An International Perspective on Inflation during the Covid-19 Recovery

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1 Introduction

One of the most spectacular recent trends in the global economy is the inflation outburst that has accompanied the recovery from the Covid-19 pandemic. As shown by Figure 1, the rise in inflation originated from the tradable components of the consumption basket, that is commodities and manufactured goods. This fact points toward the importance of open-economy forces - such as global shocks and international spillovers - in shaping this inflation cycle. Moreover, central banks throughout the world reacted by engaging in a synchronized monetary tightening, sparking a debate about the potential gains from international monetary cooperation (Frankel, 2022; Obstfeld, 2022).

The aim of this chapter is to highlight the international dimension of the post-pandemic inflation. We start with a quick review of the facts, and suggest that the post-pandemic inflation is deeply related to a global scarcity of tradable goods. We then introduce a simple conceptual framework, useful to understand the international transmission of inflation. Next we discuss the international spillovers triggered by monetary interventions, and the potential gains from international monetary policy cooperation. We conclude with a brief historical retrospective, looking back at the high inflation of the 1970s, and at two periods characterized by global deflationary forces: the Great Depression of the 1930s, and the aftermath of the 2008 global financial crisis.

2 A look at the facts

Our starting observation is that the recent inflation outburst occurred in the context of a global scarcity of tradable goods. This scarcity has been driven by a combination of demand and supply factors. On the demand side, households reduced contagion risk by suppressing consumption of

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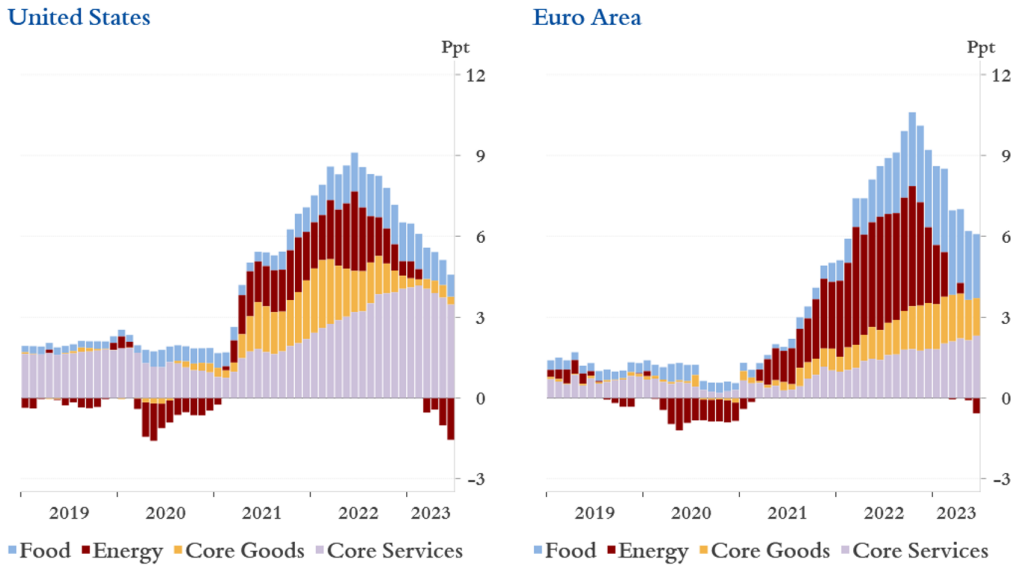

Figure 1: Contributions to CPI inflation: United States and euro area.

contact-intensive non-tradable services, and redirecting their expenditure toward tradable manufactured goods.[1] Moreover, as we will argue below, the US fiscal stimulus was associated with a sharp increase in expenditure on manufactured goods, further contributing to the rise in global demand for tradables. On the supply side, several factors reduced productivity in the tradable sector. First, global supply chains disruptions acted as a negative productivity shock for manufacturing firms. Second, Russia's invasion of Ukraine triggered a scarcity of food, energy, and other commodities, which pushed up their prices, dragging down productivity in commodity-intensive manufacturing sectors.

