transitory. This proved to be incorrect as well.

It is not the first time in history that macroeconomic orthodoxy failed to foresee and understand real-world developments – we still have fresh memories of what happened in 2008–2009, when it became obvious to many, including the late Queen Elizabeth II of England, that 'the state of macro' was not so good. Unfortunately, establishment

macroeconomics did not fundamentally change after this massive onslaught of adverse circumstances with which it could not contend, but rather it became more dogmatic, mesmerized with its own internal logic and interested only in paradigmatic survival. Such self-perpetuation was achieved by imposing a ruthless internal discipline that ensures conformity and protects the analytical core of economic orthodoxy from contrary evidence; by tightly managing an explicit pecking order of economics departments, journals and scholars, based on 'scientific purity'; by dismissing dissent and doubt; and by endless – and pointless – scholastic refinement, strictly within the narrow epistemological demands of accepted doctrine. Establishment economics, in other words, has mastered the art of 'paradigm maintenance' – using the felicitous term coined by Robert Wade (1996).

This paper looks at how New Keynesian practitioners of the self-proclaimed 'science of monetary policy' (Clarida et al. 1999; Eusepi/Preston 2018) have struggled to maintain their paradigm following the failure to foresee the surge in inflation during 2021–2023. The paper is structured as follows. Section 2 discusses how economic orthodoxy has dealt with the sudden surge in inflation during 2021–2023. The discussion will focus on the U.S. economy, but most of the arguments made are relevant for the eurozone and the U.K. as well. Section 3 reviews various epicycles that were added to the core New Keynesian macro model, in an attempt to protect its analytical core against inconvenient empirical facts – and to reduce cognitive dissonance by *ex post* rationalization. Section 4 concludes the paper.

Before proceeding, it must be pointed out that I am not in any way arguing that central bankers follow the guidelines proposed by the 'science of monetary policy'. Of course, they do not. Especially in times of economic turbulence, the principles of 'scientific monetary policy-making' offer little practical guide to monetary policy in the real world. The focus of this paper is, therefore, not on the practice but on the New Keynesian 'science of monetary policy' – the state-of-the-art of macroeconomic expertise that claims to inform policy-making. How useful is 'this science of the economist'? The recent surge in inflation in the U.S. provides a relevant testing ground to answer this question.

2 THE 'SCIENCE OF MONETARY POLICY' MEETS THE SURGE IN INFLATION (2021–2023)

The New Keynesian 'science of monetary policy' proposes a core set of 'scientific' principles that are needed to design and implement good, even 'optimal', monetary policy. These principles, intended to help central bankers determine whether the economy is overheating or underperforming, are held to be 'reasonably general in applicability' (Clarida et al. 1999: 1662) and strong enough to guide the real-world decision-making by central bankers (Woodford 2001, 2010). The following three basic principles form its core (Woodford 2001):

- *Principle 1: Focus on the output gap or, alternatively, on the unemployment gap*. According to New Keynesian consensus, if monetary policy is to be capable of keeping inflation at the inflation target, it has to stabilize actual output close to the level of potential output, or, alternatively, stabilize the actual unemployment rate close to the non-accelerating inflation rate of unemployment or NAIRU (Elias et al. 2014).[1]

1. Potential output and the NAIRU are not directly observable variables. Estimates of these measures of slack vary considerably and are also frequently adjusted following revisions to the estimations of the potential size of the labour force and labour productivity growth; see Fontanari et al. (2019) and Elias et al. (2014).

- *Principle 2: Follow the Taylor rule*. There is a long tradition in economics of trying to make monetary policy non-discretionary, removing the influence of the individual policy-maker (Woodford 2010). The monetary policy rule proposed by John B. Taylor (1993, 1999) fits in this tradition. As Taylor (1993: 197) writes, 'If there is anything about which modern macroeconomics is clear … —and on which there is substantial consensus—it is that policy rules have major advantages over discretion in improving economic performance'.[2]
- *Principle 3: Be forward-looking*. Monetary policy actions affect the economy with a considerable time-lag, often of four to six quarters (Fair 2021). Given that the effects of monetary policy come with long time-lags, central banks must be forward-looking and make sure that the timing of their policy changes is appropriate (Clarida et al. 1999; Elias et al. 2014).

These principles turned out to be of little practical use for monetary policy-making during 2021–2023.

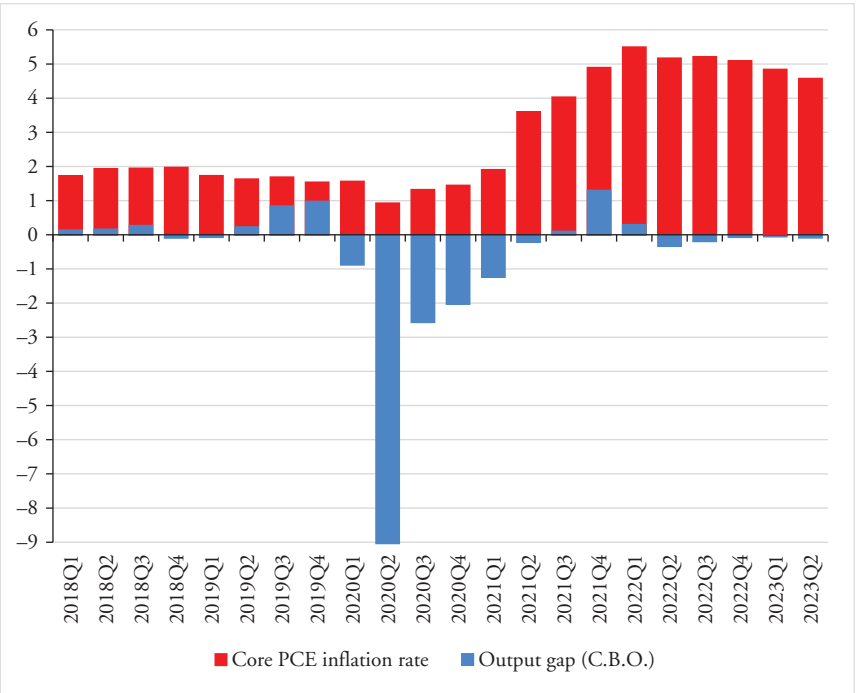
2.1 Focus on the output gap

The core inflation rate in the U.S., measured by the personal consumption expenditures price index (PCEPI) excluding food and energy, averaged 1.6 per cent per year during 2010Q1–2020Q4, fluctuating between a minimum of 0.9 per cent in 2020Q2 and a maximum of 2.1 per cent in 2018Q3. But starting in the second quarter of 2021, the core inflation rate began to increase – from 1.7 per cent in 2021Q1 to 3.5 per cent in 2021Q2 and further to 5.3 per cent in 2022Q1 – and remained elevated during 2022 and 2023 (Figure 2).

In the New Keynesian universe, accelerating inflation is normally expected to be caused by a positive output gap, which signals that the economy is overheating. However, as Figure 2 shows, the output gap in the U.S. was approximately zero throughout the period 2021Q1–2024Q1 according to official U.S. Congressional Budget Office (CBO) estimates (except briefly during the fourth quarter of 2021), even if the core inflation rate was sharply rising. This particular alarm bell did not go off, since these output gap numbers did not indicate a structural (and large) excess of aggregate demand. The close-to-zero output gap also means that it is wrong to claim that the increase in U.S. inflation was caused by rising consumption expenditure, funded by the pandemic relief spending by the Biden administration.[3]

The (initial) rise in core inflation was, of course, caused by supply disruptions, triggered by the breakdown of global supply chains due to COVID-19 and the Ukraine war (Ferguson/Storm 2023). The impact of higher energy (oil) and food prices shows up in the sharp increase in the difference between the headline PCE inflation rate and the core inflation rate between June 2021 and June 2022. Likewise, import prices rose much more strongly than the core PCE price index (Storm 2022). Finally, changes in the composition of demand – from 'in-person', 'close-contact' services to goods – played a key role in creating shortages in specific commodities, which raised their prices and elevated the core inflation rate (Ferguson/Storm 2023). New Keynesian economists also acknowledge the fact that supply disruptions and higher (imported) energy and food

2. Thirty years later, Taylor (2023) is still making exactly the same point.
3. For further evidence, see Ferguson/Storm (2023), Asdourian et al. (2022) and Parker et al. (2022).



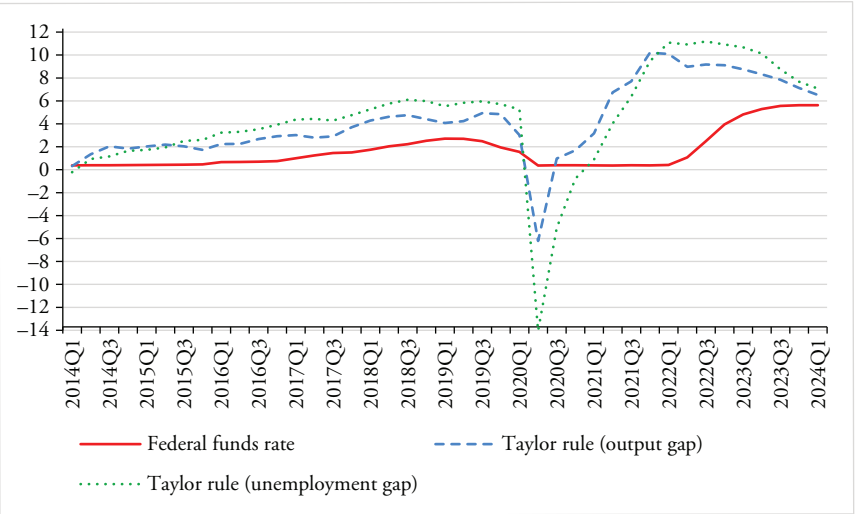
Source: FRED database (*series* PCEPILFE; GDPC1_GDPPOT; and PCEPI_PC1).
Notes: Inflation is measured using the personal consumption expenditures price index (PCEPI) excluding food and energy. The inflation rate is calculated on an annualised basis. The output gap is calculated as the difference between real and potential GDP as a percentage of potential GDP. Real potential GDP is the Congressional Budget Office's estimate of the output the economy would produce with a high rate of use of its capital and labour resources.

Figure 2 U.S. core PCE inflation and the output gap

prices were driving the acceleration of inflation, but then resort to advocating monetary tightening in order to lower demand – presumably out of fear that the inflation shock must trigger excessive nominal wage growth and un-anchor inflation expectations.

Figure 3 plots the policy rate path using the Taylor rule against the federal funds rate, the actual U.S. policy interest rate. The estimated policy rate is based on the output-gap and unemployment-gap rules proposed by Fed economists Elias et al. (2014) and Bosler et al. (2014).[4] Let us first consider the output-gap rule. In terms of movement, the estimated output-gap policy rate tracks the federal funds rate fairly closely during 2014Q1–2020Q1, when the federal funds rate was lowered to the zero lower bound (following the COVID-19 lockdowns in the second quarter of 2020). From then on, the

4. The output-gap rule proposed by Taylor (1999) has gained wide acceptance as a benchmark specification (Woodford 2010; Elias et al. 2014). Based on this rule, the nominal policy interest rate can be expressed as: policy interest rate = 1.25 + (1.5 × inflation) + output gap. It is assumed that this numerical rule is reasonably general in its applicability. If not, the first principle of the 'science of monetary policy' is already falsified.



