The Art of Paradigm Maintenance:
How the 'Science of Monetary Policy' tries to
deal with the inflation of 2021-2023

Servaas Storm [*]

Working Paper No. 214

October 4th, 2023

ABSTRACT

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

[*] Department Economics of Technology and Innovation (ETI), Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands. S.T.H.Storm@tudelft.nl

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'.

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 PCE inflation that started in 2021 and (as can be seen) it consistently projected the inflation rate to decline rapidly to its 2 percent 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?

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)
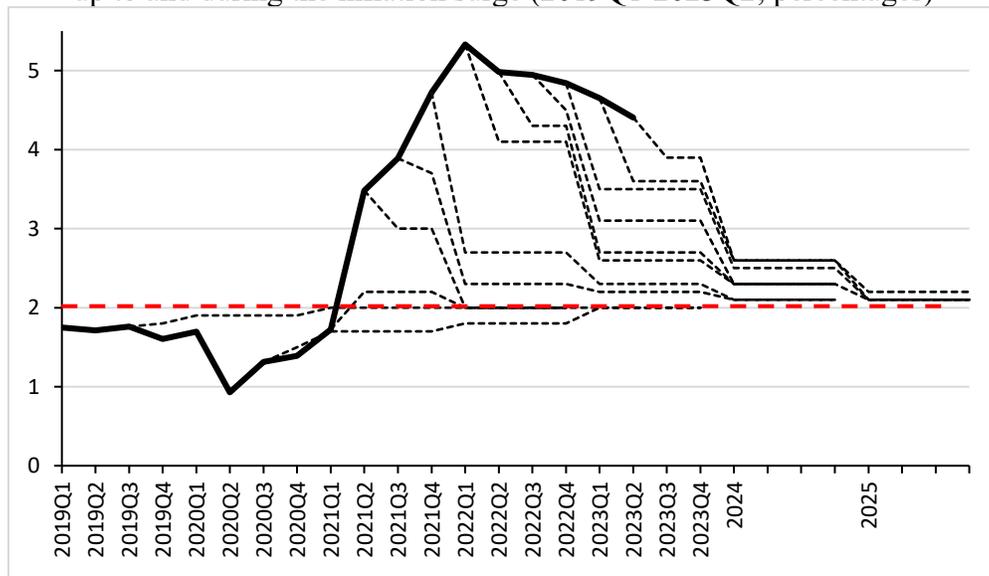
Source: FRED database (*series* PCEPILFE) and Summary of Economic Projections of the Federal Open Market Committee (FOMC) of the Federal Reserve. *Notes*: Inflation is measured using the personal consumption expenditures price index (PCEPI) excluding food and energy; this measure is commonly referred to as core PCE inflation. The dashed red line is the 2% inflation target.

The reason is that the macroeconomic models currently 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 reemergence 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

3

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 labor markets were becoming extremely tight (Domash and Summers 2022a, 2022b). 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 too low, which led establishment macroeconomic models to predict only a modest inflationary impact of a declining unemployment gap (Benigno and 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 2008-09, when it became obvious to many, including the late Queen Elizabeth II of England, that "the state of macro" was not so good (contrary to Blanchard's (2008) rightly ridiculed self-congratulatory assessment). 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).[1,2]

This paper looks at how New Keynesian practitioners of the self-proclaimed 'science of monetary policy' (Clarida, Jordi and Gertler 1999; Wieland 2010; Eusepi and Preston 2018) have struggled to maintain their paradigm following the failure to foresee the surge in (consumer price) inflation during 2021-2023. The art of paradigm maintenance, as practiced by establishment economics,

---

[1] Wade examined the internal and external mechanisms by which the World Bank's nominally 'independent' research department works to reinforce the dominant neoliberal policy agenda of the Washington Consensus. These mechanisms include incentives in hiring, promotion and publishing as well as selective enforcement of rules, cherry picking of data and ways to neutralize 'inconvenient facts' (Broad 2006).

[2] The notion of 'paradigm' is used in a Kuhnian sense. Kuhn (1962) argued that the dominant paradigm will be challenged once important anomalies undermine the basic assumptions of that paradigm; a scientific crisis develops as attempts to remove these anomalies consistently fail. The 'science of monetary policy' has never been a 'normal science', in a Kuhnian sense, however (see Storm 2021).

mostly consists of tweaking and twisting concepts, measurements and analysis—adding epicycles to epicycles, or adding more ad-hoc complexities to their (already fundamentally flawed) macro models. Steve Keen (2012) aptly calls this 'Ptolemaic economics.' The paper is structured as follows. In **Section 2**, I briefly review the main tenets of the self-proclaimed 'science of monetary policy'. **Section 3** 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. economies as well. **Section 4** 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 rationalization, *i.e.*, giving seemingly logical reasons to justify why no one saw the re-emergence of inflation coming. **Section 5** concludes the paper, from which it will be evident that the economics profession would be well advised to look beyond the pseudo-science of monetary policy.

2. The self-styled 'science of monetary policy'

Macroeconomists, especially those of a New Keynesian persuasion, propose a core set of 'scientific' principles that are (in their opinion) 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, Jordi and Gertler 1999) and strong enough to guide the real-world decision-making by central bankers (Mishkin 2007; Wieland 2010; Woodford 2001, 2010). In this sense, there is a 'science of monetary policy', as Clarida, Jordi and Gertler (1999) write. The following three basic principles form the core of this 'scientific' approach to monetary policy (Walsh 2001; Woodford 2001).

Principle 1: Focus on the output gap or, alternatively, on the unemployment gap. These two measures of macroeconomic slack—the gap between actual output and its potential level, or the deviation of the unemployment rate from the Non-Accelerating-Inflation Rate of Unemployment (NAIRU)—are key to properly calibrate monetary policy (Elias, Irvin and Jordà 2014). 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 NAIRU).[3]

---

[3] Potential output and the NAIRU are not directly observable variables, however. Hence, estimates of these measures of slack vary considerably, depending on who is doing the estimation, data sources and period of analysis. Estimates of potential output and the NAIRU are frequently adjusted following revisions to the estimations of the potential size of the labor force and labor productivity growth; see Costantini (2015) and Fontanari, Palumbo and Salvatori (2019). See also 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 or 'automatic'—Milton Friedman's proposal that the Fed should just ensure a constant annual growth rate for the money supply was an example of a non-discretionary policy designed to remove the influence of the individual policymaker (Woodford 2010). The monetary policy rule proposed by John B. Taylor (1993, 1999) fits in this tradition. As Taylor (1993) 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."[4]

Here, I use the rule proposed by Taylor (1999) which has since gained wide acceptance as a benchmark specification (see Taylor and Williams 2010; Woodford 2001, 2010; Elias, Irvin and Jordà 2014; Del Negro, Giannoni, and Schorfheide 2015; Bernanke 2015).[5] According to this version of the rule, the nominal policy interest rate can be expressed as follows:

(1)   Policy interest rate = 1.25 + (1.5 × Inflation) + Output gap

The output gap is defined as the difference between actual real GDP and potential real GDP expressed as a percentage of potential real GDP. Following practice in the Federal Reserve, inflation is measured using the personal consumption expenditures price index (PCEPI) excluding food and energy (or the index of core inflation). Taylor's rule states that the central bank's policy interest rate should be increased in response to a rise in the output gap (which indicates that the economy is or is not overheated) and more than one for one with increases in the inflation rate. As a result, an increase in the inflation rate produces a policy reaction that increases the real rate of interest, which, in turn, lowers private spending, slows down the economy, and brings inflation back to the central bank's inflation target.[6]

The Taylor rule can also be expressed in terms of the unemployment gap. One advantage of doing this is that unemployment data are available on a monthly basis as opposed to quarterly data for real GDP, and hence, offer a more up-to-date yardstick of macroeconomic slack than the output gap. Often, Okun's Law is used to relate changes in the actual unemployment rate to GDP growth; this empirical regularity suggests that for every increase in the unemployment gap by 1 percentage

---

[4] Thirty years later, Taylor (2023) is still making exactly the same point, witness the title of his paper: "It's Time to Get Back to Rules-Based Monetary Policy." Seccareccia and Matamoros (2023) offer a fundamental critique of rule-based monetary policy, arguing that the Taylor rule is biased in favor of the rentier class.

[5] According to the Fed itself, the Taylor Rule remains central to interest rate discussions (Pendered 2023). Note also that the Federal Reserve of Atlanta (2023) offers users an algorithm to generate Fed funds rate prescriptions for their own Taylor rules based on a generalization of Taylor's original formula.

[6] The numerical Taylor rules of equations (1) and (2) are from Fed economists Elias *et al*. (2014) and Bosler *et al*. (2014). I am assuming that these numerical rules are reasonably general in their applicability. If not, the first principle of the 'science of monetary policy' is already falsified.

point, the output gap will be roughly an additional 2 percentage points lower (Elias, Irvin and Jordà 2014). Using Okun's regularity, equation (1) can be rewritten as follows:

(2)   Policy interest rate = 1.25 + (1.5 × Inflation) – (2 x Unemployment gap)

The unemployment gap is measured as the percentage point difference between the actual unemployment rate and the non-accelerating inflation rate of unemployment (NAIRU). A negative unemployment gap signals labor market tightness (and a more generally overheating economy), and hence central bankers must tighten monetary policy.

Principle 3: Be forward-looking. Monetary policy actions affect the economy with a considerable time-lag. A reduction in the interest rate may not have its maximum impact on real output and inflation for one-and-a-half years. For example, based on his econometric estimates, Ray C. Fair (2021, p. 24) finds that the "effects on inflation are [....] about a half percentage point fall for a percentage point increase in [the interest rate], but it takes about 5 quarters to achieve this." 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.

Before I proceed, 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 don't.[7] Especially in times of economic turbulence (as during 2020-2023), the principles of 'scientific monetary policymaking' offer little practical guide to monetary policy in the real world. As we shall see, the different indicators of slack generate conflicting signals, the real-life time-lags of the impacts of monetary tightening are long and unpredictable, and uncertainty is so large that it is impossible for central bankers to get a clear read on what to do and when—and what to expect of persistent monetary tightening. They become, as they sometimes confess, 'data driven'.

The focus of this paper is, therefore, not on the practice but on the 'science of monetary policy'—the supposed state-of-the-art of macroeconomic expertise that informs policymaking. "Good policy will probably always require good policymakers, as it requires combining the science of the economist with the art of the practitioner," writes Carl E. Walsh (2001). But how useful is 'this science of the economist'?[8] The recent surge in inflation in the U.S. economy (2021-2023) provides a relevant testing ground to answer this particular question.

---

[7] For instance, on August 27, 2020, the FOMC released a revised *Statement on Longer-Run Goals and Monetary Policy Strategy* in which it announced a shift from inflation targeting to a not yet well-defined form of average inflation targeting. According to some observers, this shift away from the standard 'science of monetary policy' may have contributed to the delay with which the Fed responded to the surge in inflation experienced in 2021. Seen this way, the failure to foresee the recent inflation lies in the Fed abandoning the 'science of monetary policy'. This is not a plausible conclusion, however, as is explained in the rest of the paper.

[8] Consider this assessment by a former Governor of the Federal Reserve Board: "The substantive point is that we do not, at present, have a theory of inflation dynamics that works sufficiently well to be of use for

3. The 'science of monetary policy' meets the surge in inflation (2021-2023)

The confrontation between the 'science of monetary policy' and the recent surge in U.S. inflation is not a happy one (Benigno and Eggertsson 2023; Gopinath 2023). The principles that are claimed to be "reasonably general in applicability" (Clarida, Jordi and Gertler 1999) turned out to be of little practical use for monetary policy-making during 2021-2023. In response to this failure, what happened is that, paraphrasing John Kenneth Galbraith, faced with the choice between changing one's mind—and economic paradigm—and proving that there is no need to do so, almost everybody got busy on the proof. Thus, while retaining the core of the New Keynesian framework, new epicycles were added to the core—with the goal being to 'prove' that the conventional approach was able to foresee the increase in inflation, even if only after the fact. These epicycles are the subject of **Section 4**. Here I first discuss how the inflation surge of 2021-23 threw the 'science of monetary policy' off the rails.

3.1. 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 year during 2010Q1-2020Q4, fluctuating between a minimum of 0.9% in 2020Q2 and a maximum of 2.1% in 2018Q3. But starting in the second quarter of 2021, the core inflation rate began to increase—from 1.7% in 2021Q1 to 3.5% in 2021Q2 and further to 5.3% in 2022Q1; the core inflation rate remained elevated during 2022 and 2023 (**Figure 2**).

In the New Keynesian universe, accelerating inflation is normally expected to be caused by a positive and growing output gap, which signals that the economy is overheating. However, as **Figure 2** shows, the output gap in the U.S. was negative throughout the period 2021Q1-2023Q2 according to official C.B.O. 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, and these output gap numbers do not indicate an excess of aggregate demand.[9]

---

the business of real-time monetary policy-making. The sociological point is that many (though certainly not all) good monetary policymakers who were formally trained as such have an almost instinctual attachment to some of those problematic concepts and hard- to-estimate variables" (Tarullo 2017, p.2).

[9] The negative output gap also means that it is wrong to claim that the increase in U.S. inflation was caused by rising personal consumption expenditure, funded by the various rounds of federal (and state-level) pandemic relief spending by the Biden administration. Evidence provided by Ferguson and Storm (2023), Asdourian, Salwati, & Sheiner (2022) and Parker, Schild, Erhard, & Johnson (2022) puts to bed claims that the surge in inflation has been caused by Biden's pandemic relief spending.

Figure 2
U.S. core PCE inflation and the output gap
(2018Q1-2023Q2; percentages)
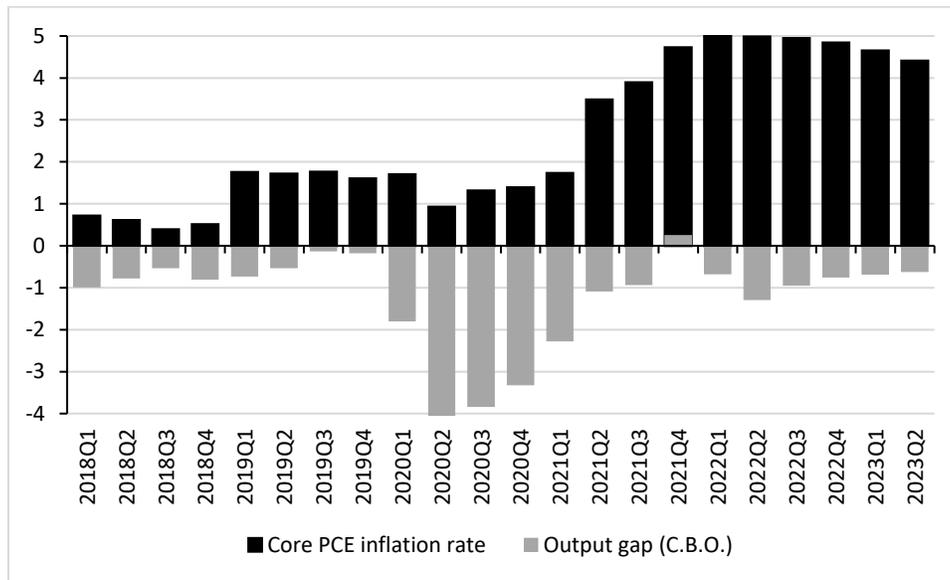
Source: FRED database (*series* PCEPILFE; GDPC1_GDPPOT; and PCEPI_PC1). *Notes*: Inflation is measured using the personal consumption expenditures price index (PCEPI) excluding food and energy. The inflation rate is calculated on an annualized basis. The output gap is calculated as the difference between real and potential GDP as a percentage of potential GDP. Real potential GDP is the C.B.O.'s estimate of the output the economy would produce with a high rate of use of its capital and labor resources. The output gap for 2020Q2 is *not shown* in the figure; it equaled -10.5% of potential output.

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 and 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 (**Figure 3**). Likewise, the import price rose much more strongly than the core PCE price index (Storm 2022), which is another sign that the troubles were on the supply-side of the economy. 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 (Storm 2022).

Figure 3
The difference between headline PCE inflation and core PCE inflation:
The U.S. economy (January 1960-July 2023; percentages)
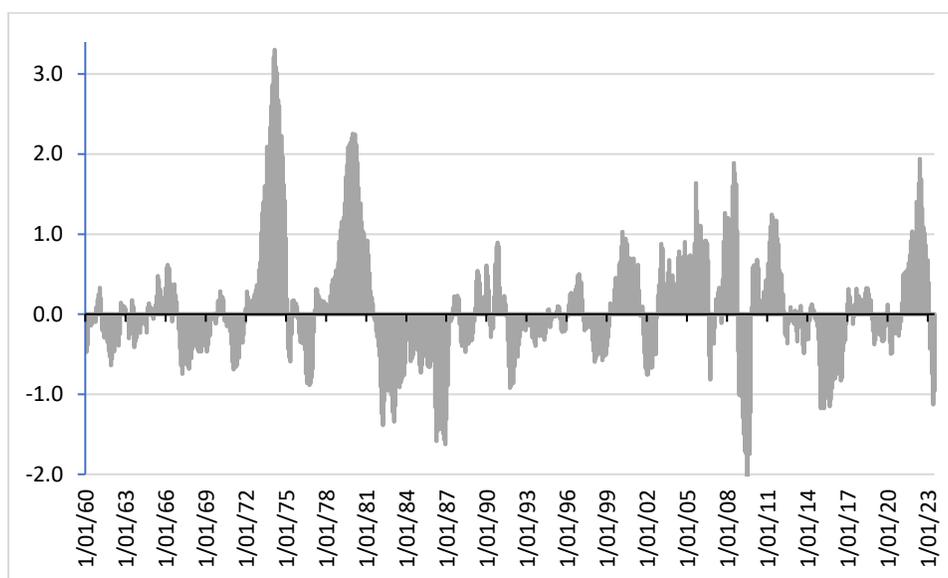
Source: FRED database (*series* PCEPILFE and PCEPI_PC1).

Following the surge in the core inflation rate, the Taylor rule of equation (1) tells us that the Federal Reserve had to raise the policy interest rate—by more than the increase in the inflation rate in order to set up an increase in the *real* interest rate. **Figure 4** plots the policy rate path using the Taylor rule of equation (1) against the federal funds rate, the actual U.S. policy interest rate. In terms of movement, the estimated 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 lockdowns of the COVID-19 crisis in the second quarter of 2020). From then on, the alternative policy path diverges significantly.

According to the Taylor rule, the Federal Reserve should have raised the policy rate earlier and much more aggressively than it actually did. The Fed kept the policy rate close to zero during 2020Q2-2022Q1 and then raised it steadily up to 5% in 2023Q2. In the alternative scenario based on the 'science of monetary policy', the policy interest rate should have been increased to 1.6% in 2021Q1, 5.4% in 2021Q2 (when core inflation rose considerably; see **Figure 2**) and further to 8.6% in the fourth quarter of 2021 and the first quarter of 2022 (**Figure 4**). Frequent calls for more aggressive monetary tightening by economic experts and commentators echoed the stiff monetary tightening implied by the Taylor rule.[10] But the Federal Reserve (wisely) decided to take a more

---

[10] Already in March 2022, Lawrence Summers insisted that in order to regain credibility, the nominal interest rate needs to be increased to at least 5% to bring inflation under control: "My sense of this is that given the likely paths of inflation, we're likely to have a need for nominal interest rates, basic Fed interest rates,

gradualist approach than the aggressive monetary tightening recommended based on the monetary policy rule of eq. (1).