All these forces contributed to create an imbalance in the traded goods market, with a strong demand chasing a weak supply. Figure 2 shows one indicator of this imbalance: the relative price of tradable goods versus non-tradable services. Over time, typically, this relative price declines because of fast technological progress in the manufacturing sector. The recent years, instead, have seen an abrupt deviation from this historical trend. Between the start of 2021 and summer 2022, in fact, the price of goods relative to services increased sharply. Since then goods have remained expensive relative to services, compared to what the pre-pandemic trend would have predicted. This is a clear signal of scarcity of traded goods.

This fact can also be documented by decomposing the current inflation cycle between its tradable component (manufactured goods and commodities), and its non-tradable one (services). This is done in Figure 1. Both in the United States and the euro area, inflation jumpstarted in the tradable sector. Only later, perhaps because of second-round effects, the inflationary impulse spilled over to the non-traded service sector.

Since tradable prices are determined on global markets, the natural implication of these facts is that international forces, such as global economic slack, have been particularly important during

[1] Think about a fitness lover canceling her gym subscription, and purchasing home-gym equipments instead.

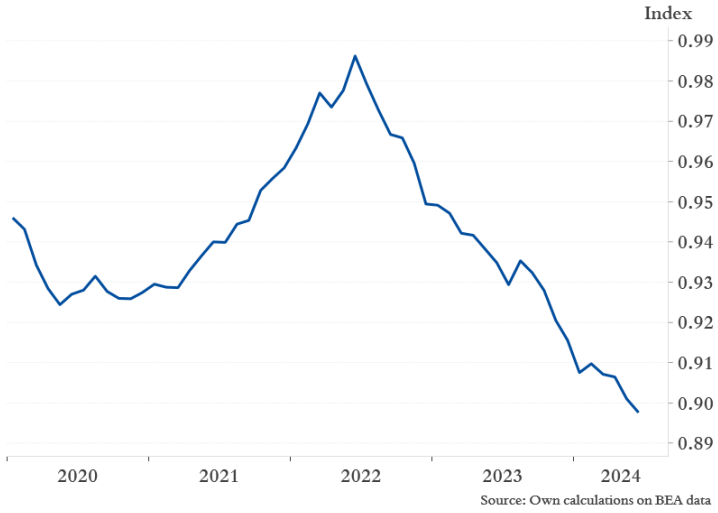

Figure 2: Price of manufactured goods relative to services.

this inflation cycle. To understand the post-pandemic inflation, it is thus crucial to take an international perspective, which accounts for spillovers across countries.

3 The international transmission of inflation

The large rise in US consumption of manufactured goods during the Covid-19 recovery is a good starting point to discuss the international transmission of inflation. As shown by the blue line in Figure 3, the start of the pandemic saw a decline in goods consumption by the United States. But the rebound was very quick, and by summer 2020 US goods consumption already exceeded its pre-pandemic trend. Interestingly, US goods consumption peaked in the first quarter of 2021, coinciding with two large fiscal stimulus programs, the Consolidated Appropriations Act (December 2020) and the American Rescue Plan Act (March 2021). This observation suggests that fiscal policy was an important driver of strong US demand for tradable goods.

A significant chunk of this rise in consumption was financed through international borrowing and trade deficits. In other words, the United States satisfied its appetite for tradable goods mostly through imports, rather than with an increase in domestic production. Indeed, US net exports dropped sharply since the start of the pandemic (red line in Figure 3).

How did these trade deficits affect inflation in the US and in the rest of the world? To address this question, we introduce a simple conceptual framework. The model is voluntarily stylized and ad-hoc. The interested reader, however, can refer to Fornaro and Romei (2022) for a more structured model delivering similar insights.[2]

There are two equally-sized regions: the United States ($) and the euro area (€). Given its salience to explain the latest inflation cycle, our model fully focuses on the tradable sector. The

[2]See also Bianchi and Coulibaly (2024), which extends the Fornaro and Romei (2022) model to a more general setting. Comin et al. (2023) and Di Giovanni et al. (2023), instead, study the international inflation spillovers during the post-pandemic period using richer frameworks suitable for quantitative analyses.