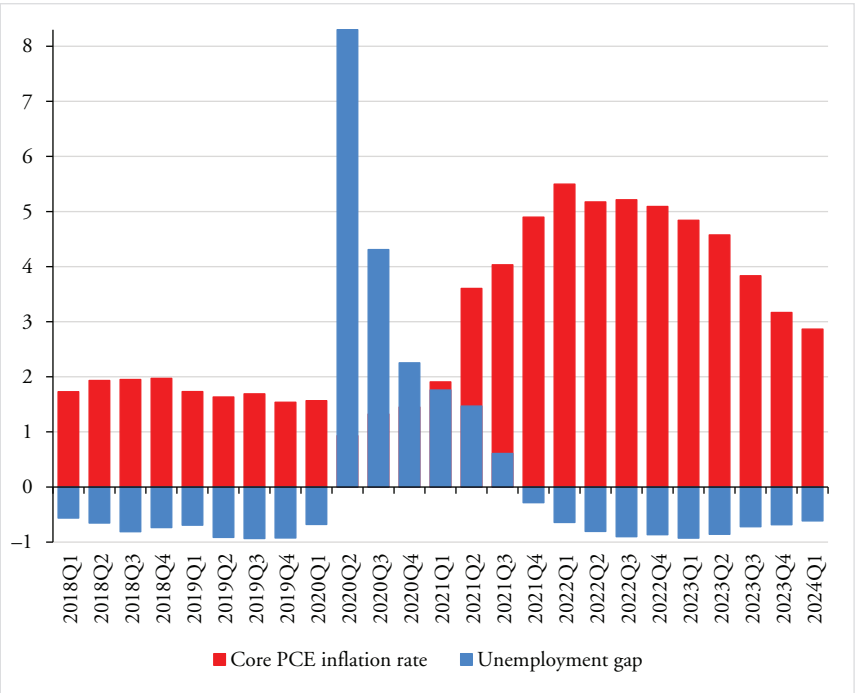
Source: FRED database (*series* FEDFUNDS).
Note: The policy interest rate has been calculated based on the Taylor rule proposed by Elias et al. (2014).

Figure 3 The federal funds rate and the policy interest rate based on the Taylor rule (2014Q1–2024Q1; percentages)

alternative policy path diverges significantly. The Fed kept the policy rate close to zero during 2020Q2–2022Q1 and then raised it steadily up to 5 per cent in 2023Q2. In the alternative scenario based on the 'science of monetary policy', the policy interest rate should have been increased to 2.9 per cent in 2021Q1, 6.4 per cent in 2021Q2 (when core inflation rose considerably; see Figure 2) and further to 9.9 per cent in the fourth quarter of 2021 and the first quarter of 2022. Frequent calls for more aggressive monetary tightening by economic experts and commentators echoed the stiff monetary tightening implied by the Taylor rule. But the Federal Reserve (wisely) decided to take a more gradualist approach than the aggressive monetary tightening recommended based on Taylor's monetary policy rule.

2.2 Focus on the unemployment gap

The evolution of the unemployment gap during 2021–2023 also did not provide a clear signal for monetary tightening. The unemployment gap was positive during 2020Q2 until 2021Q3 and negative, but relatively small (in absolute terms), in 2021Q4 (Figure 4). U.S. core inflation began its increase in the second quarter of 2021, i.e., well before the tightening of the labour market became visible in the unemployment gap. The core inflation rate peaked (at 5.3 per cent) in 2022Q1 and then declined to 4.4 per cent in 2023Q2, while the unemployment gap rose further (in absolute terms) to –0.9 per cent during 2022Q3–2023Q2. In line with this, estimates by Federal Reserve economists Jordà et al. (2022) show that the contribution of the unemployment gap to U.S. inflation during 2020–2022 was statistically negligible.



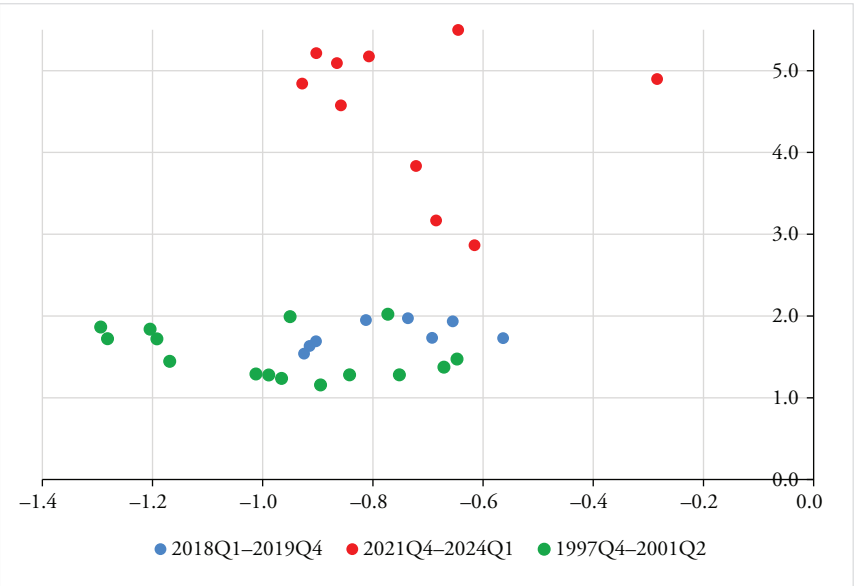
Source: FRED database (*series* UNRATE; NROU; and PCEPI_PC1).
Notes: For core inflation, see notes to Figure 2. The unemployment gap is calculated as the difference between the actual unemployment rate (U-3) and the non-cyclical rate of unemployment (NROU), estimated by the U.S. Congressional Budget Office (CBO).

Figure 4 U.S. core PCE inflation and the unemployment gap (2018Q1–2023Q2; percentages)

It is important to understand how exceptional this coincidence of moderately negative unemployment gaps and high rates of core inflation is. Figure 5 illustrates this point. It plots the quarterly unemployment rate against the quarterly core inflation rate in the U.S. during three recent historical periods: 1997Q4–2001Q2; 2018Q1–2019Q2; and 2021Q4–2024Q1. In all three periods, the unemployment gap was negative, signalling a tight labour market. It is evident that the tightness of the American labour market does not differ significantly between these three periods; if anything, the labour market was tighter during the years 1999 and 2000 than during the post-pandemic period. But the inflation rate in the recent period is exceptionally high compared to the earlier periods – and this difference cannot be attributed to the unemployment gap.

The Taylor rule can also be expressed in terms of the unemployment gap (see Elias et al. 2014).[5] Figure 3 plots the policy rate path using the Taylor rule based on the unemployment gap against the actual target for the federal funds rate. The estimated policy rate is (again)

5. Using Okun's regularity, the numerical output-gap-based Taylor rule can be rewritten as: policy interest rate = 1.25 + (1.5 × inflation) – (2 × unemployment gap). The unemployment gap is measured as the percentage point difference between the actual unemployment rate and the NAIRU.



Source: FRED database (*series* UNRATE; NROU; and PCEPI_PC1).

Figure 5 U.S. core PCE inflation rate and the unemployment gap (three historical episodes; percentages)

considerably higher than the historical federal funds rate during 2014Q1–2020Q1, but the discrepancy becomes significantly larger during 2021Q1 and 2023Q4. Monetary tightening should have proceeded earlier and much more aggressively than it actually did – and after 2022Q1, even more aggressively than the recommended policy rate based on the output gap (Figure 3). From the praxis of monetary policy-making, it is evident that the recommended policy interest rates based on the output gap and the unemployment gap are different – and they cannot both be right. The 'science of monetary policy' thus provides central bankers with mixed signals about the state of the U.S. economy, which adds further uncertainty on how to interpret the macroeconomic situation.

It is not a secret that the unemployment gap is a poor measure of labour market slack. For a start, the standard measure of the actual unemployment rate, called U-3 (by the U.S. Bureau of Labour Statistics), is narrowly defined as the percentage of the civilian non-institutionalized adult population without a job and actively searching for work. U-3 does not capture the actual labour surplus in the U.S. economy; other measures broaden the definition of unemployment by including people who are interested in working but not actively searching and who would like to work full time but can only find part-time jobs as well as discouraged workers marginally attached to the labour force (U-6). The broad unemployment rate U-6 was around 7 per cent during 2021–2023, or roughly double the narrow unemployment rate U-3.

It is not clear which measure(s) of *actual* unemployment to use to diagnose conditions in the labour market (Bosler et al. 2014). To make matters worse, estimates for the non-observable NAIRU, which are needed to calculate the unemployment gap, 'are highly uncertain' (Domash/Summers 2022a: 3), if not outright wrong (Storm/Naastepad 2012).

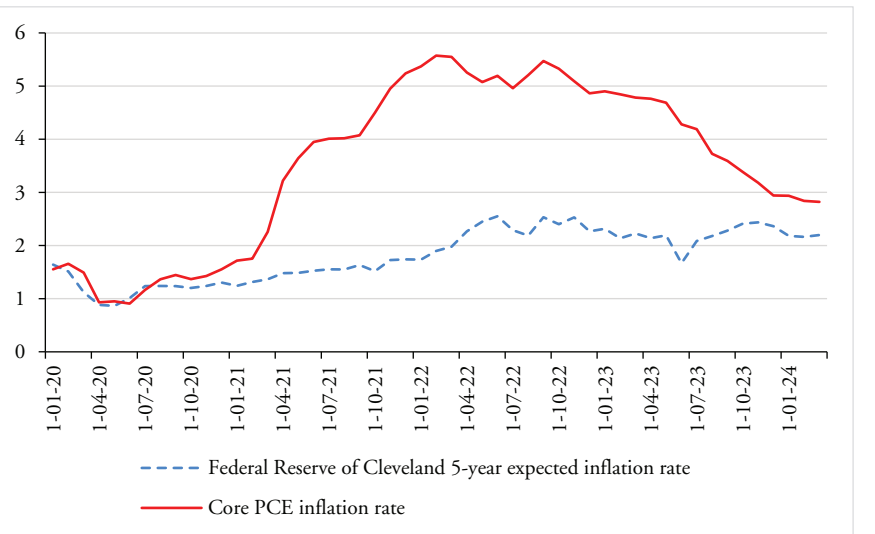
In sum, the unemployment gap is a rather flimsy concept that cannot carry the weight of monetary policy decisions – and this has become clear even to the scientists of monetary policy in recent times.

