THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

EIQ Europe in Question
Discussion Paper Series at LSE

Profits, Wages and Inflationary Dynamics in the Euro Area and the US in the Context of Uncertainty

Stefan Collignon

EIQ Paper No. 183 / 2023
September 2023

lse.ac.uk/ei

EIQ
Europe
in Question
Discussion Paper Series at **LSE**

Profits, Wages and Inflationary Dynamics in the Euro Area and the US in the Context of Uncertainty

Stefan Collignon*

Abstract

A sequence of severe shocks has brought inflation back to Europe and America, but unemployment is still at record low levels. Is higher unemployment required to bring inflation down? The challenges are the same for both economies across the Atlantic, the policy tools resemble each other, but they apply to different economic landscapes. What can we learn from each other? Who has been more successful? The paper looks at basic facts, the nature of shocks, and the efficiency of policy tools. It turns out that the Phillips curve whereby higher unemployment lowers inflation has a different role in Europe than in the US.

The key to understanding recent developments is uncertainty. The paper extends the standard New Keynesian model to measures of uncertainty. It argues that the channel through which uncertainty influences inflation, wage cost and unemployment is the markup firms charge to cover their cost of capital. The Federal Reserve Bank has been more successful because it operates in a more competitive market for goods and capital. The Euro Area lacks a fully integrated capital market with a benchmark euro bond and the institutions for setting up a coherent macroeconomic policy stance. This will make disinflationin Europe more painful in terms of unemployment.

---

* Stefan Collignon is a Guest Lecturer in European Political Economy at the LSE's European Institute (Email: S.Collignon@lse.ac.uk)

Table of Contents

Profits, Wages and Inflationary Dynamics in the Euro Area and the US in the Context of Uncertainty

Introduction

Inflation is back and unemployment is down at levels not seen in the last four decades. The shocks from the Global Financial Crisis, Euro debt crisis, Covid, and the War with Russia, have been massive and put economic policy in a crisis mode. Monetary policy has swamped banks with liquidity, and fiscal authorities have run large deficits to prevent major recessions and depressions. It worked. After shortly flaring up, unemployment is down again, but the enduring surge in inflation has been unexpected. To restore stability central banks have now pushed interest rates up but inflation remains stubborn.

This raises the question whether the return to low inflation requires higher unemployment. This, at least, seems to have been the European experience of the 1980s and 1990s (Collignon 1997). Unemployment was significantly higher in Europe than in the United States. Subsequently, European monetary union has created the conditions for unemployment to come down, but if the European Central Bank loses its credibility to preserve price stability, the Phillips curve, which states that higher unemployment slows down wage increases, will return as the prime policy tool.

Even if the economic landscapes are different, the challenges are the same for Europe and America and the policy tools resemble each other. What can we learn from each other? Who has been more successful? I will focus on the United States (US) and the Euro Area (EA) and throw some light on how inflation and unemployment are related to the capital market.

European monetary union started in 1999 and its analytic horizon is therefore shorter than for the United States. However, despite some subtle differences, the two economies have performed surprisingly similar, which justifies our treatment of the Euro Area as a single

market comparable to the US.[1] Both countries' central banks now have identical symmetric inflation targets of 2 percent,[2] although on average the realised American rate was half a percentage point higher between 1999 and 2023. The main difference was for growth (50 percent higher in the US) and unemployment (60 percent higher in Europe)[3]. This may not be surprising given that the Fed has a *double* mandate to promote "maximum employment and stable prices"[4] and may even be biased in favour of employment (Nikolsko-Rzhevskyy and Papell 2017). By contrast, the European Central Bank (ECB) has, according to the Treaty on the European Union (art. 119.2), a lexographic mandate that defines "the objective to maintain price stability" as "*primary*", but adds that "without prejudice to this objective" the ECB must "support the general economic policies in the Union" which includes promoting "economic and social progress and a high level of employment".[5] Nevertheless, the Federal Reserve System has been more successful in containing the large inflation shock after the war in the Ukraine and keeping unemployment down.

The average performance of macroeconomic variables is one thing, but the volatility around the mean also matters for stability. High volatility reduces visibility and creates uncertainty (Adam 2009). To keep inflation "low, stable and predictable",[6] expectations need to be kept

[1] In a European Central Bank (ECB) Working Paper, (Smets und Wouters 2004) compared the EA and the US and already observed that "the types of shocks and the way the central bank responds to economic developments" were "remarkably similar across both currency areas". Incidentally, this fact justifies that we can focus on aggregate data of the Euro Area in comparison to the US. We are not interested in EA member state developments in the same way as we are not interested in the economic performances of different states of the USA. This paper gives a well-deserved farewell to optimal currency area theory, for there is no evidence that the Euro Area performed significantly better or worse than the US.

[2] Initially, the ECB gave more weight to correcting above target deviations, but this was changed in July 2021. In October 1998 the ECB defined price stability as inflation of the Harmonised Consumer Price Index (HCPI) of "under 2%, over the medium term." The Governing Council clarified in May 2003 that it aims to maintain inflation rates "below, *but close to*, 2% over the medium term". In 2021, the ECB changed its inflation target to a symmetrical 2% (Schmidt 2022). The Fed did not announce an explicit inflation target, but Federal Open Market Committee (FOMC) participants generally expressed a preference for an inflation target around 1½% from 2000 to around 2007. By the end of the Great Recession in 2009 the consensus had clearly shifted to 2% (Shapiro und Wilson 2019). Symmetry around the mean has been confirmed by the Fed's Board of Governors in 2014. See: https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications-statement-on-longer-run-goals-monetary-policy-strategy.htm

[3] See below Table 1.

[4] (Yellen 2012). Section 2A of the Federal Reserve Act lists as monetary policy objectives to "maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates." [12 USC 225a. As added by act of November 16, 1977 (91 Stat. 1387) and amended by acts of October 27, 1978 (92 Stat. 1897); Aug. 23, 1988 (102 Stat. 1375); and Dec. 27, 2000 (114 Stat. 3028).] https://www.federalreserve.gov/aboutthefed/section2a.html

[5] https://lexparency.org/eu/TFEU/ART_119/

[6] For the official definition of the ECB' inflation target see: https://www.ecb.europa.eu/mopo/intro/html/index.en.html

stable as well. It seems odd to define price stability as "inflation of 2% over the medium term" without taking account of the variance around this mean. Since the early post-WWII years, output and inflation volatility in most industrialised countries has tended to come down. This has been called the *Great Moderation*. Despite major macroeconomic shocks, this trend has persisted since the early 1990, as I will show below. Given the priority mandate of the ECB, one would expect not only lower inflation in Europe, but also lower price volatility. Yet surprisingly, inflation has been more volatile in the Euro Area then in the United States.

Uncertainty is a key variable for the effectiveness of economic policy (Istrefi and Mouabbi 2018). In this paper I will compare the effect of uncertainty for inflation in the US and the Euro Area. We shall evaluate the implications for the labour market which work differently in the two economies. After a first look at the basic similarities and differences in the two economies, I will discuss the nature of shocks and uncertainties which have dominated the recent past. I will then assess the *Great Moderation* and what impact real and nominal shocks have had on economic growth and inflation. We will then evaluate the effectiveness of monetary policy in the presence of Phillips curve effects. Finally, I propose that the channel through which uncertainty impacts inflation is the profit markup of firms which is determined by capital markets. We will find that the adjustment to shocks and uncertainty operates very differently on both sides of the Atlantic.

The tale of two economies

The Euro Area is an integrated economy, even if it is politically more decentralised than the United States. The status of semi-autonomous member states leads many analysts to study national economies rather than the Euro Area as a whole. However, when we focus on monetary policy, it is appropriate to treat the Euro Area as a single economy. I will provide evidence by first looking at basic facts, then presenting evidence for the Great Moderation and a variety of shocks.

Some basic facts of the European and American economies

The comparison between the EA and US requires that the data are comparable. Data for the US were retrieved from the Economic Database of the St. Louis Federal Reserve (FRED), while

those for the EA from the ECB or Eurostat. Other sources are indicated separately. The variables encompass inflation, measured as the logarithmic difference of the consumer price indices (CPI and HCPI). Oil prices, economic growth, based on GDP in constant prices, and unemployment are from FRED and Eurostat, wage and profit shares are calculated from OECD database. Monetary policy is represented by the Federal Funds Rate (FFR) for the US and the policy rate for the ECB as well as their respective balance sheets. All the data are quarterly except for budget deficits which are annually.

Table 1 summarises the performance of the two economies between 1999Q1 and 2023Q1. Mean annual inflation was lower in the Euro Area in line with the initially lower inflation target. Yet, even though the standard deviation for inflation is lower in Europe, the extreme outliers were higher. Economic growth was also lower in Europe and more volatile. This could imply that the EA was hit by more severe supply shocks, while the US economy has been subjected to demand shocks, as suggested by Smets and Wouters (2004). This would require different policy responses. Unemployment was significantly higher in Europe and less volatile than in the US.

Monetary policy interacts with fiscal policy. In the United States, macroeconomic policy is conducted by two unified decision makers, the Federal Reserve System, and the federal government; in Europe, only money is governed by a unified institution, the ECB. Fiscal policy is restricted by the Stability and Growth Pact. It therefore serves as a policy tool only in exceptional cases, like during the pandemic when the restrictive rules were suspended. That means European stabilisation policies depend primarily on the ECB alone and this fact is causing a severe overload for the responsibility of the ECB to preserve stability. Yer, surprisingly this overload does not show up as higher activism. The Fed Funds rate has varied more than the ECB policy rate and American budget deficits have been on average twice as high and twice as variable as in Europe. Hence, the US have an active macroeconomic policy approach, while the Euro Area is more passive. One reason may be the less integrated European capital market as I will argue below.

Table 1. Summary statistics for the adopted variables

Average rates 1999Q1-2023Q1										
	Inflation		GDP growth		Unemployment		Central Bank interest		Budget deficit (annual)	
	EA	*USA*	*EA*	*USA*	*EA*	*USA*	*ECB*	*FED*	*EA*	*USA*
Mean	1.95	2.44	1.40	2.16	9.21	5.79	1.56	1.81	-3.0	-6.1
Median	1.88	2.10	1.83	2.19	9.10	5.22	1.00	1.15	-2.7	-4.8
Maximum	9.97	8.21	14.25	12.46	12.17	12.97	4.77	6.52	-0.4	-0.5
Minimum	-0.37	-1.62	-14.24	-8.35	6.67	3.57	0.00	0.06	-7.1	-14.0
Std. Dev.	1.68	1.67	2.94	2.30	1.41	1.94	1.53	1.96	1.87	3.58

Figure 1 shows the development of inflation in the EA and the US. The long run benchmark series for the US is joined by the Euro in year 1999 when monetary union stated. The oil price shock in 1973 drove inflation up worldwide, here shown for the US, but the inflation dynamics were broken in the early 1980s by the drastic tightening of monetary policy (the "Volker shock"). Since then, inflationary expectations have been anchored by credible commitments to price stability, even if small shocks have frequently caused deviations. Weak evidence suggest that economic agents may recently have lost the trust that central banks will keep their inflation targets. The inflation anchor seems to have shifted, although it may not yet be adrift (Reis 2021).

