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RELATIVE-PRICE SHOCKS AND INFLATION DYNAMICS

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ABSTRACT

During the post-COVID inflation episode, headline inflation increased rapidly and declined quickly while core inflation rose slowly and remained elevated. In several economies, most notably the U.S., disinflation proceeded without a significant rise in unemployment. We examine these patterns through a multi-sector setting with production network linkages. In our framework, an upstream sector produces intermediate inputs for a downstream sector, and the two sectors differ in the frequency of price adjustment. A negative productivity shock to the upstream sector requires relative prices to adjust, but heterogeneous nominal rigidities cause this adjustment to occur at different speeds across sectors. This generates persistent aggregate inflation even when monetary policy holds output at potential. The resulting aggregate Phillips curve features a relative-price gap term that plays the same analytical role as the exogenous cost-push shock in the one-sector model but arises endogenously from the interaction of sectoral shocks with the economy's structure and responds to monetary policy. We revisit insights from previous work discussing how stabilizing the output gap rather than strictly targeting inflation comes close to optimal policy. We also discuss how omitting relative prices from empirical Phillips curve estimation produces misleading inferences about its slope, potentially leading to opposite and incorrect prescriptions for the policy response. We conclude by discussing how structural changes such as the energy transition, deglobalization, and technological progress could make relative-price disturbances more prominent, underscoring the importance of multi-sector frameworks for research and policy.

AUTHOR NOTES AND ACKNOWLEDGEMENTS

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DISCLOSURES

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1. Introduction

The causes and consequences of post-COVID inflation have received much attention recently, both in policy discussions and academic research. This episode marked the first instance of very high and sustained inflation across many advanced economies since the 1970s inflationary episode, and, notably, it came after a period of low inflation in these countries. [1] Thus, after more than a decade of advanced-economy central banks struggling to get inflation back up to the target after the Great Recession and engaging in both conventional and unconventional monetary policy to stimulate aggregate demand, in part for that purpose, the global economy entered an era of high inflation with inflation above official inflation targets for an extended period. [2]

As shown in Figure 1, headline inflation increased substantially after 2020 in many countries globally in a synchronized way, and it has consistently remained above the target rates across these countries since then. At the same time, Figure 1 also highlights that headline inflation and core inflation have followed quite different dynamics. While headline inflation increased rapidly initially after 2020, it also declined quickly after reaching its peak. Core inflation, in contrast, increased slowly and has stayed high much more persistently. Interestingly, Figure 1 shows that a similar pattern, and in particular a similar difference between headline and core inflation dynamics, was also present for the U.S. during the two high inflation episodes in the 1970s, in the early 1990s, and a couple of other episodes in the 2000s. This raises interesting questions about the various economic mechanisms that lead to such increases in headline inflation as well as such differences in the dynamic patterns across headline inflation and core inflation.

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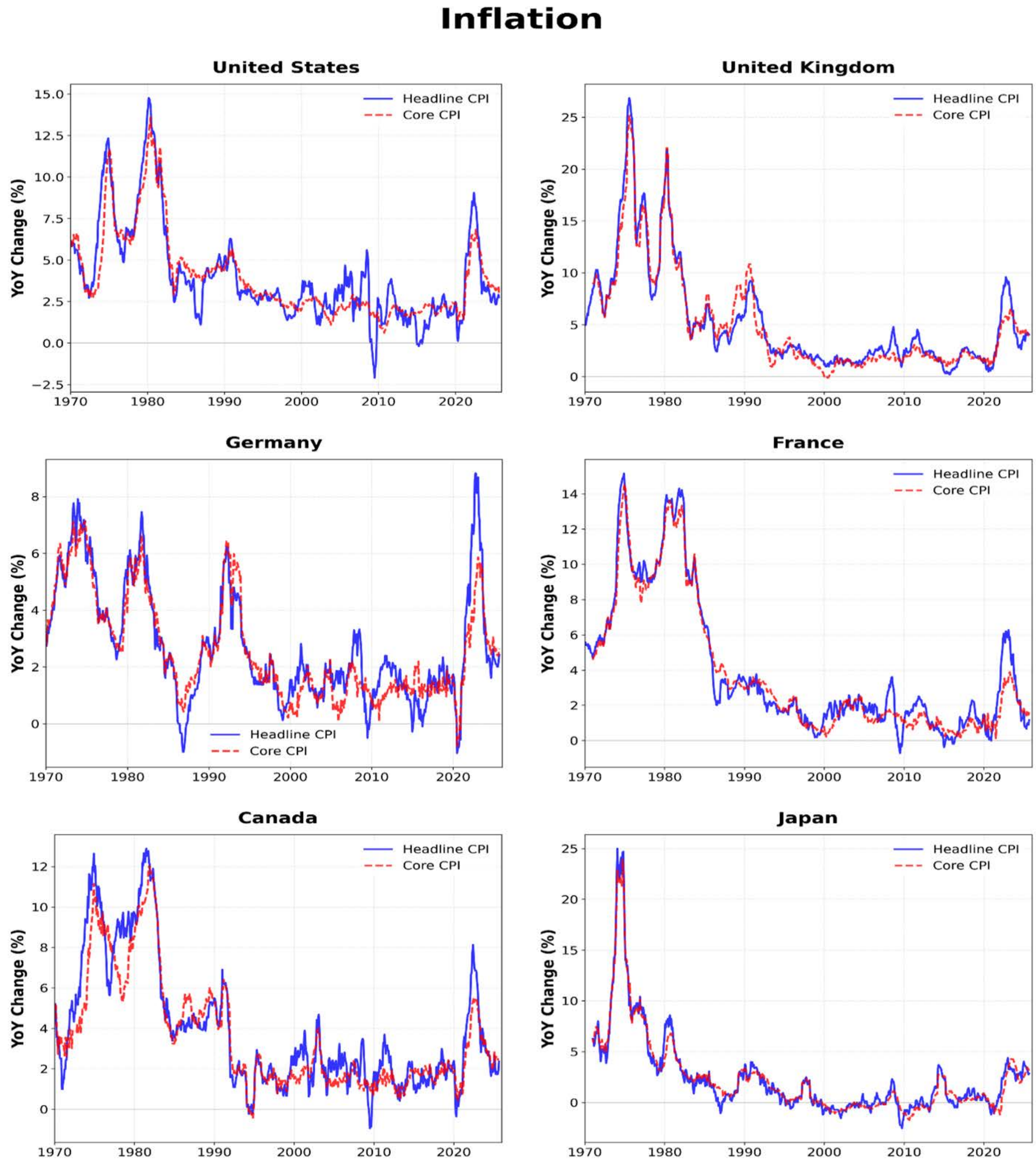
1 This contrast between pre-COVID and post-COVID inflation is perhaps most drastic qualitatively for Japan, where after a long period of very low inflation and sometimes actual deflation, inflation increased substantially after 2020s.

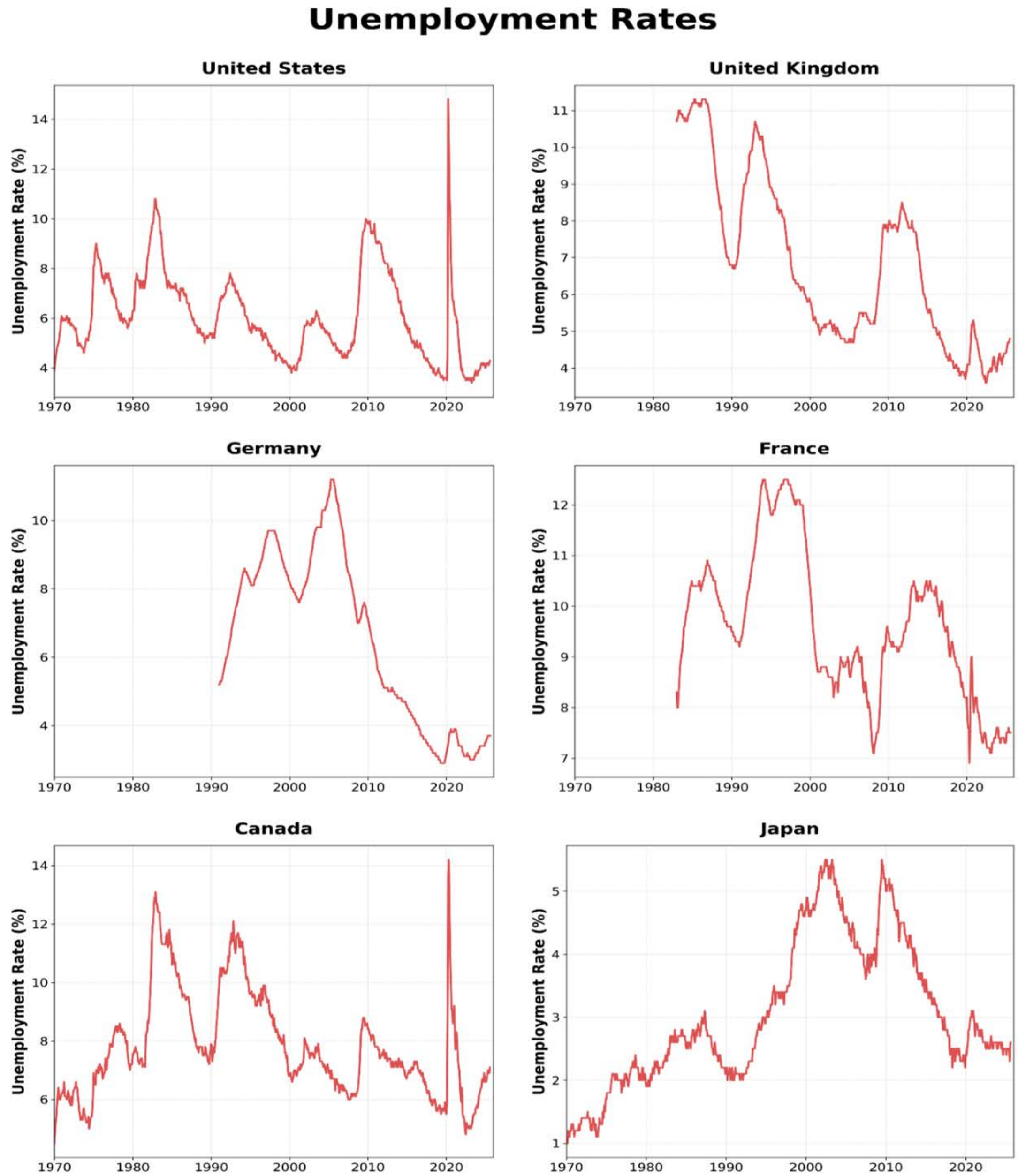
2 As of September 2025, year-on-year PCE U.S. inflation is at 2.8% (both headline and core), above the official target of 2%.

Figure 1: Headline and core inflation dynamics in advanced economies



Notes: Data for Canada are from Statistics Canada, data for Japan are from the Statistics of Japan, and data for the remaining countries are from OECD. All measures are year-on-year inflation rate in percentages for each month.