2.3 Be forward looking!

Inflation expectations feature prominently in the expectations-augmented Phillips curve that is central to the New Keynesian model. Specifically, New Keynesians assume that:

1. Current inflation is significantly influenced by expected inflation (Fair 2021; Rudd 2022a);
2. Inflation expectations are largely determined by the Federal Reserve through its monetary policy and its announced future plans (forward guidance) (Bernanke 2022); and
3. Modest increases in the federal funds rate are sufficient to lower inflation, in large part because of the strong influence of the Federal Reserve on inflation expectations (Rudd 2022a; Lansing/Nucera 2023).

During 2021–2023, there was no increase in inflation expectations, and both central bankers and market participants accordingly thought that the 2021–2022 surge was just a temporary blip. Figure 6 shows five-year inflation expectations according to the Cleveland Federal Reserve, which during 2021–2023 never did go up to more than 2.55 per cent – (inaccurate) inflation expectations provided no signal for monetary tightening. Of course, it can be argued that the commitment to control inflation and the 'forward guidance' by the Federal Reserve became so credible that the longer-run



Source: FRED database (*series* EXPINF5YR; PCEPILFE_PC1).

Figure 6 The core PCE inflation and the Cleveland's Fed five-year expected inflation rate: the U.S. economy (January 2020–March 2024; monthly; annualised percentages)

inflation expectations of the public did become firmly anchored (Rudd 2022a). That argument is not convincing, however.

The reason is that assumption (2) is inconsistent with available econometric evidence that shows that future inflation expectations depend in large part simply on actual current and lagged inflation (Fair 2021, 2022; Rudd 2022a). This macro-statistical evidence is consistent with (micro-level) survey evidence showing that the strongest predictor of households' and firms' inflation forecasts are what they believe inflation has been in the recent past – which are not always accurate beliefs (Weber et al. 2022; Candia et al. 2022). In fact, there is little evidence that firms know much about monetary policy targets, which means assumption (3) is also wrong (Candia et al. 2022). Fair (2021: 119) writes, 'It seems clear that firms' inflation expectations are not rational, nor even very sophisticated'. Rudd (2022a) concludes that the direct evidence for an 'expected-inflation channel' is not just weak, but *very* weak.

On top of all this, economic actors in the real world do not hold similar, or even comparable, inflation expectations. Survey evidence shows that households, firms, economic experts and professional forecasters disagree considerably in their views on expected inflation (Weber et al. 2022). Especially firms' inflation expectations deviate significantly from those of professional forecasters and households (Candia et al. 2022). Ahn/Fulton (2020) find that different (published) measures of expected inflation do not align, but provide mixed signals. Pairwise correlation coefficients between different public measures of expected one-year-ahead inflation are found to be worryingly low. These findings imply that it is not clear what is meant by 'expected inflation' when it is being argued that 'current inflation is significantly influenced by expected inflation'.

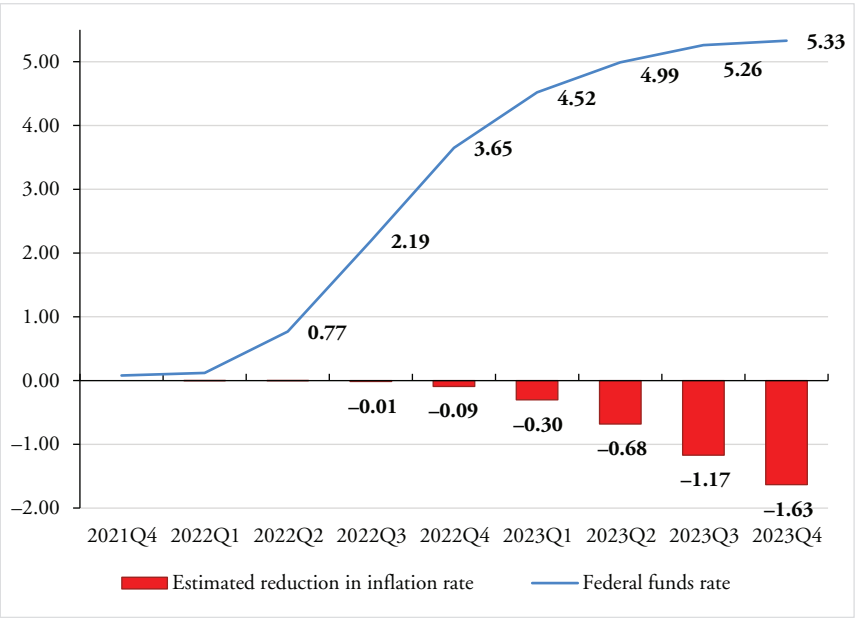
Assumption (1) is wrong for yet another reason. Higher expected inflation can only increase current inflation if firms and workers have the means to increase prices and nominal wages in anticipation of higher prices in the future. While businesses may have the market power to elevate prices (and profit margins; see Storm 2023), it is unrealistic to assume that American workers possess the bargaining power to bring about an increase in their nominal wages in anticipation of higher prices in future (Stansbury/Summers 2020; Storm 2021; Ferguson/Storm 2023).[6]

In sum, the empirical facts do not support the dynamics of the expectations-augmented Phillips curve. Or, to put it differently, actual inflation expectations of households and businesses tend to depend only on past inflation – and are, generally, not forward-looking. Forward guidance only works in New Keynesian DSGE models, but not in reality. 'Announcements about targets, future policy moves, and the like, have little if any effect on expectations' (Fair 2022: 57). This has major implications for the effectiveness of monetary policy, as Fair (2021: 127–128) points out:

> If inflation expectations depend only on past inflation, the only way the Fed can change expectations over time is by changing actual inflation. Actual inflation is changed by changing the unemployment rate (or the output gap). …. The only tool the Fed has to lower inflation according to the model is to increase the unemployment rate by raising interest rates. This effect is modest and takes time.

To get a sense of how effective monetary tightening by the Federal Reserve has been in lowering U.S. inflation, I calculated the predicted decrease in the core PCE inflation rate, using Fair's (2022) quarterly forecasts of an increase in the policy interest rate by

6. See Section 3.2 below.



Sources: Calculated based on FRED database (*series* FEDFUNDS) and Fair (2022: table 3).

Figure 7 Estimated impact of monetary tightening on the PCE inflation rate: the U.S. economy (2021Q4–2023Q4; percentages)

1 percentage point for the period 2022Q1–2023Q4.[7,8] The cumulative impact of monetary tightening on the U.S. inflation rate appears in Figure 7. The steady rise in the policy interest rate – from 0.1 per cent in 2022Q1 to 5 per cent in 2023Q2 – is found to have cumulatively lowered the core PCE inflation rate by 0.68 percentage points in the second quarter of 2023. This means that the core PCE inflation in 2023Q2 would have been 5.1 per cent without the monetary tightening by the Federal Reserve – instead of 4.4 per cent (which is the actual PCE inflation rate during 2023Q2). The drastic monetary tightening by the Fed thus managed to lower U.S. inflation by just *circa* 13 per cent.

3 ADDING EPICYCLES – OR THREE WAYS TO BLAME WORKERS FOR THE INFLATION THEY DID NOT CAUSE …

It is evident that the core principles of the 'science of monetary policy' turned out to be of little practical use for monetary policy-making during 2021–2023. In response to this

7. Fair's econometric model is the culmination of more than five decades of modelling work on the U.S. economy, based on the Cowles Commission's simultaneous equations framework. Fair (2022) measures the U.S. inflation rate based on the price deflator of the U.S. business sector. It is assumed here that Fair's estimates can be applied to the PCE inflation rate, targeted by the Fed.
8. There are other estimates of the impact of higher interest rate on U.S. inflation, including the Fed's own FRB/US model (see: https://www.federalreserve.gov/econres/notes/feds-notes/overview-of-the-changes-to-the-frb-us-model-2018-accessible-20181207.htm#fig2), but these suggest even smaller impacts of monetary tightening.

failure, what happened is that, paraphrasing John Kenneth Galbraith (1973), faced with the choice between changing one's mind – and economic paradigm – and proving that there is no need to do so, the New Keynesians got busy on constructing evidence, and novel 'stories', confirming their prior belief, namely that the surge in inflation must have been due to a sudden tightening of U.S. labour markets, leading to higher wages and threatening a re-emergence of a wage–price spiral, reminiscent of that of the 1970s. Core analytical concepts were thrown overboard – in favour of alternative, more convenient, indicators. Section 3.1 looks into the *vacancy ratio*, the proverbial rabbit that was pulled out of the New Keynesian hat as the best unambiguous indicator of the recent labour market tightness in the U.S. Section 3.2 deals with a second epicycle that was built around the analytical core of the New Keynesian approach with the intention to prove that a new U.S. wage–price spiral is just around the corner. Section 3.3 considers a third epicycle that is added to rescue economic orthodoxy: the discovery that the Phillips curve has suddenly become non-linear (Benigno/Eggertsson 2023; Hobijn et al. 2023; Crust et al. 2023).

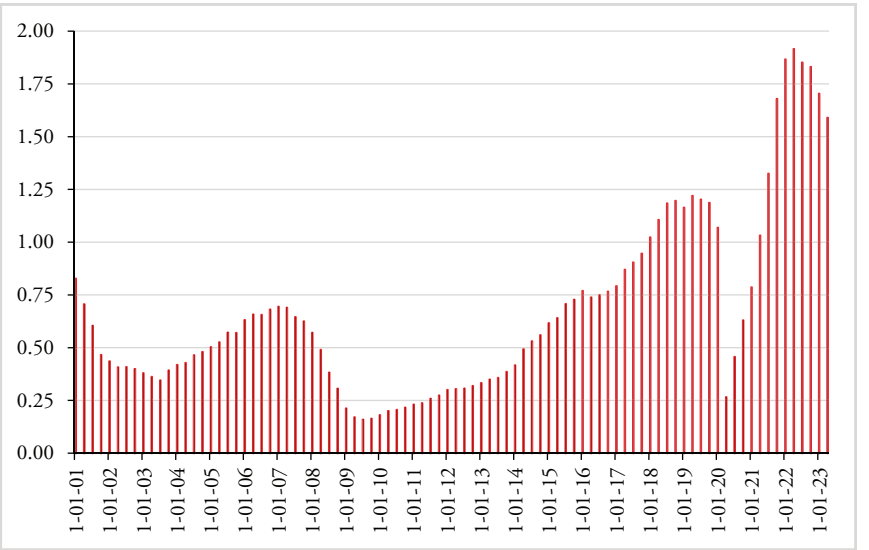
3.1 Goodbye unemployment gap, hello vacancy ratio

The COVID-19 crisis led to an unprecedented shake-up of the U.S. labour market (Ferguson/Storm 2023). Widespread job losses in 2020 gave way to tighter labour markets starting in 2021, as is indicated by the vacancy ratio in Figure 8. During 2001Q1–2019Q4, there were on average 0.57 job openings per officially unemployed American worker actively seeking for a job. However, the vacancy ratio began to rise in the first quarter of 2021 and peaked at a value of 1.9 vacancies per unemployed person in the second quarter of 2022.