Figure 1. Inflation in the EA and the US together with oil prices

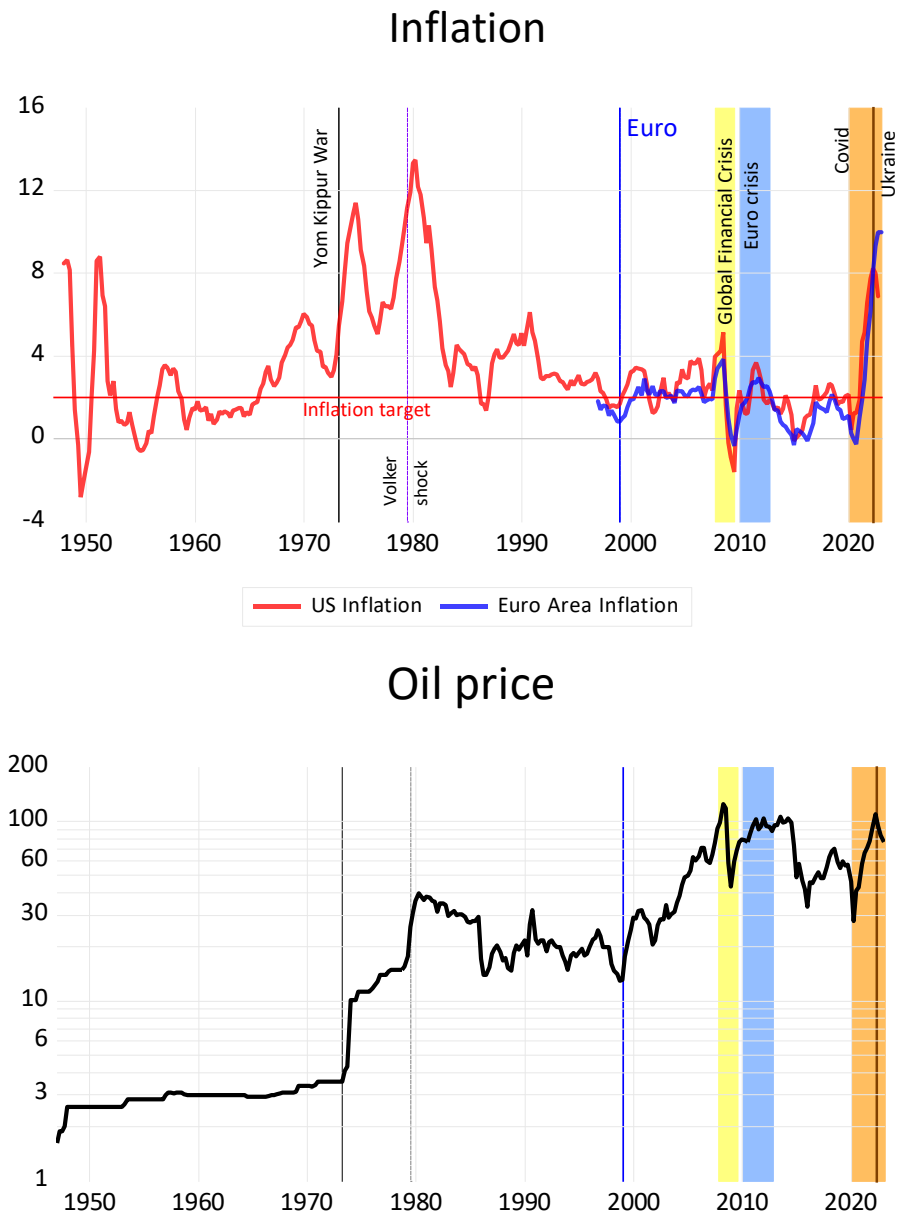
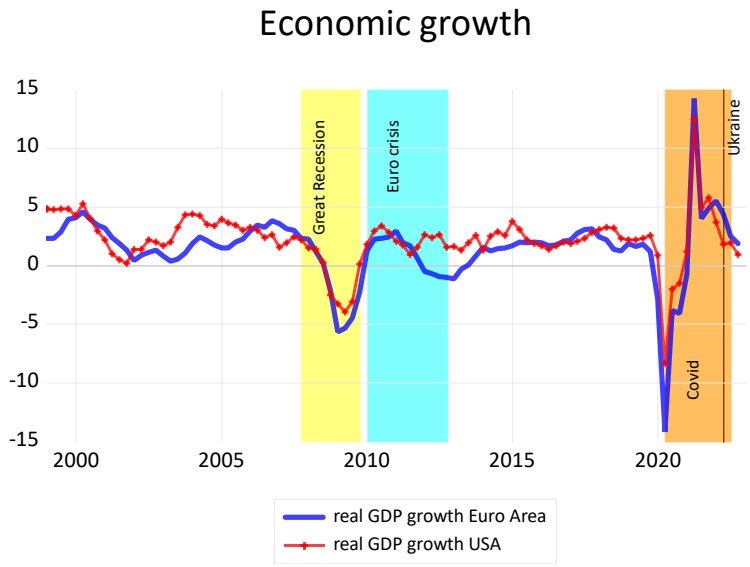


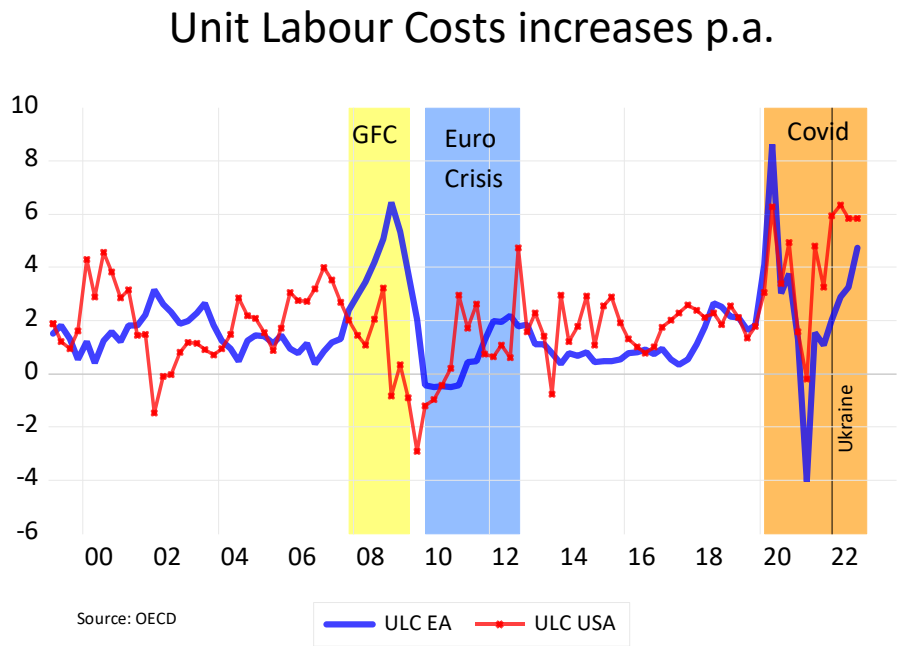
Figure 2 depicts the real growth rates of output for both the US and the Euro Area. The US experienced faster growth than the EA which suffered from self-inflicted damage during the debt crisis. Thereafter, it returned to growth for a short moment, before it was hit again by the covid pandemic.

Figure 2. The growth rate of GDP at constant prices in the EA and the US



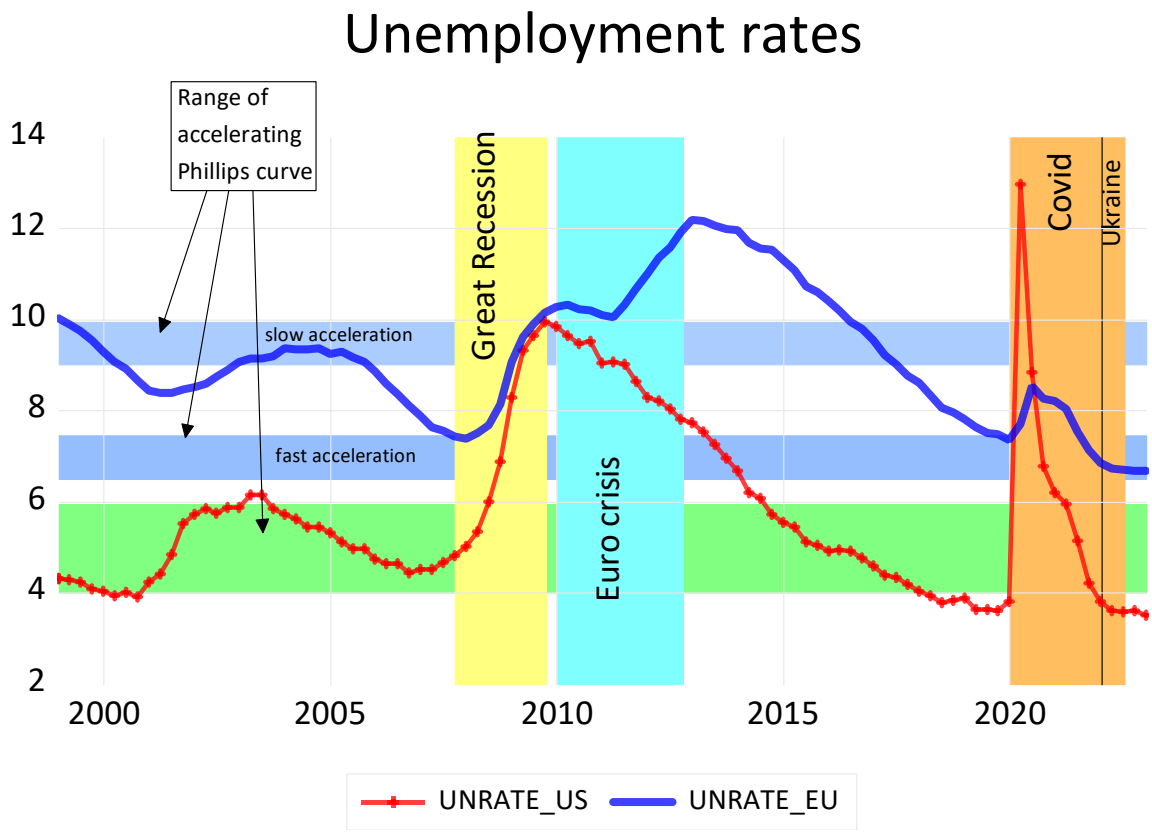
As I shall discuss below, the cost of labour is an important element of inflation. Increases in unit labour costs are remarkably similar and coherent with the inflation targets. With a mean of 1.53 percent wage growth relative to productivity was less in the EA than in the US, where ULC rose on average by 1.95 percent. However, while the standard deviations were similar (1.54 and 1.62 respectively), the extreme outliers were nearly twice as large in Europe. This can be explained by the higher variability of productivity during the three major crises.

Figure 3. The development of Unit Labour Cost (ULC) in the EA and the US



In America the unemployment rate was always lower, except during the Covid crisis. It peaked during the Great Recession at 10 percent, when it reached the European levels, but then fell below 4 percent. In Europe, unemployment was pushed up to 12 percent by the debt crisis and then fell to 7.4 percent. The pandemic had dramatic effects in the American labour market where unskilled and low paid workers lost their jobs first (Rouse and Gimbel 2021), while the European social safety net protected all employees in the Euro Area.[7]

Figure 4. The Unemployment rates in the EA and the US

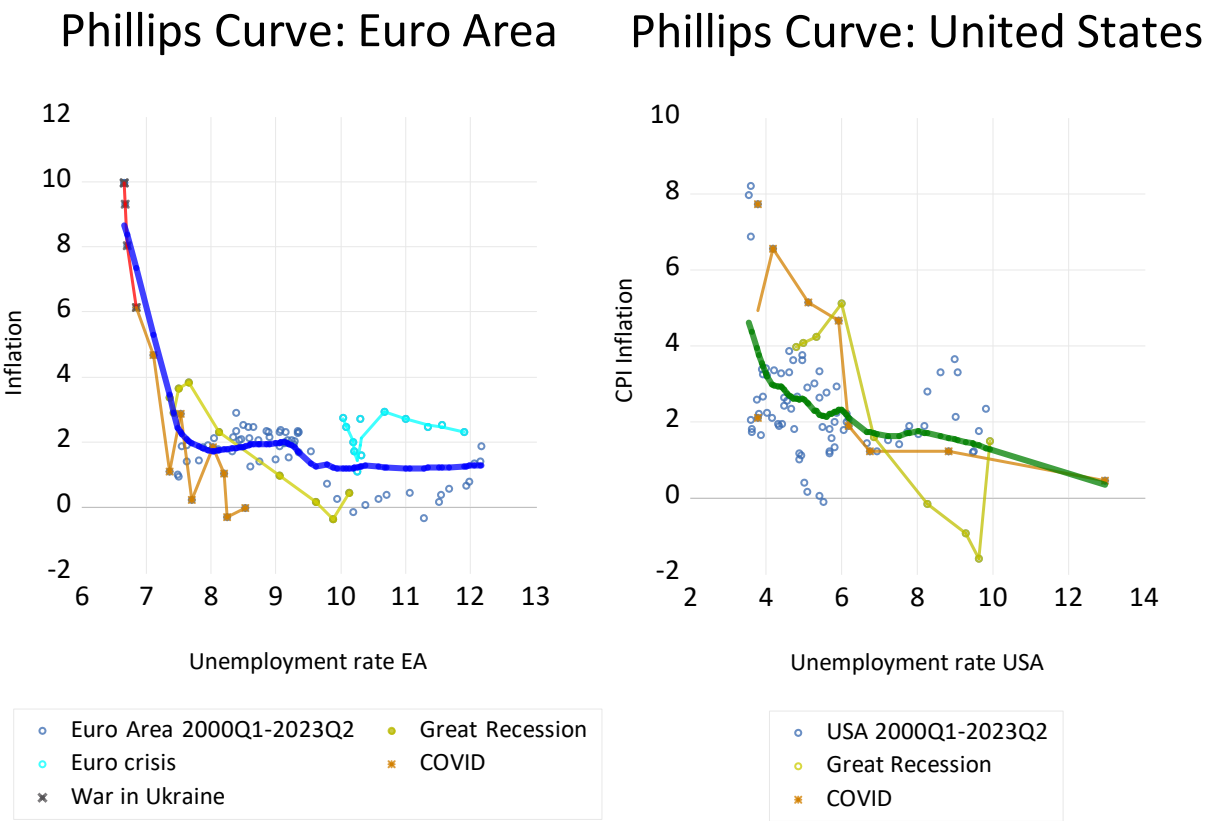


One difference between the labour markets in the two economies is the Phillips curve which shows an inverse relationship between unemployment and inflation. The Phillips curve is one of the several transmission mechanisms for the conduct of monetary policy, as tight money may increase unemployment, slow down wage increases, and thereby reduce inflation. Figure

[7] In the United States, low wage workers were the first to become unemployed which led to an increase in aggregate wage compensation per worker employed (Rouse and Gimbel 2021).

5 shows the non-linearity already observed by Benigno and Eggertson (2023). For the period since 2000, the European curve is flat for all unemployment rates above 8 percent, with a jump at 9.5 percent. In America, it is slightly steeper. In both countries, the curves increased significantly during the pandemic. With the war in Ukraine, the Phillips curve became vertical, which implies that recent inflation was entirely driven by demand. Thus, the natural rate of unemployment is between 6 and 7 percent in the Euro Area and below 4 percent in the USA.