Figure 4
The Federal funds rate and the policy interest rate
based on the Taylor rule (2014Q1-2023Q2; percentages)
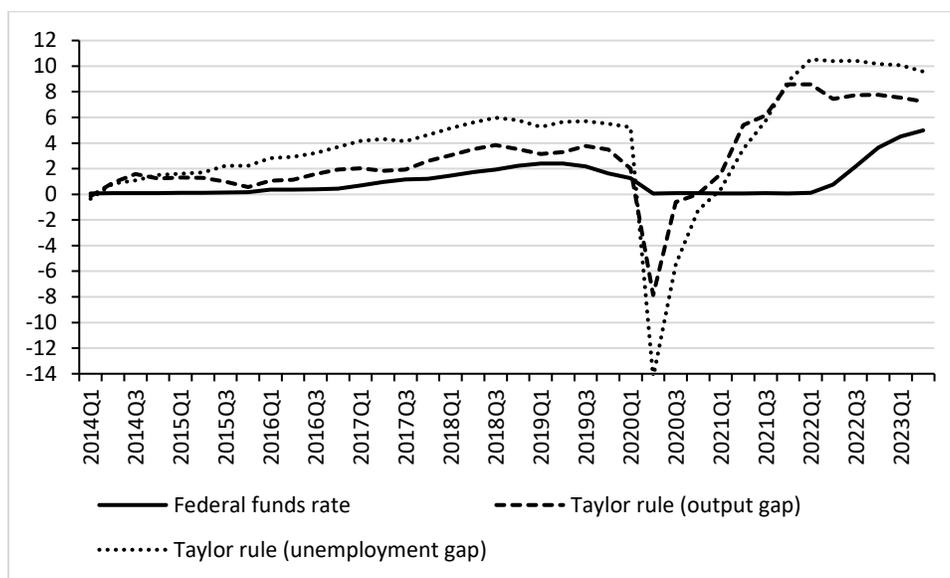
Source: FRED database (*series* FEDFUNDS). *Note*: The policy interest rate has been calculated based on the Taylor rule of the output-gap equation (1) as well as the unemployment-gap equation (2).

3.2. 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 small (in absolute terms), in 2021Q4 (**Figure 5**). U.S. core inflation began its increase in the second quarter of 2021, *i.e.*, well before the tightening of the labor market became visible in the unemployment gap. The core inflation rate peaked (at 5.3%) in 2022Q1 and then declined to 4.4% in 2023Q2, while the unemployment gap rose further (in absolute terms) to -0.9% during 2022Q3-2023Q2. In line with this, recent estimates by Federal Reserve economists Jordà, Liu, Nechio and Rivera-Reyes (2022) show that the contribution of the unemployment gap to U.S. inflation during 2020-2022 was statistically negligible.

---

to rise to the 4 percent to 5 percent range over the next couple of years. If they don't do that, I think we'll get higher inflation. And then over time, it will be necessary for them to get to still higher levels and cause even greater dislocations" (Klein 2022).

Figure 5
U.S. core PCE inflation and the unemployment gap
(2018Q1-2023Q2; percentages)
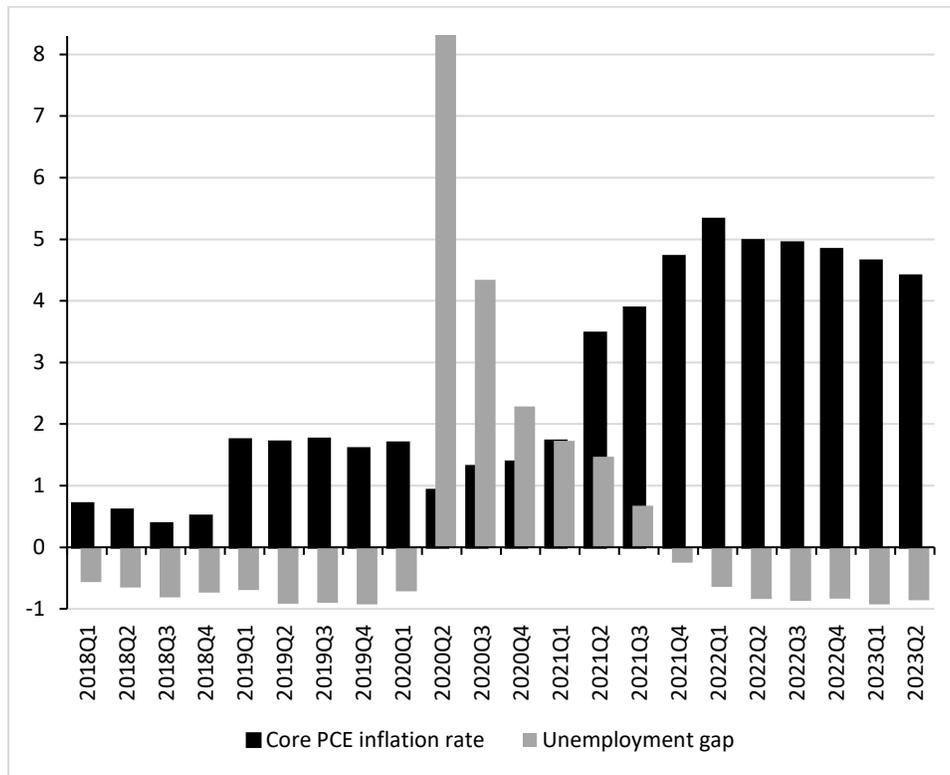
Source: FRED database (*series* UNRATE; NROU; and PCEPI_PC1). *Notes*: Core inflation is measured using the personal consumption expenditures price index (PCEPI) excluding food and energy; the inflation rate is calculated on an annualized basis. The unemployment gap is calculated as the difference between the actual unemployment rate (U3) and the non-cyclical rate of unemployment (NROU), estimated by the U.S. Congressional Budget Office.

It is important to understand how exceptional this coincidence of moderately negative unemployment gaps and high rates of core inflation is. **Figure 6** 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 2021Q4-2023Q2. In all three periods, the unemployment gap was negative, signaling a tight labor market.

It is evident that the tightness of the American labor market (as measured by the unemployment gap) does not differ significantly between these three periods; if anything, the labor 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.

Figure 6
U.S. core PCE inflation and the unemployment gap
(Three historical episodes; percentages)
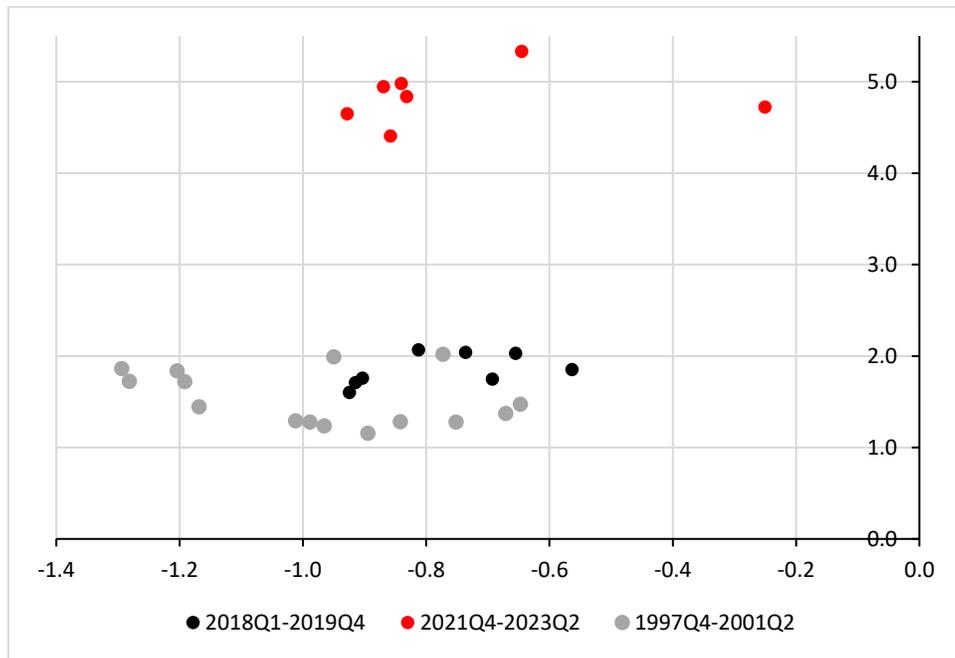
Source: FRED database (*series* UNRATE; NROU; and PCEPI_PC1).

Figure 4 plots the policy rate path using the Taylor rule based on the unemployment gap of equation (2) against the actual target for the federal funds rate. The estimated policy rate is (again) considerably higher than the historical federal funds rate during 2014Q1 – 2020Q1, but the discrepancy becomes significantly larger during 2021Q1 and 2023Q2. Monetary tightening should have proceeded earlier and much more aggressively than it actually did—even more aggressively than the recommended policy rate based on the output gap (**Figure 4**). 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 labor market slack. For a start, the standard measure of the actual unemployment rate, called U3 (by the U.S. *Bureau of Labor Statistics*), is narrowly defined as the percentage of the civilian non-institutionalized adult population without a job and actively searching for work. U3 does not capture the actual labor 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

labor force (U6). As shown in **Figure 7**, the broad unemployment rate U6 was around 7% during 2021-2023, or roughly double the narrow unemployment rate U3.

Figure 7
Narrow unemployment (U3) versus broad unemployment (U6): the U.S. economy
(2020Q1-2023Q2; percentages)
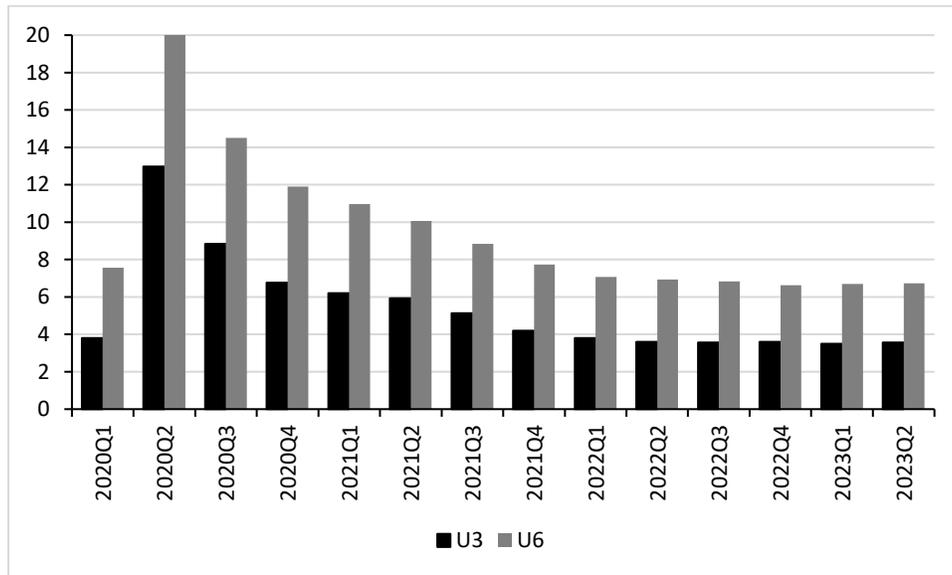
Source: FRED database (*series* UNRATE; U6RATE). *Notes*: U3 = the official (narrow) rate of unemployment; U6 = total unemployed, plus all persons marginally attached to the labor force, plus total employed part time for economic reasons, as a percent of the civilian labor force plus all persons marginally attached to the labor force.

It is not clear which measure(-s) to use to diagnose conditions in the labor market (Bosler, Daly and Nechio 2014). Hence, the 'science of monetary policy' offers policymakers so many degrees of freedom and relatively little guidance that its claim to enable non-discretionary, rule-based policy-making becomes a bit of a joke. To make matters worse, estimates for the non-observable NAIRU, which are needed to calculate the unemployment gap, "are highly uncertain" (Domash and Summers 2022a, p. 3), if not outrightly flimsy (Storm and Naastepad 2012). In sum, the unemployment gap is an empirically nebulous and analytically 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.

3.3. Be forward looking!

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

(a) Current inflation is significantly influenced by expected inflation (Fair 2021; Rudd 2022).
(b) Inflation expectations are largely determined by the Federal Reserve through its monetary policy and its announced future plans (forward guidance) (Bernanke 2022).
(c) 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 2022; Lansing and 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 8** shows 5-year inflation expectations according to the Cleveland Federal Reserve, which during 2021-2023 never did go up to more than 2.55%—inflation expectations were inaccurate, in other words, and 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 inflation expectations of the public did become firmly anchored (Rudd 2022). That argument is not convincing, however.

Figure 8
The core PCE inflation and the Cleveland's Fed 5 year expected inflation rate:
The U.S. economy (January 2020 - July 2023; monthly; percentages)
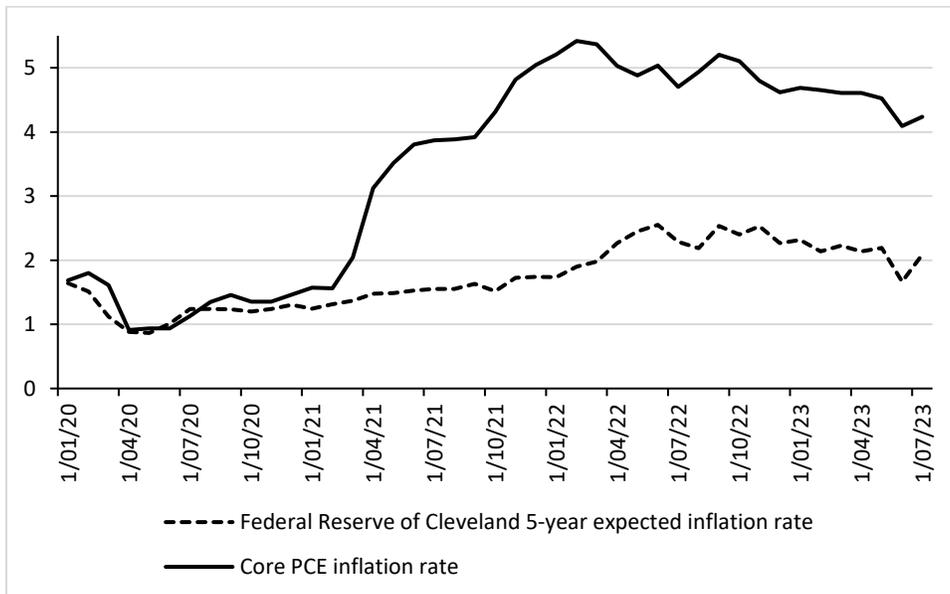
Source: FRED database (*series* EXPINF5YR; PCEPILFE_PC1).

The reason is that assumption *(b)* 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 2022). 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, Coibion and Gorodnichenko 2022). In fact, there is little evidence that firms know much about monetary policy targets, which means assumption *(c)* is also wrong. Candia *et al*. (2022) find no evidence that firms' expectations of future inflation are anchored. Contrary to assumption *(c)*, survey findings indicate that there is *systematic inattention* to monetary policy:

> "...we find that most CEOs are unaware of the Federal Reserve's inflation target. The fraction of CEOs that correctly identifies 2 percent as the inflation target is less than 20 percent. Nearly two thirds of CEOs are unwilling to even guess what the target is. Of those who dare, less than 50 percent think it is between 1.5 and 2.5 percent." (Candia *et al*. 2021, p. 4).

"It seems clear that firms' inflation expectations are not rational, nor even very sophisticated," writes Fair (2021, p. 119). Federal Reserve economist Jeremy Rudd (2021) concludes that the direct evidence for an 'expected-inflation channel' is not just weak, but *very* weak.

Assumption *(a)* is also empirically problematic, because, in the real world, economic actors 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, and to make matters worse, firms disagree even more strongly amongst themselves in their views on expected inflation (Candia *et al.* 2022).

Federal Reserve economists Ahn and Fulton (2020) find that different (published) measures of expected inflation do not align, but rather provide mixed signals. Ahn and Fulton use data for the period 1999Q1-2020Q1 to calculate pairwise correlation coefficients between different public measures of expected one-year-ahead inflation—and they find a surprisingly low correlation between these indicators. For example, the correlation coefficients between, on the one hand, the one-year-ahead inflation expectations published by the *Michigan Survey of Consumers* and, on the other hand, the measures of the *Survey of Professional Forecasters* and the Wolters Kluwer *Blue Chip Survey* turn out to be a mere 0.17 and 0.10, respectively. For three indicators that are supposed to measure the same thing (namely, expected inflation), the low correlation coefficients should be worrying. 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."

It is possible to gauge inflation expectations from the yield curve which shows the difference between short- and long-term interest rates. This is illustrated in **Figure 9** which draws the yield curve at different points in time. It can be seen that the yield curve steepened during June 2021 and

October 2022, as bond investors took note of the interest rate increases by the Federal Reserve. But the term structure of interest rates became inverted around December 2022 and has remained inverted ever since; this indicates that bond investors expect inflation (and interest rates) to go down, in response to the monetary tightening that has been implemented. However, as is argued by Fed economists Engstrom and Sharpe (2022), the various measures of the term structure often do not align: the near-forward spread (the difference between the interest rate of 18-months Treasury securities and the interest rate on 3-months Treasury securities) offers a more precise indicator of (inflation) expectations than the conventional 10-year-to-2-year interest rate spread. If we should discount the longer-term part of the term structure (i.e., 2 years and longer), then it is clear that what remains of the yield curve is mostly following actual developments in inflation and monetary policy (**Figure 9**).