Figure 2: Unemployment rate dynamics in advanced economies

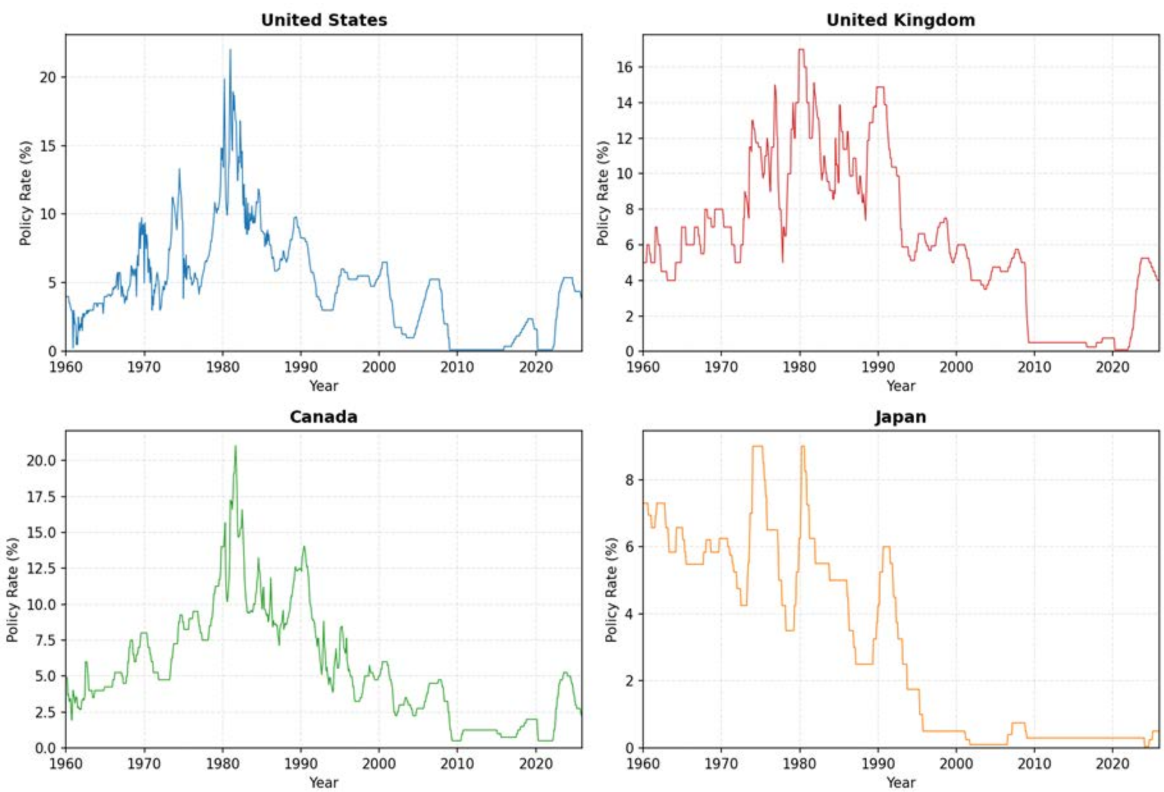


Notes: Unemployment rate data are from OECD.

Figure 2 plots the unemployment rate for the same group of advanced economies. This data is pertinent for any discussion of inflation dynamics as a long-standing tradition in monetary economics links inflation dynamics with economic slack, where a prominent measure of economic slack is the unemployment gap—the deviation of the unemployment rate from its natural level.[3] The key idea is that inflation will be higher when there is little to no economic slack (e.g., when unemployment is close to or even lower than its natural level) and vice versa.

In particular, the key prediction of this tradition is that successful monetary policies that tame high inflation raise the unemployment rate by reducing aggregate demand. A prominent historical case in point is evident in Figure 2, following the disinflationary period of the early 1980s, when the unemployment rate in the U.S., as well as U.K., Canada, and Japan, rose to high levels. In particular, as Figure 3 shows, central banks in these countries increased their policy rates significantly to bring inflation down, and that went together with a rise in the unemployment rate.

Figure 3: Monetary policy rates in advanced economies



Notes: Data for the U.S. and U.K. are from BIS, and data for Canada and Japan are from FRED (OECD). All rates are measured in percentages per annum.

[3] The natural level of unemployment is often referred to as the NAIRU (non-accelerating inflation rate of unemployment) in policy discussions.

Notably, however, Figure 2 indicates that the recent disinflationary policy did not result in a sharp increase in the unemployment rate in many advanced economies.[4] In fact, for the U.S., this seeming lack of a business cycle cost of disinflation was so remarkable that it has been termed a “soft-landing” outcome, which has been perceived as a great success for the Federal Reserve, even though inflation is still somewhat above the official target rate of 2%. A natural question, then, is what determines whether it is possible to achieve such a soft-landing–defined as disinflation without raising unemployment above its natural level–by the central bank. Moreover, if shocks that initially caused the increase in inflation have abated, what can explain the subsequent continued and persistent movements in inflation?

As mentioned above, both the 1970s inflation and the post-COVID inflation episodes, as well as some other instances in the 1990s and 2000s for the U.S., show some common patterns with respect to headline inflation increasing quickly initially, followed by a similarly quick decline. A conjecture since the 1970s, both in policy and academic research, has been that one underlying source of such inflationary episodes is adverse energy/oil price shocks or, more generally, adverse commodity price shocks. Large shocks to global commodity prices tend to be large but short-lived, making them natural candidates to explain such large, yet relatively transient, increases in headline inflation.

As supporting evidence for the inflationary effects of commodity and oil price increases across advanced economies, Figure 4 plots changes in various commodity prices from 1970 onwards. It shows that global energy and food prices indeed increased markedly during both the 1970s and post-COVID inflation, but they also fell back relatively quickly as well.[5] Moreover, some earlier instances of high U.S. and global inflation which we pointed out earlier, such as in the 1990s and 2000s, are also associated with clear increases in energy/commodity prices.[6] Finally, the experience of the 1960s and 1970s,

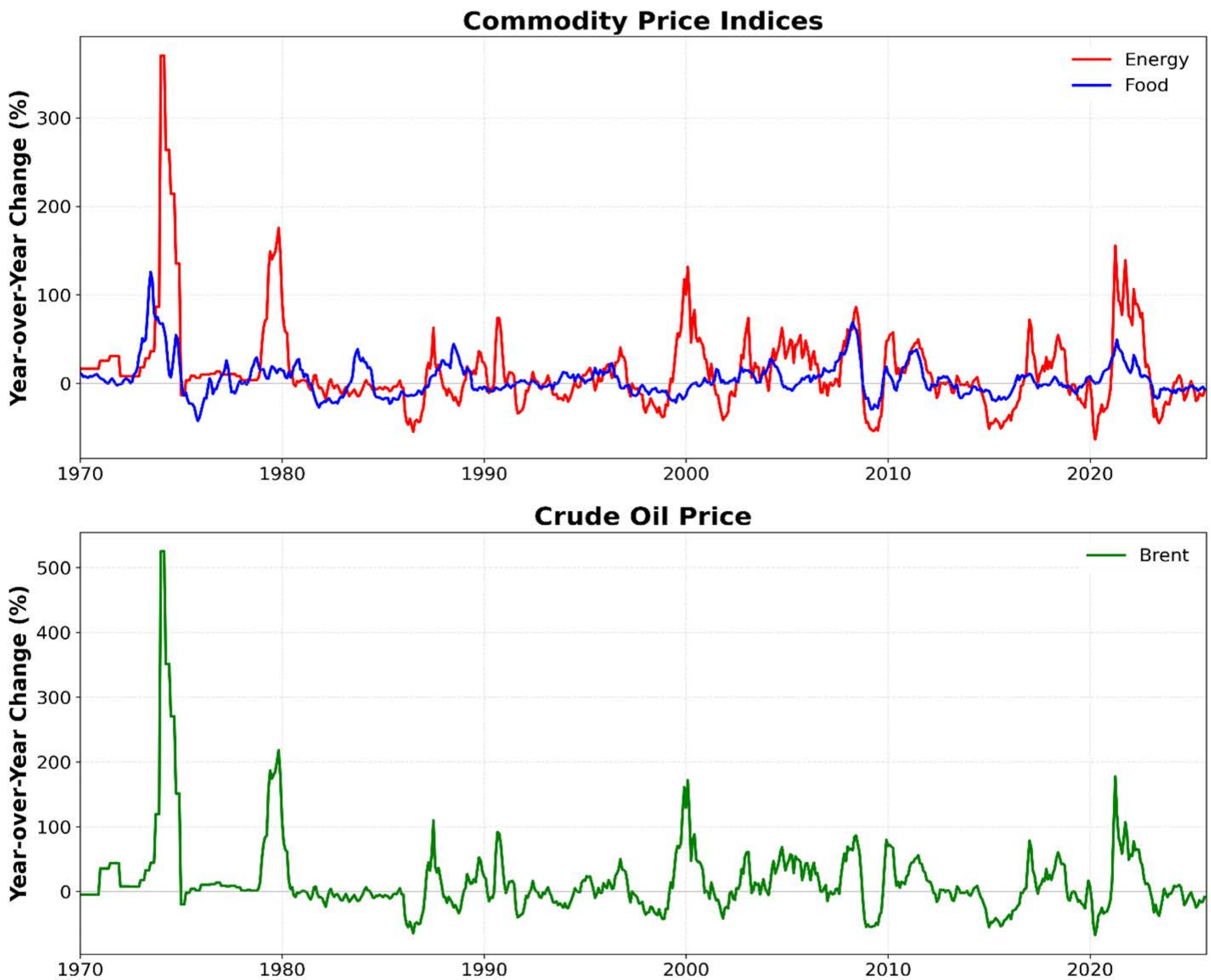
[4] We acknowledge that it is possible that the natural rate of unemployment changed dramatically recently and that such a possibility cannot be ruled out without careful model based econometric work. We analyze empirical measures of unemployment gaps (and output gaps) later.

[5] Note that, by definition, core inflation excludes food and energy inflation.

[6] All movements in commodity or energy prices, however, cannot be regarded as exogenous to the U.S. economy and thereby treated as purely external shocks. In fact, academic research points out that a vast fraction of commodity or energy price changes are due to global demand, which in turn is affected by the U.S. economy substantially. There are however, clear exceptions around instances of several large

where the increase in inflation eventually led to a monetary policy response that attempted to bring inflation down by reducing demand—while significantly raising unemployment in the process—was so prominent that since then such shocks are often referred to as "stagflationary shocks."

Figure 4: Global commodity price changes



Notes: Data are sourced from the World Bank, and the measures are year-on-year change in percentages for each month.

The importance that energy/commodity price changes played in recent global inflation dynamics can also be inferred from Figure 5 using a different sample of countries. Figure 5 plots the headline inflation rates in a range of South American countries. As was the

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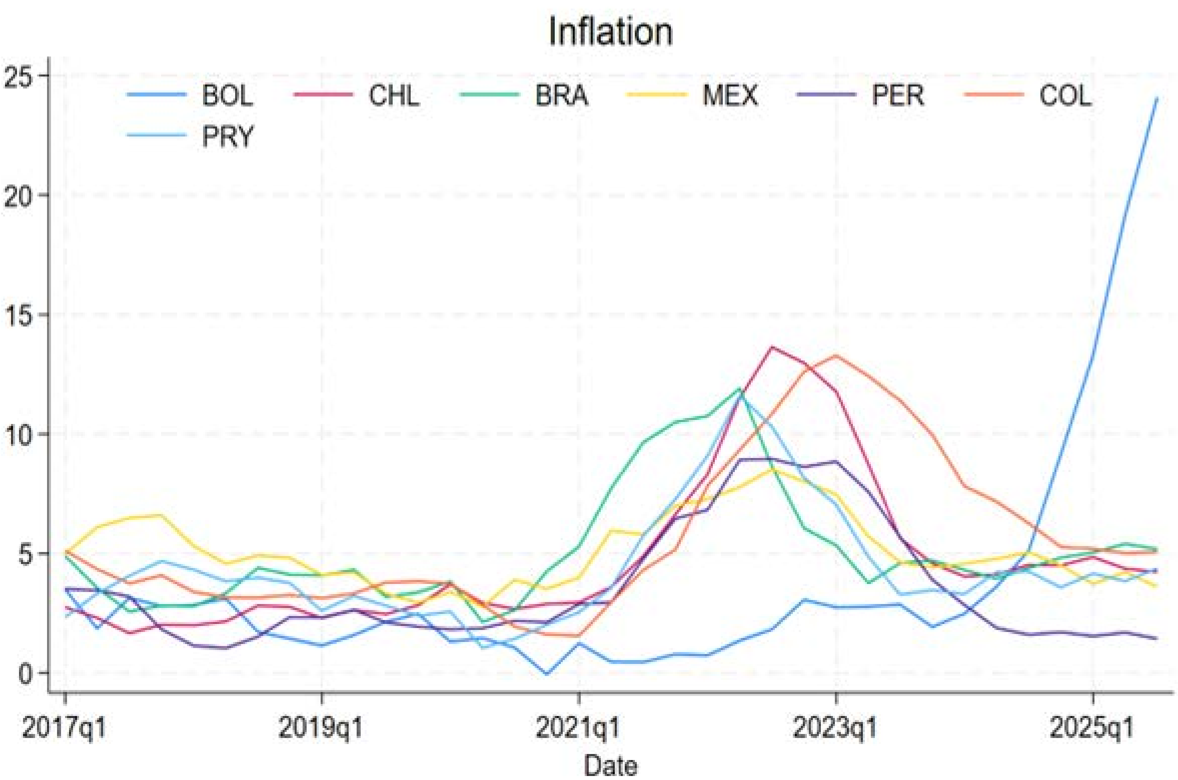
changes, which happen due to more idiosyncratic and exogenous reasons related to supply changes, such as wars and a pandemic, and which is our focus here.

case for advanced economies in Figure 1, South American economies also went through an episode of an inflation surge in 2021, with inflation peaking around 2022 and then falling back to pre-2021 levels after some time. The only stark exception to this pattern is in Bolivia. Bolivia subsidized fuel heavily, and evidently that avoided the surge in headline inflation. This subsidy was so substantial, however, that it strained government finances. As a result, after 2024, monetary financing of government deficits occurred, which led to rapidly increasing inflation.[7]

Figure 5: Headline inflation in South American countries



Notes: Inflation data are from IMF, and the measure is year-on-year inflation rate in percentages for each quarter.