Figure 5. Phillips curves in the two economies



Despite strong social safety nets, profit markups are higher in Europe than in the United States. Figure 6 shows that markups were always higher in Europe than in the US.[8] They are affected by cycles and random shocks. They fell in Europe during the Global Financial Crisis, but not in America, while they dropped in both economies at the outbreak of the Covid pandemic.

Figure 6. The markups for the EA and the US

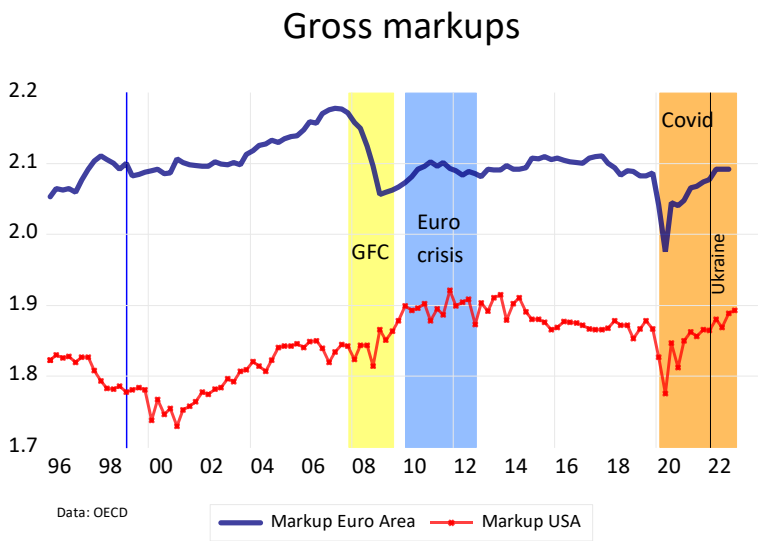
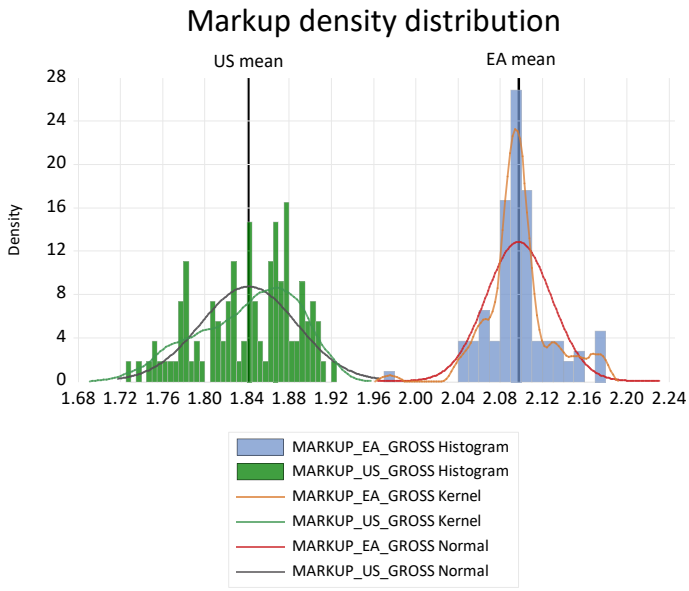


Figure 7 reveals that not only the mean of markups was significantly higher in the Euro Area, but also that the distribution of markups is highly concentrated around the mean, while in America, the histogram is skewed to the left, where the long tail indicates that lower deviations from the mean are larger but rarer, while higher deviations are more frequent but not so large. Figure 7 supports the hypothesis that the American single market is more competitive, while the European single market is more concentrated.

[8] Data for profit shares are from OECD database using nominal GDP by income.

Figure 7. The markup density function for the EA and the US



The distribution in the markups in Figure 7 indicates that American product markets are more competitive. However, the higher European markups could also be the consequence of structurally higher unemployment. In Table 2 Granger causality tests show that in both economies, markups granger-cause unit labour costs. However, in the Euro Area markups cause unemployment, while in America unemployment causes markups. This implies that in a more competitive European single market, wages could be higher. I will come back to the dynamics of wages and markups below.

Table 2. Granger causality test results

Pairwise Granger Causality Tests					
Lags: 4	**Euro Area (92 obs.)**			**United States(83 obs.)**	
Null Hypothesis:	F-Statistic	Prob.		F-Statistic	Prob.
ULC does not Granger Cause MARKUP	0.93632	0.4471		0.96425	0.4323
MARKUP does not Granger Cause ULC	3.94108	0.0056		2.52957	0.0475
UNRATE does not Granger Cause MARKUP	0.90915	0.4624		5.12785	0.0009
MARKUP does not Granger Cause UNRATE	21.2118	3.00E-12		1.33936	0.261

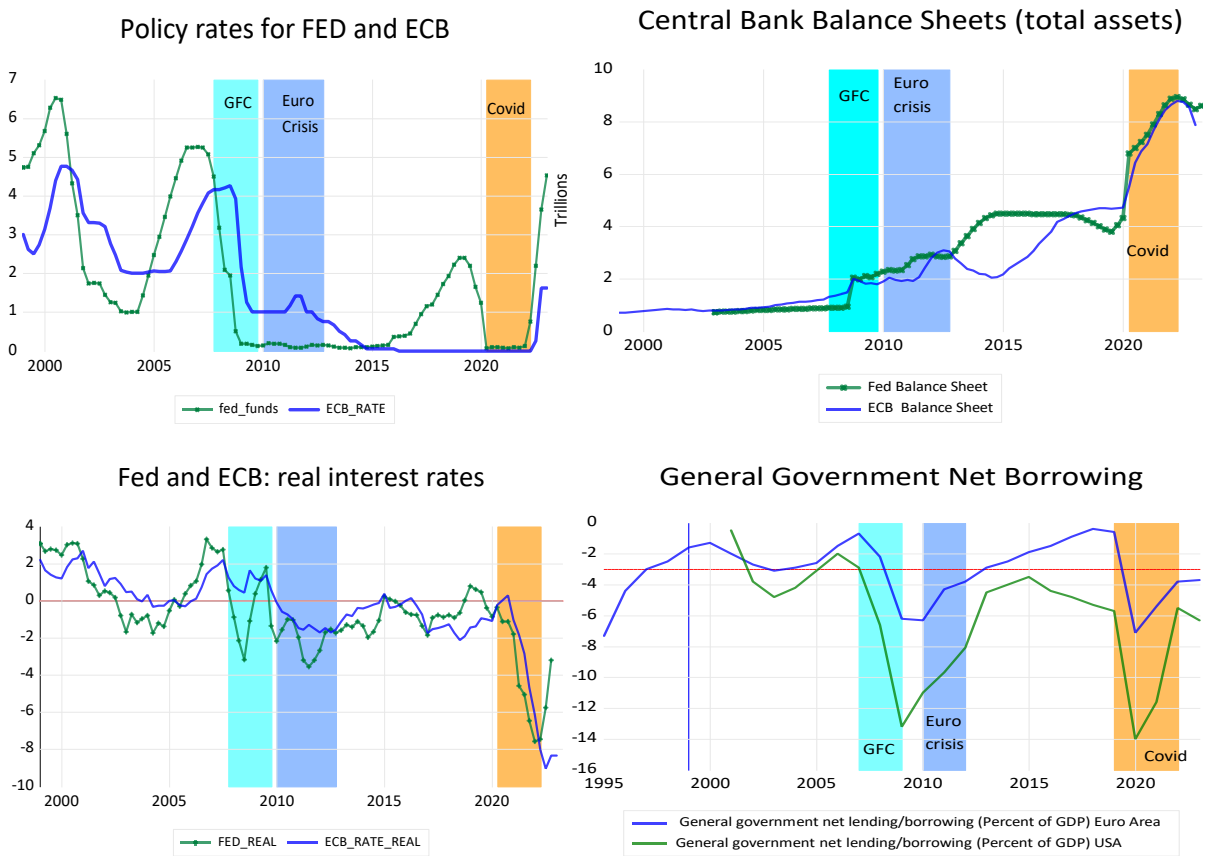
The policy variables in Figure 8 confirm that the ECB was less reactive than the Fed. The Fed cut rates quickly during the Great Recession, and when interest rates reached the zero lower bound the Fed started unconventional policies and quantitative easing.[9] The Obama administration stimulated the economy with large deficits. The ECB followed the Fed's rate decisions with delays, while fiscal policy remained restricted, so that the European policy mix worsened the crisis. After ECB-President Mario Draghi's declaration that the ECB "will do whatever it takes to preserve the euro"[10] interest rates fell close to zero (some even became negative), but quantitative easing started only in 2014 with the asset purchase programs (Wellink 2023). This ended the Euro crisis, but due to persistent uncertainties liquidity preference remained high. Central banks accommodated this. Their largest expansions of balance sheets occurred in both economies during the Covid pandemic.

Easy monetary policy came to an end when the Ukraine War generated a massive inflationary shock. Inflation started as a sectoral supply shock (mainly energy)[11] but logically aggregate price stability required the fall of other prices when energy prices go up. The tightening of monetary policy was necessary to exerted pressure for the readjustment of relative prices. In America, the central bank reacted with steep rises in interest rates, but the ECB was more timid; real interest rates are still deep in the red (i.e., negative). See Figure 8. Nevertheless, central banks have recently started to call in the excess liquidity by shrinking the central banks' balance sheets. This has been more pronounced in Europe.

Figure 8 also confirms that fiscal policy was more proactive in the US, where budget deficits were always larger. The big stimulus during the Great Recession helped the American economy to return rapidly to sustained output growth, while in the Euro Area fiscal consolidation was stringent during the Euro crisis and continued thereafter despite weakening growth. European fiscal austerity only ended with the Covid shock. The fiscal stimulus was of similar size as during the global financial crisis, but this time it arrived faster.

[9] (Kuttner 2018); (Albrizio, et al. 2023)
[10] On 26 July 2012. For a discussion of the effects, see (ECON Committee 2022)
[11] (Blanchard and Bernanke 2023)

Figure 8. Central banks' policy rates, balance sheets, real interest rates, and general government net borrowing



Macroeconomic shocks and uncertainty

Given these basic facts, I will now discuss macroeconomic shocks and the uncertainty evolution for the studied period.

In the New Keynesian model, inflation is explained by the interaction of supply and demand shocks which shift the aggregate demand and supply curves. The two curves are assumed to be orthogonal, meaning independent of each other.[12] In the long run, the aggregate supply curve is assumed fixed and vertical, or more realistically there is a "natural" rate of capacity growth that is stable. The Friedman and Phelps spoke of the "natural rate of unemployment". It depends only on "real" variables, such as the economy's stocks of labour, capital, natural

[12] This assumption allows modelling shocks as i.i.d. errors with zero mean which is convenient for econometric estimates.

resources, and technology. However, in the short run, it is upward sloping when nominal rigidities generate temporary deviations from the long run equilibrium. Aggregate demand, on the other hand, depends on nominal expenditure, hence on money. It is downward sloping because an increase in the price level reduces the purchasing power of money and therefore the demand for goods and services.[13]

The intersection of the supply and demand curves determines the equilibrium price level for the economy. A positive demand shock (an unexpected increase in spending) will shift the demand curve to the right, so that *with given supply,* prices, output, and employment will increase. A negative demand shock does the opposite. Monetary policy must combat positive demand shocks by raising interest rates, which reduces investment and private consumption and shifts the demand curve back to the left again. However, this applies only to the short term. If aggregate supply is determined by the capital stock and monetary policy affects investment (the first difference of the capital stock), then monetary policy has hysteresis effects and the long run effect on supply and employment depends on the duration of the shock.[14] A negative supply shock (e.g., an increase in energy prices) will shift the supply curve to the left; *given the level of demand* (i.e., the stock of money intended for purchases), output and employment will fall and prices go up (stagflation). Monetary policy needs to reduce money to match the lower supply and facilitate the adjustment of relative prices.

The story takes another twist when we introduce forward-looking expectations. Higher inflation expectations will shift planned future spending into the present and the demand curve to the right. Actual inflation goes up and the expectations become self-fulfilling. However, this substitution effect can switch the slope of the demand curve. As rising prices become associated with higher output, the slope becomes positive. But if the inflation leads to a permanent increase in wage costs, this is a negative supply shock (shifting the supply curve to the left) which generates a lower equilibrium with an upward sloping demand curve. Barrett and Adams (2022) have shown that this switch in the slope of the demand curve will

[13] In undergraduate textbooks, demand is modelled as $y^d = \frac{M}{P}$, the amount of real money. Nominal money supply M is a shift parameter. If it increases, effective demand y^d shifts to the right.

[14] This is called hysteresis which refers to an event that persists even after the factors that generated it have been removed or otherwise run their course. For a discussion of hysteresis effects see (Cerra, Fatás and Saxena 2020)

occur when the central bank raises interest rates less than the increase of inflation expectations. Monetary policy must avoid this behaviour by keeping inflation expectations anchored close to the inflation target. In this case, the cost of reducing inflation in terms of growth and employment will be low (Alvarez and Gloe Dizioli 2023) and this requires rapid action and clear communication by the central bank. When the commitment to price stability weakens, inflation fears will overshoot rational expectations, and this generates uncertainty about inflation expectations.