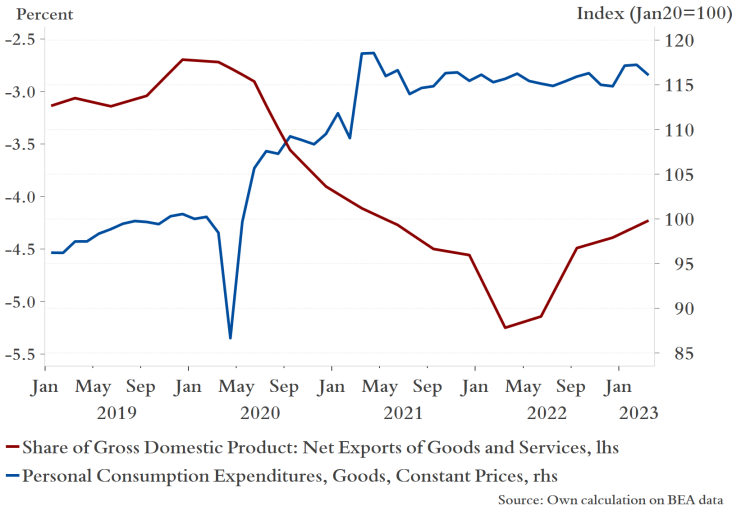

Figure 3: Consumption of manufactured goods and net exports in the United States.

United States is described by three relationships. The first one captures the supply side of the economy

$$P_\$ = \phi Y_\$ + \epsilon_\$. \tag{AS$_\$$}$$

The AS$_\$$ equation is essentially a Phillips curve, meant to summarize the behavior of US firms producing tradable goods. As it is intuitive, a higher price $P_\$$ induces firms to increase their output $Y_\$$. The variable $\epsilon_\$$ encapsulates shifts of the Phillips curve, due to factors such as supply chains disruptions or changes in energy prices.

The parameter $\phi > 0$ determines the slope of our model's Phillips curve. Existing empirical evidence suggests that in advanced economies the Phillips curve is normally quite flat (e.g. Hazell et al. (2022)), which corresponds to a low value of ϕ. Recent evidence by Boehm and Pandalai-Nayar (2022), however, shows that in sectors operating at a high level of capacity utilization the Phillips curve is very steep. Intuitively, once firms get close to their maximum production capacity, further increases in demand are mostly accommodated through price increases.[3] This is exactly the scenario that we are interested in, since during the recovery from the pandemic manufacturing firms were indeed facing extraordinarily high demand for their products. We will thus focus on a high ϕ economy.

The second expression, labeled AD$_\$$, represents the demand side of the economy

$$D_\$ = C_\$ \left(\underbrace{P_\$}_{-}, \underbrace{i_\$}_{-} \right) + G_\$. \tag{AD$_\$$}$$

Aggregate US demand is the sum of private consumption $C_\$$ and government expenditure $G_\$$. A higher price depresses consumers' demand. Moreover, private demand is decreasing in the interest rate $i_\$$, which is the monetary policy instrument set by the Federal Reserve. A higher interest rate,

[3] Fornaro and Romei (2022) and Fornaro (2024) provide theoretical frameworks that build on this effect to study the post-pandemic inflation.

the idea is, discourages households' borrowing to finance consumption.

The final equation takes into account the fact that net exports are equal to the difference between domestic output and domestic demand

$$Y_\$ - D_\$ = NX_\$ \left(\underbrace{S_{\$/€}}_{-}, \underbrace{i_\$ - i_€}_{-} \right), \tag{NX$_\$$}$$

where $S_{\$/€}$ is the dollar/euro exchange rate, defined so that when $S_{\$/€}$ increases the dollar appreciates against the euro. Net exports $NX_\$$ are decreasing in $S_{\$/€}$, that is an appreciation of the dollar worsens the US trade balance. Of course, capital flows are the counterpart of trade imbalances. For instance, a trade deficit ($NX < 0$) is financed with capital inflows. This explains why net exports are decreasing in the interest rate differential $i_\$ - i_€$, where $i_€$ denotes the ECB policy rate. Intuitively, capital tends to go where the return is higher.[4]

The euro area is described by the exact same relationships

$$P_€ = \phi Y_€ + \epsilon_€ \tag{AS$_€$}$$

$$D_€ = C_€ \left(\underbrace{P_€}_{-}, \underbrace{i_€}_{-} \right) + G_€ \tag{AD$_€$}$$

$$Y_€ - D_€ = NX_€ \left(\underbrace{S_{\$/€}}_{+}, \underbrace{i_€ - i_\$}_{-} \right). \tag{NX$_€$}$$

To close the model, we just need to specify the global market clearing condition

$$Y_\$ + Y_€ = D_\$ + D_€, \tag{MK}$$

which ensures that global production of traded goods is equal to global consumption. Finally, the law of one price pins down the euro dollar nominal exchange rate

$$S_{\$/€} = P_€ / P_\$. \tag{ER}$$

Figure 4 shows how the equilibrium is determined in this simple model. Suppose that the world starts from an equilibrium in which both regions produce the same amount of traded goods Y at the same price P. We want to study the reaction of the economy to a US fiscal stimulus ($\uparrow G_\$$), driving up US demand for traded goods.[5] Graphically, this shock is captured by an upward shift of the AD$_\$$ curve to AD$'_\$$.