Figure 9
The yield curve:
The U.S. economy (June 2021 - August 2023; percentages)
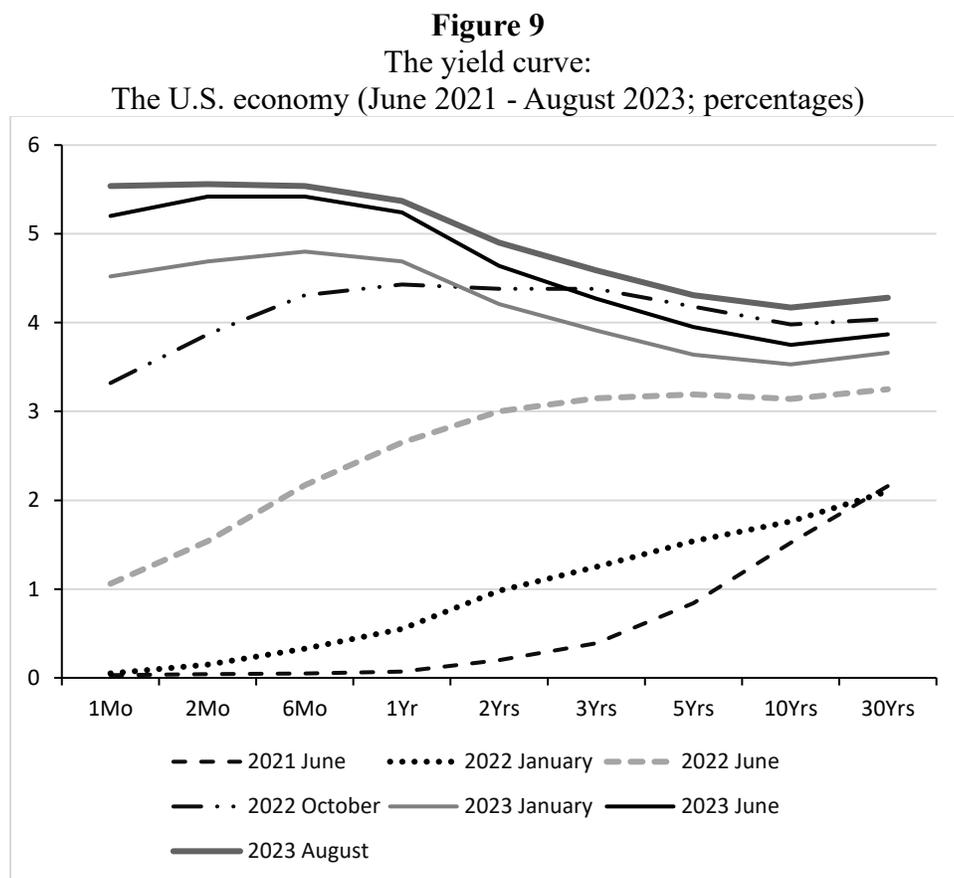
Source: FRED database.

But assumption *(a)* is wrong for yet another reason. Higher expected inflation can only raise current inflation if firms and workers have the means to raise 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), 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 (see Stansbury and Summers 2020; Storm 2021; Ferguson and Storm 2023); this issue will be explored in greater detail in the next section.

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 depend only on past inflation—and, therefore, are not forward-looking. This has major implications for the effectiveness of monetary policy, as Fair (2021, pp. 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."

Fair's (2022) evidence indicates that the effects of monetary policy are limited and build slowly—and forward guidance only works in the DSGE models of New Keynesian economists, but not in reality. "Announcements about targets, future policy moves, and the like, have little if any effect on expectations" (Fair 2022, p. 57).

Of course, for forward guidance to be effective, the Federal Reserve itself has to hold accurate expectations concerning future inflation. That this is indeed the case, cannot be taken for granted. Let us consider the (median) expectations on the core PCE inflation rate held by the members of the Federal Open Market Committee (FOMC) of the Federal Reserve, who determine the policy interest rate. **Figure 10** shows the core PCE inflation rate expected by the FOMC in its March, June, September and December meetings during 2021-2023 (as recorded in the *Summary of Economic Projections*; see also **Figure 1**).

It is clear from the figure that the FOMC members did not foresee the acceleration of core inflation in the U.S. during the second half of 2021 and early 2022. In March 2021, the FOMC expected a core inflation rate of 2.2% for 2021, 2% for 2022 and 2.1% for 2023. However, actual core inflation started to rise in the second quarter of 2021, increasing to more than 4% (on an annualized basis) in the fourth quarter of 2021. This was, of course, noticed by the FOMC, which, in December 2021, adjusted its expected inflation rate for 2021 to 4.4%; nevertheless, the core inflation rate was estimated to be only 2.7% for 2022, 2.3% in 2023, and 2.1% in 2024. Clearly, in December 2021, the FOMC believed that the surge in inflation was going to be transitory.

Figure 10
FOMC projections of the core PCE inflation rate, median
(2021-2025; percentages)
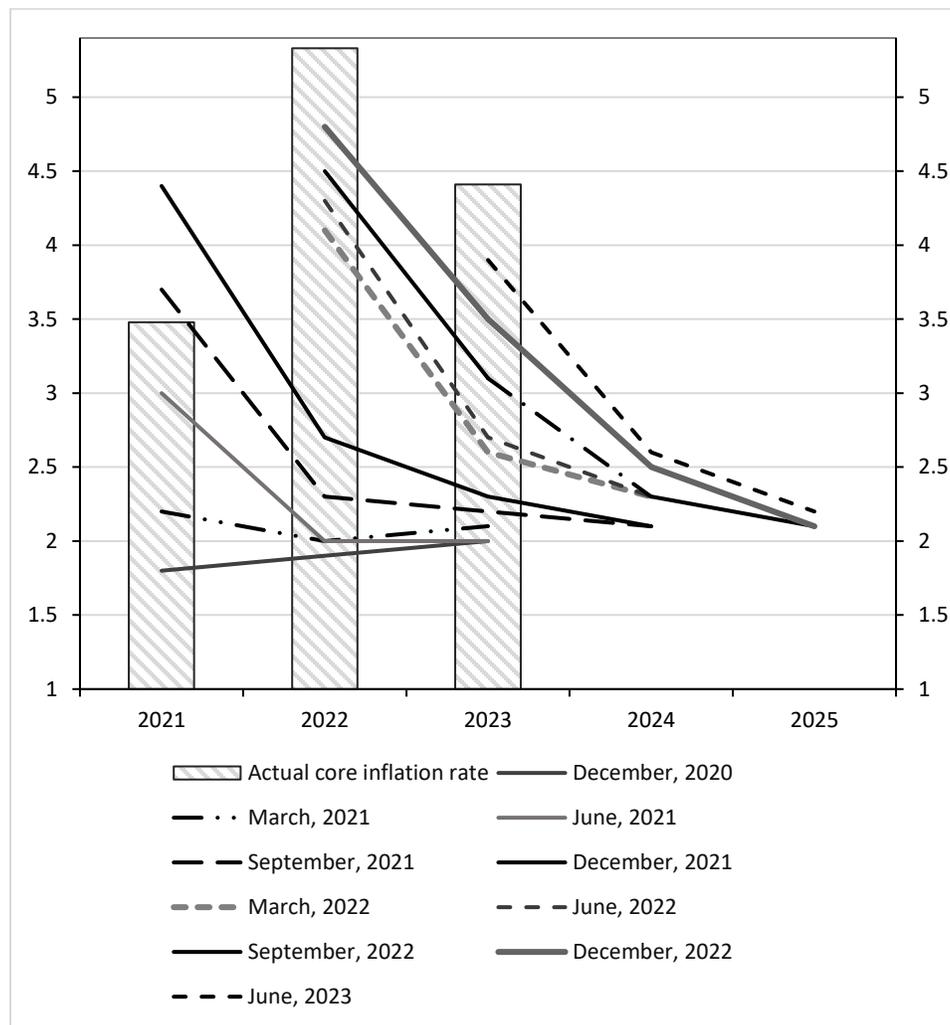
Figure 10 reveals that the FOMC changed its expectations significantly in March and June 2022, after the *actual* inflation numbers for the year 2021 had become available and following the sharp increases in energy and food prices, triggered by the Ukraine war and amplified by speculators in oil and food commodity markets (see Breman and Storm 2023). In March 2022, the FOMC expected a core inflation rate for 2022 of 4.1%, but taking actual price developments during that year into account, the expected inflation rate for 2022 was revised to 4.8% in its December meeting. The sharp upward revision of expected inflation provided the motivation for the steady and rather drastic monetary tightening that began in the second quarter of 2022. Expecting a strong

(deflationary) impact of the higher interest rates, the FOMC expects the U.S. core inflation rate to come down to 3.9% in 2023, and further to 2.6% in 2024 and 2.2% in 2025. Note that the *actual* core PCE inflation rate in the second quarter of 2023 is still 4.4% (on an annualized basis)—considerably higher than FOMC expectations for 2023 expressed in June 2023.

Two lessons can be drawn. First, despite the considerable macroeconomic expertise of the Federal Reserve and the FOMC, official inflation expectations turned out to be wrong—not just numerically, but also in terms of how long the surge in inflation would last. This inference is not meant to discredit the experts at the Federal Reserve, because most macroeconomists outside the Fed were wrong as well, and those who claim to have been right, were mostly right for the wrong reasons—similar to a broken clock being right twice a day (Ferguson and Storm 2023). The difficulty is that inflation expectations that are relevant for wage and price determination cannot be directly measured but have to be forecasted. Using inflation expectations as a key factor in formulating monetary policy thus adds another unobservable variable to the New Keynesian mix of unobservable variables that already includes the output gap and the NAIRU (Rudd 2021).

Second, what **Figure 10** shows is that the FOMC acts more in a backward-looking manner than in a forward-looking mode: the key revisions in its inflation expectations occurred during the calendar year, after the publication of actual (monthly or quarterly) inflation numbers. This reinforces Rudd's conclusion that expectations do not matter a lot for inflation, also in the case of the Federal Reserve itself.

Finally, to get a sense of how effective monetary tightening by the Federal Reserve has (so far) 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 1 percentage point for the period 2022Q1-2023Q4.[11] The cumulative impact of monetary tightening on the U.S. inflation rate appears in **Figure 11**.

The steady rise in the policy interest rate—from 0.1% in 2022Q1 to 5% in 2023Q2—has 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% without the monetary tightening by the Federal Reserve—instead of 4.4% (which is the actual PCE inflation rate during 2023Q2). Assuming a different path for the policy interest rate, Fair (2022) himself finds that an increase in the policy rate by 5 percentage points will lower the inflation rate by 1.3

---

[11] Note that Fair (2022) measures the U.S. inflation rate based on the price deflator of the U.S. business sector. This measure is different from the price deflator for personal consumption expenditures (PCE), targeted by the Federal Reserve. It is assumed here that Fair's estimates can be applied to the PCE inflation rate.

percentage points. The drastic monetary tightening by the Fed has thus managed to lower U.S. inflation by just circa 13 percent (**Figure 11**) and 23 percent (calculated based on Fair's estimate).[12]

Figure 11
Estimated impact of monetary tightening on the PCE inflation rate:
the U.S. economy (2021Q4-2023Q2; percentages)
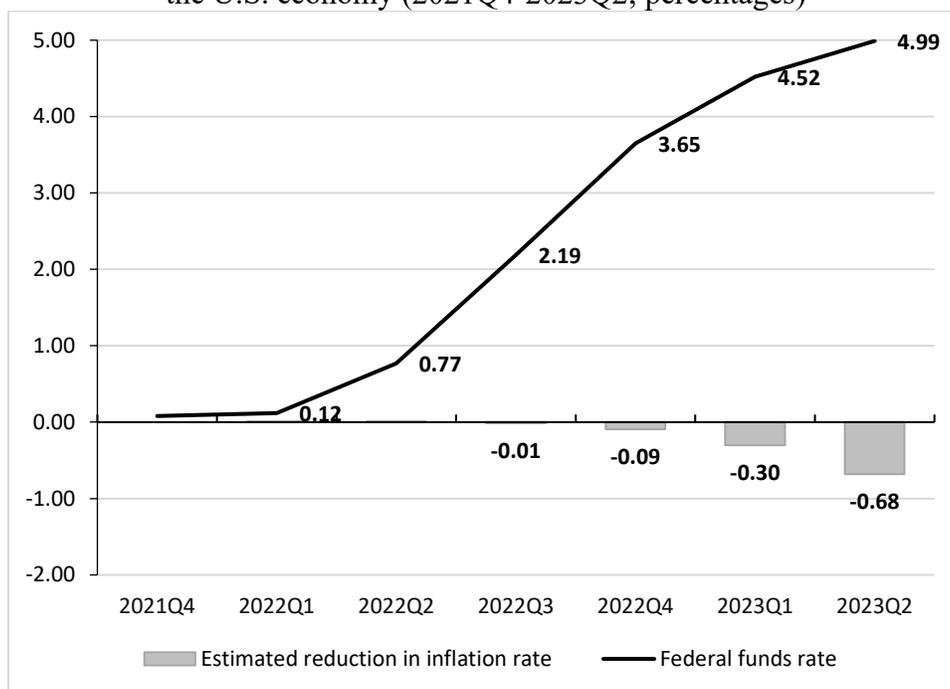
Sources: Calculated based on FRED database (*series* FEDFUNDS) and Fair (2022, Table 3).

Going by Fair's (2021) estimates, the biggest impacts of higher interest rates on inflation will occur during 2024, assuming no further rate hikes after 2023Q2, because of the lags involved; the U.S. inflation rate will be lowered by around two percentage points by the monetary tightening during 2022Q2-2023Q2, which suggests that, by mid-2023, the Federal Reserve has already raised interest rates by enough. This conclusion is confirmed by the inverted term structure of interest rates: since December 2022, the interest rates on longer-term Treasury securities (with maturities of more than 2 years) has been lower than the yields on short-term T-Bills (with maturities of 1 year or less). An inverted yield curve is commonly taken to signal that the probability of a recession has increased— and the risk of inflation is low in an economy that is weak. If correct, the far more hawkish Taylor-rule based interest rate paths appearing in **Figure 4** represent cases of a monetary-policy 'overshoot', based on flawed policy advice.

---

[12] It must be noted that the term structure of U.S. interest rates has become inverted since December 2022. The monetary tightening is less drastic when one considers longer-term interest rates.

4. Adding epicycles—or three ways to blame workers for the inflation they did not cause …

Right from its beginning, it was evident that the surge in U.S. inflation was driven primarily by higher energy and food prices, (global and domestic) supply bottlenecks and higher (corporate) profit mark-ups, rather than by higher nominal wages and unanchored inflation expectations (Ferguson and Storm 2023). However, fixated on their prior beliefs, the 'scientists of monetary policy' tend to dismiss, ignore or undervalue any evidence that contradicts their preconceived ideas. To give just one example, Benigno and Eggertsson (2023, p. 6) dismiss the inflationary impacts of persistent *supply-side* disruptions with accomplished sleight of hand, arguing that "conventional measures, such as the difference between headline and core inflation or the difference between the rates of change in the import-price and GDP deflators did not increase nearly as much in the 2020s as in the 1970s. Accordingly, supply disruptions are a less plausible candidate for the inflation surge in the 2020s relative to the 1970s …" Theirs is simply not a plausible argument—as is shown in **Figure 3**, the difference between headline and core inflation increased significantly during 2021-2023, pointing unequivocally to the supply-side nature of the surge in the U.S. inflation, particularly because the output gap remained negative. (And the comparison to the 1970s makes no sense in this case.)

Instead, the 'scientists of monetary policy' 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. labor markets, leading to higher wages and threatening a reemergence of a wage-price spiral, reminiscent of the wage-price spiral of the 1970s. With remarkable ease and speed, core analytical concepts (including the NAIRU and the unemployment gap) that were earlier argued to be central to their approach, were thrown overboard—in favor of an alternative, more convenient, indicator. **Section 4.1** 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 labor market tightness in the U.S. A closer look reveals that the vacancy ratio is an unreliable and biased indicator of labor market tightness and should not be used as a basis for monetary policy (Mui 2022). **Section 4.2** 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; if true, this would require aggressive monetary tightening, especially because inflation expectations might become unanchored. **Section 4.3** critically considers a third epicycle that is added to rescue economic orthodoxy in the face of the massive onslaught of recent circumstances: the discovery that the Phillips curve has very suddenly become non-linear (Benigno and Eggertsson 2023; Hobijn *et al*. 2023; Crust *et al*. 2023). A non-linear Phillips curve comes in handy for two reasons: first, it implies that a relatively limited tightening of the labor market does indeed generate a surge in inflation; and second, it implies that a modest degree of monetary tightening will be enough to bring about the desired disinflation.

4.1.   Goodbye unemployment gap, hello vacancy ratio

The COVID-19 crisis led to an unprecedented shake-up of the U.S. labor market (Ferguson and Storm 2023). Widespread job losses in 2020 gave way to tighter labor markets starting in 2021, as is indicated by the vacancy ratio in **Figure 12**. 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.

Figure 12
The vacancy ratio: the U.S. economy (2001Q1-2023Q2)
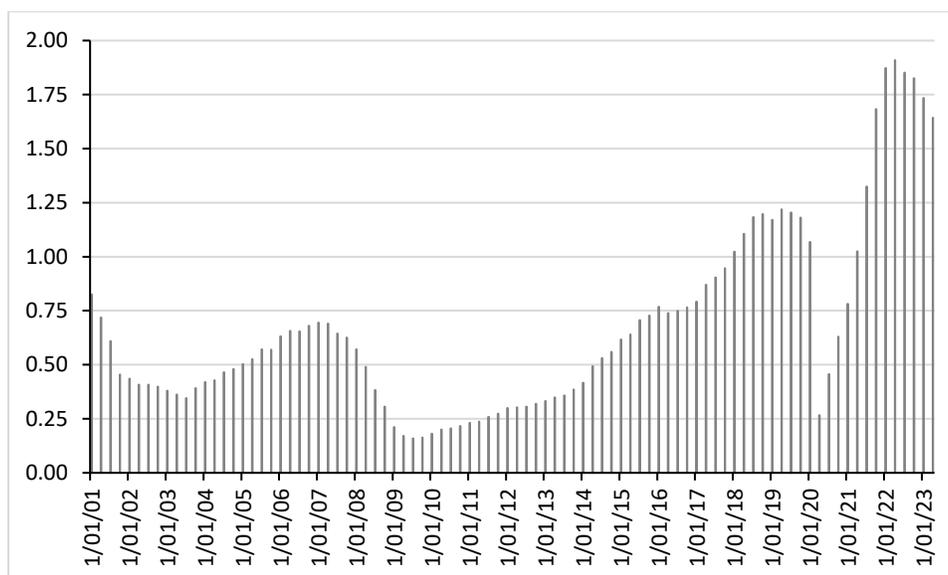
Source: Calculated based on FRED database (*series* UNEMPLOY and LMJVTTUVUSM647S). The vacancy ratio is defined as the number of vacancies per unemployed worker. The unemployment measure used is U3: all persons unemployed who are actively looking for a job.

It is clear from **Figure 12** that the American vacancy ratio is historically very high—and on the face of it, this does seem to suggest a very tight labor market. The exceptionally high vacancy ratio thus constituted a much better match with the prior beliefs of the New Keynesian *Thought-Collective* than the unemployment gap, which did not change so strongly. Appealing to the vacancy ratio as a measure of labor market tightness also has some intellectual pedigree—after all, the Diamond-Mortenson-Pissarides model of job search in labor markets with frictions was awarded the Nobel Prize in economics in 2010. Thus, Barnichon and Shapiro (2022), Domash and Summers (2022a, 2022b), Benigno and 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 unemployment gap was discarded, without further regard, in favor of the (arguably superior) indicator: the vacancy ratio.

Before proceeding, a quick reality check is in order, however. Barnichon *et al*. (2021), researchers at the *Federal Reserve Bank of San Francisco*, econometrically estimated the association between the vacancy ratio and the (core) PCE inflation rate using quarterly data for 1960-2021. Barnichon *et al*. 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.[13] 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' labor 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 indicator of labor market strength, the empirical evidence suggests that the vacancy ratio-wage-price channel is of only limited importance.