Uncertainty complicates the story, because it shifts both supply and demand curves to the left, and the orthogonality of supply and demand no longer holds.[15] For risk averse agents, uncertainty determines liquidity preference. Consumers, investors, households, firms, and banks will keep cash rather than spend it (the "precautionary savings" effect). This will depress hiring, investment, or consumption and generate a negative demand shock. Furthermore, if agents are subject to fixed costs or partial irreversibility (a "real options" effect) or if financial constraints tighten in response to higher risks (a "financial frictions" effect), uncertainty becomes a supply shock which shifts the supply curve up.[16] The net effect of uncertainty on prices depends on the positions and elasticities of the supply and demand curves (their slopes) but also on the relative impact and duration that shocks have on these curves.[17] Multiple equilibria are possible. Prices may increase or decrease, and output may shrink a lot or little. Hence macroeconomic uncertainty begets more uncertainty for prices and inflation. I will show that the channel through which uncertainty affects prices is the markup firms add to the cost of labour. Increased uncertainty will push firms to raise their markups and therefore accelerate inflation.

[15] There is now a growing literature on the effects of uncertainty on economic variables. The early literature focussed on investment which has hysteresis effects on the capital stock and therefore the supply curve. See (Bernanke 1998); (Dixit and Pindyck 1994). For recent overviews of the literature, see (N. Bloom 2014); (Istrefi and Mouabbi 2018), (Pagliacci 2003). On measuring uncertainty see (N. Bloom 2009); (Jurado, Ludvigson and Ng Source 2015); (Baker, Bloom und Davis 2016).
[16] (Jurado, Ludvigson and Ng Source 2015, 1177)
[17] (Jurado, Ludvigson and Ng 2015) discuss the duration of uncertainty shocks.

Have shocks ended the Great Moderation?

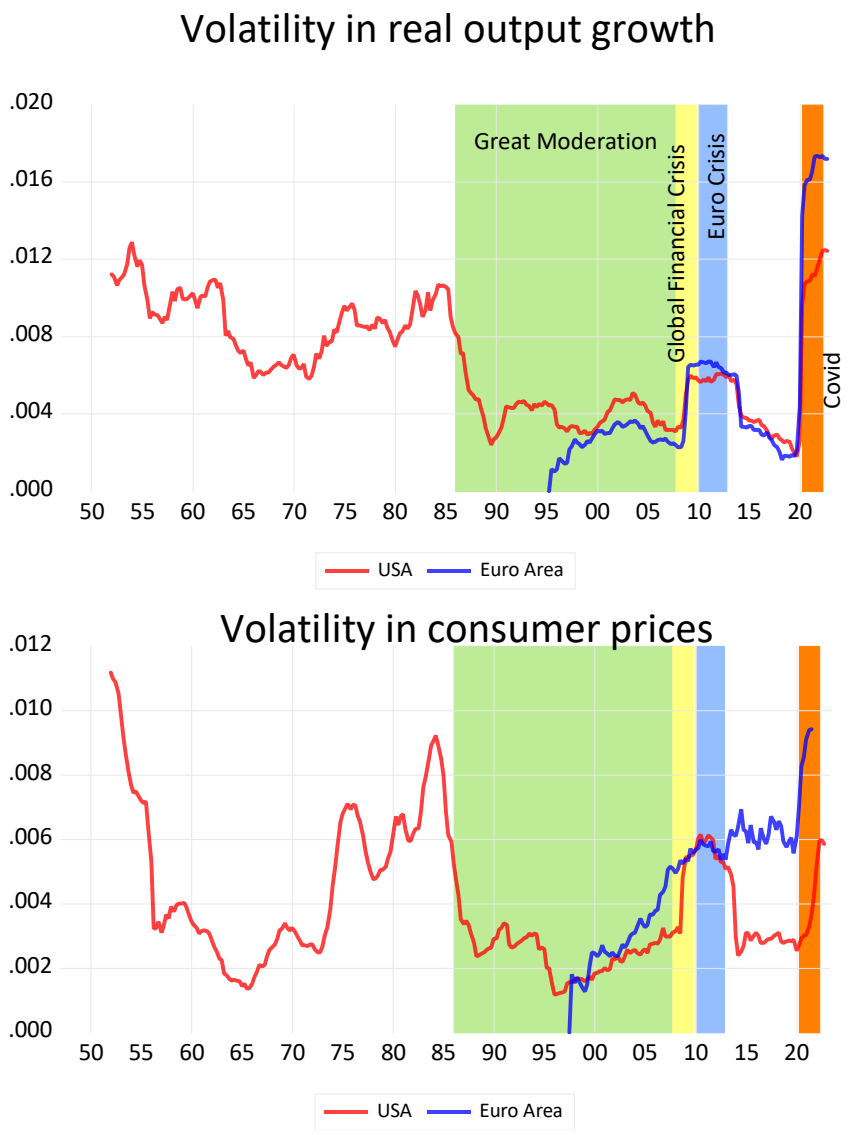
During the *Great Moderation,* macroeconomic stability seemed to be granted. When Ben Bernanke (2004) coined this notion, he suggested three not mutually exclusive explanations for the long run tendency of improved macroeconomic stability. First, structural changes occurred due to new technologies, better business practices, deregulation, and lower inventories through global supply chains. More sophisticated and deeper financial markets also increased the flexibility and stability of the economy. Second, better theories enshrined in the New Keynesian paradigm have improved macroeconomic policies since the 1970s.[18] Third, good luck also contributed to stability, as the economy was experiencing smaller and less frequent shocks. However, over the last two decades, the world has been "unlucky" as it was hit by a sequence of serious shocks, such as the Great Recession, the Euro debt crisis, Covid, and the war in Ukraine. In this context, it becomes important how the economy deals with shocks and uncertainty. We shall find important differences in the functioning of the US and Euro Area economies.

Figure 9 reproduces and extends the indices of macroeconomic volatility developed by Blanchard and Simon (2001). We clearly perceive the fall of volatility during the 1950s and 60s, first for consumer prices and then for output growth, too. After the oil price shock in 1973, it took nearly 15 years to return to stability. The Great Inflation was succeeded by the *Great Moderation* which lasted from the mid-1980s until the Global Financial Crisis in 2007 which created a huge uncertainty shock. However, after 2014 (the end of the Euro crisis and the second mandate for President Obama) the return to stable economic growth reconnected with the previous moderation trends in both economies, but mainly for output and not for inflation. Consumer prices have nearly always been more volatile in the Euro Area.[19] This rising trend of inflation volatility prevailed already long before the Global Financial Crisis. The higher price volatility in Europe is puzzling as it contradicts with the ECB's mandate of maintaining price stability. One reason for greater macroeconomic stability in the US maybe the greater

[18] (Bernanke 2004); see also (Yellen 2012); (Benigno und Eggertson 2023), (Ball, et al. 1988).
[19] The correlation between the great moderation indices and the World uncertainty indices is positive in all cases, stronger for inflation and more significant for Europe.

activism of monetary and fiscal policy, which allowed a better fine tuning of the policy mix. However, this does not explain the sudden peak in inflation in recent years.

Figure 9. The real output growth and consumer price volatility indices for the EA and the US



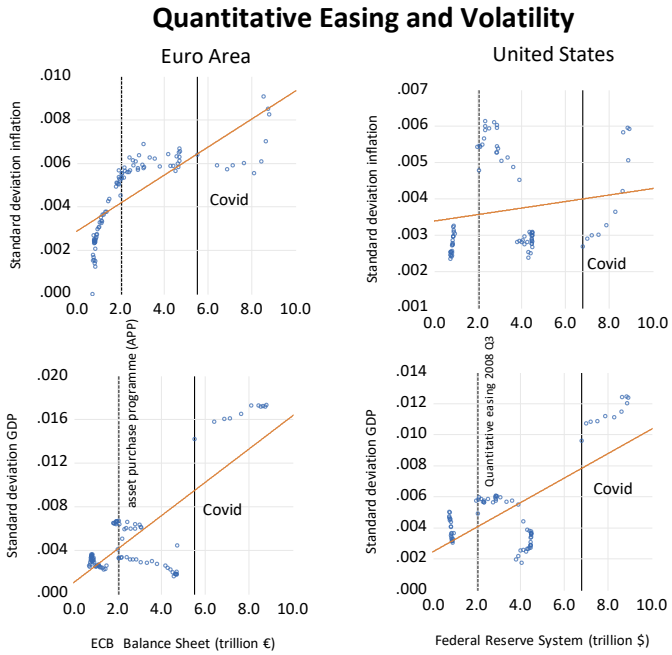
A notable contrast between the 1970s and the current era is the considerably larger size of financial markets, which implies a heightened risk of financial crises. Increased liquidity preference tightens financial constraints unless the central bank increases money supply. In an emergency, central banks give priority to the short-term policy aiming at stabilising

financial markets over their medium-term inflation targets. The great recession following the financial crisis in 2007 disrupted the financial sector and the Fed responded by unconventional monetary policies. It cut interest rates to zero and provided liquidity generously through the extension of their balance sheets. The ECB followed only with delays and even shrank its balance sheet prematurely. See Figure 8. Interestingly, in both economies inflation volatility is correlated with unconventional monetary policies (see Figure 9). With the start of the European asset purchasing program in 2014, until the end of the pandemic, the variability of inflation in the Euro Area has become more stable. It increased again with the Russian invasion of Ukraine, as this time the ECB did not create more liquidity.

Unconventional policies with zero interest rates and quantitative easing were deviations from the standard policy model, but the return to moderate volatility was surprisingly swift.[20] Volatility in real GDP came down in both economies. Pagliari (2021) found that "if the ECB had not put in place the measures adopted between 2014 and 2017, annual output growth would have been, on average, 0.67 percentage points lower in peripheral countries [of the Euro Area]". However, the return to price stability was more pronounced in the USA, indicating that macroeconomic policy was less efficient in Europe.

[20] Apparently, central bankers had learned from monetarists. (Blinder 2022, 32) recounts a speech by Fed Chairman Bernanke in honour of Milton Friedman's 90th birthday in 2002 where he referred to the Great Depression saying to Milton Friedman and Anna Schwartz, who had famously argued that the depression had been aggravated by monetary stringency: "You are right, we [i.e., the Federal Reserve System] did it [i.e., cause the depression]. We are very sorry. But thanks to you, we won't do it again."

Figure 9. Scatter plot of volatility against quantitative easing for the EA and the US



John Taylor (1998) has argued that there is a *stable* trade-off between price and output volatility caused by the business cycle. However, the data are not consistent with this hypothesis. The Taylor curve[21] had *shifted* outwards, even before the Covid pandemic. Bernanke (2004) has explained that such an outward shift might imply either that monetary policy has become less efficient in dealing with shocks, or that the favourable environment of low and less frequent shocks was no longer in place. If monetary policy has indeed become more efficient since the 1970s, then the Taylor curve must have moved inwards. However, the series of recent exogenous shocks would have shifted it outwards again. We therefore need to understand what kind of shocks drove the inflation moderation in the US and the Euro Area in different directions.

In a New Keynesian framework, inflation would be a consequence of positive demand or negative supply shocks. However, I have argued that uncertainty shocks shift both demand and supply curves to the left. If the shocks are transitory and if nominal and real rigidities are low, the two curves will revert to their initial long run equilibrium. However, if the shocks and rigidities are persistent, they generate hysteresis effects.

[21] The Taylor *curve* preceded his work on the Taylor *rule*.

Firms encounter nominal frictions when the possibility of price adjustments is low; they encounter real rigidities when they cannot quickly adjust their costs. With a continuum of monopolistic competitive firms that maximize profits subject to the demand for their products, shocks generate losses which are higher when the elasticity of demand is high (Clara 2018). Depending on how long the uncertainty lasts, the effect will be temporary if the shock is short (such as changes in spending or inventory), but long-lasting if it generates hysteresis effects (Cerra, Fatás and Saxena 2020).

Blanchard and Quah (1989) have provided a method for disentangling shocks. Such shocks are econometric artefacts. The literature calls them demand and supply shocks, but because they affect investment and employment, demand shocks can also have long supply run effects generating hysteresis. The distinction between demand and supply shocks is then blurred.[22] I will call *nominal* shocks the *transitory* combined effect of supply and demand shocks, and *real* shocks the *persistent* combined effect on costs. For example, a sudden increase in investment or a positive productivity shock will unambiguously increase economic growth. A protracted financial crisis, like the Euro debt crisis, will permanently lower real GDP growth. These are therefore real shocks. By contrast, an unexpected increase in prices or unit labour cost is a nominal shock which will only have real consequences if real rigidities prevail.