[4] Gabaix and Maggiori (2015) derive a similar expression for net exports, using a microfounded framework with international financial frictions.

[5] In reality, fiscal transfers - which presumably boosted private consumption of tradables - were a key component of the pandemic fiscal stimulus in the United States (Romer, 2021). For our purposes, however, this distinction is not important.

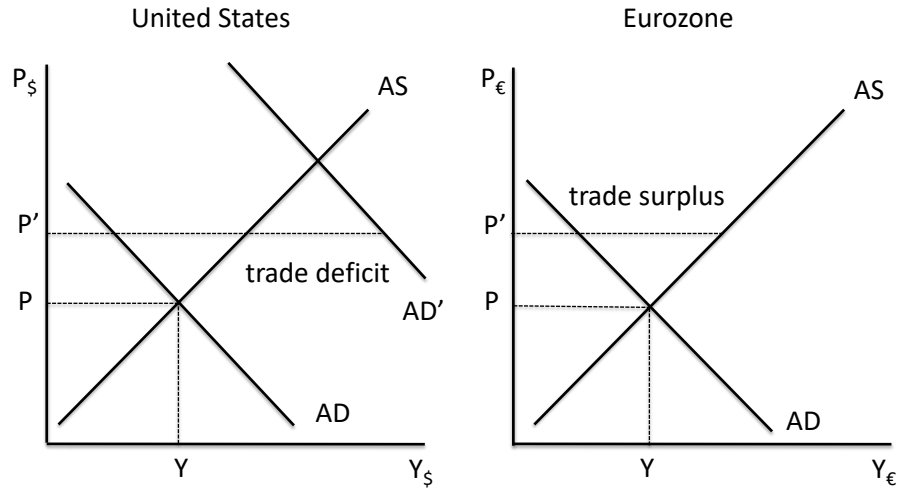

Figure 4: Impact of higher US government expenditure on global inflation.

If the economies were closed, the United States would reach a new equilibrium corresponding to the intersection of the $AS_{\$}$ and $AD'_{\$}$ schedules. High demand would trigger a large rise in inflation, and some increase in the domestic production of traded goods. Nothing would happen in the euro area, i.e. there would be no international spillovers.

But we live in a world in which economies are quite open, both in terms of trade and capital flows. In this case, the US fiscal expansion moves the world to the equilibrium corresponding to the price P'. First, compared to a counterfactual closed economy, the rise in US inflation is milder. The rationale is that the increase in US demand is now spread over a larger number of firms, since European firms can export their production to the United States. It then make sense that prices will rise by less. At the same time, as a consequence of the fiscal stimulus, the United States develops an imbalance between domestic production and consumption of traded goods, which results in a trade deficit. This trade deficit, in fact, is precisely what contains the rise in US inflation.[6]

Moreover, the US fiscal stimulus now affects the rest of the world. Facing higher global demand, European firms increase their prices. Through this channel, the US fiscal expansion causes a rise in inflation in the euro area. Moreover, higher prices induce European households to cut back on their consumption. Because of this effect, the euro area develops a trade surplus. The euro area thus starts exporting goods to the United States, but importing inflation from them. In doing so, it ends up having a bad combination of high inflation and low consumption. Though here we do not model this effect explicitly, lower consumption of traded goods is likely to drag down demand for domestic non-traded goods. Through this channel, imported inflation in the euro area will also result in lower economic activity in non-traded sectors (Fornaro and Romei, 2022).

Let us now turn to a different type of shock. Russia's invasion of Ukraine triggered a sharp rise in energy prices in European countries. In fact, as shown in Figure 1, energy prices were a

[6] A similar point was made by Sachs (1985) in the context of the trade deficits developed by the United States during the 1980s disinflation. We will get back to this at the end of the chapter.