On the face of it, this evidence does seem to suggest a very tight labour market. The exceptionally high vacancy ratio constituted a much better match with the prior beliefs of the New Keynesians than the unemployment gap, which did not change so strongly. Appealing to the vacancy ratio as a measure of labour market tightness also has some intellectual pedigree – after all, the Diamond–Mortenson–Pissarides model of job search in labour markets with frictions was awarded the Nobel Prize in economics in 2010. Thus, Barnichon et al. (2021), Domash/Summers (2022a, 2022b), Benigno/Eggertsson (2023) and many others argue that the vacancy ratio is the best measure of economic slack with a strong track record on correctly forecasting wage and price inflation. Accordingly, the output and the unemployment gap were discarded in favour of the vacancy ratio.

Before proceeding, a quick reality check is in order, however. Barnichon et al. (2021) econometrically estimated the association between the vacancy ratio and the (core) PCE inflation rate using quarterly data for 1960–2021. They find that an increase in the vacancy ratio by 0.6 jobs per unemployed worker increases the (core) PCE inflation rate by 0.3 percentage points.[9] If we use this estimate, and given that the vacancy ratio rose by around 1.2 jobs per unemployed worker, it follows that the 'extremely tight' labour market raised the (core) PCE inflation rate by only 0.6 percentage points – or around one-sixth of the actual increase in the (core) PCE inflation during 2021Q1–2022Q1 (Figure 2), leaving five-sixths of the inflationary surge unexplained. In other words, even when we uncritically accept the claim that the vacancy ratio is a sound

9. Econometric findings by Storm (2022) and Domash/Summers (2022a) are similar to those of Barnichon et al. (2021).



Source: Calculated based on FRED database (*series* UNEMPLOY and LMJVTTUVUSM647S). The vacancy ratio is defined as the number of vacancies per unemployed worker. The unemployment measure used is U-3.

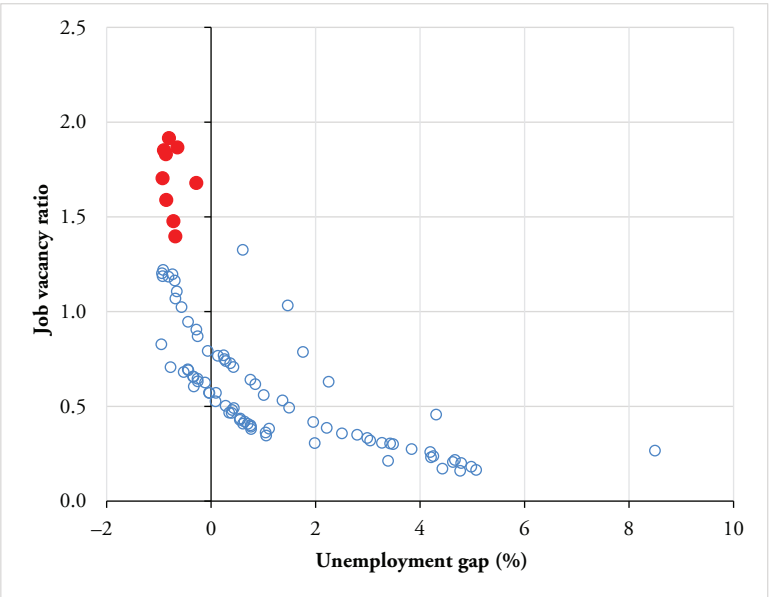
Figure 8 The job vacancy ratio: the U.S. economy (2001Q1–2023Q4)

indicator of labour market strength, the empirical evidence suggests that the vacancy ratio to wage–price channel is of only limited importance.

However, the vacancy ratio is not a sound indicator of labour market strength. To see why this is so, Figure 9 presents a scatterplot of the vacancy ratio (on the vertical axis) against the unemployment gap (on the horizontal axis), using data for the years 2001Q1–2023Q2. It is clear that there exists a strong negative (statistically significant) correlation between the unemployment gap and the vacancy ratio.[10] Both indicators are giving similar signals on the labour market: a negative unemployment gap goes together with a higher vacancy ratio (and vice versa). But it is also clear that the vacancy ratio began to rise sharply after 2021Q1, while the unemployment gap remained positive, turning negative only in the fourth quarter of 2021. Note that the long-run mean value of the vacancy ratio during 2001Q1–2021Q2 is 0.57 with a standard deviation of 0.29. If we assume a normal distribution, then the 95 per cent confidence interval for the mean vacancy ratio is $< 0; 1.14 >$ and the 99.7 per cent confidence interval would be $< 0; 1.43 >$. The very high values of the vacancy ratio recorded during 2021Q4–2023Q2 lie outside the 99.7 per cent confidence interval and must be considered outliers.

This is illustrated in Figure 9, where the nine outlier observations are indicated by black dots. The fact that the vacancy ratio 'behaves' out of sync with the unemployment gap during 2021Q4–2023Q4 and is also far outside its historical boundaries, should have set off alarm bells: why is the vacancy ratio changing in this way?

10. Using observations for 2001Q1–2020Q1, the correlation coefficient between the two indicators is $r = -0.81$ (t-value = −13.0; $n = 77$).

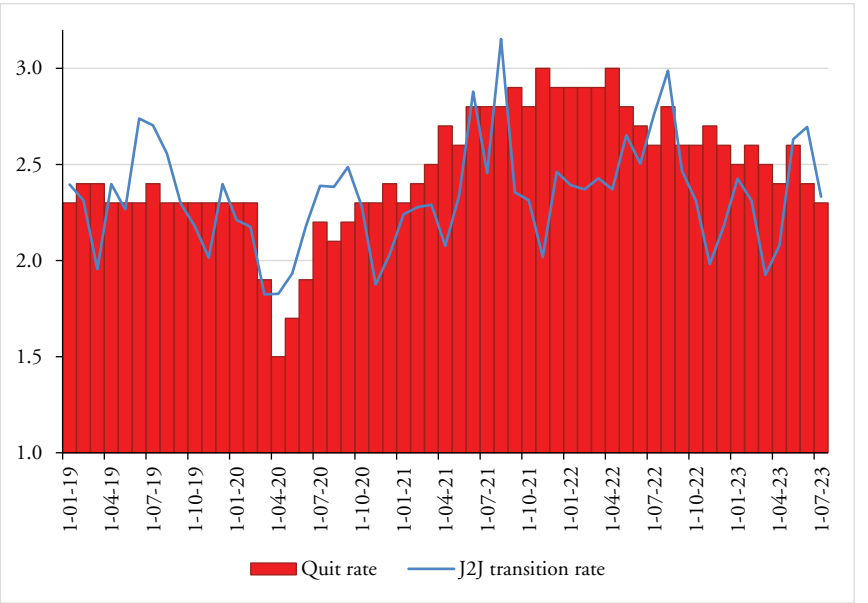


Source: Calculated based on FRED database (*series* UNEMPLOY; LMJVTTUVUSM647S; UNRATE; NROU). The black dots indicate the observations for the most recent quarters 2021Q4 – 2023Q4, during which the PCE inflation rate increased sharply. The unemployment gap is measured as the percentage point difference between the actual unemployment rate and the NAIRU.

Figure 9 The unemployment gap versus the job vacancy ratio: the U.S. economy (2001Q1–2023Q4)

The point is that the U.S. vacancy ratio rose (so strongly), not because the economy was overheating (after all, the unemployment gap remains negative) or because the labour market was extremely tight. The vacancy ratio rose because of the massive occupational restructuring that resulted from the COVID-19 crisis, the lockdowns, the shutdown of the leisure and hospitality industry, the drastic changes in health risks associated with particular (in-person, close-contact) occupations, and the growth of the tech industries, warehousing and online services and delivery (Ferguson/Storm 2023). In other words, the U.S. economy went through a post-pandemic surge in quits and job transitions (Birinci/Amburgey 2022) that is visible in the rise in the total non-farm quit rate, appearing in Figure 10.

The aggregate quit rate rose from *circa* 2.3 per cent of employed workers before 2020 to around 3 per cent during 2021Q4–2022Q2 and the quit rate remained elevated until June 2023. The *number* of American workers quitting their job rose from around 3.1 million per quarter during 2014Q1–2020Q1 to 4.1 million per quarter during 2021Q1–2023Q2. Many explanations have been offered for this phenomenon, termed the 'Great Resignation', such as workers re-evaluating their jobs in the face of new (hitherto non-explicit) health risks, a wave of early retirements (also triggered because of COVID-19), a lack of (affordable) child care and workers changing jobs in a rapidly restructuring economy, i.e., the rise of online work and the expansion of delivery jobs (Ferguson/Storm 2023). The 'Great Resignation' is in actual fact a 'Great Occupational Restructuring' (Birinci/Amburgey 2022).



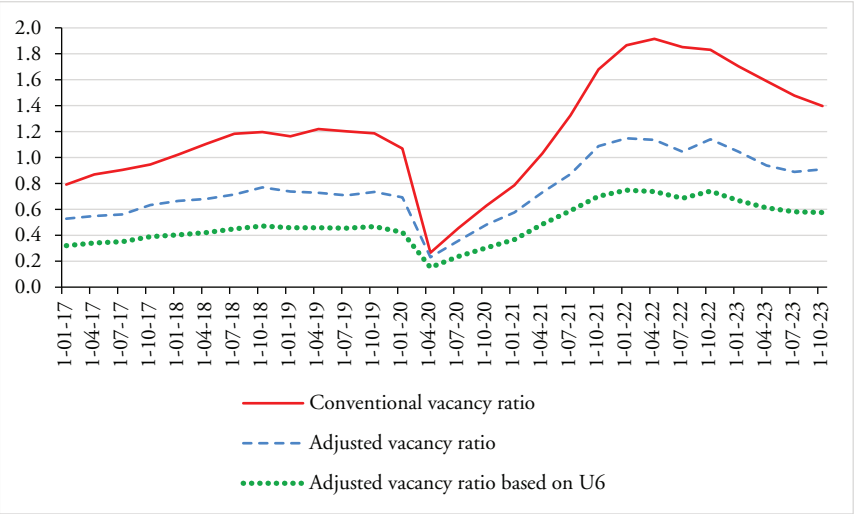
Source: FRED database (*series* JTSQUR) and monthly J2J data from Fujita et al. (2024).

Figure 10 Total non-farm quit rate and job-to-job (J2J) transition rate: the U.S. economy (2019Q1–2023Q3; percentages)

Importantly, most workers were quitting their jobs to move to new – better and less hazardous – jobs. This is illustrated by the increase in the job-to-job (J2J) transition rate in Figure 10. For most of the period 2021–2023, the quit rate was close to the J2J transition rate, which indicates that most employees quitting their jobs were switching to other jobs. The elevated quit rate and the higher J2J transition rates did, of course, raise the vacancy ratio[11] – which therefore does not signal a tight labour market, but rather a dynamic restructuring of the economy's occupational structure, triggered by the shake-up of the U.S. economy following the COVID-19 public health crisis. As a result, the vacancy ratio – the number of vacancies per unemployed worker or V/U – cannot be interpreted as an unambiguous indicator of the tightness of the labour market. In particular, many workers do not become unemployed before finding a new job, but, instead, they make job-to-job transitions. Crucially, to the extent that employed workers are competing for the available set of job vacancies, the labour market may be considerably less tight than what is implied by the V/U ratio.