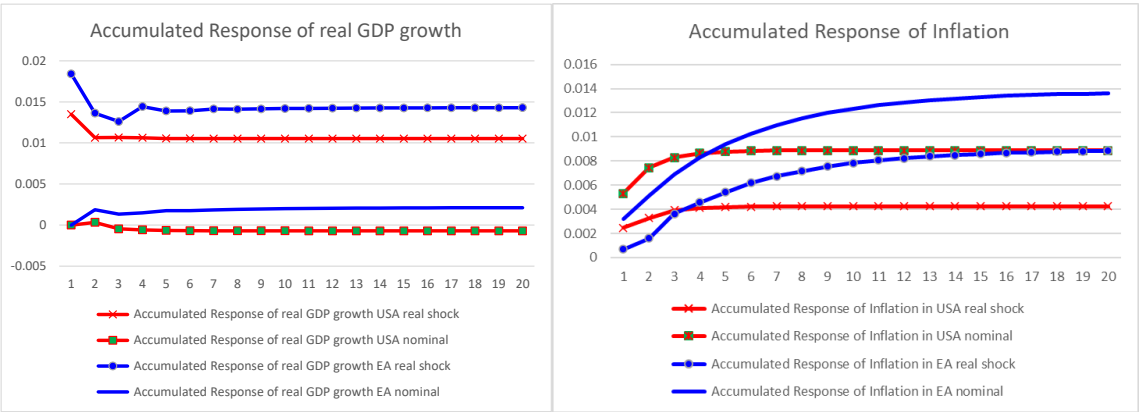
The dynamics for our two economies are shown by the impulse response functions (IRF) in Figure 10. For both countries, real persistent shocks have a stable and statistically significant positive long run effect on *real GDP growth*. We note that the mean reaction of economic growth to a real shock is higher in Europe. If we assume that the Euro Area is a portfolio of advanced and emerging economies, this is consistent with Pagliacci's (2003) observation that the negative response to real shocks is higher in emerging market economies than in advanced countries. Nominal transitory shocks, however, have no long run effect on real growth, as postulated by theory. Although the impulse-response looks higher in Europe, nominal shocks in both countries are statistically not significant. Hence, temporary increases in government spending (unless they shift the supply curve) or quantitative easing are unlikely to stimulate economic growth in the long run. However, the pandemic has generated new supply-side

[22] (Blanchard and Quah 1989) acknowledge this possibility but consider its effect negligeable.

oriented fiscal policies. In Europe, the €806.9 billion investment project called *NextGenerationEU* aims at concrete improvements in European infrastructure and production capacities. President Biden's $1.2 trillion *Bipartisan Infrastructure Law* has similar intentions. These programs diverge from traditional Keynesian demand management by not only closing the output gap, but also by generating long-lasting supply enhancements for economic growth.

The response of *inflation* to real and nominal shocks, however, is not the same in Europe and America. In both countries real and nominal shocks increase inflation. The effects where rapid in the USA but cease after one year. In Europe, they rise inflation initially less, but *over time inflation increases more in the Euro Area* than in the US. The inflationary response to an increase of temporary stimulus programs is nearly twice as high in the EA as in the US. One reason could be that the US market is more competitive and the EU more monopolistic (see below). This might explain why inflation moderation has been higher in the US after the financial crisis when quantitative easing was effectively a nominal shock. However, these estimates indicate that policies to contain inflation and return to price stability do not work in a similar fashion in the two economies.

Figure 10. The IRF plot for real and nominal shocks for the EA and the US



What does it take to bring down inflation?

The New Keynesian model postulates that to restore price stability, monetary policy must be tightened. The disinflation of the 1980s serves as the paradigm. It was a combination of new commitment technology for monetary policy (exchange rate pegging and inflation targeting) and old-fashioned austerity policies (high interest rates, raising unemployment) which aimed at breaking the wage-price spiral with the help of the Phillips curve. Unfortunately, today the implementation of monetary tightening in Europe is limited due to the presence of high public debt in certain member states and the potential risk of financial instability.[23] The extension of liquidity to stabilise European financial markets, which started during the Euro crisis, has weakened the credibility of the ECB. The slow response in monetary policy to counter the Covid and Ukraine shocks has further acerbated the dilemma between financial and price stability. This policy approach is reminiscent of the 1970s in the US.[24] With passive monetary policy, cost push inflation theories have returned. The fear of "second round effects", whereby an initial inflationary shock generates long-lasting wage inflation, has brought wage setting back to the policy debate. However, I will argue that the labour market is secondary; in the first instance inflation is driven by capital markets and the markup firms charge. Therefore, I will first show the crucial link between inflation and markups, then trace out the different channels for macroeconomic adjustment and finally provide evidence for the impact of uncertainty on inflation.

Profit markups and inflation

The standard New Keynesian model with three variables (inflation, unemployment and interest rate) has two channels for bringing down inflation. Monetary policy, in conjunction with fiscal policy, determines aggregate demand. Labour markets determine production costs and aggregate supply. The two channels are brought together by the Taylor rule whereby central banks set interest rates in response to labour market conditions and deviations from the inflation target (Taylor 1993). Yet, the evidence is not always consistent with the model.

[23] For the argument that high government debt levels pose a challenge to containing inflation see (Brandao-Marques, et al. 2023).
[24] (Blinder 2022); (Reis 2021); (Yellen 2012); (Bernanke 2004); (Balke and Emery 1994)

Prominent inconsistencies are the "price puzzle", a positive relationship between inflation and central bank policy rates,[25] and a flat Phillips curve. A prominent explanation argues that the "price puzzle" is caused by insufficiently aggressive interest hikes.[26] The flat Phillips curve is a result of price stability when inflation expectations are credibly anchored by monetary policy.[27] I will show that the puzzle disappears when we take uncertainty into account.

Before we can look at the empirical performances of the US and EA economies, we need to clarify how uncertainty shocks impact inflation. I start with some simple identities that describe the markup as the surplus which firms in aggregate add to their unit labour costs when setting prices. Abstracting from taxes, we write the price equation as:

(1) $p = (1 + m)ulc$

where m is the profit margin, and the markup is

(2) $1 + m = \frac{p}{ulc}$.

Unit labour cost are calculated as:

(3) $ulc = \frac{wL}{y} = \frac{w}{\lambda}$

where w is nominal wages (compensation per employee) and L is the number of employees. Productivity is output per worker $\lambda = \frac{y}{L}$. Real unit labour costs are ulc divided by the price level which is effectively the wage share

(4) $Rulc = \frac{w}{p}\frac{1}{\lambda} = \frac{wL}{py}$

It is determined by the level of real wages relative to productivity. The markup is the inverse of the wage share and can be considered as an estimate of real marginal costs.[28]

(5) $(1 + m) = \frac{py}{wL} = \frac{\lambda}{\frac{w}{p}} = \frac{1}{Rulc}$.

It can also be shown that the profit margin m is equal to the profit share relative to the wage share:

(6) $m = \frac{1-Rulc}{Rulc}$

[25] (Stock und Watson 2001); (Sims 1992); (Eichenbaum 1992)
[26] (Estrella 2015); (Castelnuovo and Surico 2010); (Balke and Emery 1994). (Barrett and Adams 2022) argue that weak central bank reactions even switch the slope of the aggregate demand curve.
[27] (L'Huillier and Phelan 2023); (Reis 2021); (Kuester, Müller and Stölting 2007)
[28] (Banerjee and Russell 2005) have shown that empirically the difference between marginal cost and unit cost is not significant. Reis' (2023) model of real marginal costs that are weighted by the capital share yield the same result.

Thus, when the markup increases, the *wage share* falls. The tax share would reduce the profits available to firms but given that it has been remarkably constant since the 1990s except for the covid years, we will ignore it.

Taking first differences of logs, we get the inflation rate as

(7) $\Delta p = \Delta(1+m) + \Delta ulc = \Delta(1+m) + (\Delta w - \Delta\lambda)$

Rising inflation stems from markup increments and from nominal wages surpassing productivity growth.[29] The first bracket reflects the marginal cost of capital, the second the marginal cost of labour. Because capitalism is defined by the domination of capital markets over labour markets (we do not live in labourism), I take the cost of capital as the forcing function for the inflationary process. In equilibrium, the cost of capital determines the markup. The labour market must adjust, which it does either by nominal wage setting or by employment variations (the Phillips curve logic). Entrepreneurial profits (and losses) are the deviation from equilibrium that reflect the impact of shocks in the short run and competition in the long run.

What determines the markup? Marxists believe boundless greed drives the capitalist system; there is no equilibrium. Early standard models assumed a constant markup. Later models recognised the time-varying character of markups. Models with monopolistically competitive markets interpreted markup variations as reflecting the degree of monopoly power because higher competition leads to lower markups of prices over marginal costs. Competition enhancing policies would therefore structurally lower the markup (Blanchard and Philippon 2003).

The markup can also be seen as the outcome of competing claims on aggregate income by firms and workers (Lorenzoni and Werning 2023). Inflation is then the result of inconsistent claims and its dynamics are modelled by the wage-price spiral which settles at the equilibrium non-accelerating inflation rate of unemployment (NAIRU).[30] Thus, price stability is achieved

[29] In the 1990s, several papers observed a negative relation between inflation and the markup (see (Banerjee and Russell 2005) for the literature), but this does not hold for the data since the early 2000s. Formal unit root tests show that the time series for the log of markups in both countries have no trend and are integrated of order one over the period 1997Q1 to 2023Q1. A simple OLS regression of first differences generates a positive coefficient that is statistically not significant (coefficient 0.055447, p-value 0.6298) for the Euro Area, and a significant positive coefficient for the US (coefficient 0.131454, p-value 0.0250).

[30] (Layard, Nickell and Jackman 1991)

when *claims by workers and capital owners* are consistent, unemployment is at its long run natural rate, and money supply does not exceed the growth of potential output. This idea has now re-emerged in debates on inflation shocks and the wage spiral. After an increase in nominal prices, workers seek to maintain their real wage and push for higher nominal wages. To maintain their markups, firms will increase prices, and this generates the spiral.[31] It is the result of a power game, not of market processes.[32] With a neoclassical production function, the power game is avoided because workers receive their marginal product of labour and capital owners take the rest.

However, in reality the story is not so simple. The estimates for the non-accelerating inflation rate of unemployment (NAIRU) vary significantly. Figure 5 showed a wide range of unemployment rates compatible with non-accelerating inflation. Furthermore, central banks do not control money supply but interest rates, and monetary aggregates gyrate significantly from potential output growth without inflation taking off.

An alternative view sees time-varying markups as the income share that consists of the cost of finance (including dividends and taxes) and pure entrepreneurial profits.[33] Equilibrium in the capital market reflects consistency of *claims by borrowers and lenders* and the labour market adjusts. Hence, the costs of capital set the long-run path for the evolution of markups. The business cycle is characterised by entrepreneurial profits which lift the markup above or below the long run equilibrium level.[34] If the cointegrating vector represents the equilibrium markup, we can interpret the residual as entrepreneurial q-profits. I will show these

[31] (Hansen, Toscani and Zhou 2023); (Blanchard and Bernanke 2023); (O. Blanchard 1986)
[32] Another structural explanation consistent with Table 2 refers to Hall and Soskice's (2001) model of *liberal* versus *coordinated* market economies. In liberal market economies, typically the United States, coordination occurs primarily through market mechanisms, whilst in coordinated market economies, typically Europe (essentially Germany), formal institutions play a much more central role in governing the economy and regulating firm relations with stakeholders. In liberal market economies, firms are more dependent on short term credit contracts, in coordinated market economies there is a long run relation between firms and banks (Vitols 1998). We would therefore expect higher variability of markups in liberal market economies with short term loan contracts - which is what Figure 6 depicts, but this does not explain why the Euro Areas has persistently higher markup levels.
[33] (Reis 2023) makes the point clearly, but (Bernanke and Gertler 1990) can be seen as early precursors.
[34] Such pure entrepreneurial profits can be modelled as Tobin's *q*. In equilibrium the *q*-ratio is equal to 1 and entrepreneurial profits are zero. See (Tobin and Brainard 1977). The literature has focussed on the *q*-ratio as the ratio between a physical asset's market value and its replacement value. However, it can be shown that the ratio is equivalent to the marginal efficiency of capital relative to the cost of finance (Collignon 1997). In the Treatise of Money, (Keynes, A Treatise on Money. The Pure Theory of Money 1971a [1930]) explained entrepreneurial profits as quasi-rents emerging from a disequilibrium between investment and savings (Q=I-S), but in the General Theory (1967 [1936], 23) he amalgamated this into the concept of user cost of employment: "the excess of the value of the resulting output over the sum of its factor cost and its user cost is the profit or, as we shall call it, the *income* of the entrepreneur".

entrepreneurial profits for our two economies below in Figure 12. They provide the incentive for investment and therefore for income growth and employment. In a competitive economy, these profits will be competed away. When monopoly firms dominate the market, they reap monopoly rents, although they must consider the purchasing power of consumers which depends on liquidity preference and monetary policy. The general equilibrium is therefore not set by the labour market but by capital markets, where interest rates are the compensation for giving up liquidity. As I have argued above liquidity preference is a function of uncertainty. The markup firms charge must therefore cover the cost of capital which is the compensation for lenders to give up the security of holding liquid assets and it rises with uncertainty.

For firms, the marginal cost of capital depends on the interest rate which financial institutions charge firms for lending capital. It reflects their cost of funds in the interbank market that are targeted by the central banks' policy rate i plus a liquidity premium for giving up the security of holding liquid funds ($\varrho > 0$), and their inflation expectations π^m.[35] With financial frictions which require using some of the bank's net worth, the marginal cost of capital also depends on the required return on net worth. Hence, the lending rate to rent capital is:

(8) $i^l = i + \gamma(\rho + \pi^m - i)$

Here $\gamma > 0$ stands for a parameter capturing the financial frictions. The lending rate increases with liquidity preference, which is a function of uncertainty and risk averseness for a given amount of money supply. High inflation expectations are correlated with high uncertainty. Because higher uncertainty will increase the cost of finance, we would expect that it will push up inflation or push down unit labour costs. A zero-interest rate policy by the central bank hits the lower bound where $i^l = \gamma(\rho + \pi^m)$. When uncertainty is very high, lending rates may still be too high for investment and growth, even if expected inflation is zero or negative. This provides the rationale for quantitative easing. By providing additional liquidity the central bank accommodates the higher liquidity preference which will reduce the risk premium.