But the vacancy ratio is not a sound indicator of labor market strength, even if, at first sight, using the vacancy ratio in place of the unemployment gap does appear to make sense. To illustrate, **Figure 13** 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.[14] Both indicators are giving similar signals on the labor 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 rather 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% confidence interval for the mean vacancy ratio is equal to < 0; 1.14 > and the 99.7% confidence interval would be < 0; 1.43 >. The very high values of the vacancy ratio recorded during 2021Q4-2023Q2 lie outside the 99.7% confidence interval and must be considered outliers. This is illustrated in **Figure 13**, where the seven outlier observations are indicated by black dots. The fact that the vacancy ratio 'behaves' out of sync with the unemployment gap during 2021Q4-2023Q2 and is also far outside its historical boundaries, should have set off alarm bells: why is the vacancy ratio changing in this way? Ignoring the empirical weirdness of these outliers is an example of the Texas sharpshooter fallacy.[15]

---

[13] Econometric findings by Storm (2022) and Domash and Summers (2022a) are very similar to the estimate by Barnichon *et al*. (2021).

[14] Using observations for 2001Q1-2020Q1 (and excluding the 12 quarters 2020Q2-2023Q2), the correlation coefficient between the two indicators is *r* = -0.81 (*t*-value = -13.0; *n* = 77).

[15] The Texas sharpshooter fallacy is an informal fallacy committed when differences in observations are underemphasized, but similarities are overemphasized. The name comes from the story of a legendary

Figure 13
The unemployment gap versus the vacancy ratio: the U.S. economy
(2001Q1-2023Q2)
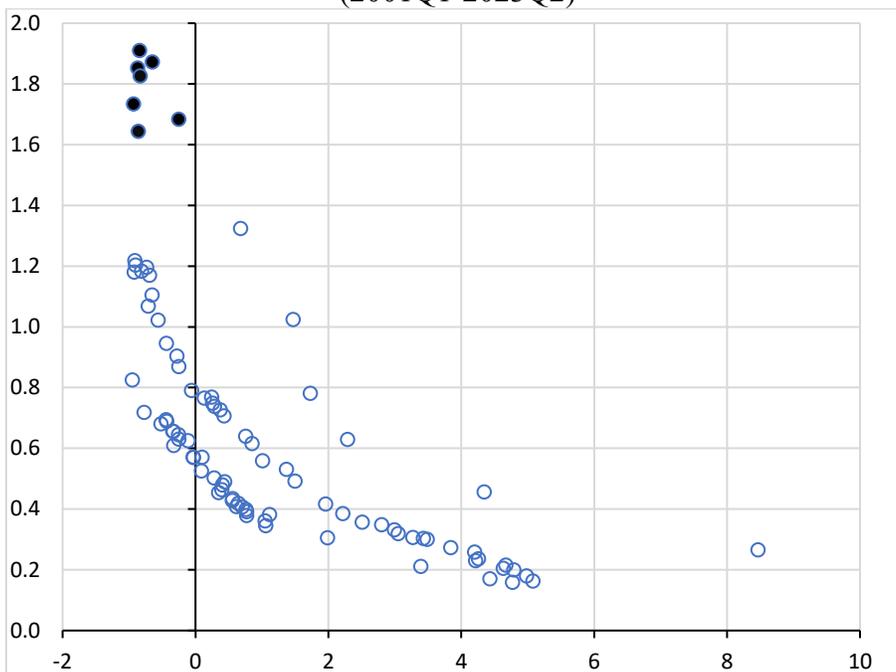
The point is that the U.S. vacancy ratio rose (so strongly), not because the economy was overheating (after all, the unemployment gap remains negative) or because the labor market was extremely tight. The vacancy ratio rose (so strongly) because of the massive occupational restructuring that resulted 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 on-line services and delivery (Ferguson and Storm 2023). In other words, the U.S. economy went through a post-pandemic surge in quits and job transitions (Birinci and Amburgey 2022) that is visible in the rise in the total non-farm quit rate, appearing in **Figure 14**.

The aggregate quit rate rose from circa 2.3% of employed workers before 2020 to around 3% 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

---

Texan who fires his rifle randomly into the side of a barn, then paints a shooting target centered on the tightest cluster of hits and claims to be a sharpshooter (Thompson 2009).

phenomenon, which has become known as the 'Great Resignation', such as workers reevaluating 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 and Storm 2023). The 'Great Resignation' is in actual fact a 'Great Occupational Restructuring' (Birinci and Amburgey 2022).

Figure 14
Total non-farm quit rate and job-to-job (J2J) transition rate:
the U.S. economy (2019Q1-2023Q3)
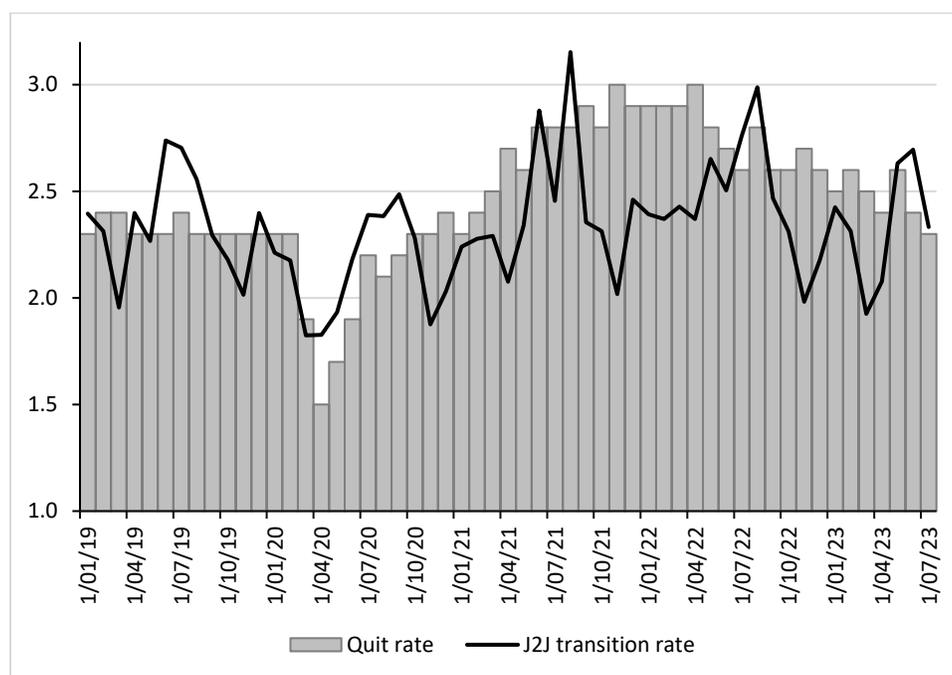
Source: FRED database (*series* JTSQUR) and monthly J2J data from Fujita, Moscarini and Postel-Vinay (2023).

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[16] in **Figure 14**. 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—which therefore does not signal a tight labor 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

---

[16] The J2J transition rate has been estimated using data from a household survey, which asks workers if they are working for the same employer as the previous month, or a different employer (Fujita *et al*. 2023).

interpreted as an unambiguous indicator of the tightness of the labor 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 labor market may be considerably less tight than what is implied by the V/U ratio.

Following the example of Fed economists Andolfatto and Birinci (2022), I therefore plot an adjusted measure of labor market tightness, V/(U3 + E*J2J) in **Figure 15**. This adjusted measure includes a different calculation for the number of 'available workers', U3 + E*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, Moscarini and Postel-Vinay (2023).

As is shown in **Figure 15**, 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 labor market from the COVID 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. labor market.

Figure 15
Measuring labor market tightness in the U.S. economy
(2017Q1-2023Q3)
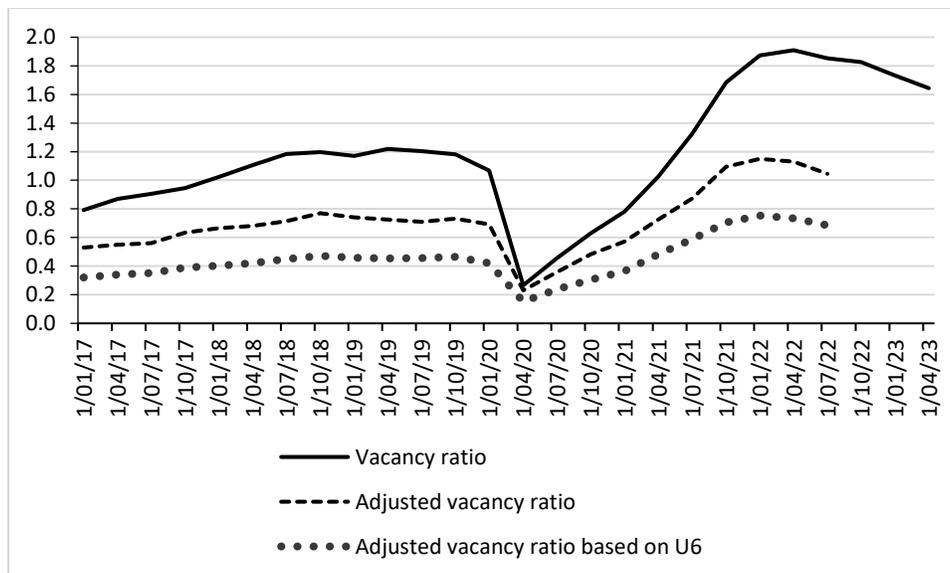
Source: FRED database (*series* UNEMPLOY; LMJVTTUVUSM647S) and monthly J2J data from Fujita, Moscarini and Postel-Vinay (2023). See also Andolfatto and Berinci (2022).

However, even this adjusted vacancy ratio still exaggerates the 'tightness' of the U.S. labor market, because it counts, in its denominator, only those unemployed workers who have been actively looking for work and excludes all discouraged workers and workers who are marginally attached to the labor force. However, as usual, as the economy recovers, large numbers of discouraged workers have re-entered the labor 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 next plot a second alternative vacancy ratio which was calculated using the broad definition of unemployment (U6, which includes discouraged workers) as well as the J2J transitions in each month. As **Figure 15** shows, the "adjusted vacancy ratio based on U6" is considerably lower than the conventional vacancy ratio and diverges from this conventional measure during 2021-2023. Both adjusted measures suggest that the U.S. labor market is not as tight as the conventional measure indicates.

However, both adjusted measures of the vacancy ratio in **Figure 15** 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. The job-switcher "wage growth premium"—the difference in median nominal wage growth between job switchers and job stayers—did increase in 2021-2022, as is shown in **Figure 16**. During January 2017 and March 2020, the nominal wage growth premium was 0.9 percentage points on average, but this premium rose to more than 2 percentage points during the fourth quarter of 2022 and the first quarter of 2023. But in recent months, the premium has declined again, to 1.3% in August 2023, which indicates a gradual post-pandemic normalization of the U.S. labor market (during 2023).

However, even if job switchers managed to move from jobs with lower nominal wage growth to jobs with (somewhat) higher nominal wage growth, America'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 17**. Right when the U.S. inflation rate begins to increase, *i.e.*, in the second quarter of 2021, 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 very low during 2022Q4-2023Q1.

Figure 16
The job switcher wage growth premium:
Percentage point difference between 12-month moving average median nominal wage growth of
job switchers and job stayers (January 2017 - August 2023)
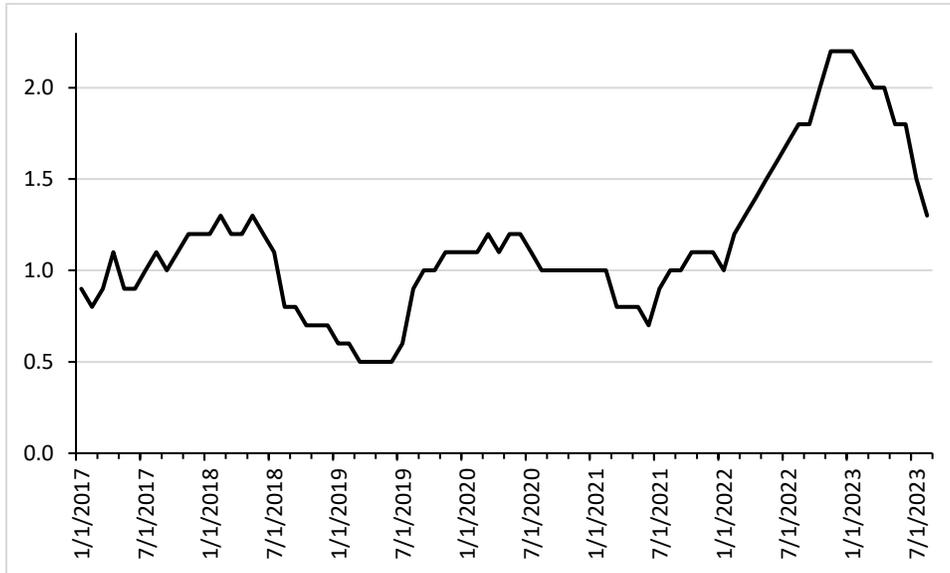
Source: Atlanta Federal Reserve *Wage Growth Tracker*. Author's calculations.

Figure 17
Growth rate of median usual weekly real earnings of (fully-employed)
wage and salary workers in the U.S. (2021Q1-2023Q2; percentages)
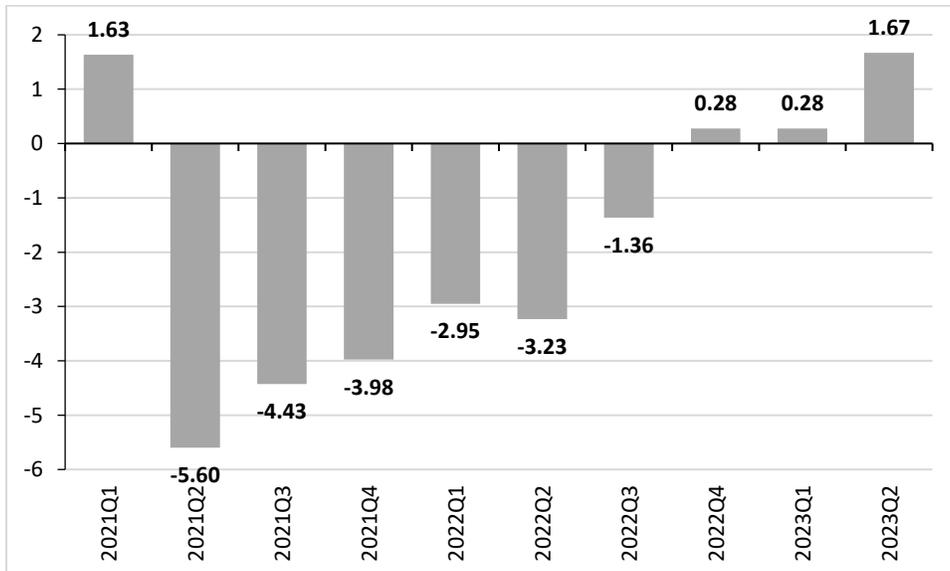
Sources: Calculated based on FRED database (*series* LES1252881600Q_PC1). Real
earnings have been calculated using the CPI.

In addition, the labor income share of all workers in U.S. GDP has steadily declined during the 30-months period of 2020Q1 and 2023Q2 (**Figure 18**). Recent household data published by the U.S. Census Bureau (2023) show that real median household income was 2.3% lower in 2022 than in 2021. The real median earnings of all workers (including part-time and full-time workers) decreased by 2.2% between 2021 and 2022, while median earnings of those who worked full-time, year-round decreased 1.3%. There is simply no evidence that the recent acceleration of inflation is caused by a wage-price spiral; until now, American workers have not been able to negotiate higher nominal pay in excess of productivity and inflation. Declining real wages and a falling labor income share are not exactly signals of an "extremely tight" labor market—and appear to be inconsistent with the very high conventional vacancy ratio.

Figure 18
Non-farm Business Sector: Labor Share for All Workers
(2021Q1-2023Q2; quarterly index 2020Q1 = 100; seasonally adjusted)
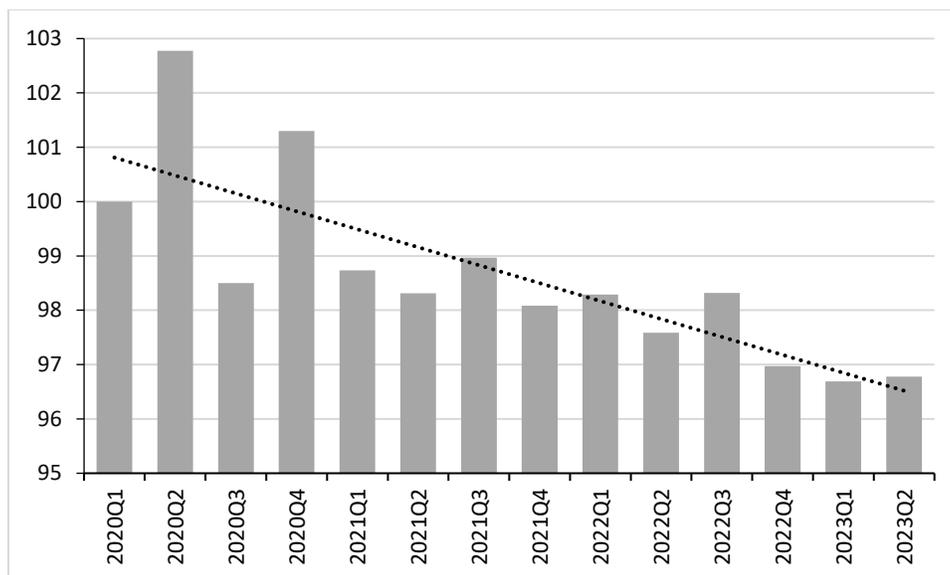
Sources: Calculated based on FRED database (*series* PRS85006173).

Other indicators of labor market strength also show that the American labor market is not tight. Consider **Figure 19**, 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 labor. As Martin Sandbu (2023) writes in *The Financial Times*:

"why, at a time of supposedly excessive demand for labor, 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?"