Following the example of Fed economists Andolfatto/Birinci (2022), I therefore plot an adjusted measure of labour market tightness, $V/(U\text{-}3 + E \times J2J)$ in Figure 11. This adjusted measure includes a different calculation for the number of 'available workers',

11. Recent U.S. Census (2024) data show that even if some workers exited the labour market entirely, others quit and eventually rejoined the labour force and others changed employers (often across industries) with little or no break in employment. Accordingly, the Great Reshuffling led to rising vacancy rates.



Source: FRED database (*series* UNEMPLOY; LMJVTTUVUSM647S) and monthly *J2J* data from Fujita et al. (2024). See also Andolfatto/Berinci (2022).

Figure 11 Measuring labour market tightness in the U.S. economy (2017Q1–2023Q4; job vacancies per unemployed worker)

$U\text{-}3 + E \times J2J$, in which E measures the number of employed workers and *J2J* measures the job-to-job transition rate in a given month; the monthly transition rates are taken from Fujita et al. (2024). As is shown in Figure 11, the *adjusted* vacancy ratio is considerably lower than the conventional vacancy ratio, although it is still elevated compared with its historical average. However, what is remarkable about this adjustment is the fact that the gap between the conventional vacancy ratio and the adjusted one noticeably increases during 2020Q3 and 2022Q3. This shows that *J2J* movements became more frequent following the recovery of the labour market from the COVID-19 recession – and by counting these movements in the numerator, but not the denominator, of the U/V ratio, the conventional vacancy ratio is found to exaggerate the degree of tightness of the U.S. labour market.

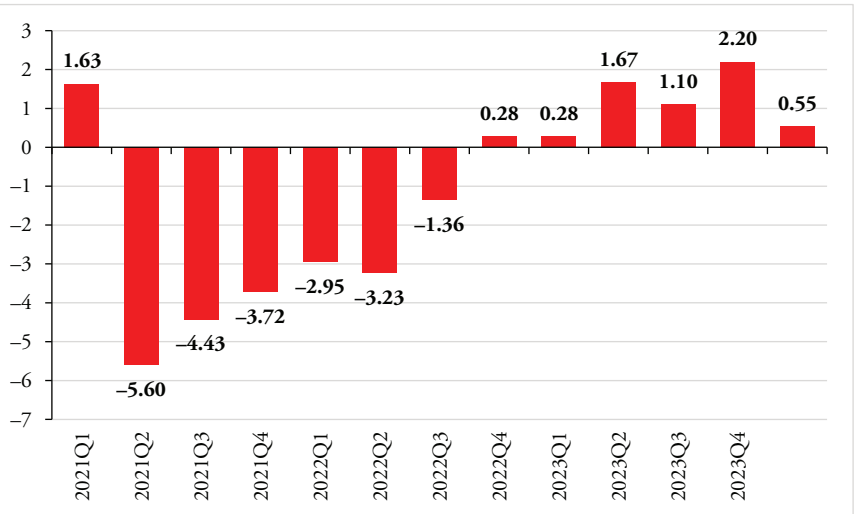
However, even this adjusted vacancy ratio still exaggerates the 'tightness' of the U.S. labour market, because it counts, in its denominator, only those unemployed workers who have been actively looking for work and excludes all discouraged workers. However, as usual, as the economy recovers, large numbers of discouraged workers have re-entered the labour force – in fact, the number of discouraged workers declined from 17.6 million in the first quarter of 2021 to 10.5 million in the fourth quarter of 2022, a drop of more than 7 million people. Therefore, I plot a second alternative vacancy ratio which was calculated using the broad definition of unemployment ($U\text{-}6$, which includes discouraged workers) as well as the *J2J* transitions in each month. As Figure 11 shows, the adjusted vacancy ratio based on $U\text{-}6$ is considerably lower than the conventional vacancy ratio and diverges from the conventional measure during 2021–2023. Both adjusted measures suggest that the U.S. labour market is not as tight as the conventional measure indicates.

However, both adjusted measures of the vacancy ratio in Figure 11 do show some tightening and, hence, could still be associated with higher nominal wage growth. This is

especially likely because many job switchers were moving to better paying jobs. Wage growth tracker data published by the Federal Reserve of Atlanta show that the job-switcher 'wage growth premium' – the difference in median nominal wage growth between job switchers and job stayers – increased during 2021–2022. But thereafter, this premium has declined again, which indicates a gradual post-pandemic normalisation of the U.S. labour market during 2023.

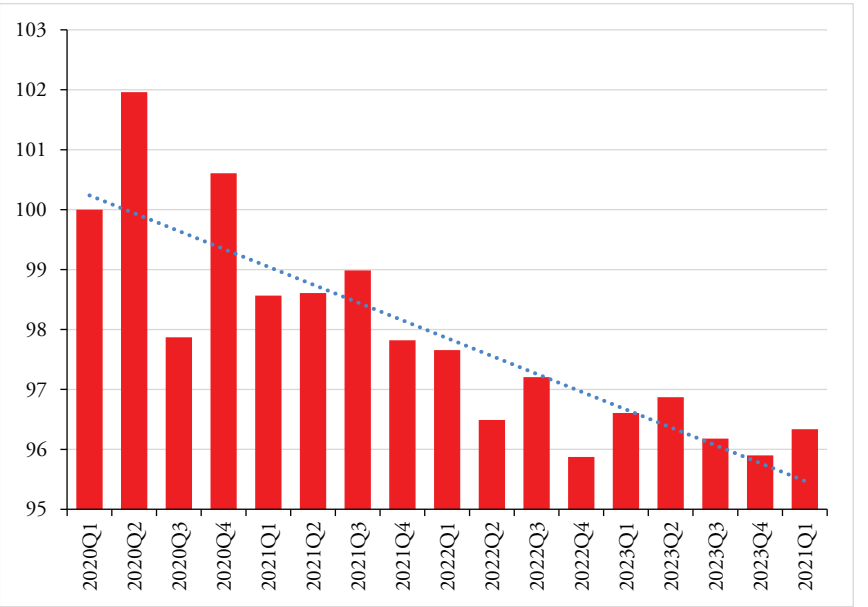
However, despite the fact that job switchers managed to move from jobs with lower nominal wage growth to jobs with higher nominal wage growth, U.S. workers were – on average – unable to protect their real wages as the inflation rate began to increase. Nominal wages have not kept up with the increase in the (CPI) inflation rate, as is shown in Figure 12. Right when the U.S. inflation rate begins to increase, i.e., in the second quarter of 2021, (annualized) real wage growth turns negative – and real wage growth remains negative for the next five quarters. Nominal wage growth only catches up with the inflation rate in the fourth quarter of 2022, but – as can be seen – real wage growth remained low during 2022Q4–2024Q1. In cumulative terms, median weekly real earnings in 2024Q1 are 2.1 per cent lower than in 2021Q1.

In addition, the labour income share of all workers in U.S. GDP has steadily declined during the 48-month period of 2020Q1 and 2024Q1 (Figure 13). Recent household data published by the U.S. Census Bureau (2023) show that real median household income was 2.3 per cent lower in 2022 than in 2021. There is simply no evidence that the acceleration of inflation during 2021–2022 has been caused by a wage–price spiral. Declining real wages and a falling labour income share are not exactly signals of an 'extremely tight' labour market – and appear to be inconsistent with the very high conventional vacancy ratio.



Sources: Calculated based on FRED database (*series* LES1252881600Q_PC1). Real earnings have been calculated using the CPI.

Figure 12 Growth rate of median usual weekly real earnings of (fully-employed) wage and salary workers in the U.S. (2021Q1–2024Q1; percentages)



Sources: Calculated based on FRED database (*series* PRS85006173).

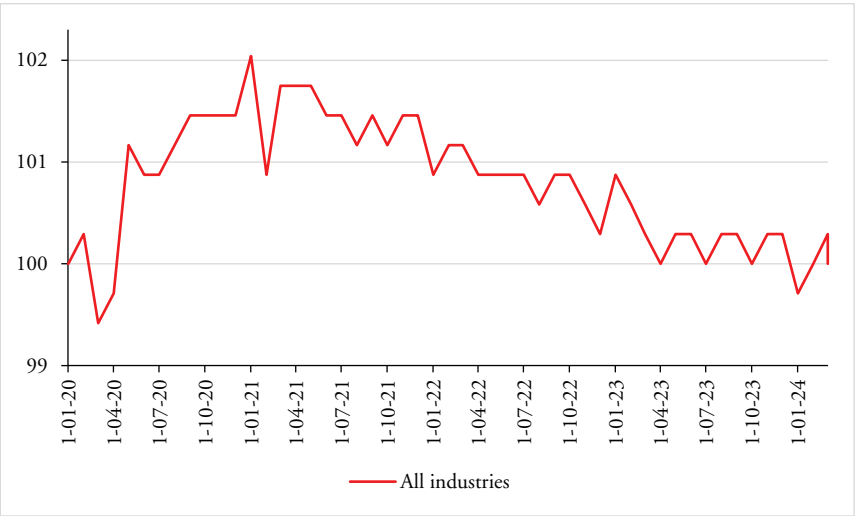
Figure 13 Non-farm business sector: labour share for all workers (2021Q1–2024Q1; quarterly index 2020Q1 = 100; seasonally adjusted)

Other indicators of labour market strength also suggest that the American labour market is not so tight. Consider Figure 14, which presents data on the stagnating average number of hours worked per week by American employees. In fact, the average number of hours worked fell during 2022 and 2023, compared to 2021 – which is strange when there is supposed to be an excess demand for labour. As Martin Sandbu (2023) writes in *The Financial Times*:

> Why, at a time of supposedly excessive demand for labour, are people working fewer hours than they used to? Or from the point of view of companies, why are they not "sweating the intensive margin" – jargon for making existing employees work longer hours? And why have average hours been falling just when employers are being forced to raise wages – so we are told as an explanation of inflation – to get enough workers to meet the demand they face?

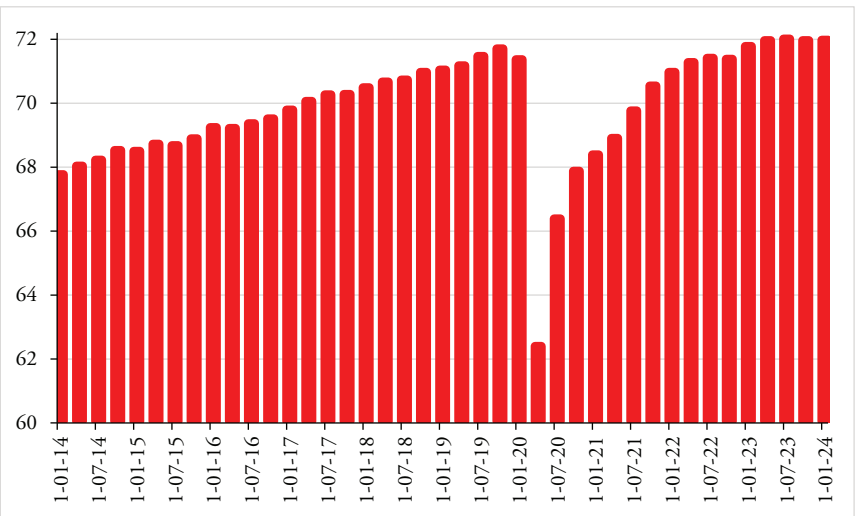
A final obvious measure of labour market strength is the employment rate (of all persons aged 15–64 years). In the U.S., the employment rate has languished below or at pre-pandemic levels (Figure 15), which – again – suggests that the labour market is not 'tight'.