If we accept that in equilibrium markup covers the marginal cost of capital, i.e.

(9) $(1 + m) = (1 + i^l)$

[35] I follow (Reis 2023) but add what Keynes (1967 [1936], 226) called the liquidity premium.

we get the equilibrium price level as follows:

$$p^* = (1 + i + \gamma(\rho + \pi^m - i))ulc \quad (10)$$

Thus, inflation depends on increases in markups and in unit labour costs. Assuming that wages respond to unemployment in accordance with the Phillips curve, we can estimate the long run equilibrium markup as a function of inflation, unit labour cost, unemployment, monetary policy variables and a proxy for uncertainty. I will do that below.

Measures of uncertainty

Before we can assess the impact of uncertainty on inflation, we need to look at measures of uncertainty. They are problematic. Measuring uncertainty is still a project at its early stage. I will use three indicators. Ahir, Bloom, and Furceri (2022) have constructed the World Uncertainty Index (WUI) for an unbalanced panel of 143 individual countries from 1952 based on the frequency of the word "uncertainty" in the quarterly Economist Intelligence Unit country reports. I have derived the index for the Euro Area as the median of the national indices of the EA member states.

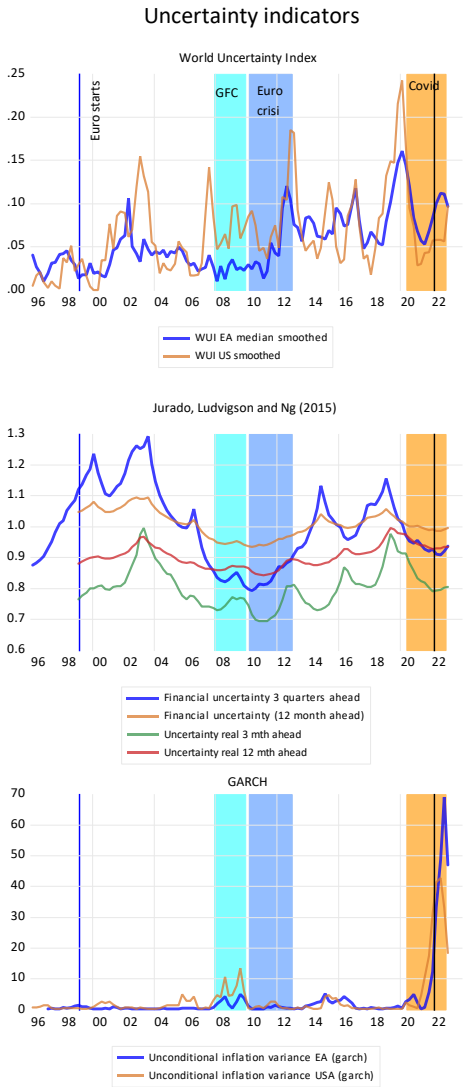
A more sophisticated index was developed by Jurado, Ludvigson and Ng (2015). They provide econometric estimates of time-varying macroeconomic uncertainty. Their estimates display significant independent variations from popular uncertainty proxies such as the WUI, suggesting that much of the variations in other proxies are not driven by uncertainty. Unfortunately, their index is only based on US data and there is no equivalent for the Euro Area. Because of the sophisticated nature of the index, I will use it in the ECM below for the US and EA economies. Of course, the results are only representative for the US economy. Using the index for the Euro Area indicates how the European economy would work if it were subject to the same uncertainties as the US.

A third approach to measuring uncertainty in the context of inflation is to calculate the unconditional variance of the inflation time series in a GARCH model, where the unconditional variance is the unexpected part in the formation of inflation expectations. It is typically clustered in periods of uncertainty. Because the unconditional variance is dependent on the rational expectations component, such estimates do not measure uncertainty as stochastic volatility, but they are indicative of big uncertainty event. Jurado et al. (2015) found

that results based on GARCH estimates indicated the number, timing, and persistence of uncertainty were very similar to their own measure of macro uncertainty. This allows us to calculate the inflation GARCH for the Euro Area as an alternative to the WUI index.

Figure 11 depicts very different features for the three uncertainty proxies. The World Uncertainty Index (WUI) shows higher volatility and uncertainty for the US. Jurado, Ludvigson and Ng (2015) have calculated monthly series for financial and real variables looking 3 and 12 months ahead. For the construction of the unconditional variance in the GARCH, I have also used monthly data. Both monthly time series were then transformed into quarterly series by using the Eviews routines. Augmented Dickey-Fuller tests confirm that all series are I(1) and indicate structural breaks. The Johansen cointegrating test confirm the cointegration of the system's variables.

Figure 11.



The impact of uncertainty on inflation

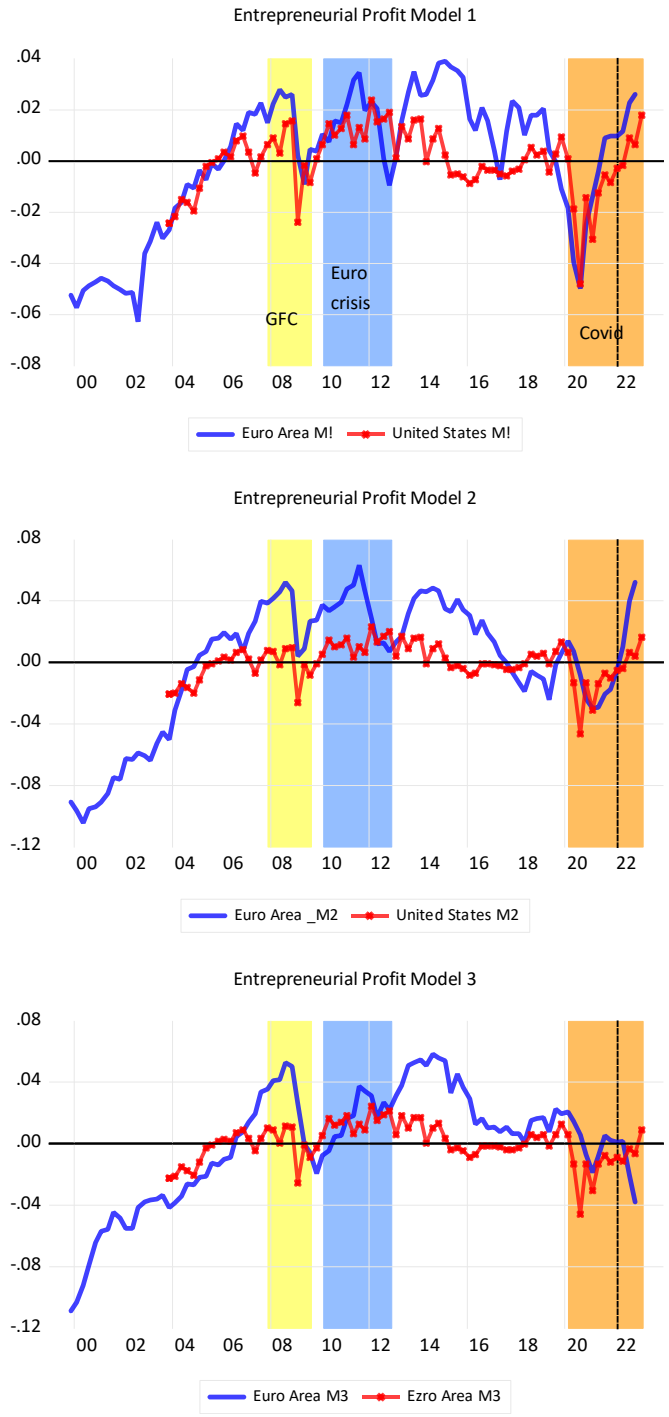
The results for estimating the effect of uncertainty on inflation are uncertain. Using these three variables, I have calculated three Error Correction Models (ECM) with identical specifications, but different uncertainty variables. Model 1 uses the WUI (Ahir, Bloom and Furceri 2022), Model 2 the American uncertainty index (Jurado, Ludvigson und Ng 2015). For purposes of comparison, I have used this uncertainty measure also for Euro Area data. We may argue that globalisation spreads uncertainty over the two highly integrated economies, but we must keep in mind that model 2 is less credible than the other two models for the Euro Area. Model

3 uses the unconditional variance of a GARCH(1,1) for the inflation rates. In addition to the standard New Keynesian model (Stock und Watson 2001) of inflation, unemployment, and interest rates, I have added unit labour costs to catch the markup effect, and the central bank's balance sheet. We are interested in the impact uncertainty has on inflation and policy making.

Error Correction Models consist of a cointegrating vector involving the endogenous variables along with a residual component. The cointegrating vector describes the long run equilibrium between levels, and the correction coefficient represents the pace at which deviations from this equilibrium level are rectified. Hence, the cointegrating vector reflects the equilibrium time-varying markup, and the residual is a measure of entrepreneurial profits. This describes the structural features of the economy.

Depending on which proxy we take to measure uncertainty, the q-profits vary somewhat, but the general orientation is clear: the Global Financial Crisis and the Covid pandemic pushed entrepreneurial profits deep into loss. See Figure 12. Since the mid-2000s, q-profits have mostly been higher in the Euro Area than in the US, although they have been lower in the first years of the euro. We also observe that the higher GDP growth in the Euro Area after the euro crisis (see Figure 2) corresponds to a phase with higher q-profits.

Figure 12. Entrepreneurial Profits for the three models for the EA and the US



The IRF describes the short-run relationship between the shock of one variable and its effects on other variables within the system. The IRF provides insights into short-term policy effects, enabling us to evaluate the influence of an uncertainty shock on variables such as inflation, monetary policy, unemployment, and unit labour costs.

Table 3 shows the long run coefficients of the cointegration vector for the three models estimated for our two economies.[36] With the exception of the Jurado-index in the US, the signs of the coefficients for uncertainty all indicate that *an increase in uncertainty raises inflation*. Higher unit labour costs are always related to higher prices, too. Monetary policy has two channels. A rise in interest rates lowers inflation in the long run (except in model 2 for EA, which however is not reliable), but the effect is not significant in the US. The effect is *consistent with New Keynesian theory and eliminates the price puzzle*. Expanding the balance sheet of the central bank always and significantly increases inflation. Thus, the consequences of quantitative easing are not trivial. Finally, unemployment lowers inflation in the long run (the Phillips curve effect). The effect is weaker, i.e., the Phillips curve is flatter, in the US.

Table 3. Cointegrating vectors for the three models for the EA and the US

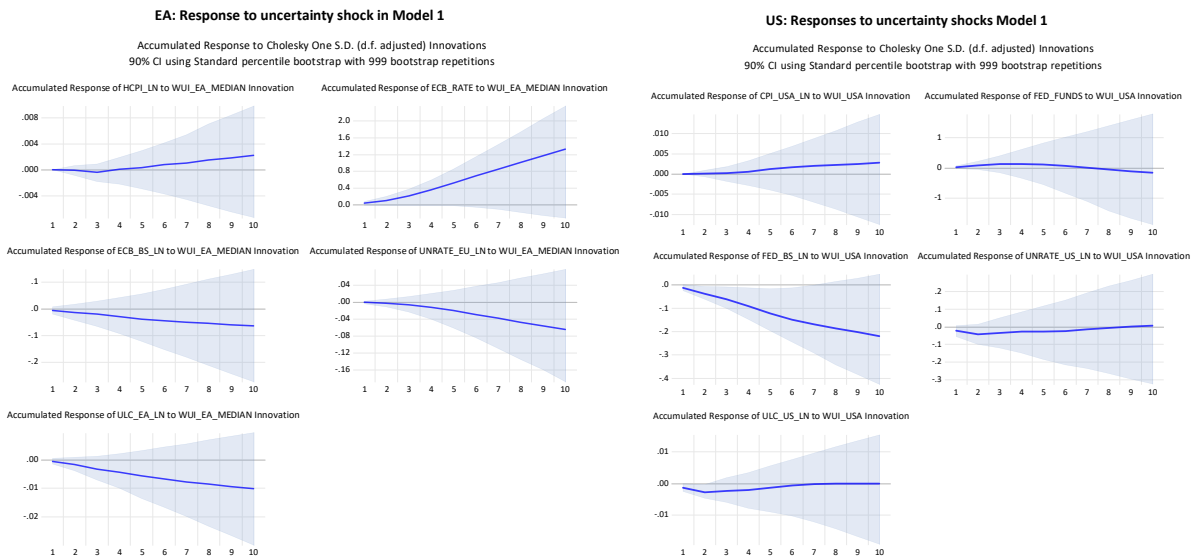
Coefficients for the cointegrating vectors						
Standard errors in italics & t-statistics in [ ]						
	Euro Area			**United States**		
	model 1	***model 2***	***model 3***	***model 1***	***model 2***	***model 3***
	WUI	*Jurado et al.*	*GARCH*	*WUI*	*Jurado et al.*	*GARCH*
CPI	1	1	1	1	1	1
Uncertainty	-0.59627	-0.175073	-0.002509	-0.03435	0.033101	-0.00029
	-0.07081	*-0.0522*	*-0.00205*	*-0.01755*	*-0.0266*	*-0.00014*
	[-8.42009]	*[-3.35386]*	*[-1.22141]*	*[-1.95754]*	*[1.24433]*	*[-2.16117]*
CBk interest rate	0.028018	-0.00933	0.017575	0.000143	0.000709	0.000724
	-0.00493	*-0.00683*	*-0.00497*	*-0.00094*	*-0.00106*	*-0.00105*
	[5.68547]	*[-1.36572]*	*[3.53628]*	*[0.15194]*	*[0.66928]*	*[0.69111]*
CBk balance sheet	-0.0506	-0.121798	-0.082322	-0.03077	-0.02465	-0.02672
	-0.02552	*-0.02634*	*-0.02064*	*-0.0048*	*-0.00518*	*-0.00521*
	[-1.98308]	*[-4.62358]*	*[-3.98807]*	*[-6.41577]*	*[-4.76081]*	*[-5.13024]*
Unemployment	0.321208	-0.045304	0.045969	0.006384	0.004219	0.005552
	-0.041	*-0.03844*	*-0.02814*	*-0.00353*	*-0.00345*	*-0.00391*
	[7.83452]	*[-1.17873]*	*[1.63376]*	*[1.81104]*	*[1.22161]*	*[1.42070]*
ULC	-0.6969	-0.209145	-0.013202	-0.82888	-0.876711	-0.85569
	-0.14929	*-0.18025*	*-0.15171*	*-0.03215*	*-0.03536*	*-0.03436*
	[-4.66803]	*[-1.16034]*	*[-0.08702]*	*[-25.7819]*	*[-24.7928]*	*[-24.9009]*
C	-1.9213	-1.681582	-3.410113	-0.9996	-0.889137	-0.93114