Figure 19
Average Weekly Hours of All Employees, Total Private
(January 2021 – August 2023; monthly index January 2020 = 100; seasonally adjusted)
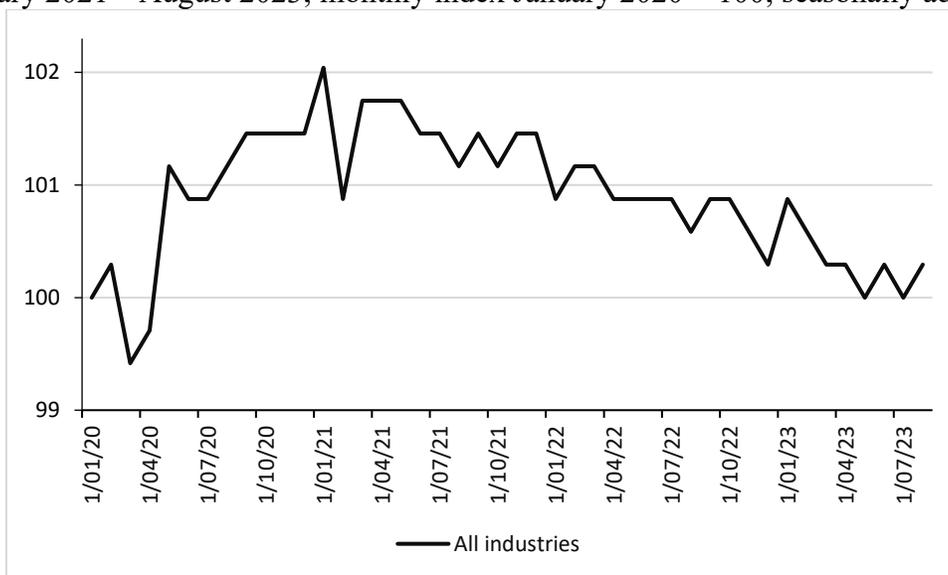
Sources: Calculated based on FRED database (*series* AWHAETP).

31

Figure 20
U.S. Employment Rate: Aged 15-64: All Persons
(2020Q1 – 2023Q2; percent; seasonally adjusted)
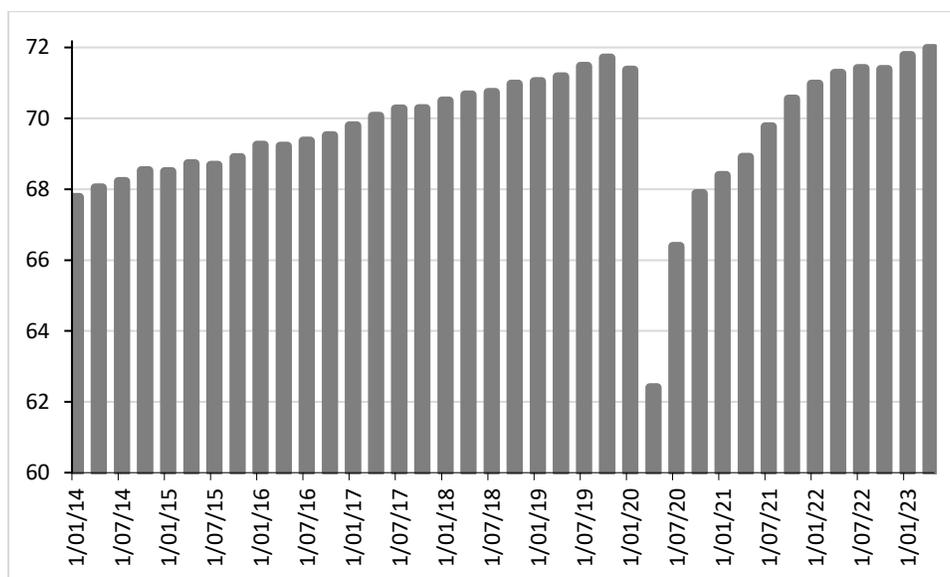
Sources: FRED database (*series* LREM64TTUSM156S).

A final obvious measure of labor 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 20**), which—again—suggests that the labor 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 12**, which was found to be out of sync with the 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. labor market. Uncritical use of the vacancy ratio as an indicator of the tightness of the labor market is bad scientific practice. It amounts to cherry-picking an indicator that is 'biased' to showing an exaggerated tightness of the labor market, setting monetary policymakers up to deliver significantly more monetary tightening than can be justified on the basis of alternative and arguably more reliable indicators (Mui 2022).

4.2. The perversity trope: higher nominal wages are not in the interest of workers

Psychologist Abraham Maslow once wrote the following: "I remember seeing an elaborate and complicated automatic washing machine for automobiles that did a beautiful job of washing them. But it could do only that, and everything else that got into its clutches was treated as if it were an automobile to be washed. I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail" (Maslow 1966, pp. 15-16). In the clutches of the washing machine

that is the 'science of monetary policy', all increases in inflation are treated as if these are based on a wage-price spiral, caused by a very tight labor market, that has to be stopped, before inflation expectations become unanchored.

Thus, the Federal Reserve and many economists became worried that rising nominal wages were about to start a wage-price spiral—the stuff of inflationary nightmares. These fears were fueled 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 and Summers 2022a, p. 32) and that "nominal wage growth […] is projected to increase *dramatically* over the next two years, surpassing 6% wage inflation by 2023 …." (Domash and Summers 2022a, p. 21). This is clearly serious stuff—notice the use of the words "extremely" and "dramatically" in these sentences. A re-emergence of the wage-price spiral would become likely, as soon as the public's inflation expectations would become unanchored, if actual inflation is allowed to accelerate too strongly. Fed economists Jordà *et al*. (2022) warned that inflation expectations had an average pass-through to wage inflation of 100% in the recent period 2020Q2-2022Q1—compared to a much lower average pass-through of only 12% during 2007Q-2019Q4.[17] For the New Keynesian *Thought Collective*, the risks of a U.S. wage-price spiral were looming large.

Convinced by their own evidence, Domash and Summers (2022c) put forward the argument that it is not in the interest of U.S. workers to demand higher nominal wages (as compensation for the sharply rising costs of living). Claiming higher nominal wages could turn into a self-defeating strategy, they argue, because individual gains in nominal income will be eroded by the consequent increase in aggregate inflation. This particular proposition is a clear instance of what Albert Hirschman (1991) called the 'rhetoric of reaction', and more specifically, of the 'perversity trope': the claim that some purposive intervention to improve some feature of the political, social or economic order only serves to worsen the condition one wishes to ameliorate.[18]

To buttress their point, Domash and Summers (2022c) present a statistically significant parabolic relationship between U.S. nominal wage growth and real wage growth: as nominal wage growth rises from a low level, real wage growth rises as well—until nominal wage growth reaches about 5.6 percent—and falls thereafter. The (rather crude) intuition behind this result, if we define intuition strictly within the boundaries of the New Keynesian universe, is that excessive nominal wage growth will lead to the overheating of the U.S. economy, which will trigger price increases in excess of nominal wage increases.

---

[17] However, the analysis by Jordà *et al*. (2022) is spurious—because it assumes that the observed correlation between (higher) nominal wage growth and elevated consumer price expectations (based on the *Michigan Survey*) represents a causal relationship. For this relationship to work, one has to assume that U.S. workers possess the bargaining power that is required to push through nominal wage increases—which is obviously not the American reality, following decades of increased use of automation, declining union membership and labor market deregulation (Storm 2017; Stansbury and Summers 2020).

[18] This section is based on Storm (2022).

I have replicated their analysis (**Figure 21**) and also obtain a parabolic—inverse U-shaped—relationship between lagged nominal wage growth and real wage growth in the US during 1965Q1-2019Q4. The parabola has a turning point at a nominal wage growth rate of 5.6%; real wage growth peaks at 1.44%. If we take **Figure 21** seriously, it would mean that average U.S. real wage growth will decline from its peak level of 1.44%, the more U.S. workers manage to push nominal wage growth above the threshold of 5.6%. Real wage growth will even turn negative once nominal wage growth exceeds 11.4%. Domash and Summers (2022c) make it clear that it is not appropriate to interpret the parabolic relationship between nominal and real wage growth in causal way. After making this token caveat, they nevertheless offer a causal explanation:

> "Both nominal wage growth and real wage growth reflect a variety of economic forces. Our suspicion about the best way to understand the documented relationship is that in environments of stable inflation, increases in wages are primarily driven by increases in productivity growth, which justify higher real wages. But past a certain point, it is likely that most increases in wages are driven either by adverse supply shocks or by increases in nominal aggregate demand, both of which are naturally associated with decreases in real wages." (Domash and Summers 2022c).

Figure 21

Real compensation growth versus nominal compensation growth,
US non-farm employees (1965Q1-2019Q4)
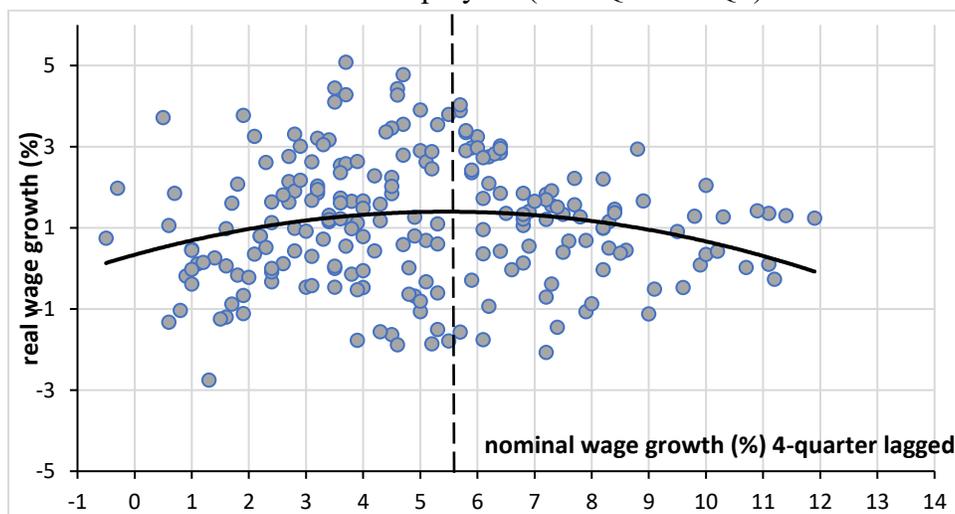
Source: Author's estimations based on BLS data via FRED. *Notes*: Nominal (real) compensation growth is calculated as the 4-quarter percent change in the hourly nominal (real) compensation for non-farm employees from the BLS. The estimated relationship between nominal wage growth W and real wage growth w is: $w = 0.508\,W - 0.045\,W^2$. Coefficient 0.508 has a *t*-value of 8.63 and coefficient -0.045 a *t*-value of -5.87; $\bar{R}^2 = 0.37; F = 64.9; n = 216$. The coordinates of the turning point are: $W = \frac{0.508}{2 \times 0.045} \approx 5.69\% ; w \approx 1.44\%$.

U.S. workers be warned: nominal wage growth, which was running at 6.5% in the first quarter of 2022, had already passed the turning point of **Figure 21**, and hence, Domash and Summers predicted that U.S. real wage growth should decline (which it did not, see **Figure 17**). Based on the evidence, it follows that nominal wage growth restraint will 'lead to' *higher* real wage growth, because it will help cool down the overheated US economy.

The 'perversity trope' used by Domash and Summers (2022c) can only work, however, if higher nominal wage growth raises the growth of nominal unit labor cost (ULC) and firms shift the higher ULC on to prices. Nominal unit labor cost growth is, by definition, equal to the difference between nominal wage growth and labor productivity growth. It follows that an increase in nominal wage growth that is accompanied by a similar increase in labor productivity growth does not raise nominal ULC growth and inflation. Hence, the correlation between nominal wage growth and real wage growth in **Figure 21** is misleading, because higher nominal wage growth will only impact inflation and real wage growth if it exceeds labor productivity growth and raises ULC growth.

Therefore, in **Figure 22**, I plot the 4-quarters lagged growth of nominal ULC against real wage growth. Nominal ULC growth is a more relevant *explanans* than just nominal wage growth, because it also includes labor productivity growth;[19] nominal ULC growth is what matters for inflation. I obtain a parabolic relationship between ULC growth and real wage growth in the US during 1965Q1-2019Q4. The parabola has a turning point at a nominal ULC growth rate of 6.2%; real wage growth peaks at 2.5%.

---

[19] This is acknowledged by Domash and Summers (2022c) who write: "wage growth that runs too far ahead of productivity can contribute to underlying inflation and reverse the very gains in worker purchasing power that we are trying to achieve."

Figure 22

Real compensation growth versus nominal unit labor cost growth (ULC),
US non-farm employees (1965Q1-2019Q4)
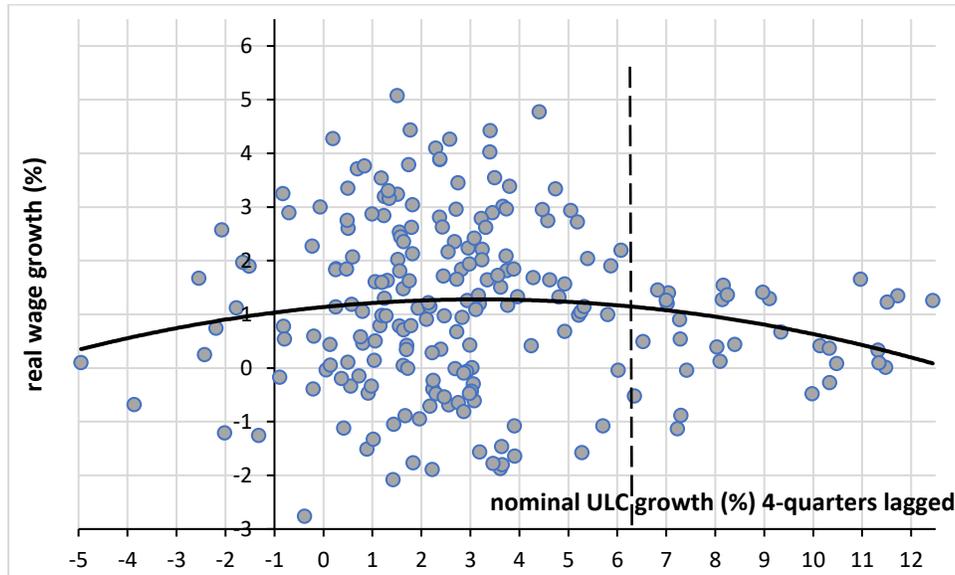
Source: Author's estimations based on BLS data via FRED. *Notes*: The estimated relationship between nominal ULC growth ULC and real wage growth w is: $w = 0.421\,ULC - 0.034\,ULC^2$. Coefficient 0.421 has a *t*-value of 6.61 and coefficient -0.045 a *t*-value of -4.39; $\bar{R}^2 = 0.21$; $F = 29.2$; $n = 216$. The coordinates of the turning point are: $ULC \approx 6.24\%$; $w \approx 2.53\%$.

What does this finding mean for nominal wage growth and the warning by Domash and Summers? Note first that labor productivity growth in the U.S. during 1965Q1 and 2019Q4 was 1.9% on average per year. This implies that a nominal wage growth rate of 8.1% is consistent with a growth rate of nominal ULC of 6.2%. In other words, using nominal ULC growth instead of nominal wage growth, I find that the turning point after which nominal wage growth is associated with declining real wage growth is 8.1% rather than 5.6%. With U.S. nominal wage growth running at 6.5%, which is firmly on the upward-sloping left-side of the parabola in **Figure 22**, it still makes good sense for U.S. workers to push up nominal *and* real wages—completely in line with the crude logic proposed by Domash and Summers.

Domash and Summers are right when they write that the parabolic relationship is not meaningful in a causal way, because "nominal wage growth and real wage growth reflect a variety of economic forces." As is shown by the adjusted R^2's reported in the notes to **Figures 21** and **22**, the parabolic relationships explain only around one-third of the variance in real wage growth—which means that two-thirds are left unexplained. As a result, the out-of-sample performance of the econometric model underling **Figure 21** is very poor, as the out-of-sample prediction errors are rather large (Storm 2022). That the predictive power of the parabolic relationship between nominal and real wage growth in the U.S. proposed by Domash and Summers is a complete shambles is shown by

Figure 23. **Figure 23** is the same as **Figure 21**, but includes in addition the data on real and nominal compensation growth for the recent quarters 2021Q2-2023Q2. It is evident that American workers did not 'push' nominal wage growth beyond the turning point—but their real wages nevertheless declined by much more than the curve does predict.

This brings us to the greatest weakness of the argument put forward by Domash and Summers (2022c): it incorrectly presupposes that U.S. workers somehow have sufficient bargaining power to obtain higher and higher nominal wage increases. Structural evidence provided by Stansbury and Summers (2020) shows that this presupposition is empirically incorrect.[20] U.S. workers are relatively powerless and incapable of protecting their real wages in this inflationary era (Storm 2017; Ferguson and Storm 2023). Average real earnings in the U.S. fell off a cliff, declining in cumulative terms by more than 9 percent during 2020Q2 and 2022Q2, and have not yet bounced back—as is shown in **Figure 23** and **Figure 24**. The surge in the inflation rate has been very costly to workers.

---

[20] Stansbury and Summers (2020, p. 2) identify three causes for the structural decline in worker power in the U.S.: "First, institutional changes: the policy environment has become less supportive of worker power by reducing the incidence of unionism and the credibility of the "threat effect" of unionism or other organized labor, and the real value of the minimum wage has fallen. Second, changes within firms: the increase in shareholder power and shareholder activism has led to pressures on companies to cut labor costs, resulting in wage reductions within firms and the "fissuring" of the workplace as companies increasingly outsource and subcontract labor. And third, changes in economic conditions: increased competition for labor from technology or from low-wage countries has [….] has improved employers' outside option."

Figure 23

Real compensation growth versus nominal compensation growth,
US non-farm employees (1965Q1-2019Q4 and 2021Q2-2023Q2)
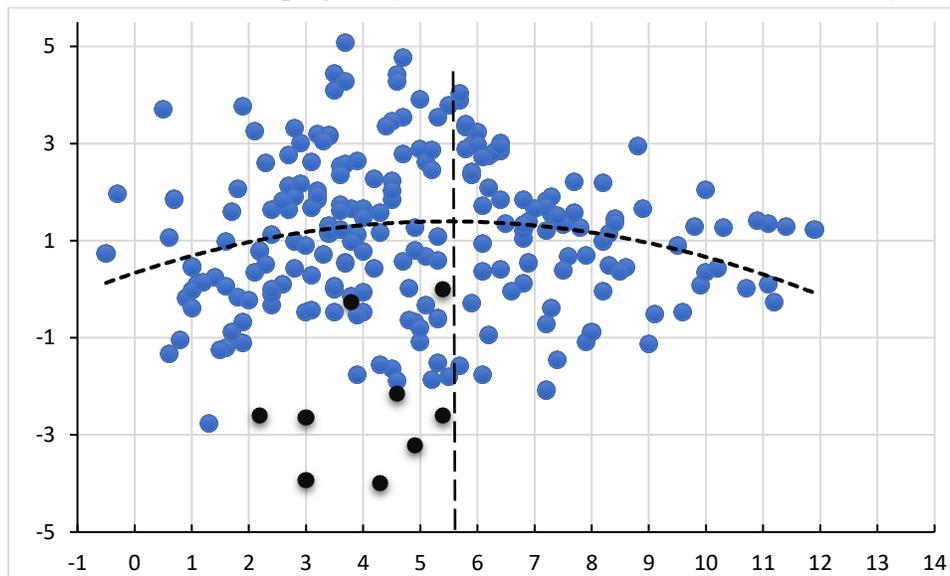
Source: Author's estimations based on BLS data via FRED. *Notes*: See **Figure 20**. The black dots are observations for the period 2021Q2-2023Q2.