Taken together, Figures 1-5 raise some important questions: If these (global) energy and commodity price shocks are responsible for explaining headline inflation dynamics in prominent high inflation periods that are synchronized across many countries, how can

7 Bolivia imports refined gasoline and diesel, and the government sells it domestically at a subsidized fixed price.

we explain the differing dynamics of headline and core inflation? Is core inflation affected more by economic slack, compared to headline inflation? If so, what kind of framework can explain it? Moreover, how, if at all, do such energy/commodity price shocks pass through to core inflation? Thus generally, as the COVID pandemic and the period afterwards featured many supply shocks, such as significant movements in commodity prices or disruptions along the production networks, they have now come to the forefront of monetary policy, much like it was the case in the 1970s.

Specifically, sector-specific shocks like energy price shocks, sometimes also referred to as "relative-price" shocks as they affect relative prices across sectors, are now prominently discussed as possible drivers of aggregate inflation.[8] One key reason for this is that the increase in inflation in several episodes, as we have emphasized here, was a global phenomenon with synchronized movements across a range of countries. The precise way in which relative-price shocks contribute to generating aggregate inflation has, however, remained somewhat elusive.[9]

What are the channels and what structural features of the economy determine how relative-price shocks affect aggregate inflation? Moreover, if such shocks can indeed drive aggregate inflation dynamics, what can we expect looking forward in terms of their salience? Finally, what lessons do we learn from this perspective that are relevant for policymaking? This paper is an attempt to answer these three broad questions in a framework that emphasizes the need to consider a multi-sector model of production networks.

2. Exogenous cost-push theory of inflation: One-sector model

Before moving on to our framework, it is useful to review what determines aggregate inflation dynamics in the popular one-sector model, widely used in teaching, research, and policy discussions. This will help recap the strengths and weaknesses of the standard

8 The relative price of energy is thus the price of energy relative to the price of the consumption bundle (CPI).

9 In fact, a classical perspective would be that such relative-price shocks, by their very nature, cannot affect aggregate inflation as whatever relative price they increase will be offset by another relative-price decrease, thereby leading average inflation in the economy to not change.

model, particularly as it relates to understanding recent inflation and unemployment dynamics, as shown in Figures 1-2.

The canonical framework used to think about inflation dynamics relies on a notion of a Phillips curve derived from a closed-economy, one-sector model. Such a Phillips curve posits that inflation is determined by economic slack, say the unemployment gap (the deviation of unemployment from its natural level), and expectations of inflation (either past expectations of current inflation, as in the Neo Classical Phillips curve, or current expectations of short-run future inflation, as in the New Keynesian Phillips curve). Then, exogenous cost-push shocks are added to the Phillips curve, such that they act as shifters of the curve, leading to higher inflation at a given level of the unemployment gap. These cost-push shocks are thus a stand-in for supply shocks that cause inefficiencies in the economy. [10] One common micro-foundation for these exogenous cost-push shocks is shocks to the elasticity of substitution across various brands of goods sold in the economy—that is, exogeneous shocks to markups. More broadly, cost-push shocks are often meant to stand in for supply shocks, such as oil price shocks.

The simple New Keynesian Phillips curve set-up is formally given by

$$\pi_t = \beta E_t[\pi_{t+1}] + \kappa_x x_t + u_t,$$

where π_t is inflation, x_t is the output gap, and u_t represents an exogenous cost-push shock[11]. Productivity shocks are present in the model, but they are already incorporated in the output gap as they affect potential output. That is, $x_t = y_t - y_{p,t}$ where $y_{p,t}$, the potential output, is affected positively by the productivity shock. Finally, $E_t[\pi_{t+1}]$ is the current period expectations of next period inflation, and standard models assume full-information rational expectations.

[10] By “inefficiencies” we mean that the distortions lead to higher inflation at a given unemployment rate gap or output gap. It is useful to contrast such shocks with negative supply shocks that are not cost-push shocks and thus do not cause distortions. For example, a simple negative productivity shock means more resources are required to make the same amount of output; that shock leads to lower potential output and thus the relationship between inflation and economic slack remains unchanged: Inflation rises only to the degree that economic slack is reduced while the shock lasts.

[11] When discussing the theory now, we express economic slack in terms of the output gap instead of the unemployment gap, as the basic sticky price model does not feature unemployment. The two are often related empirically via Okun’s law.

While simple, this setup is powerful enough to lead to important insights for practical monetary policy. First, the presence of cost-push shocks uniquely generates a trade-off for monetary policy in terms of its two goals in the dual mandate. That is, with cost-push shocks, unlike the case with productivity shocks or demand shocks, even under optimal monetary policy it is not possible to simultaneously achieve inflation at target and the closing of the unemployment gap.[12] Thus, when an adverse cost-push shock hits the economy, monetary policy will have to decide how much of it to pass through to higher inflation vs. a higher unemployment gap. The optimal management of this trade-off—holding long-run inflation expectations fixed—is determined by two important parameters in the model: the slope of the Phillips curve that captures the relationship between current inflation and unemployment gap holding fixed expectations and the weight on inflation in the (dual mandate) loss-function of the central bank.

Second, these cost-push shocks formalize the notion of "stagflationary shocks" as, under the optimal policy implied by the two parameters described above, they will generally lead the economy to go through an episode of high inflation and a high unemployment gap. That is, while the central bank will optimally decide the extent of differential pass-through to inflation vs. the unemployment gap, it likely will not avoid a simultaneous increase in inflation and the unemployment rate gap, as keeping the unemployment rate gap unchanged would be suboptimal.

This model, however, has important shortcomings as a framework to understand the recent post-COVID inflation and the subsequent disinflationary episode. First, in this model, once the cost-push shocks are over, inflation goes back to the target, and the unemployment gap is closed immediately. As such, it cannot explain why inflation can remain elevated and on a declining path with no movement in the unemployment rate long after supply shocks such as commodity price shocks have been subdued. Second in the data, there are very interesting differences in the dynamics of headline and core

[12] By optimal policy we mean the central bank minimizing a loss-function subject to constraints from the demand and supply sides of the economy that are a result of private sector behavior. It contrasts with monetary policy determination through an ad-hoc reaction function.

inflation that cannot be explained using a one-sector model with an exogenous persistence in the cost-push shock itself as the only driver of persistence in the model.

Third, are the cost-push shocks that lead to a trade-off for monetary policy between inflation and the unemployment gap best thought of as completely exogenous? This is certainly convenient both theoretically and empirically. Theoretically, it implies that the trade-off faced by monetary policy is simply about how much of the exogenous cost-push shock to pass through to inflation vs. the unemployment/output gap. Empirically, it reduces inflation dynamics to just one determinant and focuses attention on the estimation of the slope of the Phillips curve. While very useful, this one-sector abstraction can, however, miss issues that are of first-order importance both theoretically and empirically.

We will discuss below how a multi-sector production network extension of this canonical model can help us make progress on these important issues and allow us to draw appropriate, and in some cases novel, lessons from the recent inflationary period.

3. Relative-price theory of inflation: Multi-sector input-output model

Relative-price changes have been a defining feature of the economic environment in recent years, with many suggesting they played a key role in the post-COVID inflation surge. Yet their contribution to aggregate inflation remains elusive for both theoretical and empirical reasons. Theoretically, mainstream frameworks—such as the benchmark New Keynesian model discussed in Section 2—do not grant relative prices an independent role in driving inflation apart from economic slack. Empirically, isolating their effect is difficult because it depends on input–output linkages, price stickiness, and the conduct of monetary policy. Moreover, relative-price shocks may influence aggregate inflation only with a delay. For example, changes in oil prices can have very different inflationary consequences from shocks in other sectors, as different sectoral shocks interact differently with monetary policy. This section examines how relative prices—e.g., those of energy, imports, and exports—shape inflation dynamics.

The one-sector New Keynesian model is not up to this task. First, without cost-push shocks, it portrays a world with what Blanchard and Galí (2007) called “divine coincidence”—stabilizing the output gap automatically stabilizes inflation and vice versa. Inflation, therefore, arises only when policy allows aggregate demand to deviate from potential, and relative prices have no independent role in aggregate inflation. Second, this model can explain inflation beyond what is driven by the output gap only by adding exogenous cost-push shocks.

Therefore, to examine whether relative prices can themselves be a source of inflation—cases in which sector-specific cost changes or input reallocations create inflation without changes in aggregate slack—we must extend the model beyond one sector. In a multi-sector economy, when there is a sectoral productivity shock, sectoral relative prices can vary independently of aggregate demand, allowing relative-price disturbances to become distinct drivers of inflation dynamics.[13]

3.1. The multi-sector framework

A useful starting point is a two-sector “upstream–downstream” framework of the kind developed by Afrouzi, Bhattarai, and Wu (2024). The environment is deliberately simple but rich enough to illustrate how sectoral heterogeneity shapes the inflationary consequences of relative-price distortions.

Consider an economy with two sectors: an upstream sector that uses labor as its sole input to produce an intermediate output, such as energy, and a downstream sector that uses both labor and the intermediate good produced by the upstream sector. There are sectoral productivity shocks in the model. Households consume the output of both sectors, but the upstream sector also produces intermediate inputs—such as energy, materials, or transportation services—that enter as costs for the downstream sector. Both sectors set prices subject to Calvo-type nominal rigidities, where firms only get to change their prices with some constant frequency, with these price change opportunities arriving

[13] Ball and Mankiw (1995) study the role of relative-price movements as aggregate supply shocks but in a different framework that has a distinct mechanism. In their model, firms pay a menu cost to adjust prices, which leads to state-dependent pricing rules and the presence of asymmetric price adjustment to large vs. small shocks.

independently across different firms but possibly with different frequencies across the two sectors. This asymmetry captures an essential empirical fact: Energy and commodity prices move frequently, while services and retail prices adjust far more slowly.

In the two-sector model, each sector follows its own Phillips curve, where inflation in a sector depends on the relative prices of its inputs. The upstream sector uses only labor, and its inflation tracks the real wage. The downstream sector's costs, however, depend on both the real wage and the relative price of the upstream good, introducing a channel through which sectoral interactions matter for aggregate inflation.

Two distinct forces can now generate aggregate inflation, even when total output is at potential.

First, differences in price stickiness alone can produce inflation. If the two sectors adjust prices at different speeds—say, upstream firms reprice frequently while downstream firms are sluggish—then even without input–output linkages, shocks to costs or productivity create temporary dispersion in sectoral prices. Aggregate inflation reflects the average rate of this asynchronous price adjustment. In this case, even though policy and other factors have lowered demand for output in line with lower potential (so that the output gap is unchanged), inflation arises because the economy is transitioning between old and new relative prices.

Second, when sectors are connected through input–output linkages, shocks to costs or productivity can generate inflation even when the degree of stickiness is similar across sectors. A cost shock in one sector changes the marginal cost in another, but not all firms can adjust immediately. Suppose a negative productivity shock hits the upstream sector—e.g., an increase in costs of energy production. Upstream firms raise prices, which immediately raises downstream costs, yet downstream prices adjust slowly and rise gradually. The relative price of upstream to downstream goods therefore deviates from its efficient, flexible-price level, distorting the allocation of production factors. The pressure on relative prices to move to the efficient level requires aggregate inflation adjustment, even if policy lowers aggregate output to meet potential and thus eliminates the output gap.