[36] Note that the cointegrating vector is in the form of an implicit function $p - a_1\rho - a_2 i - a_3 bs - a_4 un - a_5 ulc = \epsilon$, so that the signs of the independent variables are negative when the variables have a long run positive effect on inflation. ϵ is entrepreneurial profits.

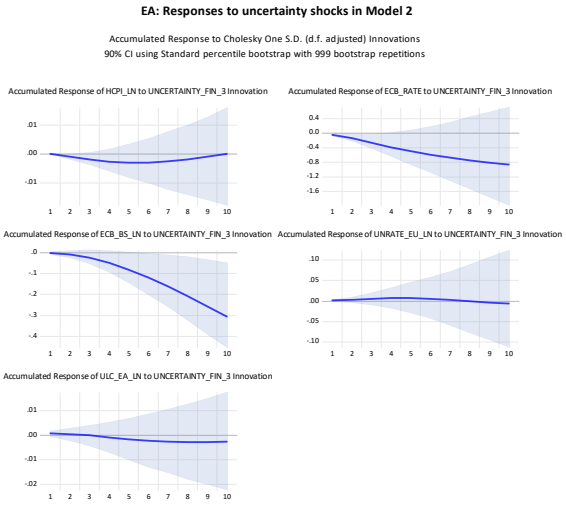
Figure 13 shows the short run dynamics for each economy five panels and the three models. The first panel shows the impact of uncertainty on inflation, the second on central bank rates, the third on central bank balance sheets, the fourth on the unemployment rate, and the last on unit labour cost. In the Euro Area, the impact of uncertainty is never statistically significant, except for a deceleration of quantitative easing and in the US stochastic uncertainty may even decelerate inflation in the short run (Model 2). The World Uncertainty Index in model 1 also fails to indicate significant short-term results. However, the GARCH model 3, based on the in conditional variance of inflation expectations, fares much better. In both economies uncertainty significantly accelerates inflation and unit labour costs; not surprisingly, interest rates go up. However, in none of the three models and two countries does the labour market react significantly to uncertainty.

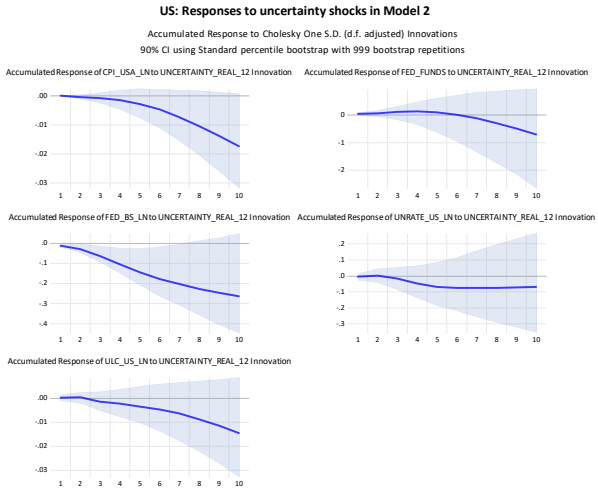
Figure 13. IRF plots as a result of uncertainty shocks

Model 1

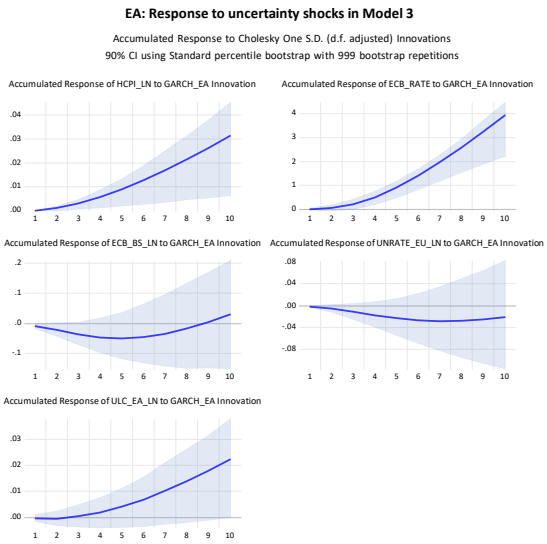


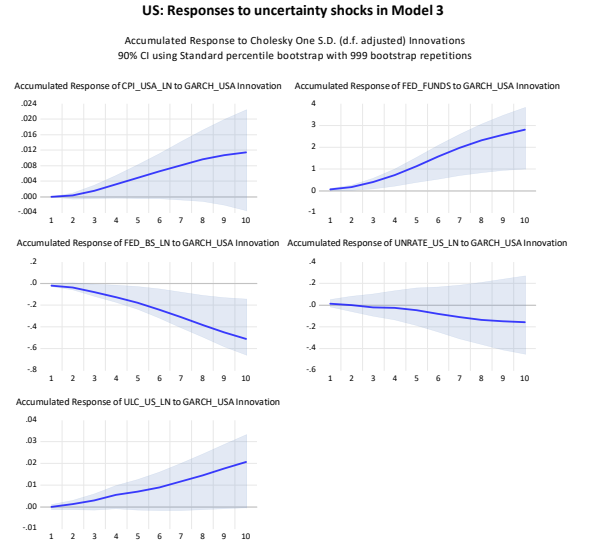
Model 2





Model 3





How does uncertainty affect the traditional policy instruments? New Keynesian theory would lead us to expect that increases in interest rates will reduce inflation, while quantitative easing might increase it. On the other hand, the Phillips curve will lower inflation if unemployment increases and wage increases above productivity gains would be a nominal shock that raises inflation. None of our IRF fits these assumptions completely. In the US, the link between

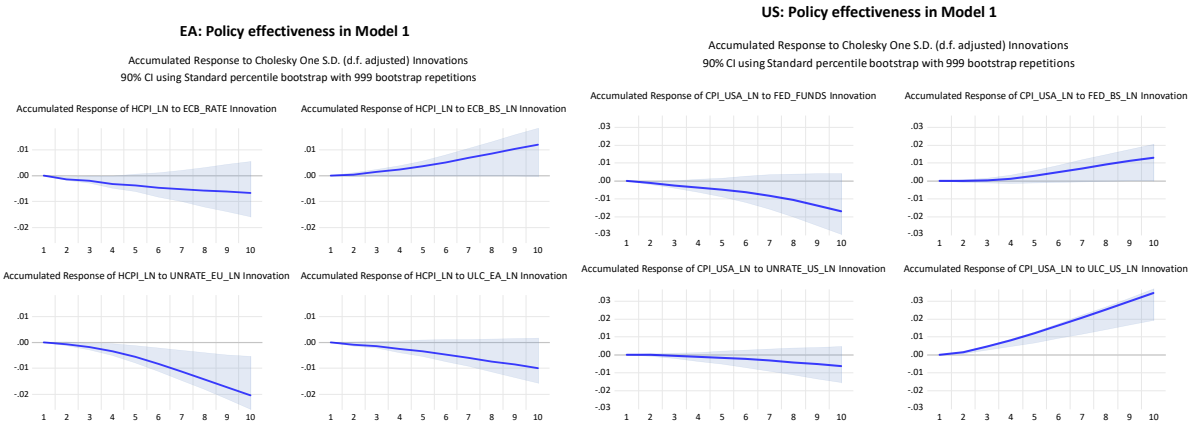
interest rates and inflation is as expected in all three models, but in the Euro Area, only Model 3 yields this result. Thus, monetary policy is less efficient in the Euro Area, and this may explain the higher price volatility we observed in Figure 8. In Model 1 the error margins are higher, but the mean is pointing in the expected direction. In Model 2, the result for the EA is as expected in the first year after the shock and then becomes insignificant. By contrast, the effect of quantitative easing jacks up inflation in all three European models, but not in the US, where this is only confirmed by Model 1. The Phillips curve is never significant in the US, but always in Europe. This fits with the observation that European monetary policy is less efficient. In the Euro Area unemployment is the prime channel to bring down inflation.

Finally, the last panel, in each model shows negative coefficients in Europe and positive coefficients in America. This implies, because of equations (4) and (7), nominal wage increases over the productivity improvement will lower the markup in the EA but increase it in the US. This would indicate that American firms can pass on higher labour costs to prices because monetary policy is more accommodating. However, we know from Figure 11 that the initial inflation response to real and nominal shocks dies out after one year while in Europe it continues to raise. The slowdown in the US could be the consequences of higher productivity (e.g., economies of scale) as aggregate demand is less constrained. By contrast, in Europe, nominal wage increases cannot be passed on (prices are rigid because of lower inflation targets) and therefore higher wages will reduce the markups.[37] Firms must increase productivity or will go bankrupt. Because aggregate demand is more restricted, less productive firms are eliminated and unemployment rises. This would explain why the Phillips curve has higher significance in Europe.

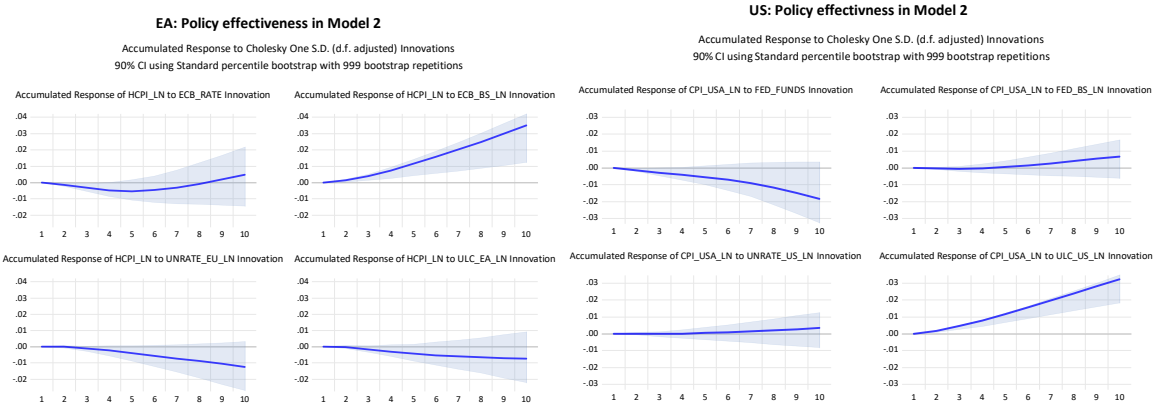
[37] The two central banks have now similar inflation targets. It will be interesting to see if this will change the dynamics in the US labour market.

Figure 14. Policy efficiency measured by IRF

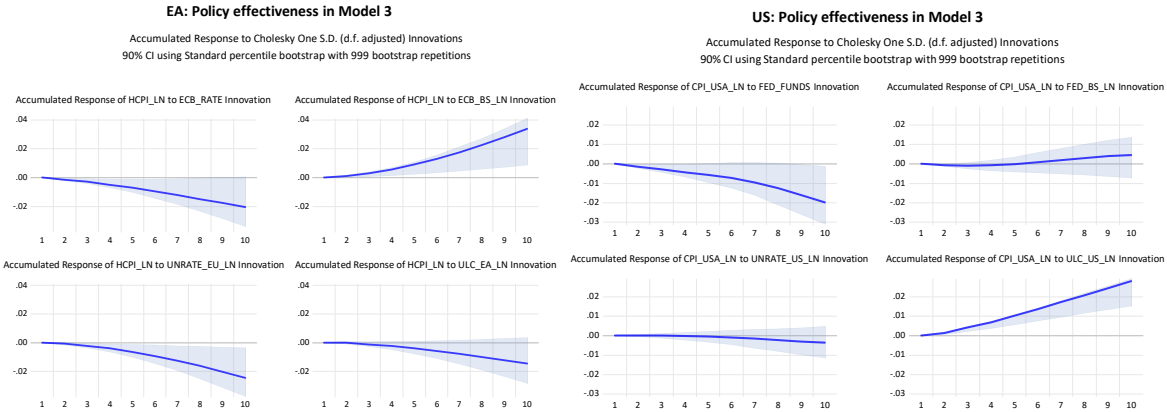
Model 1



Model 2.