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. Jeremy Rudd (2022) 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.[21] Even though many

---

[21] The nominal wages of the bottom 25% of American workers increased more strongly than the nominal wages of the other 75% 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

workers benefitted from the job-switcher "wage growth premium" (**Figure 16**), America's workers have—on average—been unable to protect their real wages as the inflation rate began to increase (**Figure 24**). 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.

Figure 24
Cumulative decline in median usual weekly real earnings of (fully-employed)
wage and salary workers in the U.S. (2020Q2-2023Q2; index 2020Q2 = 100)
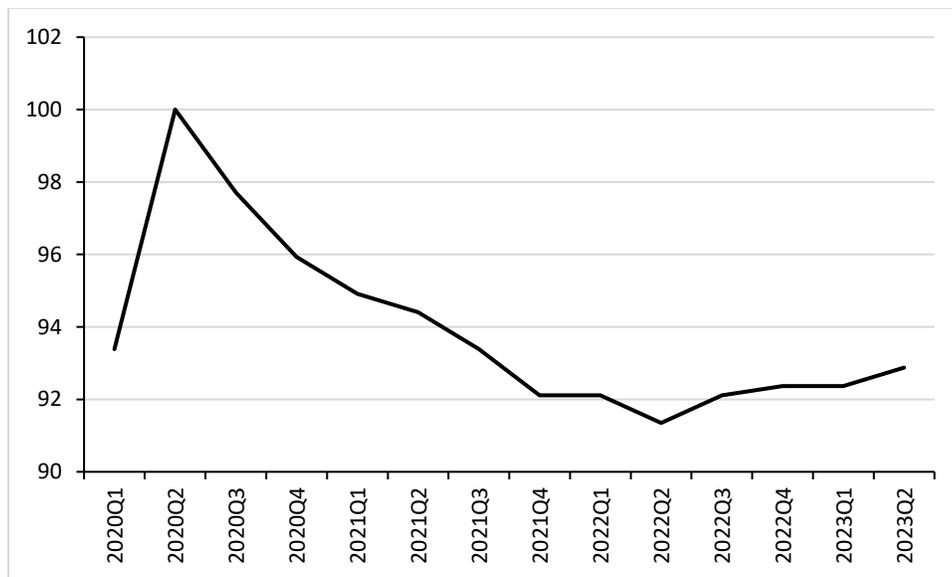
Sources: Calculated based on FRED database (*series* LES1252881600Q_PC1). Real earnings have been calculated using the CPI.

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

The third and final 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

---

have trouble finding anyone willing to do 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 and Storm 2023, pp. 17-18).

steeper Phillips curve suggests a stronger trade-off between unemployment and inflation and a lower sacrifice ratio of monetary policy.

The Phillips curve was very flat for the 20-plus years before the pandemic, as shown by Stock and Watson (2019), Stansbury and 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 25**: the slope of the pre-pandemic Phillips curve for the U.S. is much smaller (in absolute terms) than the slope of the Phillips curve during the recovery period. Based on simple linear OLS regressions, the pre-pandemic Phillips curve has a slope coefficient of -0.11 compared to a slope coefficient of -0.87 for the recovery-period Phillips curve. The pre-pandemic slope coefficient implies that the unemployment rate must be raised by 9 percentage points in order to lower the core inflation rate by 1 percentage point.

Figure 25

Phillips curves for the United States: pre-pandemic and recovery periods
(2001Q1-2019Q4 versus 2021Q1-2023Q2)
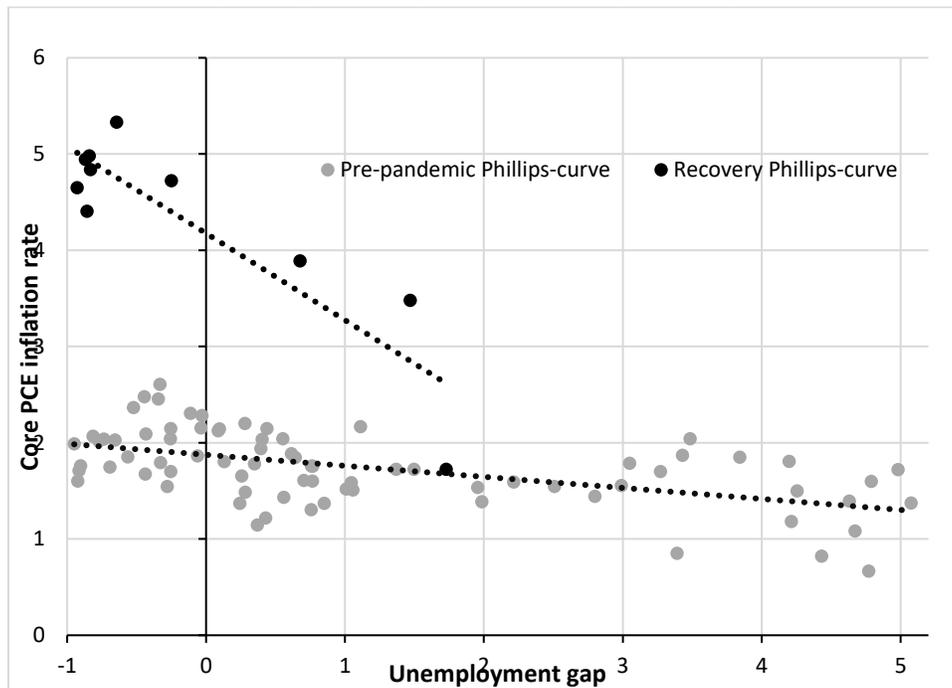
Source: Author's construction based on FRED data (*series* UNRATE; NROU; PCEPILFE_PC1).

This 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. As Fed economists Del Negro *et al*. (2022) point out:

> "In the New York Fed DSGE model, monetary policy faces an unfavorable trade-off when attempting to stabilize inflation in response to cost-push shocks, due to an extremely flat Phillips curve. Lowering inflation requires a deep and protracted contraction, regardless of the policy strategy underlying the pursuit of this objective. [….] the Phillips curve may be— or may have recently become—steeper than estimated in the model. However, our calculations suggest that it would need to be even steeper than the one estimated with data up to 1990—a period in which the connection between inflation and real activity was arguably tighter than in the more recent past—for higher interest rates to make a sizable dent in inflation."

Robert M. Solow is clear: "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).

The recovery-period slope coefficient suggests a much lower sacrifice ratio: to bring the inflation rate down by 1 percentage point, the unemployment rate must be increased by only 1.14 percentage points. Hobijn, Miles, Royal and Zhang (2023), Crust, Lansing and Petrosky-Nadeau (2023) and Benigno and Eggertsson (2023) present more sophisticated econometric evidence of the steepening Phillips curve and the lowering of the sacrifice ratio for the recovery period (2021Q1-2022Q2). Their 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.

Based on these empirical results, the Phillips curve has been argued to have become non-linear which becomes very steep at more negative magnitudes of the unemployment gap (Crust *et al*. 2023). This can be seen in **Figure 25** when one visually combines the two linear curves into one downward-sloping curve (which would run convex to the origin). As a result, a relatively small increase in labor market slack can 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.

Figure 26 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 and Eggertsson (2023), this figure is worth more than a thousand words, because it so strongly suggests that the relationship between inflation and labor market strength is more or less flat up to the point where V/U ≤ 1, after which it becomes steeply upward-sloping when V/U > 1, *i.e.*, when there is a labor shortage. Benigno and Eggertsson (2023) build a New Keynesian DSGE model in which the labor 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 ≤ 1, but will rise rapidly when the labor 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 and Eggertson (2023) then is that the Biden demand stimulus of 2021 was excessive[22] and pushed the vacancy ratio above the threshold value of 1. Central bankers and private forecasters were caught by surprise, assuming that the Phillips curve would remain flat and thinking the impact on inflation would remain limited; supposedly only Lawrence Summers (2021) had it right, predicting that the economy would end up on the steeply upward-sloping segment of the Phillips curve of **Figure 26**.

Figure 26
Sometimes a Figure is Worth More Than a Thousand Words—Also When It's Wrong:
Core PCE inflation versus the vacancy ratio (2001Q1-2023Q2; percentages)
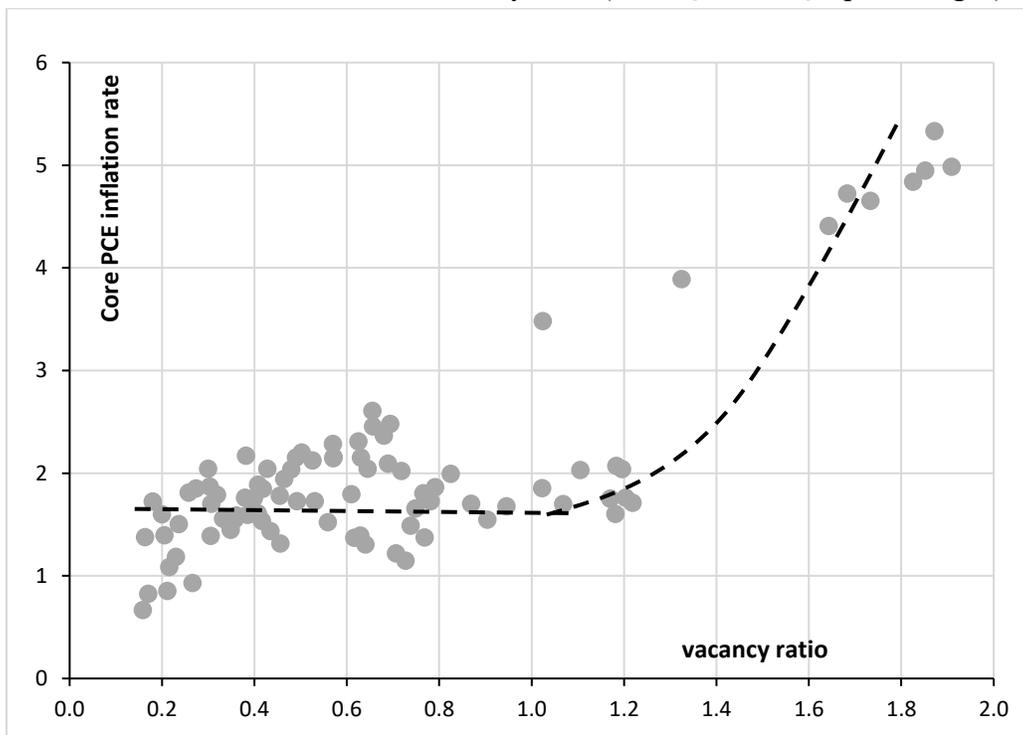
Source: Author's construction based on FRED data (*series* UNRATE; NROU; PCEPILFE_PC1).

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) are careful, writing that "it is still too early to determine whether

---

[22] Repeating the same story again and again does not render it true. Evidence provided by Ferguson and Storm (2023), Asdourian, Salwati, & Sheiner (2022) and Parker, Schild, Erhard, & Johnson (2022) shows that the surge in U.S. inflation was not caused by Biden's pandemic relief spending. The DSGE model of Benigno and Eggertson (2023) has been calibrated to generate the "stimulus causes inflation" story—and as with any algorithm, the GIGO principle applies here as well.

this steepening of the Phillips curve is temporary or persistent." A second problem is that the conventional vacancy ratio is a biased and unreliable indicator of labor market strength—and is grossly overstating the post-pandemic tightness of the labor market (as argued above). For this reason, **Figure 26** is misleading: it is suggesting a causal relationship where there is none. I will return to this point below.

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 specification of the (linear) New Keynesian Phillips curve (Benigno and Eggertson 2023; Gagliardone, Gertler, Lenzu and Tielens 2023):

(1) $\qquad \pi_t = \kappa \, y_t \, + \, \mu_t \, + \, \beta \, E_t \, \pi_{t+1}$

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 on inflation of excess aggregate demand. In the underlying theory, excess demand leads to a tight labor 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 labor market tightness, the output gap and the inflation rate have weakened over time. At that time, most New Keynesian economists argued that the relationship between the output gap and inflation had weakened because of the credible commitment of the Federal Reserve to control inflation by stabilizing the output gap and inflation expectations in response to supply shocks (McLeay and Tenreyo 2020). This view has been expressed in no unclear terms by St. Louis Fed President James Bullard (in 2018), when he discussed the flattening of the empirical Phillips curve: "If you put it in a murder mystery framework—'Who Killed the Phillips Curve?'—it was the Fed that killed the Phillips curve" (Ydstie 2018).

Clearly, this triumphant 'murder mystery' narrative is no longer plausible, because there is no longer a corpse: the Phillips curve has—on the face of it, at least—returned to life. 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 recognize 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 and Eggertson (2023) who argue that the slope of the Phillips curve, κ, is a non-linear function of the vacancy ratio θ, or:

(2) $\qquad \kappa = \bar{\kappa}$ if $\vartheta \leq 1$ and $\kappa = \bar{\kappa}\,\vartheta^{\varepsilon}$ if $\vartheta > 1$; $\varepsilon > 1$

This corresponds to what is shown in Figure 25: the slope of the Phillips curve is small and constant for as long as the (conventional) vacancy ratio is below (or equal to) unity, and there is slack in the labor market. The slope will rise, however, as soon as the (conventional) vacancy ratio exceeds unity and the labor market becomes tight. 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 2 jobs per unemployed worker. On an aside, Benigno and 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. labor market.

The empirical evidence is also not in favor of the explanation by Benigno and Eggertson (2023). True, **Figure 26** is very suggestive of a Phillips curve that is non-linear in the conventional vacancy ratio (as in eq. (2)), as high values for ϑ during 2021-2023 coincide with high rates of core PCE inflation during the same period. However, **Figure 27** shows that the coincidence is spurious: the extremely high values for ϑ do not coincide with significantly higher growth rates for nominal wages. In other words, the 'extremely' tight American labor 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 4.1**. The reason is that the conventional vacancy ratio is significantly overstating the strength of the U.S. labor market, unlike alternative indicators discussed above. There is no wage-price spiral at work, in other words, even if ϑ has risen far above unity.

The explanation offered by Benigno and Eggertson (2023) is not persuasive. This is recognized, albeit implicitly, by fellow New Keynesians Gagliardone, Gertler, Lenzu and Tielens (2023, p. 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 labor market (as **Figure 27** shows). And it is not plausible to claim, as Benigno and 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.

Figure 27

Here is a Figure that is Worth More Than a Thousand Words:
The Vacancy Ratio versus Nominal Wage Growth (2001Q1-2023Q2; percentages)
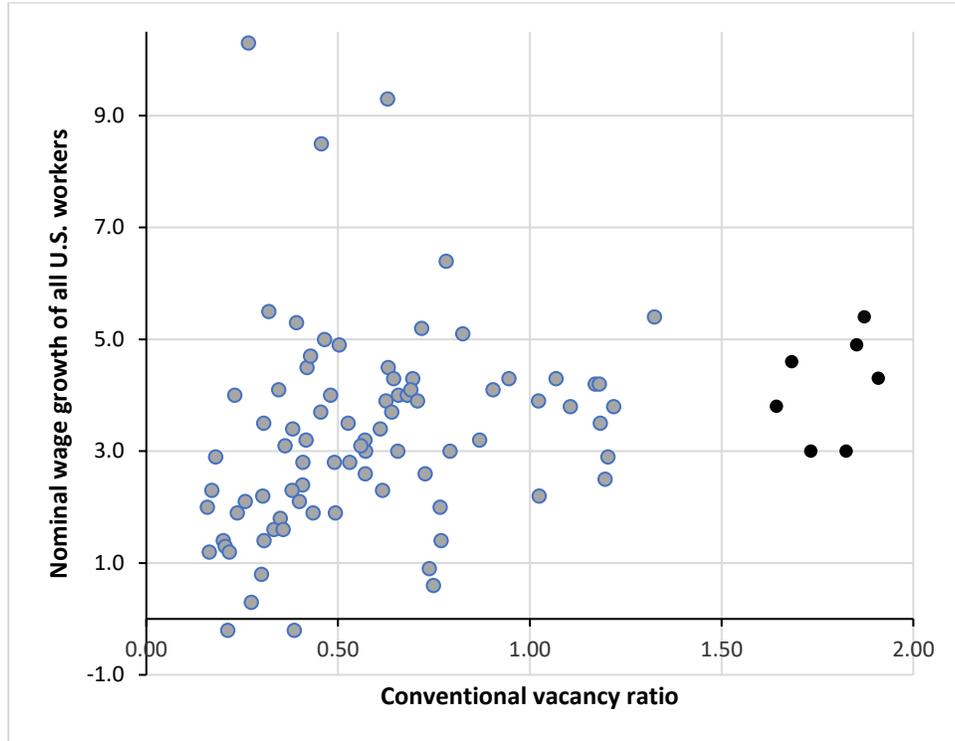
Source: Author's construction based on FRED data (*series* UNEMPLOY, LMJVTTUVUSM647S and PRS85006101). The black dots are observations for the recovery period.

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

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

They show that the econometric estimates of the slope coefficient κ based on eq. (3) are three to four times larger than the estimates of κ based on eq. (1). The 'true' slope of the Phillips curve is, therefore, not so small after all. It is somewhat ironic that the 'better' estimates of the slope of the Phillips curve are based on the *primitive* form of the curve, because it means that the theoretically supposedly more sophisticated eq. (1) does not produce better results. Anyway, assuming a steeper Phillips curve, Gagliardone *et al*. (2023) and Gagliardone and 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 eq. (3); and (*b*) inflation surged during 2021-2023, primarily because oil prices rose strongly, raising mc_t. Both Gagliardone *et al*. (2023) and Gagliardone and 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. It is reasonable to read the findings of Gagliardone *et al*. (2023) as follows: the Phillips curve has drifted upwards because of major (energy) cost shocks, while the slope coefficient κ remains small.

There is a very good reason why the Phillips curve has become flat: decades of labor market deregulation have created what Alan Greenspan called workers 'traumatized' by job insecurity and afraid or simply unable to press for wage increases (Storm and Naastepad 2012; Weil 2014; Storm 2017). Drastic labor market deregulation in favor of corporations was one of the key drivers of de-unionization, as the political support for and enforcement of labor laws weakened, pattern bargaining broke down and the number of right-to-work states[23] in the U.S. increased. Workers' ability to organize was reduced by a direct weakening of labor law, employment protection and labor law enforcement, and by an increased corporate use of union avoidance tactics (Stansbury and Summers 2020, p. 10).

Job insecurity rose and pay stagnated as workplaces fissured after large corporations shed their role as direct employers in favor 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 (**Figure 28**), (private-sector) trade union density and collective bargaining coverage have fallen (**Figure 29**), as the number of workers in the gig economy rose, shareholders have become more demanding and powerful, and globalization has made workers more vulnerable to threats of job loss due to delocalization (see Stansbury and Summers 2020).[24] Job insecurity has become an endemic part of American working life, even though the official unemployment rate is low.

---

[23] In these states, laws prohibit union security agreements between employers and labor unions; employees in unionized workplaces are prohibited from negotiating contracts which require workers who are not union members to contribute to the costs of union representation.