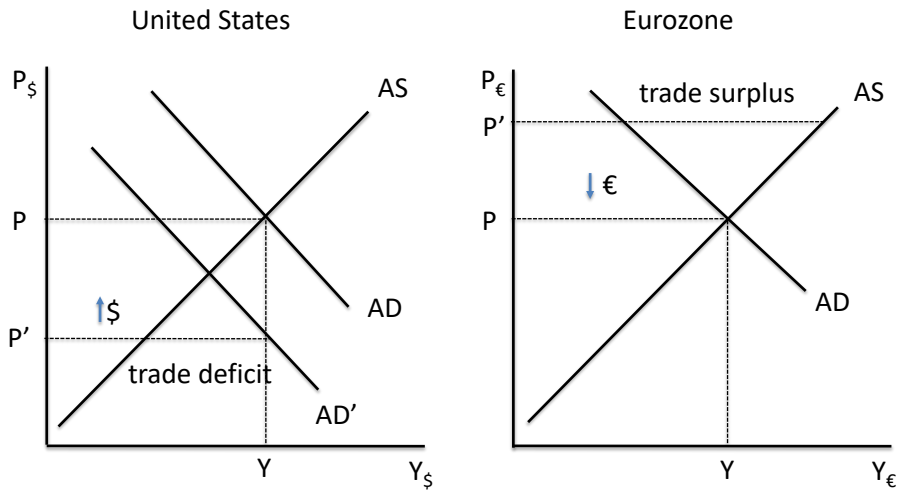

Figure 5: Impact of US monetary tightening.

particularly strong contributor to high inflation in the euro area. In our simple framework, this shock can be captured with an adverse shift of the euro area Phillips curve ($\uparrow \epsilon_{€}$). The idea is that high energy prices increase production costs for European manufacturers.

The impact of this energy shock on the global economy is easy to trace. Higher energy prices cause a leftward shift of the $AS_{€}$ schedule, leading to a combination of high inflation and low output in the euro area. Facing lower supply by domestic firms, European consumers satisfy part of their demand through an increase in imports from the United States. The euro area thus develops a trade deficit. In turn, US firms react to the higher demand by increasing prices, leading to a drop in consumption and a trade balance surplus in the United States. So it is now the United States' turn to export goods and import inflation from the euro area.

4 International monetary spillovers and gains from cooperation

Starting from 2022, central banks throughout the world reacted to the inflation outburst by engaging in a synchronized monetary tightening. What are the international spillovers caused by these monetary interventions? Is there a rationale for international monetary cooperation? These are the questions to which we turn next.

Let us, once again, assume that the United States and the euro area start from an equilibrium with equal output and inflation. But now imagine that the Federal Reserve tightens monetary policy ($\uparrow i_{\$}$) to reduce inflation. As shown in Figure 5, a higher interest rate induces US households to cut back consumption, causing a leftward shift of the aggregate demand schedule from $AD_{\$}$ to $AD'_{\$}$. The result is a reduction in output and prices by US firms. This is the standard transmission channel of monetary policy, linking domestic demand to domestic inflation. In a counterfactual closed economy, the United States would reach a new equilibrium corresponding to the intersection of the $AS_{\$}$ and $AD'_{\$}$ schedules, and the US monetary tightening would not have any effect on the euro area.

In open economies, however, there is an additional transmission channel of monetary policy. Following the Fed tightening, capital flows toward the United States chasing the now higher dollar interest rate. Capital inflows cause an appreciation of the dollar, which further moderates inflation in the United States. Moreover, capital inflows allow the United States to run trade deficits, mitigating the impact of the monetary tightening on US consumption. Hence, the capital flows channel of monetary policy increases the appeal of a disinflation, since it amplifies the impact of the policy rate hike on inflation, and mitigates its effect on consumption.

To put it in other terms, the capital flows channel reduces the sacrifice ratio associated with a disinflation. Strictly speaking, in our simple model the sacrifice ratio is framed in terms of the tradable consumption loss associated with a disinflation. However, for the reasons spelled out above, if we were to add a non-traded sector to the model the capital flows channel of monetary policy would also reduce the impact of a disinflation on domestic output and employment (Fornaro and Romei, 2022).