When both features are present—heterogeneous stickiness and input–output linkages—the two mechanisms reinforce one another. Differences in adjustment frequency create asynchronous price movements, while production linkages ensure that these movements spill over across sectors. The result is persistent inflation even in an economy where aggregate demand is perfectly aligned with potential output.

The key is to note that even conditional on monetary policy holding output equal to its lower potential level, the prices of both sectors must adjust to the underlying shock, but they do so at different speeds. Because of the staggered nature of pricing, downstream firms adjust their prices more slowly than the upstream sector, as their price revisions are in response to the price of the upstream sector that itself adjusts gradually. For instance, when the upstream sector faces a productivity decline—such as a rise in energy costs—it raises its prices quickly to preserve markups. The downstream sector, however, constrained by its own sticky prices, adjusts more gradually. As a result, during this transition the aggregate price level—an average of both sectoral prices—increases even though aggregate demand is perfectly aligned with potential output.

In this environment, inflation arises not from an overheating economy but from the process of relative-price realignment between sectors that adjust at different speeds. The overall price level rises because flexible sectors move ahead of sticky ones, creating temporary dispersion in prices. Closing the output gap, therefore, does not eliminate inflation because there is another distinct source of price adjustment that lies in the differential pace of sectoral adjustment, not in aggregate slack.

To see this more concretely, one can derive an aggregate inflation Phillips-curve in this as:

$$\pi_t = \beta E_t[\pi_{t+1}] + \kappa_x x_t + \kappa_r r_t \qquad (1)$$

where x_t denotes the aggregate output gap and r_t measures the relative-price gap—the deviation of sectoral relative prices from their efficient levels. The new term $\kappa_r r_t$ captures how relative-price misalignments contribute to inflation. When all sectors have identical price rigidities and there are no input-output linkages, implying that $\kappa_r r_t = 0$, the model collapses to the standard New Keynesian Phillips Curve that we presented previously (without cost-push shocks). When rigidities differ or input-output linkages are present,

$\kappa_r r_t$ fluctuations with sectoral shocks produce inflation even without changes in aggregate slack x_t. Moreover, note that $\kappa_r r_t$ is distinct from the exogenous cost-push shock in the one-sector model described in Section 2. In this two-sector model, $\kappa_r r_t$ fluctuations can occur endogenously in response to sectoral productivity shocks.

This richer framework changes the interpretation of inflation. In a one-sector world without exogenous cost-push shocks, inflation is synonymous with excess demand. In a multi-sector world, even without exogenous cost-push shocks, it can instead reflect the slow convergence of relative prices following sector-specific shocks. The greater the asymmetry in price stickiness and the stronger the linkages between sectors, the more important the role of relative-price gaps becomes in driving inflation dynamics. Inflation can therefore persist even when output is at potential, underscoring that not all inflation originates from demand pressures—some reflects the macroeconomic imprint of an economy gradually realigning its relative prices.

3.2. Relative-price distortions as endogenous cost-push shocks and the role of policy

The multi-sector framework described in Section 3.1 gives relative-price distortions an independent and explicitly endogenous cost-push role in shaping inflation dynamics. To compare, we recall that in the textbook, one-sector New Keynesian model with cost-push shocks, the Phillips curve is

$$\pi_t = \beta E_t[\pi_{t+1}] + \kappa_x x_t + u_t,$$

where x_t is the output gap and u_t represents an exogenous cost-push shock—again often rationalized as exogenous changes in markups, distortionary taxes, or imported-input costs. Nothing in the model explains u_t; it is a residual disturbance shifting the Phillips curve independent of the output gap and creating a short-run trade-off between inflation and output stabilization. Most notably, u_t is assumed to be an independent source of fluctuations.

In contrast, the multi-sector environment provides an endogenous analog to this term. When sectors differ in their degrees of price rigidity or are connected through input-output linkages, shocks to productivity (or input costs) alter relative prices that cannot instantaneously adjust, as seen in the aggregate Phillips curve in Equation (1), where the term $\kappa_r r_t$ now plays the exact analytical role of u_t but is generated within the model itself. Relative-price distortions, therefore, become a version of cost-push shocks arising endogenously from the economy's structure and adjustment frictions with one key difference: They move endogenously with other exogenous shocks and disturbances in the model, such as sectoral productivity shocks.

To illustrate how relative-price gap can act in a similar way to exogenous cost-push shocks in a one-sector model, suppose a negative productivity shock hits the upstream sector. Because upstream firms are directly affected, absent any monetary policy intervention, prices start rising in the upstream sector sluggishly but immediately. In addition, downstream firms, not affected by any productivity shocks of their own, now face these slowly rising input costs and must absorb the higher input costs into their prices. As they gradually reprice, they also raise their prices, and aggregate inflation rises.[14]

The rise in input costs of the downstream sector is, in particular, conceptually identical to an exogenous cost-push disturbance: It shifts the short-run inflation-output relationship upward, not because of new demand pressure but because of the marginal cost rise resulting from an increase in input prices. Thus, the upstream sector experiences a pure productivity shock while the downstream sector reacts to the implied cost-shock. While the cost-shock is exogenous to the downstream sector, it implies endogenous movements in its costs as a result of the initial productivity shock in the upstream sector. Meanwhile, the potential level of aggregate output falls in response to the productivity shock because the economy is, on aggregate, less productive. However, without monetary intervention, both prices and nominal demand remain unchanged before any firms in either sector have had a chance to adjust their prices. Hence, demand is above its potential on impact and subsequently falls as prices rise. Therefore, the response of the two-sector economy to a negative productivity shock to the upstream sector, absent any monetary intervention, is

[14] These dynamics correspond to the blue lines in Figure 3 in Afrouzi, Bhattarai, and Wu (2024).

akin to the response of a one-sector economy to a combination of productivity and cost-push shocks.

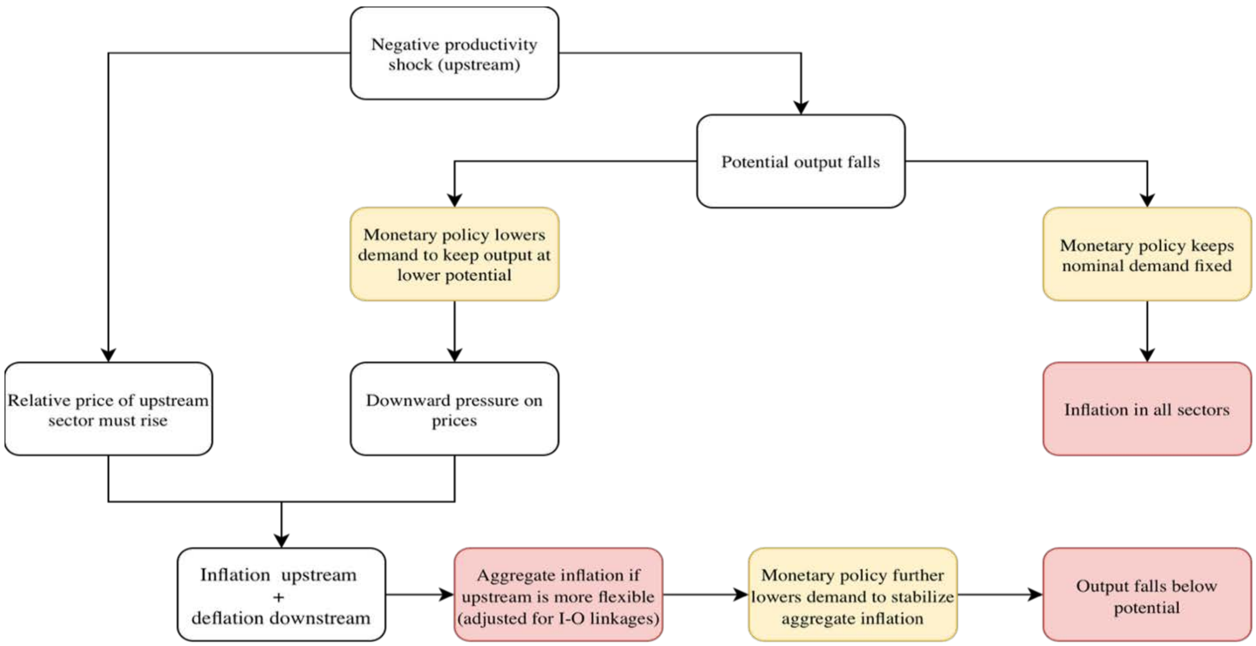
To disentangle the effect of lower productivity from the cost-push nature of its impact on inflation, let us now consider a monetary policy that aims to keep output at its potential along the path after the negative productivity shock to the upstream sector takes place. Now, in contrast to a one-sector model where keeping the output at potential after a productivity shock eliminates inflationary pressures, the two-sector economy will feature endogenous adjustment of prices. Even with output fixed at its potential, the upstream sector is now less productive, and thus the natural price of the upstream sector relative to the downstream sector has increased. Thus, the price in the upstream sector must rise relative to the downstream sector, which happens only gradually due to nominal rigidities.

Furthermore, since the shock reduces the natural level of output on impact, to keep output at its potential, monetary policy must contract demand to bring output down to its new natural level. Thus, the negative productivity shock must now be accompanied by lower nominal demand, offsetting the upward pressure on prices from the reduction in potential output. At the same time, the productivity shock increases costs more in the upstream sector than in the downstream sector. For monetary policy to close the output gap and thus avoid the effect of a positive output gap on inflation, the result must be to allow some upward pressure on prices in the upstream sector while ensuring downward pressure on prices in the downstream sector. If prices in both sectors were to be higher than before the shock, that would suggest aggregate demand is higher than potential and vice versa.

Putting all these forces and mechanisms together, we observe that an output gap stabilization policy after a negative sectoral shock to the upstream sector should feature the following properties: The price of the upstream sector must rise relative to the downstream sector but without both prices moving in the same direction. The result is that the upstream sector experiences inflation while the downstream sector experiences deflation due to the fall in its demand through the output gap stabilization policy.

However, aggregate inflation may nonetheless be boosted if the input-output adjusted price flexibility of the upstream sector is higher. Such differences in price flexibility lead to the endogenous cost-push shock described above. That occurs because the inflation in the upstream sector will happen at a faster pace than deflation in the downstream sector, leading to aggregate inflation being elevated along the path despite the output gap being closed.[15] The flowchart in Figure 6 shows these effects.

Figure 6: Flow chart for effect of sectoral productivity shocks in upstream sector



Monetary policymakers can go further, tightening policy to prevent the inflationary effects of the endogenous cost-push shock. A policy that aims to fully stabilize inflation must contract the economy so much so that the aggregate price does not move. However, the price of the upstream sector must still increase relative to the downstream sector to follow its new natural level after the negative productivity shock. Accordingly, the price in the downstream sector must fall fast enough to compensate for the rise in the price of the upstream sector for the aggregate price to remain stable. Such a policy, therefore, would result in a massive contraction in the downstream sector if its prices are stickier or its reliance on the upstream sector's output is higher. The flowchart in Figure 6 also shows these effects under this alternative policy response.

15 The red lines in Figure 3 in Afrouzi, Bhattarai, and Wu (2024) show such price changes under output gap stabilization policies.

In fact, each of the output gap stabilization and inflation stabilization policies aims to stabilize specific price indices along the economy's transition path after the shock. While inflation stabilization directly targets the consumer price index, output gap stabilization targets an alternative price index that puts more weight on stabilizing the price of the stickier sector in order to avoid excessive contractions in such sectors. It is in this sense that output gap stabilization policies are closer to the optimal monetary policy, an insight that was first presented by Aoki (2001) in the context of a two-sector model with one fully flexible price sector and another sticky-price sector. More broadly, output-gap stabilization performs far better than strict inflation targeting because it implicitly places more weight on the sticky-price sectors, which drive welfare losses. Inflation targeting, by contrast, overreacts to flexible-price sectors and causes unnecessarily large contractions in the economy.

More broadly, the idea that monetary policy can stabilize output gap to zero in multi-sector models by targeting a particular price index has been explored further in the literature following the work in Aoki (2001). Woodford (2003a) develops such a price index for a more general two-sector model with heterogeneous price stickiness, and Gali (2015) develops it in a model with both price and wage stickiness. Rubbo (2023) derives this index in a general multi-sector model with production networks, a feature absent in Aoki (2001), Woodford (2003a), and Gali (2015). Finally, in a general multi-sector model with production networks, Afrouzi and Bhattarai (2025) provides closed-form solutions for sectoral inflation dynamics following sectoral shocks when monetary policy targets such a price index.