[24] Union density declined from around 30% in the early 1960s to less than 10.1% in 2022. The private-sector unionization rate is only 6%. Unionized workers receive significantly higher wages than observationally equivalent non-union workers. Estimates by Stansbury and Summers (2020) shows that the union wage premium for private sector workers in the U.S. declined by almost one-third during 1982 and 2019, in line with the steady decline in union density. This loss in union wage premia led to a secular decline in 'labor rents' as a share of the net value added in the non-financial corporate sector.

Figure 28

Real minimum wage per hour of work:
The U.S. economy (1970-2022)
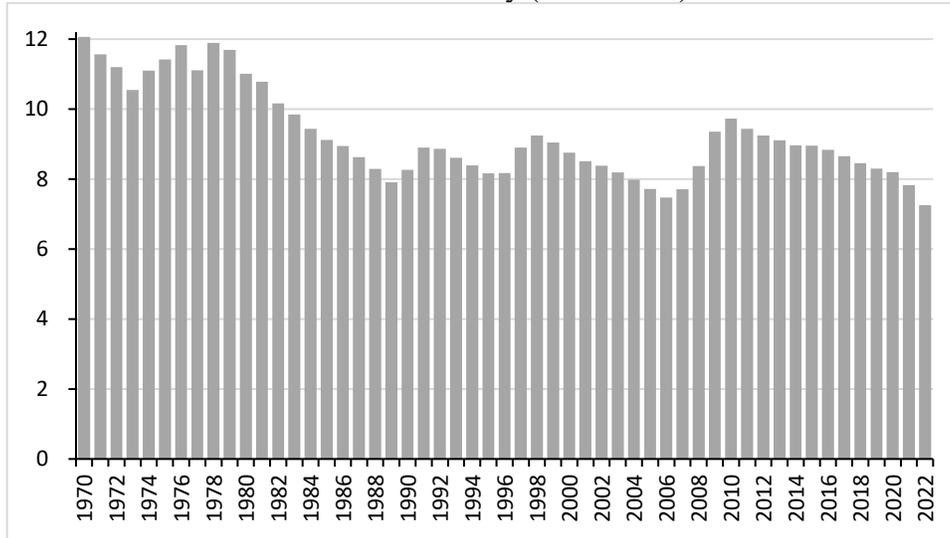
Source: OECD Statistics. Nominal hourly wages have been deflated using the Consumer Price Index (base-year = 2022).

Figure 29

Union density and collective bargaining coverage: The U.S. economy (1970-2022)

Collective bargaining coverage ----- Union density

Private sector unionisation rate
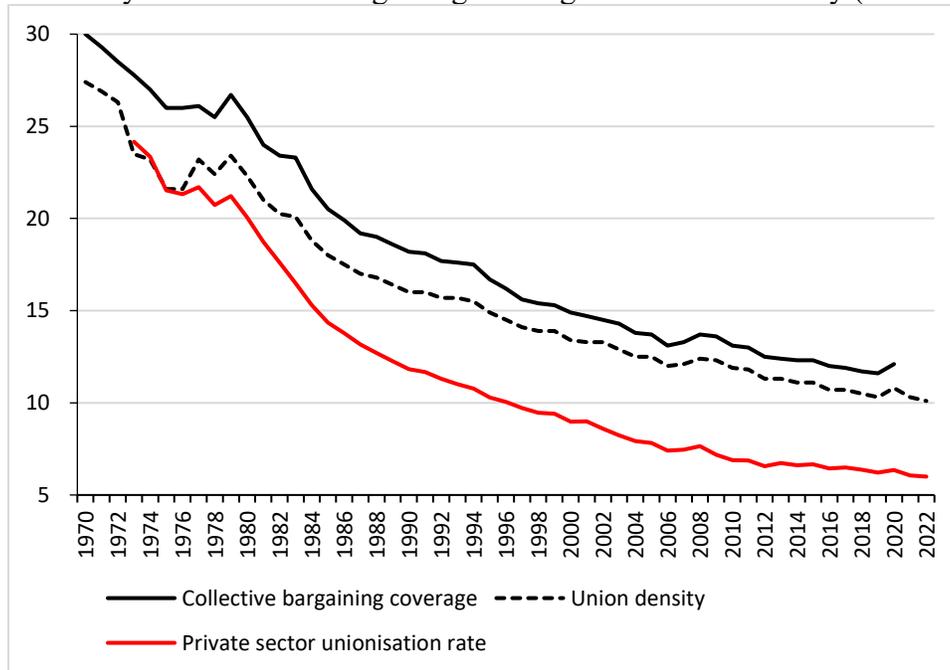
Sources: Data on (aggregate) union density (1960-1982) from Mayer (2004); data on (aggregate) union density (1983-2022) from Bureau of Labor Statistics; data on collective bargaining coverage from OECD Statistics. Data on private sector union density from Hirsch, Macpherson and Even (2023), *Union Membership and Coverage Database from the CPS,* https://www.unionstats.com/ The data for 1982 have been obtained by means of interpolation.

47

Figure 30 illustrates the point: both the bargaining power of workers and the core inflation rate collapsed around the early-1980s. **Figure 30** presents annual data on the number of registered major work stoppages (stoppages involving 1,000 or more workers lasting one shift or longer) and the PCE inflation rate during 1960-2022. The number of work stoppages, which is assumed to be a proxy for 'worker power' as these provide critical leverage to workers when bargaining with their employer over pay and working conditions (or when their employer violates labor law), peaked in the mid-1970s and stayed elevated until 1980, but then dropped to an average of less than 20 during 2000-2020. The secular decline in the incidence of major work stoppages is strongly and positively correlated with the steady decline in the core PCE inflation rate; the correlation coefficient between union density and PCE inflation is +0.48 (t-value = 17.8).

Figure 30
Work stoppages and core inflation: The U.S. economy 1960-2022
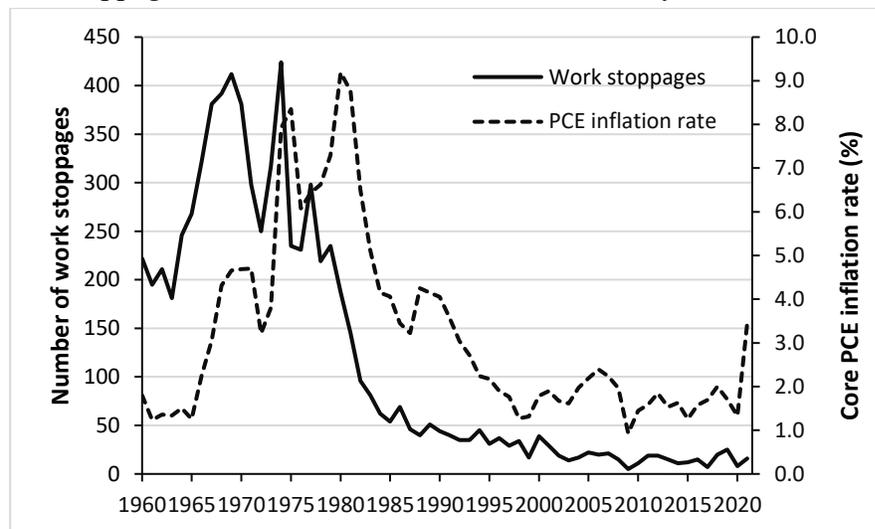
Source: Data on major work stoppages involving 1,000 or more workers lasting one shift or longer are from Bureau of Labor Statistics; data on the core PCE inflation rate are from FRED database. *Notes*: Data are for work stoppages that began and ended in the data year. Data are for public- and private-sector workers. The figure is based on Ratner and Sim (2022), Figure 1. The correlation coefficient between the number of work stoppages and PCE inflation is +0.48 (*t*-value = 17.8).

As a result of the observed decline in worker power and in workers' ability to organize, the tightening of the U.S. labor market no longer automatically results in higher nominal wage growth, because the employment relation has fundamentally changed. Stansbury and Summers (2020) provide convincing empirical evidence showing that higher economic growth and lower unemployment no longer lead to structurally higher wage growth and higher inflation. The decline in the organizing and bargaining power of U.S. workers is the main reason why the Phillips curve for the U.S. economy has become flatter (Taylor and Barbosa-Filho 2021). Fed economists David

Ratner and Jae Sim (2022) investigate the empirical relationship between the slope of reduced-form Phillips curves and worker bargaining power (as measured by union density) for the U.S. and the U.K. Ratner and Sim (2022, pp. 3-4) conclude:

> "… we show that the assumed change in bargaining power, and the resulting flattening of the Phillips curve, reduces inflation volatility by 87 percent *without any changes in the monetary policy regime*. This result casts doubt on the dominant view that the disinflation since the 1980s was due to Volcker's monetary policy. It suggests an alternative view that labor market policy since the 1980s, and structural changes in the labor market, led to reduced worker bargaining power, and it was those forces which induced the large disinflation."

Three conclusions follow from the above. 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 labor 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 (organized) labor has become stronger. The conventional vacancy ratio may well be 'extremely high', but it is a poor indicator of labor market strength and the U.S. labor market is not 'hot'—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.

5. Conclusion: The art of paradigm maintenance

Zooming in on the U.S. economy, this paper has tried to document how the practitioners of the self-proclaimed 'science of monetary policy' have gone out of their way to salvage their paradigm—after the inflationary surge of 2021-2023 made it clear that the New Keynesian emperor was not wearing any clothes. All their elaborate tools and instruments, including the output gap, the unemployment gap, the New Keynesian Phillips curve and forward-looking inflation expectations, were found lacking, incapable of giving timely signals of the re-emergence of high inflation. To be fair, most economists, not just the New Keynesian ones, were caught unprepared—but for Keynesian economists, for instance, it was relatively straightforward to empirically account for the (unexpected) 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 and Storm 2023; Breman and Storm 2023; Storm 2023).

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 so much effort to steadfastly align their paradigm to real-world events. In the preceding sections, I have discussed these efforts under the heading 'the art of paradigm maintenance', and if I were to summarize its essence in one sentence, I could do no better than repeat Mark Twain's words: "All you need in this life is ignorance and confidence; then success is sure." A somewhat longer (*tongue-in-cheek*) list of how establishment economists are trying to maintain their paradigm, goes as follows:

1. For over more than four decades, following Friedman and Phelps, we were told that central banks have to stabilize actual output close to the level of potential output, or, alternatively, stabilize the actual unemployment rate close to the NAIRU. Steady inflation (at the mandated target) would be guaranteed only if central banks would strictly follow the non-discretionary monetary policy rule, which, because of its predictability, would also help anchor inflation expectations. But Friedman and Phelps are no longer modern. What we learn now, confronted by the recent surge in inflation, is that neither the output gap nor the unemployment gap is a useful indicator of real economic activity—and must therefore be discarded. To protect the 'science of monetary policy', the Friedman-Phelps legacy of 'natural output' and a 'natural unemployment rate' must be thrown overboard. Thus, clearly, the art of paradigm maintenance is not based on half-baked measures. Good riddance.

2. In place of the output gap / unemployment gap, which are unobservable variables anyway, we must now closely monitor the vacancy ratio as the 'best' indicator of real economic activity. This ratio also has the added benefit that it is an observable variable. It definitely makes us look more empirical and evidence-based. The vacancy ratio has a 'natural' value of 1, because we calibrate our DSGE model in such a manner that as soon as vacancy ratio rises above unity, the Phillips curve becomes steeply upward-sloping. Note that we still have to devise a new optimal monetary policy rule in which the policy interest rate becomes a function of deviations between the actual and the 'natural' vacancy ratio. Perhaps Professor John B. Taylor can give us a suggestion. Otherwise, this is a topic we leave for future research.

3. Returning to a *primitive* Phillips curve based on (marginal) cost, as the indicator of real economic activity, may be empirically advantageous, but does not look good—any image of regression (instead of progress) has to be avoided. The moniker 'primitive' is already a killer. In contrast, invoking the vacancy ratio does look like a solid sign of scientific progress. We can argue that we learned from our mistakes, modified the paradigm (dropping the output gap / unemployment gap) and now advance further—while leaving untouched the core of the paradigm (which is built around the wage-price spiral). A non-linear Phillips curve also has a nice, sophisticated look.

4. The conventional vacancy ratio is (in the now modern view) a very good measure of real economic activity and labor market strength, especially if we ignore all qualifications and complications which suggest that the ratio V/U may be exaggerating the tightness of the U.S. labor market. We simply must not mention such complications. To avoid cognitive dissonance, we also do not consider alternative indicators of labor market strength, especially because these alternative indicators are rather unambiguously signaling that the U.S. labor market is not 'hot'. We are not, after all, in the business of complicating matters for central bankers. However, if we are forced to discuss these alternative measures, we just state, with measured authority, that the degree of labor market tightness remains an open issue.

5. We continue to invoke the influence of inflation expectations on *actual* inflation, knowing that inflation expectations remained unchanged while actual inflation surged. We stick to the inflation-expectations channel even when the econometric evidence is showing no such influence (Fair 2021, 2022; Rudd 2022). We do not pay attention to this evidence. We do not have to, in fact. Our belief in forward-looking model-consistent inflation expectations is so strong that we discount all survey evidence that is showing that household's and firms' inflation expectations are backward-looking, namely based on what they believe inflation has been in the recent past (Weber *et al.* 2022; Candia *et al.* 2022). That is, we ignore that, in reality, causality runs from actual inflation to inflation expectations. This cannot be true, because Robert Lucas told us that it is not so.

6. We continue to hammer on the fact that the Federal Reserve succeeded in anchoring long-term expectations of the public and that this helps to stabilize inflation. Everyone needs some good news once in a while, and besides, the illusion that the Fed is in control has to be sustained. Markets will otherwise panic. Forward guidance matters, which is easier stated than shown to be the case, because its effects are so volatile and impossible to measure. But quantum mechanics also poses measurement problems, doesn't it? Of course, deep down we know that it is simply not believable that U.S. workers are willing to suffer real wage declines for prolonged periods of time when deciding on the nominal wage rate, just because they are convinced that the Fed will somehow sometime bring inflation back to 2% (Rudd 2022a). Deep inside, we know that the proposition that expectations are drivers of inflation is "arrant nonsense" (Rudd 2022a, p. 1). But appealing to inflation expectations as a causal factor remains a useful smokescreen for our paradigm. As Robert Solow (1979) explains, "expectations are by definition a force that that you intuitively feel must be ever present and very important, but which somehow you are never allowed to observe directly."

7. It is imperative to redesign the canonical New Keynesian DSGE model based on our 'modern' insights—in order to demonstrate that the paradigmatic core of our approach is

still alive. Micro-founded optimizing behavior, deep (policy-invariant) model parameters, forward-looking expectations, and anchored inflation expectations constitute essential building blocks of this core. For the rest, things do not matter so much. Hence, we can add a Diamond-Mortensen-Pissarides' labor market with search and matching frictions and a leading role for the vacancy ratio (see lesson 2). The retrofitted DSGE model featuring a Phillips curve that is non-linear in the vacancy ratio, can then be used to explain why and how labor market tightness 'causes' runaway inflation. Methodologically, the recalibrated DSGE model helps us to convince ourselves that our argument makes sense. Chari (2010, p. 32) is right, "If you have an interesting and a coherent story to tell, you can do so within a DSGE model. If you cannot, it is probably incoherent." This is indeed the point: to tell our Just-So stories, we need the semblance of logical coherence, provided by the heavy mathematical artillery of DSGE models, to obscure the lack of consistency between our analytical core and the various ad-hoc epicycles that we have added in order to suggest that our stories possess empirical and policy relevance (Storm 2021).

8. We must do whatever it takes to uphold the claim that the Biden pandemic relief spending was excessive, causing an excess of demand and spiraling inflation. After all, it is the only way we can explain the sudden surge in inflation with our amended model. Besides, the spending was excessive for a family of four with a pre-tax income of $1,000 (Summers 2021). Never mind that in 2009 we spent about $498 billion on bank bailouts, all tax payers' money used to rescue the already very rich shareholders of these banks (Lucas 2019). The fact that the pandemic relief money was mostly saved—and not spent—is just a detail; what matters is that it constitutes *latent* demand and will be spent at some point. Don't tell me that there is convincing evidence showing that the relief expenditures did not lead to an excess aggregate demand—this cannot be true, because we all saw that the rate of inflation rose sharply. "In solving a problem […], the grand thing is to be able to reason backward," Sherlock Holmes (1898, p. 168) already explained. We know how to reason backward—it is an accomplishment according to Conan Doyle.

9. What has to be avoided at all costs, is that the 'traumatized' U.S. worker narrative gets traction. We do not talk about the destruction of the power of organized labor and the inability of workers to protect their real wages. Instead, we talk about the risk that inflation expectations become unanchored, which will drive up inflation, somehow. We also have to continually emphasize that the recent labor shortage, as measured by the vacancy ratio, is historically unprecedented except in wartime. Yes, the V/U ratio was only this high during some war. Mentioning a war almost always works.

10. Finally, a few defensive measures are also in order. First, we accuse plausible alternative diagnoses, for instance, analyses highlighting the role of steadily increasing profit mark-

ups in the rise in core inflation, of 'science denial'. This is ironic, because the accusation is true: the alternative view does deny the relevance of the 'science of monetary policy'. Luckily, this irony is completely lost on the media and the public. Second, we must emphasize the good news: our paradigm, reconstituted around the steeply rising Phillips curve, does suggest that the sacrifice ratio of monetary tightening is much smaller than doomsayers claim it to be (based on their incorrect flat Phillips curve). Monetary tightening may lower inflation and lead to a soft landing of the economy. But to hedge our bets, we should add that this is an open question. In reality, relying on tight money, while it may work eventually, will be a very painful way to lower the inflation rate and very costly to the economy—someone once compared it to burning down the house to roast the pig. This may be true. And yes, there may well be alternative ways, such as price controls, to achieve disinflation that are less costly to the economy. But for us, those policy alternatives are beyond pale.