But there is a catch. The natural counterpart of a stronger dollar is a depreciation of the euro. As a consequence of the depreciation, inflation in the euro area rises. Higher prices, moreover, lead European households to reduce their consumption. The result is a euro area trade surplus. Through this channel, a monetary tightening originating from the United States causes a rise in inflation and a drop in consumption in the euro area. So the low sacrifice ratio for the United States comes at the expenses of imported inflation in the euro area.

Of course, the ECB will have an incentive to retaliate, that is to hike its policy rate to reduce domestic inflation. In doing so, the euro area will export inflation to the United States, perhaps triggering another monetary tightening by the Fed. These dynamics may lead to a situation in which central banks engage in competitive appreciations, or reverse currency wars. In this scenario, every central bank tries to appreciate its exchange rate and attract capital inflows in order to disinflate its own economy at the expenses of higher inflation in the rest of the world.

Competitive appreciations look very much like a rat race. If all the central banks tighten monetary policy contemporaneously, in fact, the effect on exchange rates and capital flows washes out. As highlighted by Frankel (2022) and Obstfeld (2022), the risk is that central banks may end up hiking their policy rates too much, causing an excessive global slump. The idea goes like this. Each national central bank perceives that tightening to disinflate is not too painful, because of the capital flows channel of monetary policy. But when the monetary tightening is synchronized internationally, the capital flows channel does not operate. Disinflating is thus more costly than what individual central banks perceive. In the end, the problem is that national central banks do not have an incentive to internalize the inflation spillovers that monetary tightenings impose on the rest of the world.

This logic implies that, in times of high global inflation, national central banks may fall into a coordination trap. Collectively, national monetary authorities would like to avoid an excessive global slump. However, absent some institution fostering international cooperation, the desire to competitively appreciate the exchange rate and attract capital inflows may induce national central

banks to tighten too much compared to the global optimum. International monetary cooperation may thus be useful during periods of high global inflationary pressures, to prevent central banks from causing an unnecessarily harsh global slump.

5 A brief historical retrospective

Looking at the latest inflation cycle, it seems that the world may have escaped the risk of competitive appreciations. At the time of writing, indeed, inflation is moderating without any apparent slowdown in economic activity. While time will tell how the post-pandemic inflation outburst will end, we find useful to place our insights about the gains from international cooperation in historical context.

Let us start from the 1970s, a period characterized by high global inflation. While the differences are important, this episode shares some similarities with the Covid-19 pandemic. In both cases, for instance, the relative price of goods versus services increased sharply, signaling a global scarcity of traded goods. In the case of the 1970s, the likely drivers of this scarcity were the two oil shocks of 1973 and 1979, as well as shortages in other commodity markets, which reduced productivity in the manufacturing sector (Bruno, 1984). Moreover, also back then the inflation cycle ended with a global monetary tightening, implemented during the early 1980s.

One important difference between the two episodes is that the global monetary tightening of the early 1980s was followed by a deep global slump. Perhaps because of this, the 1980s disinflation triggered a heated policy debate about the international spillovers caused by monetary and fiscal policy interventions. This debate centered around the impact of the US disinflation, which was achieved through a combination of tight monetary and loose fiscal policy, on the rest of the world (Sachs, 1985; Frankel, 2016).

The US disinflation started with a sharp monetary contraction in the early 1980s, associated with Paul Volcker's nomination as chair of the Federal Reserve.[7] Figure 6 shows that, just like what our simple model would predict, the monetary contraction was associated with a sharp appreciation of the dollar and the widening of the US trade deficits. As argued by Sachs (1985), loose fiscal policy by the Reagan administration likely amplified both the dollar appreciation and the US trade imbalances.

Other industrial countries complained vigorously (Frankel, 2015). Their logic was that the US policy mix was a source of global inflationary pressures, forcing them to tighten monetary policy in order to limit the depreciation of their currencies and the passthrough to domestic inflation. These are the same considerations emphasized by the simple framework that we used in this chapter. The disinflation of the 1980s thus strikes us as a historical example of competitive appreciations.[8]

[7] The narrative analysis conducted by Romer and Romer (2023) points toward two contractionary monetary shocks under Volcker's tenure: October 1979 and May 1981.