Another implication is that endogenous cost-push pressures through relative prices exhibit intrinsic persistence. The variable r_t follows its own dynamic process, typically governed by the speed of price adjustment and the propagation of shocks through the input-output network. If upstream sectors reset frequently, r_t decays faster; if both sectors are sticky or strongly linked, r_t converges more slowly. This persistence explains why inflation can remain elevated even after monetary policy tightens and expectations remain anchored—a pattern observed in many recent episodes.

From a policy standpoint, relative-price shocks are thus endogenous in two senses. First, they arise from structural features of the economy—heterogeneity in price rigidity and production linkages. Second, their magnitude and persistence depend on how monetary policy reacts. Monetary policy that aims to stabilize aggregate inflation more aggressively may compress demand and reduce cost pressures further, but it can also widen relative-price gaps, especially when prices are more flexible in the upstream sector. Conversely, a more gradual adjustment allows relative prices to converge naturally but prolongs above-target inflation.

In a nutshell, this framework recasts the classic cost-push view in a fully micro-founded way, giving u_t an interpretation in terms of sectoral price dynamics. Inflation persistence in the face of stable expectations or tight policy no longer signals a failure of credibility; it reflects the economy's internal adjustment constraints and the interaction between monetary policy and the real structure of production that shapes inflation.

In this sense, the multi-sector framework bridges the gap between traditional New Keynesian analysis and the real-side mechanisms emphasized in recent policy debates. It shows that the observed trade-off between disinflation speed and output stability is not a new puzzle but an inherent feature of economies where prices adjust heterogeneously and sectors are interconnected. The challenge for monetary policy is therefore not to eliminate this trade-off but to manage it—recognizing that part of what we call "cost-push" inflation is simply the visible footprint of relative-price adjustment in a complex, multisector production network.

3.3. US inflation and unemployment gap through the lens of the multi-sector model

The multi-sector model provides a natural explanation for the recent, rare episode in the U.S.—one where inflation was quite high and then declined without unemployment deviating from its natural level—that has puzzled many observers. While such declines in inflation are usually attributed to the anchoring of inflation expectations—i.e., if expectations are anchored, the central bank does not need to open up an output gap to bring down inflation—it is important to note that, even with perfectly anchored inflation expectations, cost-push or relative-price shocks pose a trade-off for the policy in terms of passing them through to inflation or output gap, as described above.

In the framework described in Section 3.2, closing the output gap does not automatically stabilize inflation because inflation can persist even when the economy operates at its efficient level. This dynamic describes well the recent U.S. experience. Following the post-COVID inflation surge, the Federal Reserve tightened policy to cool demand. Unemployment remained historically low, and inflation receded only gradually. The persistence reflected ongoing relative-price adjustment—especially in services—rather than continued excess demand. Inflation fell as those sectoral misalignments dissipated, not because output had to be (or was) forced below potential.

This breakdown of divine coincidence, even with productivity shocks only, means the central bank must navigate a real trade-off. Stabilizing inflation rapidly entails sharper demand contractions, while stabilizing the output gap allows inflation to fade more slowly as relative prices adjust. Theory suggests the latter approach—keeping output close to potential—is closer to the welfare-optimal path.

3.4. Role of expectations and anchoring

Another channel commonly discussed as a policy concern is the role—and anchoring—of inflation expectations, particularly in the long run. Thus, it is important to distinguish the role of relative-price shocks from that of this alternative channel. In fact, in the class of models we have discussed here, the literature deliberately abstracts from the "anchoring" channel by assuming that expectations are formed rationally and that the economy converges back to its steady state in the long run, the combination of which implicitly anchors the private sector's inflation expectations to the exogenously fixed steady-state inflation rate. We follow this tradition in our discussion above, which is useful for delineating the relative-price channel from any expectations-anchoring concerns.

This abstraction, however, comes at the cost of ignoring potential interactions between the two channels. While the literature lacks rigorous theories that investigate such interactions in multi-sector models, one can nonetheless speculate about concerns that might arise when de-anchoring is possible in such environments. First, as discussed above, absent anchoring concerns, a monetary authority facing inflation–output tradeoffs induced by relative-price distortions could keep output at potential at the cost of some inflation—a policy that may even be closer to optimal than fully eliminating inflation. It is natural to hypothesize that, once anchoring concerns are present, the inflation cost assigned to such policies should be larger. Allowing inflation to rise in order to stabilize real activity could "de-anchor" expectations if the policy is not communicated properly, which in turn could lead to higher and more persistent inflation.

However, credible communication plays a central role in such an environment. The inflationary cost associated with relative-price distortions is inherently temporary; it never warrants keeping inflation at a higher level in the long run. Thus, concerns about de-anchoring in this context should be understood as concerns generically about the private sector mistaking a transitory, state-contingent response for a permanent shift toward higher inflation. A policy framework that can clearly and credibly communicate its objective can therefore weaken this link to the anchoring channel and need not treat anchoring implications as a first-order constraint when responding to relative-price distortions.

To the extent that relative-price distortions were active in both inflationary episodes of the 1970s and the recent post-COVID period, such credible communication is perhaps the most salient reason for why, in the post-COVID episode, monetary policy did not react as much in terms of raising interest rates (see Figure 3), and yet, inflation was more short-lived.

3.5. Further implications

Viewing inflation through the lens of relative-price adjustment provides a coherent explanation for several stylized facts that have challenged policymakers.

Headline versus core inflation. Sectors with flexible prices—energy, food, and commodities—respond quickly to shocks, causing large but short-lived movements in headline inflation. Stickier sectors, such as housing and services, adjust slowly, generating persistent core inflation. These phases are two parts of the same process: the gradual return of relative prices to equilibrium. Because energy and transportation sit upstream in the production network, their shocks ripple through downstream sectors, sustaining inflation even after the initial disturbance subsides. This is the "second-round" effects of upstream sector shocks on aggregate inflation that is often invoked in policy discussions.

Conflict inflation and wage–price spirals. When both wages and prices are sticky, relative-price adjustment extends to the labor market. Workers and firms alternately try to restore their preferred real income shares, producing the familiar wage–price spiral. What appears as "conflict inflation," as coined by Lorenzoni and Werning (2023), is another important case of staggered relative-price realignment—between labor and goods prices—rather than uncontrolled aggregate demand growth.

4. Policy implications of relative-price shocks as drivers of inflation

In the one-sector New Keynesian benchmark, inflation arises from movements in the output gap or exogenous cost-push shocks. In particular, in response to a cost-push shock, monetary policy faces a familiar trade-off: Fully stabilizing inflation would require contracting GDP, while stabilizing output would allow higher inflation. However, once we move beyond the one-sector model, where sectors differ in price stickiness and upstreamness, relative-price gaps themselves become drivers of aggregate inflation. Importantly, while these gaps enter the Phillips curve in the same functional form as cost-push terms, unlike exogenous cost shocks they arise endogenously from sectoral adjustment dynamics and respond to monetary policy.

Our aim in this section is to focus on the different policy implications that arise from the endogeneity of relative-price shocks despite their similarities with exogenous cost-push shocks. In particular, understanding the subtleties around the endogenous adjustment of relative prices in these models has significant implications for how policymakers should think about optimal stabilization policy and the interpretation of inflation data.

4.1. Optimal policy

To consider how optimal policy in a multi-sector model should respond to sectoral origins of inflation, it is useful to benchmark our discussion to the one-sector model with an exogenous cost-push shock. In such a model, a policymaker with commitment understands that stabilizing an inflationary cost-push shock would come at the cost of contracting the economy. The intuition for this trade-off is that an inflationary cost-push shock puts upward pressure on prices independent of the output gap. Thus, to eliminate this inflationary pressure, monetary policy must contract demand to mitigate the direct inflationary effects of the shock. But such contraction in demand would then push output below its potential, leading to a recession. Therefore, the main question for policymakers is to decide how much of the shock should be absorbed by inflation versus contracting demand.

While a common proposal is that policymakers should "look through" such shocks, letting them have their transitory effect on inflation without contracting demand—which happens to coincide with the optimal policy in a special case proposed by Aoki (2001) as discussed below—Woodford (2003b) rigorously characterizes the optimal response of such a policymaker under commitment for the general case as follows. The policymakers facing such a tradeoff would optimally choose to mitigate some of the initial inflationary effects of inflation by contracting demand. In addition, if policymakers can commit to a whole path of policy, they would do so by smoothing out the contraction over time to mitigate its impact on the households.[16] Thus, optimal policy features a mitigated inflationary effect of the shock on impact and a subsequent gradual and demand-driven recession that is necessary for that mitigation. In particular, along the path, as the initial and direct inflationary effect of the shock disappears, inflation also falls below its target due to the gradual, demand-driven recession.

The multi-sector framework, however, changes this understanding. To illustrate the differences between the two settings as clearly as possible, let us first consider a two-sector Aoki (2001) economy, where one sector has sticky prices and the other features fully flexible prices. This would be nested within the framework described in Section 3.2 if we were to shut down the use of upstream goods as inputs for the downstream sector and make the prices in the upstream sector fully flexible. The first observation is that in this economy, even if the sectoral shock is a productivity shock, divine coincidence fails for the reasons we described in Section 3. In particular, the differences in the price

[16] It is again important to note that this smoothing incentive is independent of any concerns about "de-anchoring" of inflation expectations, which is often discussed in the context of policy. In fact, in Woodford (2003b), long-run inflation expectations are perfectly anchored and independent of the nature of the stabilization policy in the short-run, but the optimal policy still smoothes the impact of the shock because the household is risk averse and misallocative consequences of inflation are higher in absence of such smoothing.

stickiness of the two sectors create distortions in relative prices that independently affect inflation dynamics. Thus, policymakers might be inclined to inform their policy decisions based on the optimal policy recommendations of the one-sector model with an exogenous cost-push shock.

But such policies would fail to be even remotely optimal. Replicating the one-sector cost-push policy—tightening to (partially) offset headline inflation—would depress employment and output in the sticky sector without reducing the underlying misalignment. Following the logic outlined in Section 3, the sectoral shock requires the price of the flexible sector to rise relative to the sticky sector. Thus, stabilizing headline inflation would require imposing a large enough contraction in the sticky sector so that the aggregate price remains constant. But this is suboptimal because such additional distortions in the price of the sticky sector reduce welfare even more.

In fact, the optimal policy in the Aoki economy would precisely aim to avoid such additional distortions. The best policy would be such that firms in the sticky price sector do not need to adjust their prices at all and leave the adjustment of relative prices to happen through adjustment in the flexible sector; i.e., optimal policy would take full advantage of the flexibility of prices in the flexible sector and would eliminate any need for price adjustments in the sticky price sector. But we note that such a policy is identical to keeping aggregate slack fixed along the path so firms in the sticky sector do not have to adjust their prices in response to additional distortions in demand. In other words, the optimal policy in such a model is to keep output at its lower potential and let the changes in the relative prices pass through fully to headline inflation.

This logic generalizes to richer multi-sector settings. Benigno (2004) and Woodford (2003a) show that optimal policy systematically places greater weight on sectors with more rigid prices because price dispersion there generates the largest welfare losses. Stabilizing the aggregate output gap therefore comes close to optimal policy, since it implicitly gives higher weight to sticky sectors while allowing relative-price adjustment elsewhere. More recent work by La'O and Tahbaz-Salehi (2023) extends this insight further to economies with production networks and shows that, in addition to more sticky sectors, optimal policy puts more weight on more upstream sectors measured by their

Domar weight. They show that even in these types of frameworks, stabilizing the aggregate output gap comes quantitatively close to the fully optimal policy.

Therefore, policy design in a rapidly changing global economy where the relative prices of upstream sectors—energy, transportation, imported inputs—can move sharply and by large amounts must recognize that shocks to more flexible sectors must be passed through to inflation more readily. Importantly, such movements in inflation are necessary for a more stable output. An increase in oil prices, for example, generates large and transitory inflationary pressures. The well-known result is that the optimal policy lets those changes pass through rather than offsetting them through tighter demand management. Misidentifying such an episode as driven by an exogenous view of cost-push shocks—particularly in periods when the Phillips curve is believed to be steep—would lead to suboptimal prescriptions and unnecessary welfare losses.