It is reasonable to conclude that the signal given by the sharp rise in the conventional vacancy ratio (V/U) in Figure 8, which was found to be out of sync with unemployment gap, is caused by the drastic occupational and sectoral restructuring that occurred during the COVID-19 crisis, and does *not* reflect a general tightness of the U.S. labour market. Uncritical use of the vacancy ratio as an indicator of the *aggregate* tightness of the labour market is bad scientific practice. It amounts to cherry-picking an indicator that is 'biased' to showing an exaggerated tightness of the labour market, setting monetary policy-makers up to deliver significantly more monetary tightening than can be justified on the basis of alternative and arguably more reliable indicators (Mui 2022).



Sources: Calculated based on FRED database (*series* AWHAETP).

Figure 14 Average weekly hours of all employees, total private (January 2021–August 2023; monthly index January 2020 = 100; seasonally adjusted)



Sources: FRED database (*series* LREM64TTUSM156S).

Figure 15 U.S. employment rate: aged 15–64: all persons (2020Q1–2024Q1; percent; seasonally adjusted)

3.2 Maslow's hammer: the looming wage–price spiral

The unexpected re-emergence in inflation during 2021–2022 led to flashbacks about the trauma of stagflation of the 1970s. These traumatic memories re-energised the pre-existing cognitive bias concerning the danger that accelerating inflation would un-anchor inflation expectations and lead to an unstoppable wage–price spiral. These fears, expressed by the Federal Reserve and many economists, were fuelled by (econometric) analyses warning that the high vacancy and quit rates experienced by the U.S. economy would make for '*extremely* rapid growth in nominal wages' (Domash/Summers 2022a: 32, emphasis added) and that 'nominal wage growth … is projected to increase *dramatically* over the next two years, surpassing 6% wage inflation by 2023 …' (Domash/Summers 2022a: 21, emphasis added). A re-emergence of the wage–price spiral would become likely, if and when the public's inflation expectations would become unanchored. Fed economists Jordà et al. (2022) warned that inflation expectations had an average pass-through to wage inflation of 100 per cent in the recent period 2020Q2–2022Q1 – compared to a much lower average pass-through of only 12 per cent during 2007Q–2019Q4. For the New Keynesians, the risk of a revived U.S. wage–price spiral became terrifyingly real.

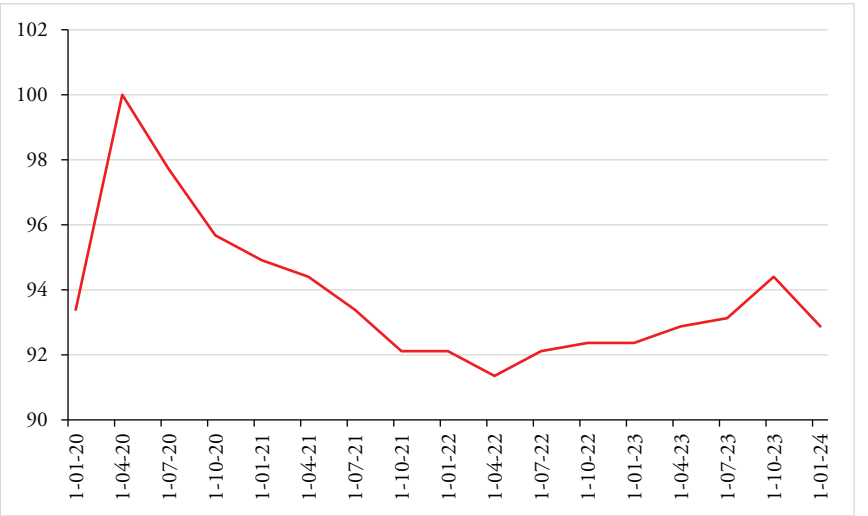
These fears appear not well founded, however. The argument put forward by Domash/Summers (2022a, 2022b) and Jordà et al. (2022) incorrectly assumes that U.S. workers somehow have sufficient bargaining power to effect higher and higher nominal wage increases. But structural evidence provided by Stansbury/Summers (2020) shows that this presupposition is empirically incorrect.[12] U.S. workers are relatively powerless and incapable of protecting their real wages in this inflationary era (Storm 2017; Ferguson/Storm 2023). This is underscored by the econometric evidence on the relationship between the PCE inflation rate and nominal wage growth in the U.S. during January 1965–August 2023 presented in Table 1. During this period (and during the two sub-periods), nominal wage growth did *not* Granger-cause inflation, but the PCE inflation rate did affect nominal wage growth in a Granger-causal sense. This implies that wage growth is not informative for predicting price inflation, but price inflation does help predict wage growth; similar evidence for the U.S. has been found by Palley (1999) and Hu/Toussaint-Comeau (2010).

Table 1 Linear Granger causality tests of inflation and nominal wage growth (monthly data; January 1965–August 2023)

			Nominal wage growth Granger-causes The PCE inflation rate		PCE inflation rate Granger-causes nominal wage growth	
Period	*n*	Lags	*p*-value	Decision	*p*-value	Decision
January 1965–August 2023	692	13	0.40	No GC	0.01	Yes GC
January 1965–December 2001	444	14	0,19	No GC	0.00	Yes GC
January 2002–August 2023	248	6	0.56	No GC	0.04	Yes GC

Notes: (1) If Augmented Dickey–Fuller unit root tests report non-stationarity, then the first difference values are used; (2) The Akaike Information Criterion is used to choose the proper number of lags for the GC test; (3) GC = Granger causality and n = the number of observations.

12. Stansbury/Summers (2020) identify three causes for the structural decline in worker power in the U.S.: the decline of unions and union power; rising shareholder power and the fissuring of the workplace; and increased competition for labour from technology and from low-wage countries.



Sources: Calculated based on FRED database (*series* LES1252881600Q_PC1). Real earnings have been calculated using the CPI.

Figure 16 Cumulative decline in median usual weekly real earnings of (fully-employed) wage and salary workers in the U.S. (2020Q2–2024Q1; index 2020Q2 = 100)

With nominal wages lagging behind price inflation, average real earnings in the U.S. fell off a cliff, declining in cumulative terms by around 9 per cent during 2020Q2 and 2022Q2, and have not yet bounced back – as is shown in Figure 16. The surge in the inflation rate has been very costly to workers. It is therefore not surprising that the rate of inflation *expected* by American households increased. It also not a mystery that nominal wages have increased (with a lag) in response to the rise in the inflation rate. Rudd (2022a: 12) explains the U.S. reality well:

> Outside of a few unionized industries (which now account for only about 6 percent of employment), a formal wage bargain – in the sense of a structured negotiation over pay rates for the coming year – doesn't really exist anymore in the United States. In a world where most employment is "at will," changes in the cost of living will enter nominal wages as part of an employer's attempt to retain workers: If employers pay their workers a wage that falls too far behind the cost of living, they will start to see more quits, which will in turn force them to raise the wages they pay to existing workers (and those they offer to new hires). But there is no real scope for direct negotiation.

Hence, the only way by which higher inflation expectations can and do lead to higher average nominal growth is through workers voting with their feet, quitting their current jobs and moving to higher paying jobs – but it does not happen by means of wage bargaining.[13]

13. The nominal wages of the bottom 25 per cent of American workers increased more strongly than the nominal wages of the other 75 per cent of workers. 'When millions of jobs previously considered very safe abruptly become perilous, wage levels should be expected to adjust according to virtually any theory of wages. This reaction, which empirically was most common in the lowest wage jobs, should not be confused with a system-wide rise in the power of labor or a "Kaleckian moment" (Ratner and Sim 2022). These frames of reference blind analysts to the real nature of what was transpiring: jobs that are suddenly dangerous have trouble finding anyone willing to do

Even though many workers benefitted from the job-switcher 'wage growth premium', U.S. workers have – on average – been unable to protect their real wages as the inflation rate began to increase. To single out higher nominal wages as a main *cause* of the increase in U.S. inflation is not just incorrect, because wage growth is mostly *following* (not leading) inflation, but quite a stark example of blaming the victim. And stories of the re-emergence of the wage–price spiral are just that: only stories.

3.3 Professor Phillips to the rescue: invoking a *non-linear* Phillips curve

The third epicycle that has been added to give the 'science of monetary policy' a semblance of real-world relevance is the argument that the good-old Phillips curve, which had 'flattened' in previous decades and was already proclaimed 'dead' by some, has suddenly and vigorously returned to life, becoming much steeper than before during 2021Q1–2023Q2. The steeper Phillips curve suggests a stronger trade-off between unemployment and inflation and a lower sacrifice ratio of monetary policy.

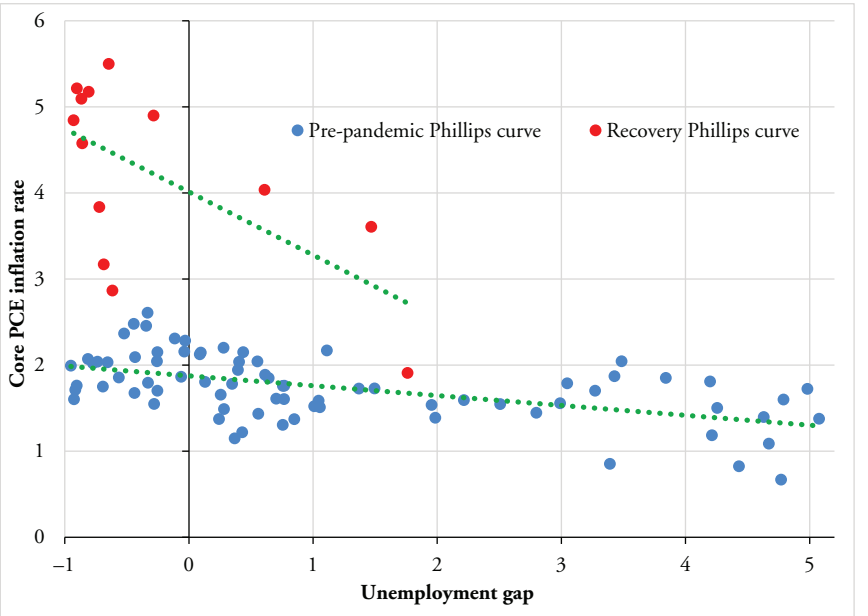
The U.S. Phillips curve was very flat for the 20-plus years before the pandemic, as shown by Stock/Watson (2019), Stansbury/Summers (2020), Hazell et al. (2021), Del Negro et al. (2022) and others. Then in the spring of 2021, after more than a decade of hibernation, inflation came back to life and suddenly the Phillips curve looked steep. This is illustrated in Figure 17: the slope of the *pre-pandemic* Phillips curve is much smaller (in absolute terms) than the slope of the Phillips curve *during the recovery period*. An almost-horizontal Phillips curve poses a conundrum for monetary policy-makers, particularly in the case of a cost-push shock originating from (global) supply-side and energy bottlenecks: in such circumstances, monetary tightening can only achieve disinflation at the disproportionate cost of a huge increase in the number of unemployed (Del Negro et al. 2022). Robert Solow put it clearly: 'To try effectively to wipe out hard-core inflation by squeezing the economy is possible, but disproportionately costly. It is burning down the house to roast the pig' (quoted in Rudd 2022b: 9).