[8] The 1992 crisis of the Exchange Rate Mechanism may be another examples of these dynamics. Back then, Germany adjusted to the reunification shock by engaging in a mix of loose fiscal and tight monetary policy. Buiter et al. (2001) suggest that this policy mix ended up exporting inflation to other members of the Exchange Rate Mechanism.

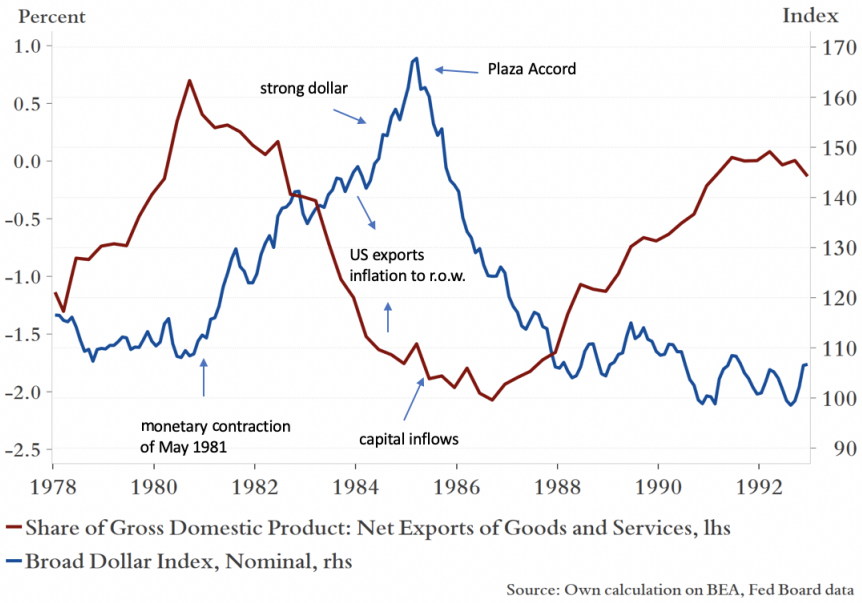

Figure 6: International aspects of the 1980s US disinflation.

Monetary cooperation, perhaps, could have helped to moderate the global economic slump which accompanied the disinflation.[9]

We would like to conclude by spending a few words on two historical episodes associated with a radically different kind of cooperation problem: the Great Depression of the 1930s and the Great Recession of the 2010s. During these periods, the concern was that countries would engage in competitive depreciations. This happens when national governments intervene to devalue their exchange rates, in order to boost domestic employment by attracting a higher share of global demand. This looks very much like the opposite concern, compared to the competitive appreciations that we emphasized in the previous section. But this difference makes perfect sense, once one realizes that the 1930s and 2010s were periods characterized by weak global demand for tradables and low inflation, rather than by scarcity of supply and excessive inflation. It is only natural then that the cooperation problem gets reversed.

Moreover, Eichengreen and Sachs (1985, 1986) have argued, in our view persuasively, that concerns of competitive depreciations during times of weak global demand may be overblown. In the end, the solution to periods of insufficient global demand is stronger monetary stimulus. So if national governments attempt to depreciate their exchange rate through expansionary monetary interventions, the result may very well be a faster global recovery.[10]

During times of weak global demand cooperation problems may be more salient for fiscal policy, as we discuss in Fornaro and Romei (2019). To see the logic behind this claim, think of a scenario in which global output and inflation are undesirably low. Against this background,

[9] In fact, eventually an agreement was reached to coordinate an international intervention to bring the value of the dollar down, the Plaza accord (Frankel, 2015). But this agreement came in 1985, so after the bulk of the disinflation had already taken place.

[10] Bouscasse (2023) provides some empirical evidence in support of this hypothesis, while Fornaro (2018) shows that holding exchange rates fixed during periods of global financial turmoil may amplify the drop in world output.

imagine that national governments implement a fiscal austerity program, perhaps because they are worried about the sustainability of their public debt (Romer and Romer, 2019). In open economies, a fiscal contraction not only depresses domestic economic activity, but also global demand and output in the rest of the world. Fiscal contractions thus generate disinflationary international spillovers, exacerbating the inefficiently low global demand. But national governments do not have an incentive to internalize these spillovers, and so they may engage in fiscal contractions which are excessive from the point of view of global welfare. This reasoning suggests that in times of weak global demand the focus of international cooperation should be on fiscal policy.

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