To that end, multisector models are not just a theoretical refinement but practical diagnostic tools for policy in real time. The key issue is attribution: Observed "steepening" of the aggregate Phillips curve may reflect relative-price movements propagating through input-output linkages as opposed to broad-based nominal pressures that warrant demand restraint. Aggregate data alone can hardly distinguish between the two. Using multisector models to interpret sectoral price and quantity data helps trace where inflation originates, how it propagates upstream to downstream, and whether it is concentrated in flexible sectors in a way consistent with efficient pass-through. This, in turn, reduces the risk of mistaking a relative-price episode for evidence of a steeper Phillips curve and overtightening in response.

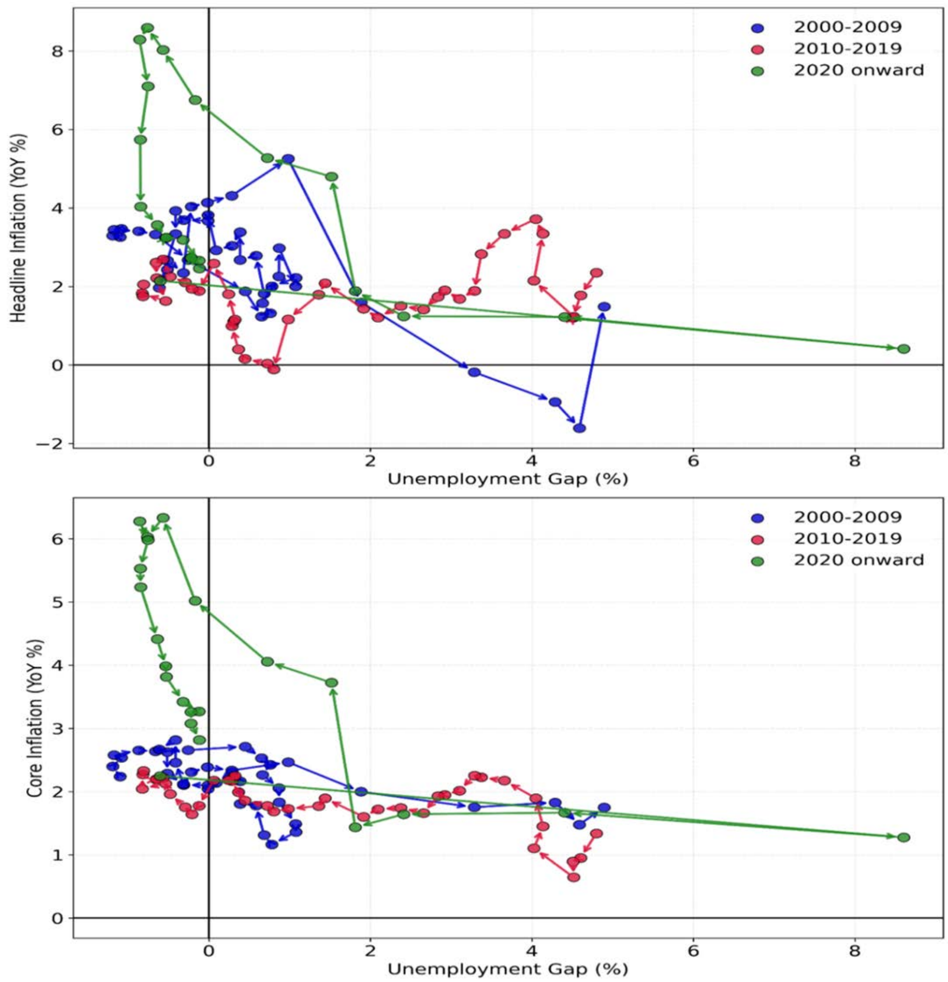
4.2. Empirical and identification implications

Because relative-price gaps respond endogenously to both shocks and policy, omitting them from empirical Phillips-curve estimates introduces an omitted-variable bias that could lead to substantial mistakes in policy implications. Periods dominated by sectoral shocks—such as the 1970s or the post-COVID era—can therefore generate persistent inflation without directly affecting the output gap, leading to misinterpretations that the Phillips curve has steepened or flattened structurally. Accounting explicitly for relative prices can restore stability to the estimates of underlying parameters and would show that inflation persistence in those episodes reflects sectoral adjustment rather than changes in pricing behavior.

More concretely, consider a relative-price shock originating from a flexible price sector that leads to inflation. As discussed above, the optimal policy would let such a shock pass through to inflation and engineer a zero output gap. Such a policy response would be reflected in the data as large movements in inflation, with little to no change in the aggregate slack. An observer who ignores the role of relative prices in driving inflation would then conclude that the Phillips curve must be very steep, wrongly inferring the exact opposite policy as optimal (see Figure 7 and discussion of it below): If the Phillips curve is so steep, one can eliminate inflation with little to no cost on the output gap, leading to the wrong conclusion that policy should tighten immediately.

This identification problem can be illustrated well by looking at the evolution of inflation and unemployment gap. In Figure 7 we plot these variables for the U.S. economy, using the CBO measure of U.S. natural unemployment to construct the unemployment gap. As is clear, in post-financial crisis and pre-COVID period (2010-2019), it appears that the Phillips curve has flattened. This is especially clear when using core inflation. Then, following the post-COVID inflation surge, it is clear that there is a large rise and subsequent fall in inflation without much movement in economic slack.

Figure 7: US Inflation and unemployment gap dynamics



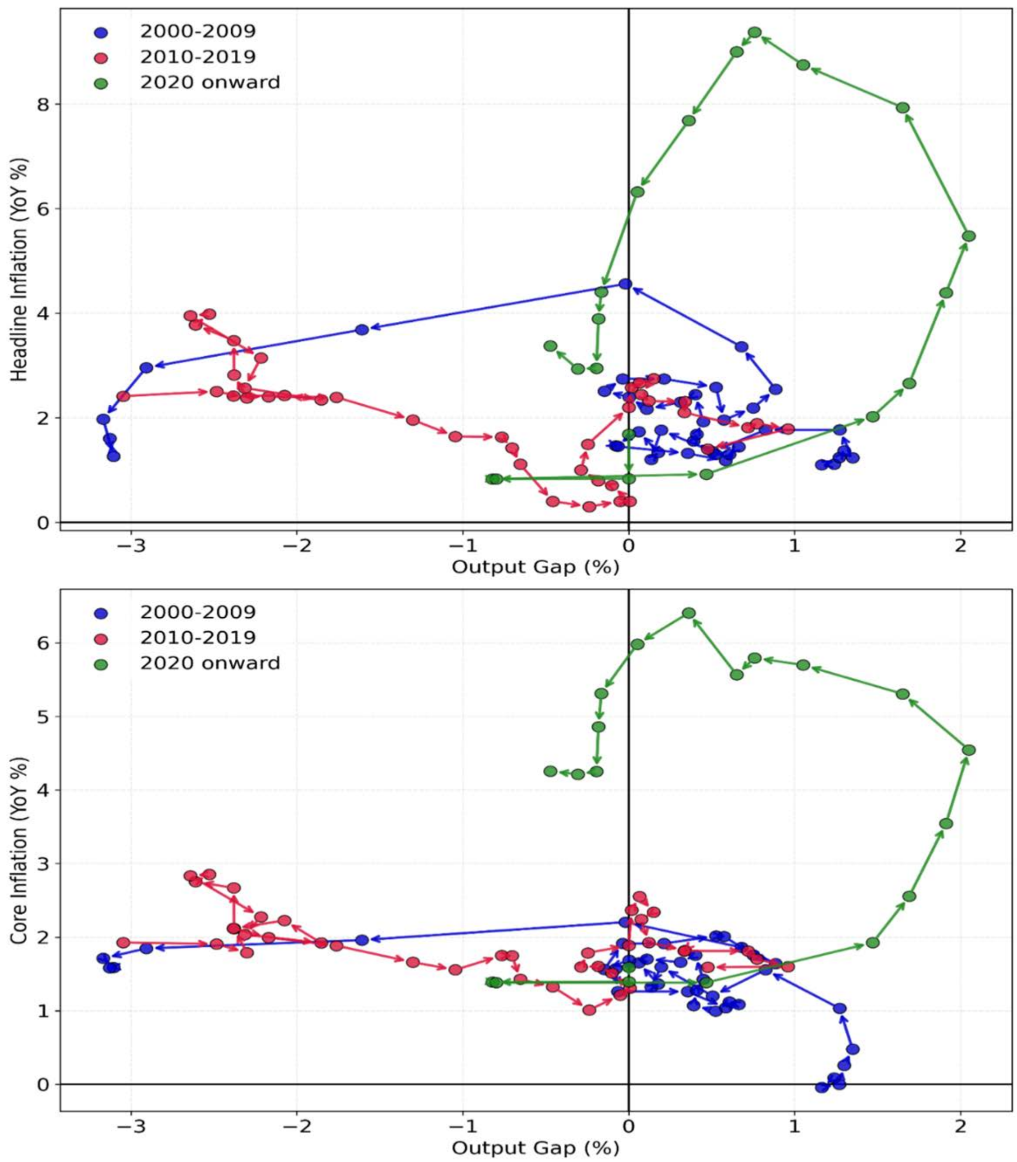
Notes: Inflation and unemployment gap data are from FRED (BLS, CBO). Inflation is measured as the year-on-year percentage change for each quarter. Unemployment gap is measured as the difference between the actual unemployment rate and NAIRU in percentage points.

Figure 8 shows similar dynamics for the U.K. economy, where we use the output gap constructed by the U.K. Office of Budget Responsibility (OBR), while Figures 9 and 10 show similar dynamics for the Japanese and Canadian economy, where we use the output gap constructed by the Bank of Japan and Bank of Canada respectively.[17] Thus, looking at Figures 8, 9, and 10, one might be tempted to conclude that the Phillips curve

[17] A quarterly unemployment gap measure for the U.K. is not available through the OBR. A quarterly unemployment gap measures for Japan and Canada are not available through the respective central banks.

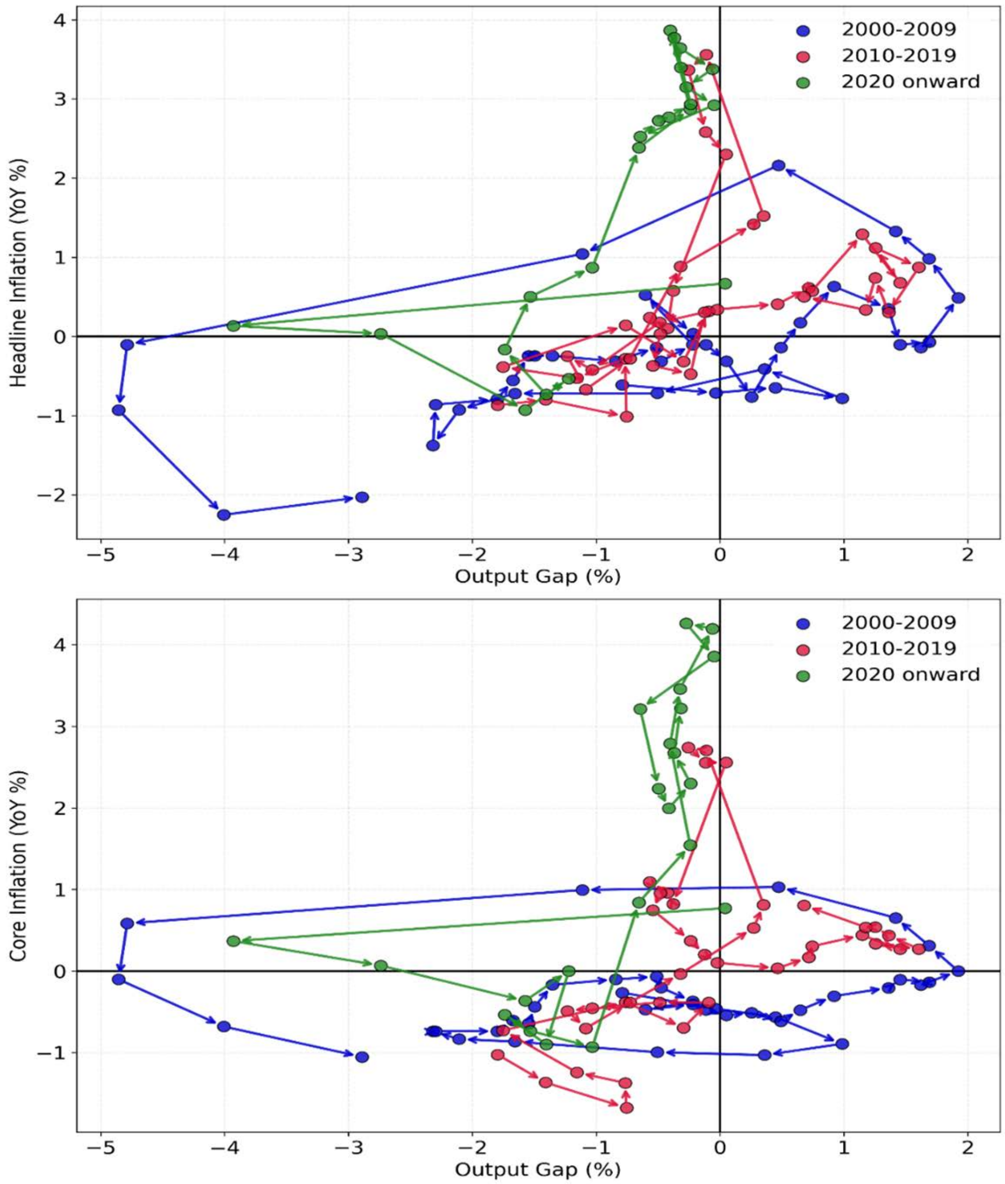
has now suddenly steepened in the U.K., Japan, and Canada as well. But as we have explained earlier, this period is one with large commodity prices and other relative price changes, and it might just be that these endogenous shifters of the Phillips curve played a large role, with monetary policy mostly focused on stabilizing the unemployment/output gap.