In contrast, the *recovery-period* slope coefficient in Figure 17 suggests a much lower sacrifice ratio. Estimates by Hobijn et al. (2023), Crust et al. (2023) and Benigno/Eggertsson (2023) suggest that the Phillips curve has become steeper at more negative magnitudes of the unemployment gap, and the sacrifice ratio has become smaller during the recovery period (2021–2022). These estimates are important, because they provide a new lease of life to the New Keynesian approach and also constitute good news for central bankers, who no longer have to burn down the house to roast the pig. Indeed, if true, a relatively small increase in labour market slack could push inflation down from current elevated levels, provided (of course!) that the public's inflation expectations remain well anchored – which suggests a potential path to a soft landing for the U.S. economy.[14]

Figure 18 presents an even more powerful illustration of the non-linear Phillips curve – one in which the unemployment gap (or output gap) is replaced by the conventional vacancy ratio. According to Benigno/Eggertsson (2023), this figure is worth more than

them. Discussions of "monopsony" in labor markets (Autor et al. 2022) are beside the point, especially in industries such as restaurants or leisure, where unions are rare and many employers usually cluster' (Ferguson/Storm 2023: 17–18).

14. U.S. inflation has come down during 2023–2024, while economic growth recovered and the unemployment rate has remained low. While this looks like a soft landing, inflation has come down while the job vacancy ratio has stubbornly remained elevated, at 1.4 job vacancies per unemployed worker, which is twice as high as the long-run average vacancy ratio.

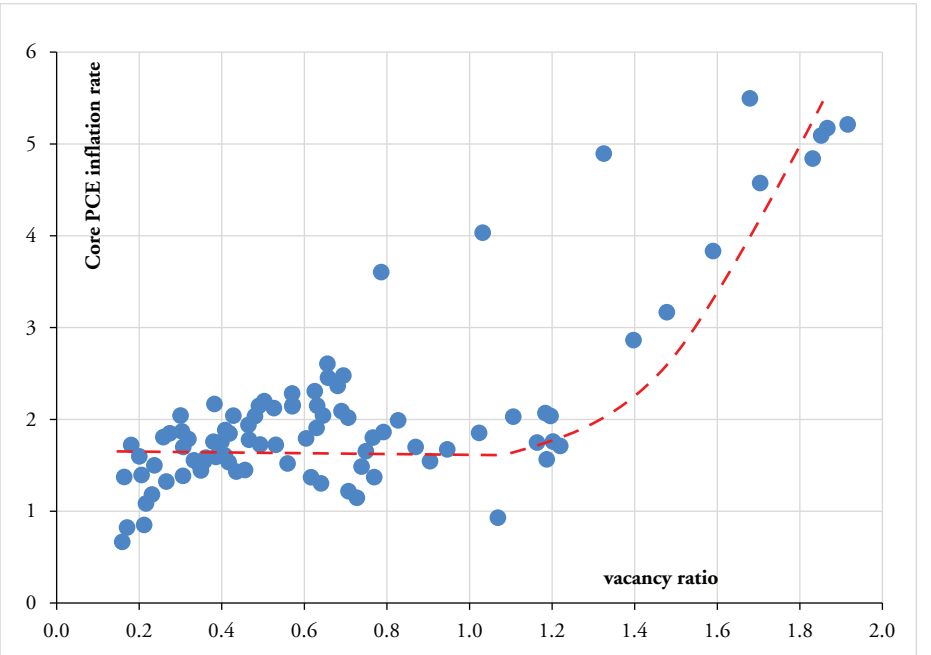


Source: Author's construction based on FRED data (*series* UNRATE; NROU; PCEPILFE_PC1). The unemployment gap is measured as the percentage point difference between the actual unemployment rate and the NAIRU.

Figure 17 Phillips curves for the United States: pre-pandemic and recovery periods (2001Q1–2019Q4 vs. 2021Q1–2024Q1)

a thousand words, because it so strongly suggests that the relationship between inflation and labour market strength is more or less flat up to the point where $V/U \leq 1$, after which it becomes steeply upward-sloping when $V/U > 1$, i.e., when there is a labour shortage. To solidify their claim, Benigno/Eggertsson (2023) build a New Keynesian DSGE model in which the labour market is modelled via search and matching. The key mechanism of the model is that nominal wages are 'downwardly rigid' as long as $V/U \leq 1$, but will rise rapidly when the labour market is tight (i.e., $V/U > 1$) and firms will outbid one another other for new hires. The simple (but incorrect) argument of Benigno/Eggertson (2023) then is that the Biden demand stimulus of 2021 was excessive and pushed the vacancy ratio above the threshold value of 1. Central bankers and private forecasters were caught by surprise, since they were assuming that the Phillips curve is flat and thinking the impact on inflation would remain limited.

How persuasive is the claim that the Phillips curve suddenly became non-linear? A first obvious problem is that the hypothesis of a non-linear Phillips curve is based on just 10 (quarterly) data points. Hence, Hobijn et al. (2023: 6) are careful, writing that 'it is still too early to determine whether this steepening of the Phillips curve is temporary or persistent'. A second problem is that the conventional vacancy ratio is a biased indicator of labour market strength – overstating the post-pandemic tightness of the labour market. For this reason, Figure 18 is misleading: it is suggesting a causal relationship where there is none. But there is a deeper reason why it is unlikely that the New Keynesian Phillips curve suddenly has become steeper. To see why, let us consider the most common



Source: Author's construction based on FRED data (*series* UNRATE; NROU; PCEPILFE_PC1).

Figure 18 Sometimes a figure is worth more than a thousand words – also when it is wrong: core PCE inflation versus the job vacancy ratio (2001Q1–2024Q1)

specification of the (linear) New Keynesian Phillips curve (Benigno/Eggertson 2023; Gagliardone et al. 2023):

$$\pi_t = \kappa y_t + \mu_t + \beta E_t \pi_{t+1} \tag{1}$$

where π_t = the (core) inflation rate; y_t = the output gap (a measure of excess demand); μ_t = a random disturbance capturing cost shocks; $\kappa > 0$ and $0 < \beta < 1$ are coefficients; β is a subjective discount factor, typically a parameter with a value close to unity; and E_t = an expectations operator. The claim that the Phillips curve has become steeper means that, for some reason, the slope coefficient κ must have become larger during the post-pandemic period. What does κ express?

The answer, of course, is that κ measures the impact of excess aggregate demand on inflation. In the underlying theory, excess demand leads to a tight labour market, higher nominal wages and higher (marginal) costs for oligopolistic firms – and these firms will pass these cost increases through onto prices. Before the COVID-19 crisis, there was agreement that the empirical relationships between labour market tightness, the output gap and the inflation rate had weakened over time. The re-emergence of inflation caught the 'scientists of monetary policy' flat-footed. What had they been missing? Their answer is, perhaps surprisingly, that a decade of low inflation had lulled them into incorrectly believing that the Phillips curve had flattened – but now, following the surge in inflation, they recognise what they should have seen all along: the slope coefficient of the Phillips

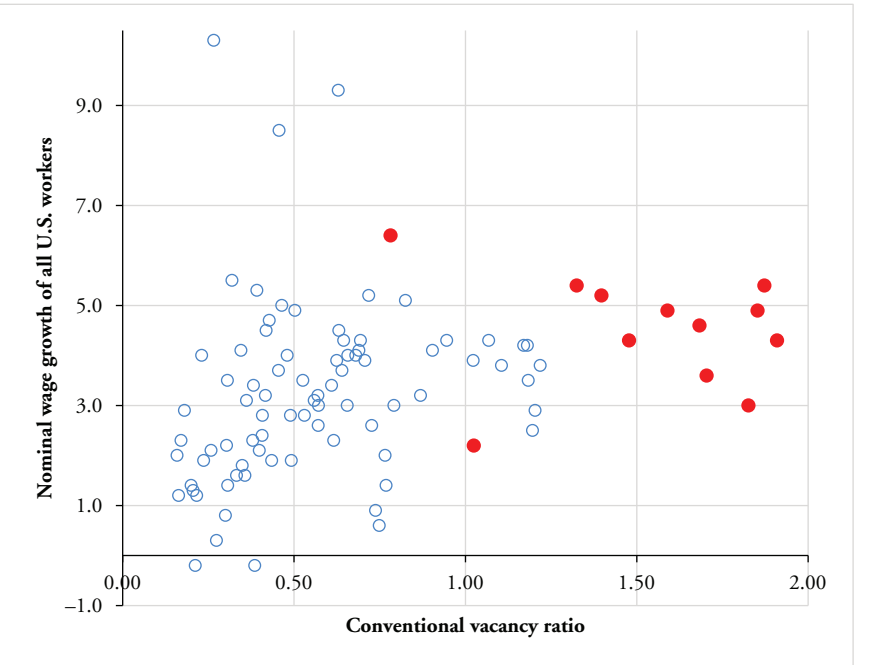
curve, κ, has always been large, at least for those willing to see. In a way, the slope of the Phillips curve resembles Schrödinger's cat: it is both flat and steep. So, what is the missing piece to explain this paradoxical outcome? New Keynesian economists have, so far, proposed two possible explanations.

The first is proposed by Benigno/Eggertson (2023) who argue that the slope of the Phillips curve, κ, is a non-linear function of the vacancy ratio θ, or:

$$\kappa = \bar{\kappa} \text{ if } \vartheta \leq 1 \quad \text{and} \quad \kappa = \bar{\kappa}\vartheta^{\varepsilon} \text{ if } \vartheta > 1; \varepsilon > 1 \tag{2}$$

This corresponds to what is shown in Figure 18. Because the vacancy ratio remained below 1 for most of the time during 2001–2020 and κ was small, no one could have foreseen the sudden, sharp increase in the slope of the Phillips curve, once the U.S. vacancy ratio surged to a value of almost two jobs per unemployed worker. Benigno/Eggertson (2023) do not explain why a vacancy ratio $\vartheta = 1$ constitutes the critical threshold – nor are they cognizant of the fact that the sharp rise in the conventional vacancy ratio is largely due to the drastic occupational and sectoral restructuring that occurred during the COVID-19 crisis, and does *not* reflect a general tightness of the U.S. labour market.