Model 3



Conclusion

The overall performance of the European and American economies is remarkably similar despite some differences in details. They both had a long-run tendency for macroeconomic moderation. However, exogeneous shocks have recently created a climate of uncertainty. That has increased liquidity preference which has pushed up the cost of finance. But in the context of uncertainty, the effects of monetary policy are uncertain.

Anti-inflationary policies work through changes in the markup which firms add to their marginal labour costs. Monetary tightening increases the cost of capital and therefore requires higher markups and lower wage costs. If prices are flexible and wages downward sticky, tighter money will increase prices. This explains the price puzzle found empirically in the conventional New Keynesian models.

With tight money, the markup can only be raised by lowering unit labour costs which is achieved by wage moderation or unemployment (the Phillips curve mechanism). To avoid this trade-off, the European Macroeconomic Dialogue with the Social Partners proposed that nominal wage growth should remain close to the rate of productivity growth and the inflation target set by the ECB (Koll 2005). When the formula was invented in 1999, it was a nice try, but it never worked because there are no institutions to enforce the rule.

The key to returning to price stability is breaking excessive inflation expectations and restoring certainty that the inflation target will be achieved. But while the Fed does this through the successful management of liquidity preference in financial markets, in Europe the burden is on the labour market. The Euro Area lacks a fully integrated capital market with a benchmark euro bond, and it lacks the institutions for setting up a coherent macroeconomic policy stance. This may explain why disinflation will be more painful in terms of European unemployment.

Bibliography

Adam, Klaus. 2009. "Monetary policy and aggregate volatility." *Journal of monetary economics* 56 ((Supp)): 1-18.

Ahir, H, N. Bloom, and D. Furceri. 2022. “World Uncertainty Index.” *NBER Working Paper.*

Albrizio, Silvia, Iván Kataryniuk, Luis Molina, and Jan Schäfer. 2023. "ECB Euro Liquidity Lines." *IMF Working Papers* 96.

Alvarez, Jorge, and Allan Gloe Dizioli. 2023. “How Costly Will Reining in Inflation Be? It Depends on How Rational We Are.” *IMF Working Paper* WP 23/21.

Baker, Scott R., Nicholas Bloom, and Steven J. Davis. 2016. "Measuring Economic Policy Uncertainty." *The Quarterly Journal of Economics* 131 (4): 1593-1636.

Balke, Nathan S., and Kenneth M. Emery. 1994. “Understanding the Price Puzzle.” *Economic Review* (Fourth Quarter 1994): 15-26.

Ball, Laurence, Gregory Mankiw, David Romer, George A. Akerlof, Andrew Rose, Janet Yellen, and Christopher Sims. 1988. "The New Keynesian Economics and the Output-Inflation Trade-Off." *Brookings Papers on Economic Activity* 1988 (1): 1-82.

Banerjee, Anindya, and Bill Inflation and measures of the markup Journal of Macroeconomics 27 (2005) 289–306 Russell. 2005. "Banerjee, Anindya; Russell, Bill." *Journal of Macroeconomics* 27: 289–306.

Barrett, Philip, and Jonathan J. Adams. 2022. “Shocks to Inflation Expectations.” *IMF Working Papers* (International Monetary Fund) 22 (72).

Benigno, Pierpaolo, and Gauti B. Eggertson. 2023. "It's baaack; the Surge in Inflation in the 2020s and the Retrun of the Non-linear Phillips Curve." *NBER Working Paper Series* wp 31197.

Bernanke, Ben. 1998. "Irreversibility, uncertainty, and cyclical investment." *Journal of Qarterly Economics* 98 (1): 85–106 .

—. 2004. "The Great Moderation." *The Federal Reserve Board.* February 29. Accessed 4 23, 2023. https://www.federalreserve.gov/boarddocs/speeches/2004/20040220/.

Bernanke, Ben, and Mark Gertler. 1990. "Financial Fragility and Economic Performance." *The Quarterly Journal of Economics* 105 (1): 87-114.

Blanchard, Olivier J., and Ben S. Bernanke. 2023. "What Caused the US Pandemic-Era Inflation?" *NBER Working Paper* (31417). http://www.nber.org/papers/w31417.

Blanchard, Olivier. 1986. "The Wage Price Spiral ." *The Quarterly Journal of Economics* 101 (3): 543-566.

Blanchard, Olivier, and Danny Quah. 1989. “The dynamic effects of aggregate demand and supply disturbances.” *American Economic Review* 79: 655-673.

Blanchard, Olivier, and John Simon. 2001. “The Long and Large Decline in U.S. Output Volatility.” *Brookings Papers on Economic Activity* 2001 (1): 135- 164.

Blanchard, Olivier, and Thomas Philippon. 2003. "The decline of rents and the rise and fall of European unemployment." *Unpublished paper, MIT.* https://crei.cat/wp-content/uploads/2016/09/blanchard.pdf.

Blinder, Alan. 2022. *A Monetary and Fiscal History of the United States, 1961-2021.* Princeton and Oxford: Princeton University Press.

Bloom, Nicholas. 2009. "The Impact of Uncertainty Shocks." *Econometrica* 77 (3): 623-685.

Bloom, Nicolas. 2014. "Fluctuations in Uncertainty." *Journal of Economic Perspectives* 28 (2): 153–176.

Brandao-Marques, Luis, Marco Casiraghi, Gaston Gelos, Olamide Harrison, and Kamber. 2023. “Is High Debt Constraining Monetary Policy? Evidence from Inflation

Expectations.” *IMF Working Paper* (Monetary and Capital Markets and Western Hemisphere Departments) 23 (143).
Castelnuovo, Efrem, and Paolo Surico. 2010. "Monetary Policy, Inflation Expectations and the Price Puzzle." *The Economic Journal* 120 (549): 1262-1283.
Cerra, Valerie, Antonio Fatás, and Sweta C. Saxena. 2020. “Hysteresis and Business Cycles.” *IMF Working Paper* WP/20/73.
Clara, Nuno. 2018. "Demand Elasticities, Nominal Rigidities and Asset Prices." *ECB forum on Central Banking Young economists session and winner of best paper award.* ECB. https://www.ecb.europa.eu/pub/conferences/ecbforum/YE_competition/shared/pdf/2018/EFCB_2018_Nuno_Clara_Paper.it.pdf.
Collignon, Stefan. 1997. *European Monetary Policy.* London: Cassel Academic.
Dixit, Avinash, and Robert S. Pindyck. 1994. *nvestment Under Uncertainty.* Princeton, New Jersey: Princeton University Press,.
ECON Committee. 2022. "10 years after “whatever it takes”: fragmentation risk in the current context Compilation of papers." European Parliament.
Eichenbaum, M. 1992. "Comment on Interpreting the macroeconomic time series facts: the effects monetary policy by CA. Sims." *European Economic Review* 36 (5): 1001-11.
Estrella, Arturo. 2015. "The price puzzle and VAR Identification." *MacroeconomicDynamics* 19: 1880–1887. doi:10.1017/S1365100514000200.
Hall, Peter A. und David Soskice. 2001. *Hall, Peter A. und David Soskice (2001) Varieties of Capitalism: The Institutional Foundations of Comparative Advantage.* Oxford: Oxford University Press.
Hansen, Niels-Jakob, Frederik Toscani, and Jing Zhou. 2023. "Euro Area Inflation after the Pandemic and Energy Shock: Import Prices, Profits and Wages ." *IMF Working Papers* WP/23/131.
Istrefi, Klodiana, and Sarah Mouabbi. 2018. “Subjective interest rate uncertainty and the macroeconomy: A cross-country analysis.” *Journal of International Money and Finance* 88: 296–313.
Jurado, Kyle, Sydney C. Ludvigson, and Serena Ng. 2015. "Measuring Uncertainty." *The American Economic Review* 105 (3): 1177-1216.
Jurado, Kyle, Sydney C. Ludvigson, and Serena Ng Source. 2015. “Measuring Uncertainty.” *The American Economic Review* 105 (3): 1177-1216.
Keynes, John Maynard. 1971a [1930]. *A Treatise on Money. The Pure Theory of Money.* Edited by The Collected Writings of John Maynard Keynes. Vol. V. London: Macmillan Press.
—. 1967 [1936]. *The General Theory of Employment, Interest and Money.* London: Macmillan.
Koll, Willy. 2005. "Macroeconomic Dialogue development and intentions." In *Macroeconomic policy coordination in Europe and the role of the trade unions*, by Schulten and Truger (eds.) Hein, 175–212. ETUI and WSI.
Kuester, Keith, Gernot J. Müller, and Sarah Stölting. 2007. “Is the New Keynesian Phillips Curve Flat? .” *Working Paper Series* (European Central Bank) 809.
Kuttner, Kenneth N. 2018. "Outside the Box: Unconventional Monetary Policy in the Great Recession and Beyond." *Journal of Economic Perspectives* 32 (4): 121–146.
L’Huillier, Jean-Paul, and Gregory Phelan. 2023. "Can Supply Shocks Be Inflationary with a Flat Phillips Curve?" *Office of Financial Research (OFR) Working Paper Series* 23 (3).
Layard, Richard, Stephen Nickell, and Richard Jackman. 1991. *Unemployment. Macroeconomic Performance and the Labour Market.* Oxford: OUP.

Lorenzoni, Guido, and Iván Werning. 2023. "Inflation Is Conflict." *National Bureau of Economic Research Working Papers* Working Paper 31099. http://www.nber.org/papers/w31099 National Bureau of Economic Research.

Nikolsko-Rzhevskyy, Alex, and David H. Papell. 2017. “The Yellen rules Journal of Macroeconomics Volume 54, Part A, December 2017, Pages 59-71.” *Nikolsko-Rzhevskyy, Alex; Papell, David H. The Yellen rules Journal of Macroeconomics* 54 (Part A, December): 59-71.

Pagliacci, Carolina. 2003. "Comparing the inflationary impacts of uncertainty between advanced and emerging economies." *MACROECONOMICS AND FINANCE IN EMERGING MARKET ECONOMIES.* doi:https://doi.org/10.1080/17520843.2023.2195738.

Pagliari, Maria Sole. 2021. "Does one (unconventional) size fit all? Effects of the ECB's unconventional monetary policies on the euro area economies." *Banque de France Working Paper* 829.

Reis, Ricardo. 2023. "Four Mistakes in the Use of Measures of Expected Inflation." *AEA Papers and Proceedings* 113: 47-51.

Reis, Ricardo. 2021. "Losing the Inflation Anchor." *Brookings Papers on Economic Activity.*

Rouse, Cecilia, and Martha Gimbel. 2021. “The Pandemic’s Effect on Measured Wage Growth.” *CEA - The White House.* 19 April. Accessed May 3, 2023. https://www.whitehouse.gov/cea/written-materials/2021/04/19/the-pandemics-effect-on-measured-wage-growth/.

Shapiro, Adam, and Daniel J. Wilson. 2019. "The Evolution of the FOMC’s Explicit Inflation Target." *FRBSF Economic Letter* 2012 (12).

Sims, Christopher A. 1992. "Interpreting the macroeconomic time series facts: the effects of monetary policy." *European Economic Review* 36 (5): 975-1000.

Smets, Frank, and Raf Wouters. 2004. "Comparing shocks and frictions in US and Euro Area business cycles. A bayesian DSGE approach." *ECB Working Paper Series 391 September 2004* 391.

Stock, James H., and Mark W. Watson. 2001. "Vector Autoregressions." *The Journal of Economic Perspectives* 15 (4): 101-115.

Taylor, John B. 1993. "Discretion versus policy rules in practice." *Carnegie-Rochester conference series on public policy* 39 (1): 195-214.

Taylor, John B. 1998. "Monetary Policy Guidelines for Employment and Inflation Stability.." In *Inflation, Unemployment, and Monetary Policy*, by eds., Benjamin Friedman and Robert Solow. Cambridge, MA: MIT Press.

Tobin, James, and William Brainard. 1977. “Asset Markets and the Cost of Capital.” In *Essays in Economics: Theory and Policy. Vol. 3*, by James Tobin. Cambridge, MA: MIT Press.

Vitols, Sigurt. 1998. "Are German Banks Different?" *Small Business Economics* 10: 79–91.

Wellink, Nout. 2023. "Crises have shaped the European Central Bank." *Journal of International Money and Finance* 138.

Yellen, Janet L. 2012. "Revolution and Evolution in Central Bank Communications ." *Board of Governors of the Federal Reserve System.* November 13. Accessed April 24, 2023. https://www.federalreserve.gov/newsevents/speech/yellen20121113a.htm.

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

EIQ Europe in Question
Discussion Paper Series at LSE