Figure 8: UK inflation and output gap dynamics



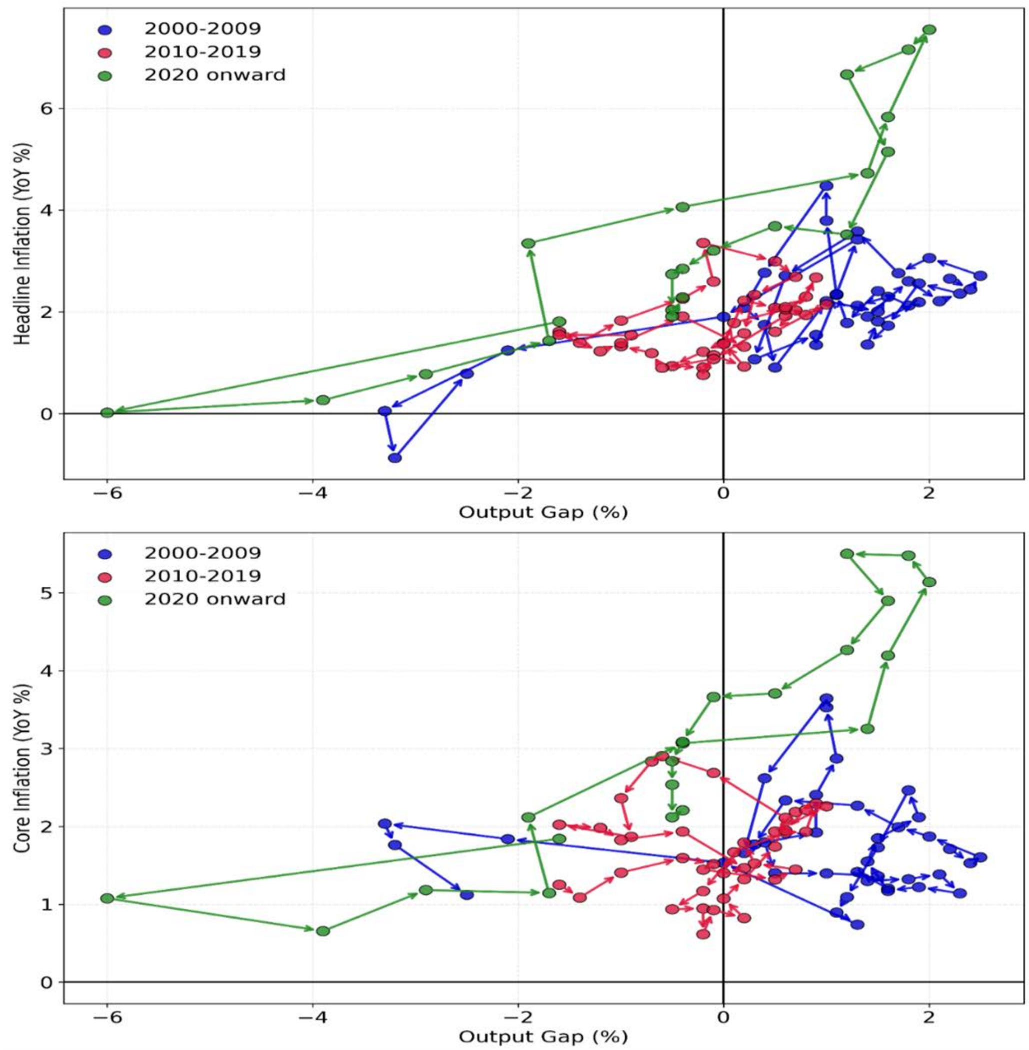
Notes: Inflation data is from FRED (OECD), and the measure is year-on-year inflation rate in percentages for each quarter. Output gap data is from the Office for Budget Responsibility and measured as the percentage deviation of actual GDP from potential GDP for each quarter.

Figure 9: Inflation and output gap dynamics in Japan



Notes: Inflation data is from the Statistics of Japan, and the measure is year-on-year inflation rate in percentages for each quarter using quarterly averages of monthly indices. Output gap data is from the Bank of Japan and measured as the percentage deviation of actual GDP from potential GDP for each quarter.

Figure 10: Inflation and output gap dynamics in Canada



Notes: Inflation data is from FRED (OECD), and the measure is year-on-year inflation rate in percentages for each quarter. Output gap data is from the Bank of Canada and measured as the percentage deviation of actual GDP from potential GDP for each quarter.

Nonetheless, at a given level of economic slack, it can be difficult to discern from an inflationary episode whether relative-price changes are the main driver of high inflation or whether the slope of the Phillips curve has changed. Both possibilities yield similar reduced-form relationships between inflation and output, but they imply very different mechanisms and policy responses, just as we illustrated in actual data with the U.S. and other economies in Figures 7-10. Inflation arising from relative-price misalignment can persist even when the Phillips curve is stable; inflation driven by a steeper Phillips curve reflects a fundamentally different process. Failing to include relative prices in the analysis can thus lead to systematic misdiagnosis of the inflation process and to policies that overreact to what are, in reality, self-correcting dynamics.

Two features of relative-price adjustment make this identification issue particularly challenging. First, unlike true cost-push shocks, relative prices respond to monetary policy itself because they are endogenous. The speed and amplitude of relative-price convergence depend on how policy affects sectoral prices. Conducting the right policy, therefore, requires understanding the joint evolution of relative prices and policy, not treating the gap as an exogenous disturbance. In contrast, under traditional cost-push shocks, policy only decides how much of the shock to accommodate in inflation.

Second, relative-price gaps are correlated with potential output. Sectoral productivity or input-cost shocks shift the efficient allocation of resources and hence the natural level of output. This correlation complicates empirical identification: Inflation appears correlated with the output gap even when it actually reflects the changing structure of relative prices. Traditional methods that omit relative-price terms in estimating the Phillips curve thus produce time-varying slopes, especially during episodes of large sectoral shocks.

These challenges underscore why the analogy between relative-price shocks and cost-push shocks, though intuitive, can be misleading. While the mathematical form in the Phillips curve is similar, the economic implications are different. Relative-price gaps are not independent disturbances but endogenous components of the economy's adjustment process. Responding to them as if they were exogenous cost-push shocks—e.g., by tightening policy to force inflation down or simply assuming they are short-lived and thus "seeing through them"—fails to recognize that such policy actions themselves influence the pace of relative-price realignment.

Recognizing these identification problems changes how policymakers should interpret inflation data. Periods of high inflation accompanied by large sectoral dispersion in price changes are likely driven by relative-price adjustment. In contrast, generalized price increases across sectors with limited dispersion signal genuine overheating or aggregate cost-push shocks akin to those in the one-sector model. Incorporating measures of sectoral inflation dispersion, input-cost ratios, and relative-price gaps into policy analysis would allow central banks to distinguish between these two cases.

4.3. Further implications and looking ahead

Temporary deviations of inflation from target do not always signal overheating or conventional cost-push pressures. In economies characterized by sectoral heterogeneity and input-output linkages, such deviations may simply reflect the natural process of relative-price adjustment, as seen in recent U.S. experience. This demonstrates that inflation can remain elevated even when output is near potential, consistent with the dynamics emphasized by this framework.

Looking ahead, similar challenges will arise repeatedly as economies undergo structural transformation. The energy transition, re-shoring of supply chains, and technological change in upstream industries will generate persistent shifts in relative prices. Policymakers will need to distinguish between inflation caused by relative-price movements and inflation driven by more conventionally considered origins such as excess demand or exogenous aggregate cost-push shocks. Designing robust monetary frameworks for such environments—rules that perform well when relative prices change sharply—should be a key priority. As such, diagnosing inflationary pressures due to relative-price distortions must be a priority for policymakers. An obvious step toward this direction is to move beyond single metrics as well as single-sector models and track the distribution of sectoral prices through the lens of multi-sector frameworks.

Furthermore, the sectoral nature of relative-price disturbances also create a new role for fiscal policy to intervene. Because sectoral price shocks affect different groups of households differently, relative-price changes have important distributional consequences. Energy or food price shocks, for instance, weigh more heavily on lower-income households even when aggregate welfare losses are small. Well-targeted fiscal measures can mitigate these effects without interfering with the optimal monetary policy and relative-price adjustment itself. Understanding how fiscal and monetary policy could and should interact in such environments—and how sectoral price dynamics shape income distribution—remains an important area for future work.

5. Relative-price changes in practice and inflation looking forward

The framework developed above clarifies how changes in relative prices across sectors can generate aggregate inflation even when the economy is operating near potential. The last several years have offered repeated, large-scale examples of relative-price shocks interacting with nominal rigidities that have been suspected as sources of aggregate inflationary pressures. Looking ahead, the structure of the global economy suggests that such disturbances will likely become more frequent and more central to the conduct of stabilization policy. Understanding inflation through a multi-sector production networks lens is therefore essential for interpreting both recent experience and the environment policymakers will face in the coming decades.

5.1. Relative-price changes in recent experience

Events of recent years illustrate how sector-specific shocks can translate into aggregate inflation through the mechanisms emphasized by the multi-sector model.[18] The post-pandemic surge in energy and food prices, driven first by supply disruptions and later by the Russian invasion of Ukraine, is the most visible example. Energy is an archetypal upstream sector: It enters directly into production costs across the economy. When oil and gas prices rose sharply, upstream firms adjusted their prices quickly, while downstream producers—particularly in services and retail—did so gradually. The resulting misalignment between fast-moving and slow-moving sectors raised the overall prices which continued even after the initial effect of the shock vanished.

Shipping and logistics disruptions produced a similar pattern. Bottlenecks in container transport and port capacity sharply increased the cost of moving goods, effectively raising the relative price of traded to non-traded sectors. Because many service prices adjust infrequently, the pass-through occurred with a delay, generating the kind of staggered relative-price adjustment that sustains persistent inflation in the multi-sector framework. As another example, semiconductor shortages in 2021–22 also propagated through

18 Ruge-Murcia and Wolman (2022) study in an estimated DSGE model the role of relative-price shocks on historical U.S. inflation.

production networks, raising prices for vehicles and electronics far more than for other goods and contributing to the dispersion in prices.

Trade policy has been another important source of relative-price movements recently. The tariff increases introduced initially during 2018–19 and later extended or reoriented through strategic industrial policy raised the relative price of imported intermediate goods. Downstream firms that relied on these inputs faced higher costs but adjusted their own prices gradually, again producing inflationary persistence through the same mechanism. Tariffs have been increased much more drastically recently, since early 2025.