The empirical evidence is also not in favour of the explanation by Benigno/Eggertson (2023). True, Figure 18 is very suggestive of a Phillips curve that is non-linear in the conventional vacancy ratio. However, Figure 19 shows that the coincidence is spurious: the extremely high values for ϑ do not coincide with significantly higher growth rates for



Source: Author's construction based on FRED data (*series* UNEMPLOY, LMJVTTUVUSM647S and PRS85006101). The black dots are observations for the recovery period.

Figure 19 Here is a figure that is worth more than a thousand words: the job vacancy ratio versus nominal wage growth (2001Q1–2024Q1)

nominal wages. In other words, the 'extremely' tight American labour market is not generating extremely high rates of nominal wage growth and does not, therefore, 'explain' the recent acceleration in inflation – as we already saw in Section 3.1. The reason is that the conventional vacancy ratio is overstating the strength of the U.S. labour market, unlike alternative indicators discussed above.

The explanation offered by Benigno/Eggertson (2023) is not persuasive. This is recognised, albeit implicitly, by fellow New Keynesians Gagliardone et al. (2023: 37) who argue, based on pre-pandemic empirical evidence, that the elasticity of marginal cost with respect to the output gap is low, roughly around 0.23. In plain English, this means that an increase in the output gap of 1 percentage point increases (marginal) costs and prices by just 0.23 percentage points. Marginal cost, including wages, are therefore not very sensitive to output conditions – including an extremely tight labour market (as Figure 19 shows). And it is not plausible to claim, as Benigno/Eggertsson (2023) do, that the elasticity of marginal cost with respect to the output gap has suddenly somehow increased significantly during the post-pandemic inflation surge.

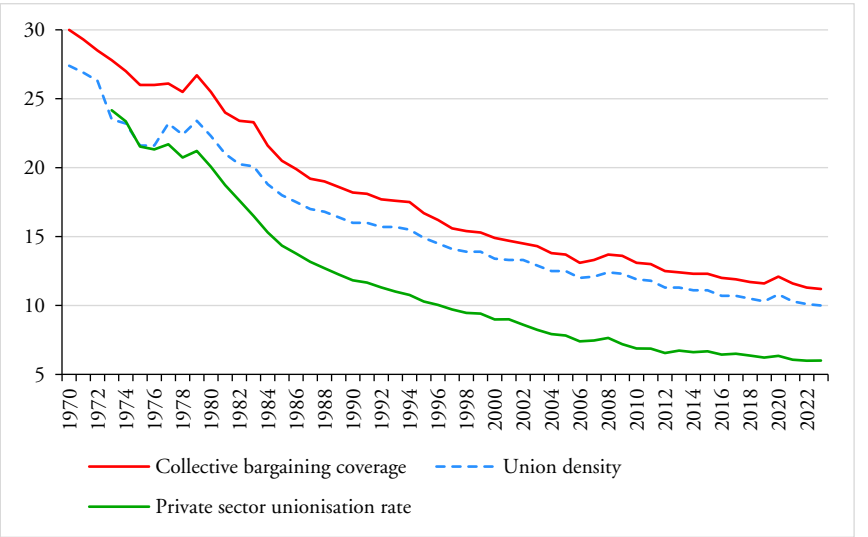
The second explanation, offered by Gagliardone et al. (2023), makes more empirical sense. They dismiss the output-gap-based Phillips curve of equation (1) in favour of a *primitive* Phillips curve which is directly based on marginal cost mc_t:

$$\pi_t = \kappa mc_t + \mu_t + \beta E_t \pi_{t+1} \tag{3}$$

They show that the econometric estimates of the slope coefficient κ based on equation (3) are three to four times larger than the estimates of κ based on equation (1). Assuming a steeper Phillips curve, Gagliardone et al. (2023) and Gagliardone/Gertler (2023) focus not on increases in nominal wages, but on increases in the oil price – arguing that (a) inflation was low during 2015–2019 despite low unemployment, because oil prices were low, lowering mc_t in equation (3); and (b) inflation surged during 2021–2023, primarily because oil prices rose strongly, raising mc_t. Gagliardone et al. (2023) and Gagliardone/Gertler (2023) conclude that the recent re-emergence of inflation is mostly due to energy cost shocks on the supply side of the economy, which have shifted the Phillips curve up. In terms of equations (1) and (3), μ_t increased, while κ did not change.

Ignoring the primitive Phillips curve (which is invoked to cover the relatively rare case of an energy price shock), there is a clear reason why the Phillips curve of equation (1) has become flat: decades of labour market deregulation have created what Alan Greenspan called workers 'traumatized' by job insecurity and afraid or simply unable to press for wage increases (Storm/Naastepad 2012; Weil 2014; Storm 2017; Stansbury/Summers 2020). Drastic labour market deregulation in favour of corporations was one of the key drivers of de-unionisation, as the political support for and enforcement of labour laws weakened, pattern bargaining broke down and the number of right-to-work states in the U.S. increased. Workers' ability to organise was reduced by a direct weakening of labour law, employment protection and labour law enforcement and by an increased corporate use of union avoidance tactics (Stansbury/Summers 2020).

Job insecurity rose and pay stagnated as workplaces fissured after large corporations shed their role as direct employers in favour of outsourcing work to small companies that compete fiercely with one another (Weil 2014). All the forces that traditionally counterbalanced firms' monopsony power and boosted workers' bargaining power have been weakened in recent decades. Employment protection laws have become looser, the minimum wage has decreased in real terms, (private-sector) trade union density and collective bargaining coverage have fallen (Figure 20), as the number of workers in the gig economy rose, shareholders have become more demanding and powerful, and globalisation has made workers more vulnerable to threats of job loss due to delocalisation (Stansbury/



Sources: Data on (aggregate) union density (1960–1982) from Mayer (2004); data on (aggregate) union density (1983–2022) from Bureau of Labor Statistics; data on collective bargaining coverage from OECD Statistics. Data on private sector union density are from Hirsch et al. (2023). The data for 1982 have been obtained by means of interpolation.

Figure 20 Union density and collective bargaining coverage: the U.S. economy (1970–2023) (per cent)

Summers 2020). Job insecurity has become an endemic part of American working life, even though the official unemployment rate is low.

As a result of the observed decline in worker power and in workers' ability to organise, the tightening of the U.S. labour market no longer automatically results in higher nominal wage growth (Stansbury/Summers 2020; Ratner/Sim 2022; Table 1).[15] Three conclusions follow from all this. First, it was not the Federal Reserve that killed the Phillips curve, but the policy choices of successive U.S. administrations – starting with the Reagan administration in the 1980s – which structurally weakened the bargaining position of American workers. The Federal Reserve actively supported these policies by tightening interest rates every time the labour market became too tight. Second, there is no convincing reason to think that the Phillips curve has become steeper during 2021–2023, because there is not the slightest indication that the bargaining power of (organised) labour has become stronger. The conventional vacancy ratio may well be 'extremely high', but it is a rather poor indicator of labour market strength – in fact, U.S. workers are not driving inflation, but instead are coping the best as they can with the soaring cost of living. Finally, the zeal with which the 'scientists of monetary policy' are trying to protect the analytical core of their model (i.e., the wage–price spiral) puts Ptolemy in the shade.

15. It must be noted that a new wave of unionization is under way in U.S. manufacturing following the victory of the United Auto Workers (UAW) in the Volkswagen assembly plant in Chattanooga, Tennessee, in April 2024. However, the UAW lost a similar vote in the Mercedes-Benz plant in Vance, Alabama, in May 2024. The private-sector unionization rate remains very low (only 6 per cent).

4 CONCLUSION: THE ART OF PARADIGM MAINTENANCE

Zooming in on the U.S. economy, this article has documented how the practitioners of the self-proclaimed 'science of monetary policy' have tried to salvage their paradigm – after the inflationary surge of 2021–2023 made it clear that the New Keynesian emperor was not wearing any clothes. To be fair, most economists, not just the New Keynesians, were caught unprepared – but for Keynesian economists, for instance, it was relatively straightforward to empirically account for the surge in inflation within their existing paradigm, which allows for cost-push inflation, working through backward input–output linkages in global supply chains, and for constant – and rising – profit mark-ups as well as for wealth effects (on consumption) and oil and commodity price speculation (Ferguson/Storm 2023; Breman/Storm 2023; Storm 2023).[16]

New Keynesian economists do not have this luxury of a macro model that is relevant to the real world. And that is why they have to put in much effort to somehow align their paradigm to real-world events. These efforts have been discussed here under the heading 'the art of paradigm maintenance' – and a few key lessons can be highlighted. First, because neither the output gap nor the unemployment gap was a useful indicator of real economic activity, these were discarded in favour of new measures, notably the vacancy ratio. However, the conventional vacancy ratio is exaggerating the tightness of the U.S. labour market. Second, New Keynesian economists continue to invoke the influence of inflation expectations on *actual* inflation, even when the econometric and survey evidence is showing no such influence. Third, it is essential to the maintenance of the New Keynesian paradigm to uphold the claim that the Biden pandemic relief spending was excessive, causing an excess of demand and spiralling inflation. This claim is contradicted by evidence of a negative output gap during 2021Q1–2023Q2 as well as by evidence provided by Ferguson/Storm (2023). Fourth, the 'science of monetary policy' remains silent on the destruction of the power of organised labour and the inability of workers to protect their real wages, but instead talks a lot about the risk of a wage–price spiral, once workers' inflation expectations become unanchored, which will drive up inflation, somehow. Finally, the New Keynesian 'scientists of monetary policy' continue to rely on tight money, which, while it may work eventually, will be a very painful way to lower the inflation rate. There may well be alternative ways, such as price controls, to achieve disinflation that are less costly to the economy. But those policy alternatives are ruled out and left unanalysed.

A strange paradox remains unresolved, however. The 'scientists of monetary policy' commonly accuse economists working on alternative paradigms of being incoherent dilettantes whose arguments rely on *ad hoc* assumptions and policy-variant model parameters. But if the present article has one take-away lesson, it is this: the New Keynesians manage to maintain their paradigm only by adding further epicycles to its analytical core that are justified by 'Just So' stories. The pot is thus calling the kettle black. So far, they are still getting away with it. However, it is safe to predict that the New Keynesian core will break down under the ever-expanding weight of the added epicycles. The sooner this happens, the better. After all, the impenetrability of this continuously expanding New Keynesian paradigm is maddening – one must feel great sympathy for King Alfonso X of Castille (1122–1184), who, when shown the minutiae of the Ptolemaic system, is said to have remarked that 'if the Almighty had consulted him on the matter, he would have recommended something a little simpler ... '

16. As discussed above, New Keynesian economists Gagliardone et al. (2023) and Gagliardone/Gertler (2023) also conclude that the recent re-emergence of inflation is mostly due to energy cost shocks on the supply side of the economy, which pushed up the Phillips curve.

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