This way, the 'scientists of monetary policy' are trying to maintain their paradigm. A strange paradox remains unresolved, however. They commonly accuse economists working on alternative paradigms of being incoherent dilletantes whose arguments rely on ad-hoc assumptions and policy-variant model parameters. But if the present paper 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. But 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 (1221-1284), 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... "

References

Ahn, H.J. and C. Fulton. 2020. 'Index of Common Inflation Expectations.' FEDS Notes. Washington: Board of Governors of the Federal Reserve System, September 02. https://doi.org/10.17016/2380-7172.2551

Aldrick, P. (2022). "Larry Summers Says US Needs 5% Jobless Rate for Five Years to Ease Inflation." Bloomberg.com. June 20; https://www.bloomberg.com/news/articles/2022-06-20/summers-says-us-needs-5-jobless-rate-for-five-years-to-ease-cpi?sref=pyiu6SiD

Andolfatto, D. and S. Birinci. 2022. 'Is the Labor Market as Tight as It Seems?' The Economy Blog, Federal Reserve Bank of St. Louis. June 21. https://www.stlouisfed.org/on-the-economy/2022/jun/is-labor-market-as-tight-as-it-seems

Asdourian, E., N. Salwati, & L. Sheiner. (2022). "Federal, State and Local Fiscal Policy and the Economy." Hutchins Center Fiscal Impact Measure. Washington, D.C.: Brookings Institution; https://www.brookings.edu/interactives/hutchins-center-fiscal-impact-measure/

Autor, D., A. Dube, and A. McGrew. 2023. 'The unexpected compression: competition at work in the low wage labor market.' NBER Working Paper No. 31010. Cambridge, Mass.: National Bureau of Economics Research. https://doi.org/10.3386/w31010

Ball, L., D. Leigh P. Mishra. 2022. 'Understanding U.S. inflation during the COVID era.' NBER Working Paper 30613. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w30613

Barnichon, R., L.E. Oliveira, and A.H. Shapiro. 2021. 'Is the American Rescue Plan Taking Us Back to the '60s?' FRBSF Economic Letter 2021-27. San Francisco: Federal Reserve Bank of San Francisco. https://www.frbsf.org/economic-research/publications/economic-letter/2021/october/is-american-rescue-plan-taking-us-back-to-1960s/

Benigno, P. and G.B. Eggertsson. 2023. 'It's Baaack: The surge in inflation in the 2020s and the return of the non-linear Phillips curve.' NBER Working Paper 31197. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w31197

Bernanke, B. S. 2015. 'The Taylor Rule: A benchmark for monetary policy?' Brookings Commentary (April 28). https://www.brookings.edu/articles/the-taylor-rule-a-benchmark-for-monetary-policy/

Bernanke, B.S. 2022. 'Inflation expectations and monetary policy.' Keynote speech at the NBER conference 'Inflation Expectations: Determinants and Consequence, May 19. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/lecture/2022-inflation-expectations-determinants-and-consequence-keynote-ben-bernanke-inflation-expectations

Birinci, S. and A. Amburgey. 2022. 'The Great Resignation vs. The Great Reallocation: Industry-Level evidence.' Economic Synopses 2022-04. Federal Reserve bank of St. Louis. https://doi.org/10.20955/es.2022.4

Blanchard, O.J. 2008. 'The state of macro.' NBER Working Paper 14259. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w14259

Bosler, C., M.C. Daly, and F. Nechio. 2014. 'Mixed Signals: Labor Markets and Monetary Policy.' FRBSF Economic Letter 2014-36. https://www.frbsf.org/economic-research/wp-content/uploads/sites/4/el2014-36.pdf

Breman, C. and S. Storm. 2023. "Betting on Black Gold: Oil Speculation and U.S. Inflation (2020-2022)." International Journal of Political Economy 52 (2): 153-180. https://doi.org/10.1080/08911916.2023.2238565

Broad, R. 2006. 'Research, knowledge, and the art of 'paradigm maintenance': the World Bank's Development Economics Vice-Presidency (DEC).' Review of International Political Economy 13 (3): 387-419. https://doi.org/10.1080/09692290600769260

Candia, B., O. Coibion and Y. Gorodnichenko. 2021. 'The inflation expectations of U.S. firms: Evidence from a new survey.' NBER Working Paper No. 28836. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w28836

Chari, V.V. (2010) Testimony. In Building a Science of Economics for the Real World. US House of Representatives, House Committee on Science and Technology, Subcommittee on Investigations and Oversight, June.

Clarida, R., J. Gali and M. Gertler. 1999. 'The Science of Monetary Policy: A New Keynesian Perspective.' Journal of Economic Literature 37 (4): 1661-1707. https://doi.org/10.1257/jel.37.4.1661

Coibon, O., Y. Gorodnichenko and M. Weber. 2021. 'Monetary policy communications and their effects on household inflation expectations.' NBER Working Paper 25482. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w25482

Conan Doyle, A. 1898. A Study in Scarlet. London: Street & Smith Publishers.

Costantini, O. 2015. The cyclically adjusted budget: The history and exegesis of a fateful estimate.' INET Working Paper no. 24 (October). New York: Institute for New Economic Thinking. https://doi.org/10.2139/ssrn.2682868

Crust, E.E., K. J. Lansing and N. Petrosky-Nadeau. 2023. 'Reducing inflation along a nonlinear Phillips Curve.' FRBSF Economic Letter 2023-17, July 10. https://www.frbsf.org/economic-research/publications/economic-letter/2023/july/reducing-inflation-along-nonlinear-Phillips-curve/

Del Negro, M., M.P. Giannoni and F. Schorfheide. 2015. 'Inflation in the Great Recession and New Keynesian models.' American Economic Journal: Macroeconomics 7 (January): 168-96. https://doi.org/10.1257/mac.20140097

Del Negro, M., A. Gleich, S. Goyal, A. Johnson and A. Tambalotti. 2022. 'Disinflation policies with a flat Phillips curve.' Federal Reserve Bank of New York Liberty Street Economics, March 2. https://libertystreeteconomics.newyorkfed.org/2022/03/disinflation-policies-with-a-flat-phillips-curve/

Domash, A. and L. H. Summers. 2022a. 'How tight are U.S. labor markets?' NBER Working Paper 29739. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w29739

Domash, A. and L. H. Summers. 2022b. 'A labor market view on the risks of a U.S. hard landing.' NBER Working Paper 29910. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w29910

Domash, A. and L.H. Summers. 2022c. 'The relation between nominal and real wage growth.' Medium.com, April 11. Link: https://medium.com/@alex.domash/the-relation-between-nominal-and-real-wage-growth-2bfd2e1b27b8

Elias, E., H. Irvin and Ò, Jordà. 2014. 'Monetary policy when the spyglass is smudged.' FRBSF Economic Letter 2014-35. Federal Reserve Bank of San Francisco. https://www.frbsf.org/economic-research/publications/economic-letter/2014/november/unemployment-monetary-policy-economic-growth-taylor-rule/

Engstrom, E.C. and S.A. Sharpe. 2022. '(Don't fear) the yield curve, reprise.' FEDS Notes, March 25. Board of Governors of the Federal Reserve System. https://doi.org/10.17016/2380-7172.3099

Eusepi, S. and B. Preston. 2018. 'The Science of Monetary Policy: An Imperfect Knowledge Perspective.' Journal of Economic Literature 56 (1): 3-59. https://doi.org/10.1257/jel.20160889

Fair, R.C. 2021. 'What do price equations say about future inflation?' Business Economics 56 (1): 118-128. https://doi.org/10.1057/s11369-021-00227-2

Fair, R.C. 2022. 'A note on the Fed's power to lower inflation.' Business Economics 57 (1): 56-63. https://doi.org/10.1057/s11369-022-00254-7

Federal Reserve Bank of Atlanta. 2023. 'Taylor Rule Utility.' Center for Quantitative Economic Research; https://www.atlantafed.org/cqer/research/taylor-rule?panel=2

Ferguson, T. and S. Storm. 2023. "Myth and Reality in the Great Inflation Debate: Supply Shocks and Wealth Effects in a Multipolar World Economy." International Journal of Political Economy 52 (1): 1-44. Link: https://doi.org/10.1080/08911916.2023.2191421

Fontanari, C., A. Palumbo and C. Salvatori. 2019. 'Why We Need New Measures of Potential Output - and What They Tell Us.' INET Blog (May 16). New York: Institute for New Economic Thinking. https://www.ineteconomics.org/perspectives/blog/why-we-need-new-measures-of-potential-output-and-what-they-tell-us

Gagliardone, L. and M. Gertler. 2023. 'Oil prices, monetary policy and inflation surges.' NBER Working Paper 31263. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w31263

Gagliardone, L., M. Gertler, S. Lenzu and J. Tielens. 2023. 'Anatomy of the Phillips Curve: Micro Evidence and Macro Implications.' NBER Working Paper 31382. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w31382

Gali, J. 2015. Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework and Its Applications. Princeton University Press.

Galbraith, J.K. 1973. Economics and the Public Purpose. Boston, MA: Houghton Mifflin.

Gopinath, G. 2023. 'Crisis and Monetary Policy.' Finance & Development, March: 15-17. Washington, D.C.: International Monetary Fund.

Hazell, J., J. Herreño, E. Nakamura and J. Steinsson. 2021. 'The slope of the Phillips Curve: Evidence from U.S. states.' NBER Working Paper No. 28005. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w28005

Hirsch, B.T., D.A. Macpherson and W.E. Even. 2023. Union Membership and Coverage Database from the CPS. Link: https://www.unionstats.com/

Hirschman, A.O. 1991. The Rhetoric of Reaction: Perversity, Futility, Jeopardy. Cambridge, MA: Harvard University Press. https://doi.org/10.2307/j.ctvjnrs9q

Hobijn, B., R.A. Miles, J. Royal and J. Zhang. 2023. 'The recent steepening of Phillips curves.' Chicago Fed Letter No. 475, January. https://doi.org/10.21033/cfl-2023-475

Jordà, Ò., C. Liu, F. Nechio and F. Rivera-Reyes. 2022. 'Wage growth when inflation is high.' FRBSF Economic Letter 2022-25, September 6. https://www.frbsf.org/economic-research/publications/economic-letter/2022/september/wage-growth-when-inflation-is-high/

Jørgensen, P.L. and K.J. Lansing. 2021. 'Anchored Inflation Expectations and the Slope of the Phillips Curve.' Federal Reserve Bank of San Francisco Working Paper 2019-27. https://doi.org/10.24148/wp2019-27

Keen, S. 2012. 'Ptolemaic Economics in the Age of Einstein.' Steve Keen's Debtwatch, April 2. Link: https://www.debtdeflation.com/blogs/2012/04/02/ptolemaic-economics-in-the-age-of-einstein/

Klein, E. 2022. 'Transcript: Ezra Klein interviews Larry Summers.' The Ezra Klein Show, The New York Times, March 29. https://www.nytimes.com/2022/03/29/podcasts/transcript-ezra-klein-interviews-larry-summers.html

Kuhn, T. 1962. The Structure of Scientific Revolutions. Chicago: University of Chicago Press.

Lansing, K.J. and F.C. Nucera. 2023. 'Inflation expectations, the Phillips curve, and stock prices.' FRBSF Economic Letter 2023-24, September 25. Federal Reserve Bank of San Francisco. https://www.frbsf.org/economic-research/publications/economic-letter/2023/september/inflation-expectations-phillips-curve-and-stock-prices/

Lucas, D.J. 'Measuring the costs of bailouts.' Annual Review of Financial Economics 11 (1): 85-108. https://doi.org/10.1146/annurev-financial-110217-022532

Maslow, A.H. 1966. The Psychology of Science: A Reconnaissance. New York: Harper & Row.

Mayer, G. 2004. 'Union membership trends in the United States.' CRS Report for Congress. Washington, DC: Congressional Research Service. https://sgp.fas.org/crs/misc/RL32553.pdf

McLaey, M. and S. Tenreyro. 2020. 'Optimal inflation and the identification of the Phillips Curve.' NBER Macroeconomics Annual 2019, Volume 34: 199-255. https://www.journals.uchicago.edu/doi/full/10.1086/707181

Mishkin, F.S. 2007. 'Will monetary policy become more of a science?' Finance and Economics Discussion Series. Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington, D.C. https://doi.org/10.17016/FEDS.2007.44

Mui, P. 2022. "A Vacant Metric: Why Job Openings Are So Unreliable." EmployAmerica.org. August 31; https://www.employamerica.org/researchreports/a-vacant-metric-why-job-openings-are-so-unreliable/

Parker, J. A., J. Schild, L. Erhard, & D. Johnson. (2022). "Economic Impact Payments and Household Spending During the Pandemic." Cambridge: National Bureau of Economic Research, Working Paper No. 30596; https://doi.org/10.3386/w30596

Pendered, D. 2023. 'Taylor rule remains central to interest rate discussions.' Economy Matters/Inside the Fed, August 3. Federal Reserve Bank of Atlanta. https://www.atlantafed.org/economy-matters/inside-the-fed/2023/08/03/taylor-rule-remains-central-to-interest-rate-discussions

Ratner, D. and J. Sim. 2022. 'Who killed the Phillips Curve? A murder mystery.' Finance and Economics Discussion Series 2022-028. Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/FEDS.2022.028

Rudd, J.B. 2022a. 'Why do we think that inflation expectations matter for inflation? (And should we?)' Review of Keynesian Economics 10 (1): 25-45. https://doi.org/10.4337/roke.2022.01.02

Rudd, J. B. 2022b. 'The anatomy of single-digit inflation in the 1960s.' Finance and Economics Discussion Series 2022-029. Washington: Board of Governors of the Federal Reserve. https://doi.org/10.17016/FEDS.2022.029

Seccareccia, M. and Guillermo Matamoros. 2023. 'Is "Inflation First" Really "Rentiers First"? The Taylor Rule and Rentier Income in Industrialized Countries.' INET Working Paper No. 209, July 10. New York: Institute for New Economic Thinking. https://doi.org/10.36687/inetwp209

Solow, R.M. 1979. 'What we know and don't know about inflation.' Technology Review 81 (3): 30-46.

Solow, R.M. 2010. 'Building a science of economics for the real world.' Statement to the House Committee on Science and Technology Subcommittee on Investigations and Oversight, July 20.

Stansbury, A. and L.H. Summers. 2019. 'The Declining Worker Power Hypothesis: An explanation for the recent evolution of the American economy.' NBER Working Paper 27193. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w27193

Stock, J.H. and M.W. Watson. 2019. 'Slack and cyclically sensitive inflation.' NBER Working Paper No. 25987. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w25987

Storm, S. 2017. 'The new normal: Demand, secular stagnation, and the vanishing middle class.' International Journal of Political Economy 46 (4): 169-210. https://doi.org/10.1080/08911916.2017.1407742

Storm, S. 2021. 'Cordon of conformity: Why DSGE Models are not the future of macroeconomics.' International Journal of Political Economy 50 (2): 77-98. https://doi.org/10.1080/08911916.2021.1929582

Storm, S. 2022. "Inflation in a Time of Corona and War." INET Working Paper No. 185. New York: Institute for New Economic Thinking. https://doi.org/10.36687/inetwp185

Storm, S. 2023. 'Profit inflation is real.' PSL Quarterly Review, forthcoming.

Storm, S. and C.W.M. Naastepad. 2012. Macroeconomics beyond the NAIRU. Cambridge, Mass.: Harvard University Press. https://doi.org/10.4159/harvard.9780674063242

Summers, L.H. 2021. 'Opinion: The Biden Stimulus Is Admirably Ambitious. But It Brings Some Big Risks, Too.' The Washington Post, February 4. https://www.washingtonpost.com/opinions/2021/02/04/larry-summers-biden-covid-stimulus/

Summers, L.H. 2022. 'The Fed is charting a course to stagflation and recession.' The Washington Post, March 15. https://www.washingtonpost.com/opinions/2022/03/15/fed-powell-fight-inflation-interest-rate-hike/

Tarullo, D.K. 2017. 'Monetary policy without a working theory of inflation.' Hutchins Center Working Paper 33. Washington, DC: Brookings Institute. https://www.brookings.edu/articles/monetary-policy-without-a-working-theory-of-inflation/

Taylor, J. B. 1993. 'Discretion versus policy rules in practice.' Carnegie-Rochester Conference Series on Public Policy 39: 195-214. https://doi.org/10.1016/0167-2231(93)90009-L

Taylor, J. B. 1999. 'The robustness and efficiency of monetary policy rules as guidelines for interest rate setting by the European Central Bank.' Journal of Monetary Economics 43 (3): 655-679. https://doi.org/10.1016/S0304-3932(99)00008-2

Taylor, J.B. 2023. 'It's time to get back to rules-based monetary policy.' In M.D. Bordo, J.H. Cochrane and J.B. Taylor (eds.) How Monetary Policy Got Behind the Curve - and How to Get Back, 33-52. Hoover Institution Press. https://www.hoover.org/sites/default/files/research/docs/22111-taylor-2.pdf

Taylor, J.B. and J.C. Williams. 2010. 'Simple and robust rules for monetary policy', in B. M. Friedman and M. Woodford (eds.), Handbook of Monetary Economics, vol. 3B, pp. 829-59. San Diego: Elsevier. https://doi.org/10.1016/B978-0-444-53454-5.00003-7

Taylor, L., & N. Barbosa-Filho. 2021. "Inflation? It's Import Prices and the Labor Share!" New York: Institute for New Economic Thinking, Working Paper 145. New York: Institute for New Economic Thinking. https://doi.org/10.36687/inetwp145

Thompson, W.C. 2009. 'Painting the target around the matching profile: the Texas sharpshooter fallacy in forensic DNA interpretation.' Law, Probability and Risk 8 (3): 257-276. https://doi.org/10.1093/lpr/mgp013

U.S. Census Bureau. 2023. 'Income, Poverty and Health Insurance Coverage in the United States: 2022.' Press release, September 12. Link: https://www.census.gov/newsroom/press-releases/2023/income-poverty-health-insurance-coverage.html

Wade, R.H. 1996. 'Japan, the World Bank and the art of paradigm maintenance: The East Asian Miracle in political perspective.' New Left Review 217 (May/June): 3-38.

https://newleftreview.org/issues/i217/articles/robert-wade-japan-the-world-bank-and-the-art-of-paradigm-maintenance-the-east-asian-miracle-in-political-perspective

Walsh, C.E. 2001. 'The science (and art) of monetary policy.' FRBSF Economic Letter 2001-13, May. Federal Reserve Bank of San Francisco. Link: https://www.frbsf.org/economic-research/publications/economic-letter/2001/May/the-science-and-art-of-monetary-policy/

Weber, M., Y. Gorodnichenko and O. Coibion. 2022. 'The Expected, Perceived, and Realized Inflation of U.S. Households before and during the COVID19 Pandemic.' Becker Friedman Institute for Economics Working Paper No. 2022-09. University of Chicago. https://bfi.uchicago.edu/wp-content/uploads/2022/01/The-Expected-Perceived-and-Realized-Inflation-of-U.S.-Households.pdf

Weber, M., F. D'Acunto, Y. Gorodnichenko and O. Coibion. 2022. 'The Subjective Inflation Expectations of Households and Firms: Measurement, Determinants, and Implications.' NBER Working Paper No. 30046. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w30046

Weil, D. 2014. The Fissured Workplace: Why Work Became So Bad for So Many and What Can Be Done to Improve It. Cambridge, Mass.: Harvard University Press. https://doi.org/10.4159/9780674726123

Ydtsie, J. 2018. 'Is it time for the Fed so say goodbye to the Phillips Curve Theory?' NPR, October 29. https://www.npr.org/2018/10/29/661879814/is-it-time-for-the-fed-to-say-goodbye-to-the-phillips-curve-theory?t=1654798723685

Wieland, V. 2010. The Science and Practice of Monetary Policy Today. Heidelberg: Springer. https://doi.org/10.1007/978-3-642-02953-0

Woodford, M. 2001. 'The Taylor rule and optimal monetary policy.' American Economic Review 91 (2): 232-237. https://doi.org/10.1257/aer.91.2.232

Woodford, M. 2010. 'Optimal monetary stabilization policy.' NBER Working Paper 16095. Cambridge, Mass.: National Bureau of Economic Research. https://doi.org/10.3386/w16095