5.2. Channels of future relative-price changes

If anything, the forces shaping the global economy suggest that such shocks will become more salient in the future. Several structural transitions are likely to generate large and frequent changes in relative prices across sectors, often through channels that interact with nominal rigidities and monetary policy.

Energy transition and climate policy. Decarbonization or shifting toward new sources of energy will raise the relative price of carbon-intensive energy and materials during the adjustment phase. Investment in renewable capacity, carbon pricing, and the retirement of fossil assets will all affect the marginal cost of energy. Because energy is an upstream input to nearly every production process, these adjustments will have broad pass-through effects. Unlike temporary oil shocks, transition-related increases in energy costs may persist for years, keeping upstream prices elevated relative to downstream ones and thereby sustaining mild but ongoing inflationary pressure.

Geopolitical fragmentation and supply-chain reconfiguration. The shift toward on-shoring and building redundancy in supply chains will alter the geography and cost structure of production. Higher transportation and inventory costs, along with duplicated production capacity that lowers efficiency, will raise the relative price of traded goods and critical inputs. Periodic geopolitical tensions or sanctions can further amplify these differences, leading to episodes of relative-price volatility that spill into headline inflation and to core inflation afterwards, even when global demand remains subdued.

Deglobalization and trade policy. Beyond discrete disruptions, the general trend toward deglobalization is in and of itself a source of slow-moving relative-price change. Tariffs, export restrictions, and industrial subsidies all shift relative costs across countries and sectors. These policies often target intermediate or capital goods—sectors that are both upstream and price-flexible—thereby affecting downstream price adjustment dynamics in exactly the way the model predicts. As these interventions become more common, aggregate inflation will increasingly reflect the cumulative effect of overlapping sectoral realignments rather than a single macroeconomic demand imbalance.

Technological change and artificial intelligence. Rapid advances in automation and artificial intelligence are poised to alter relative prices in technology-intensive sectors. On the one hand, AI adoption may reduce the effective cost of producing certain high-skill services or software, lowering their relative prices. On the other hand, if AI capital and computational resources become essential intermediate inputs across industries, the relative price of these upstream technologies could rise sharply during the diffusion phase. Hardware constraints—such as limited supply of advanced semiconductors or energy costs of data centers—can amplify this effect and put upward pressure on energy prices. These dynamics would again create staggered price adjustments, leading to aggregate inflation that reflects their interaction.

Demographic and labor-market shifts. Aging populations in advanced economies and changing migration patterns can alter the relative price of labor-intensive services. When labor supply tightens unevenly across sectors—health care, education, personal services—the relative price of these services tends to rise persistently. Because many of these sectors are also characterized by high price rigidity, their slow adjustment can generate sustained inflation even when aggregate demand remains moderate.

Taken together, these channels point toward a macroeconomic environment where relative-price shocks are becoming more frequent, overlapping, and sometimes prolonged. Their aggregate manifestation will depend on how heterogeneous sectoral rigidities interact with policy, but the central implication is clear: With more disturbances in relative prices on the horizon, policy must prepare to respond to different sectoral origins of inflation appropriately instead of just focusing as traditionally on an aggregate demand origin.

5.3. Implications for inflation dynamics

The growing prominence of relative-price shocks implies that future inflation dynamics will often resemble those generated by endogenous Philips curve shifters in the multi-sector model rather than by aggregate demand or productivity fluctuations in the one-sector benchmark. When shocks originate in upstream sectors—energy, transportation, critical technologies—the initial increase in their prices propagates slowly through production networks. Downstream sectors with stickier prices adjust over time, producing a path of inflation that is persistent but self-correcting. Even when monetary policy keeps output at potential, aggregate inflation may remain above target until relative prices converge to their new efficient levels. This explains why inflation can coexist with near-neutral policy and stable expectations, as observed recently.

Future episodes may exhibit similar patterns. The energy transition, for example, could produce several years of relative-price realignment as the cost of carbon-intensive inputs rises and renewable capacity scales up. Likewise, an acceleration in AI investment could shift resources toward capital-intensive upstream sectors, raising their relative price and compressing markups elsewhere. Each of these processes would generate inflationary pressure unrelated to aggregate demand. The challenge for central banks will be to distinguish these episodes from conventional overheating due to positive output gaps and to calibrate policy so that it accommodates necessary price adjustments.

5.4. Competing long-term forces

The next decade will likely feature the interaction of two opposing regimes. On the one side is the view that the global economy is facing an era of low natural interest rates, subdued demand, and chronically low inflation—a continuation of the "secular stagnation" pattern that characterized the 2010s and was much discussed in policy and academic research due to an aging population and the global saving glut, among other forces. On the other side is the emerging reality of more frequent and sizable sectoral shocks, driven by climate policy, geopolitics, deglobalization forces, and technological change. Which force dominates will determine the character of macroeconomic stabilization in the years ahead.

If the low-rate, low-inflation environment reasserts itself, the policy questions of the 2010s—effective lower bounds, forward guidance, and unconventional monetary easing—will again be central. But if the pattern of large relative-price disturbances persists, the dominant challenge will be different: how to manage the trade-off between inflation stability and output stability in a world where sectoral shocks continually shift the efficient structure of prices. The multi-sector production networks model offers the analytical tools for understanding that trade-off, showing that such inflation need not indicate policy failure but rather the normal operation of an economy adjusting to structural change.

5.5. Looking forward

The experience of the past few years may therefore be a preview of a new macroeconomic regime—one in which the main sources of inflation originate in the micro or, at the minimum, sectoral structure of production. Policymakers should expect more frequent episodes where aggregate inflation reflects sectoral realignment. In this environment, the central challenge will be to maintain credibility while allowing relative prices to adjust. Traditional frameworks that treat all inflation as a monetary phenomenon and evidence of excess demand will yield misleading guidance. Instead, policy must distinguish between inflation that signals overheating and inflation that signals across-sector adjustment, responding to the latter with patience and to the former with restraint.

Understanding inflation through the lens of relative prices thus moves beyond the conventional dichotomy of "supply versus demand." It highlights that, in an interconnected and structurally evolving economy, inflation is often the macroeconomic footprint of relative-price realignment. As energy systems, production networks, and technologies continue to evolve, the ability of policymakers to interpret these signals accurately will be crucial for avoiding both unnecessary recessions and prolonged inflation. The multi-sector perspective provides precisely the conceptual foundation needed for that task.

6. Conclusion

Relative-price shocks, a version of supply shocks in the sense we have made precise in this paper, have not only played a role in previous inflationary episodes, but are also likely to be even more prominent drivers of inflation going forward. We have explained in this paper how such shocks affect aggregate inflation dynamics by endogenously shifting inflation for a given level of aggregate slack, using a multi-sector model of heterogeneous sectors and input-output linkages. In such a setup, shocks to upstream sectors propagate to downstream sectors through input-output linkages, and the price flexibility of upstream sectors can create distinct dynamics that affect both the interpretation of the data as well as conclusions for policy. A key lesson from this perspective is that overlooking the role of relative prices in aggregate inflation dynamics can lead to misleading conclusions from both positive and normative standpoints.

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Data Appendix

Series	Country	Description	Source	Mnemonic	Accessed
Headline CPI	US	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, Total, NSA, monthly	OECD		10/25/2025
Headline CPI	UK	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, Total, NSA, monthly	OECD		10/25/2025
Headline CPI	Germany	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, Total, NSA, monthly	OECD		10/25/2025
Headline CPI	France	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, Total, NSA, monthly	OECD		10/25/2025
Headline CPI	Canada	Consumer Price Index, NSA, All-items, monthly, 2002=100	Statistics Canada		10/25/2025
Headline CPI	Japan	Consumer Price Index 2020-Base Consumer Price Index, All items, monthly	Statistics Bureau of Japan		10/25/2025
Core CPI	US	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, All items non-food non-energy, NSA, monthly	OECD		10/25/2025
Core CPI	UK	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, All items non-food non-energy, NSA, monthly	OECD		10/25/2025
Core CPI	Germany	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, All items non-food non-energy, NSA, monthly	OECD		10/25/2025
Core CPI	France	Consumer price indices (CPIs, HICPs), COICOP 1999, 2015=100, All items non-food non-energy, NSA, monthly	OECD		10/25/2025
Core CPI	Canada	Consumer Price Index, NSA, All-items excluding food and energy, monthly, 2002=100	Statistics Canada		10/25/2025

Series	Country	Description	Source	Mnemonic	Accessed
Core CPI	Japan	Consumer Price Index 2020-Base Consumer Price Index, All items, less fresh food and energy	Statistics Bureau of Japan		10/25/2025
Unemployment rate	US	Monthly unemployment rate, Calendar and seasonally adjusted	OECD		10/25/2025
Unemployment rate	Germany	Monthly unemployment rate, Calendar and seasonally adjusted	OECD		10/25/2025
Unemployment rate	UK	Monthly unemployment rate, Calendar and seasonally adjusted	OECD		10/25/2025
Unemployment rate	Canada	Monthly unemployment rate, Calendar and seasonally adjusted	OECD		10/25/2025
Unemployment rate	Japan	Monthly unemployment rate, Calendar and seasonally adjusted	OECD		10/25/2025
Unemployment rate	France	Monthly unemployment rate, Calendar and seasonally adjusted	OECD		10/25/2025
Policy Rates	US	Central bank policy rates (% per annum)	BIS		12/16/2025
Policy Rates	UK	Central bank policy rates (% per annum)	BIS		12/16/2025
Policy Rates	Canada	Immediate Rates (< 24 Hours): Central Bank Rates	FRED (OECD)	IRSTCB01CAM156N	12/16/2025
Policy Rates	Japan	Immediate Rates (< 24 Hours): Central Bank Rates	FRED (OECD)	IRSTCB01JPM156N	12/16/2025
Commodity Index	World	World Bank Commodity Price Data (The Pink Sheet), All (nominal US dollars, 2010=100)	World Bank		10/26/2025
Commodity Index	World	World Bank Commodity Price Data (The Pink Sheet), Food (nominal US dollars, 2010=100)	World Bank		10/26/2025
Crude Oil Price	World	World Bank Commodity Price Data (The Pink Sheet), Brent Crude Oil ($/bbl)	World Bank		10/26/2025
Headline CPI	Bolivia	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025
Headline CPI	Brazil	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025

Series	Country	Description	Source	Mnemonic	Accessed
Headline CPI	Chile	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025
Headline CPI	Colombia	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025
Headline CPI	Mexico	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025
Headline CPI	Paraguay	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025
Headline CPI	Peru	Consumer price index (CPI) - All items	IMF/IFS		11/02/2025
Headline CPI	US	Consumer Price Index for All Urban Consumers: All Items in U.S. City Average, 1982-1984=100	FRED (BLS)	CPIAUCSL	11/02/2025
Headline CPI	UK	Consumer Price Index: Total, 2015=100	FRED (OECD)	GBRCPIALLQINMEI	11/03/2025
Headline CPI	Canada	Consumer Price Index: Total, 2015=100	FRED (OECD)	CANCPIALLQINMEI	11/06/2025
Core CPI	US	Consumer Price Index for All Urban Consumers: All Items Less Food and Energy in U.S. City Average, 1982-1984=100	FRED (BLS)	CPILFESL	11/02/2025
Core CPI	UK	Consumer Price Index: All Items Non-Food Non-Energy, 2015=100	FRED (OECD)	GBRCPICORQINMEI	11/03/2025
Core CPI	Canada	Consumer Price Index: All Items Non-Food Non-Energy, 2015=100	FRED (OECD)	CANCPICORQINMEI	11/06/2025
Unemployment Gap	US	Unemployment Rate, Seasonally Adjusted	FRED (BLS)	UNRATE	11/02/2025
Unemployment Gap	US	Noncyclical Rate of Unemployment, Quarterly, Not Seasonally Adjusted	FRED (CBO)	NROU	11/02/2025
Output Gap	UK	OBR central estimate of the output gap	OBR		11/03/2025
Output Gap	Japan	Output Gap	Bank of Japan		11/04/2025
Output Gap	Canada	Current MPR output gap estimate (%)	Bank of Canada		11/06/2025

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