Inflation Shocks and Disinflation: Stylised Facts from the Past 50 Years*

Balázs Spéder – Balázs Vonnák

In our study, we examine the circumstances under which major inflation shocks lead to persistently high inflation. For our analysis, we use macroeconomic data from a broad sample of countries for the past fifty years or more. We identify several cases where inflation rises from the single-digit range to above 20 per cent, followed by successful disinflation within two years. Similarly, there are many examples where inflation remains high after an initial shock. The former cases are characterised by more pronounced increases in interest rates during inflation shocks, more disciplined fiscal policy and favourable commodity price developments. Examining the same sample, we also show that the disinflation after a period of persistently high inflation was not typically accompanied by a significant slowdown in the real economy and instead was often followed by higher economic growth. In the disinflationary episodes we identified, the size of the real cost of disinflation is negatively correlated with the central bank independence, suggesting that a disinflationary commitment played a positive role.

Journal of Economic Literature (JEL) codes: E31, E63, N10

Keywords: inflation, stabilisation, monetary policy, central bank independence

1. Introduction

By the end of 2022, global inflation had risen to unprecedented levels as a result of successive shocks, with annual rates exceeding 10 per cent in nearly half of the world's countries and more than three quarters of the world's countries showing inflation rates above 5 per cent (*Figure 1, left panel*). Over the past half century, there were several periods when inflation caused a global problem (*Figure 1, right panel*). In the 1970s, inflation came in several waves. As a result of the two oil price shocks during that decade, inflation rose to double digits in most economies between 1973–1975 and 1979–1982. With the end of the Cold War

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

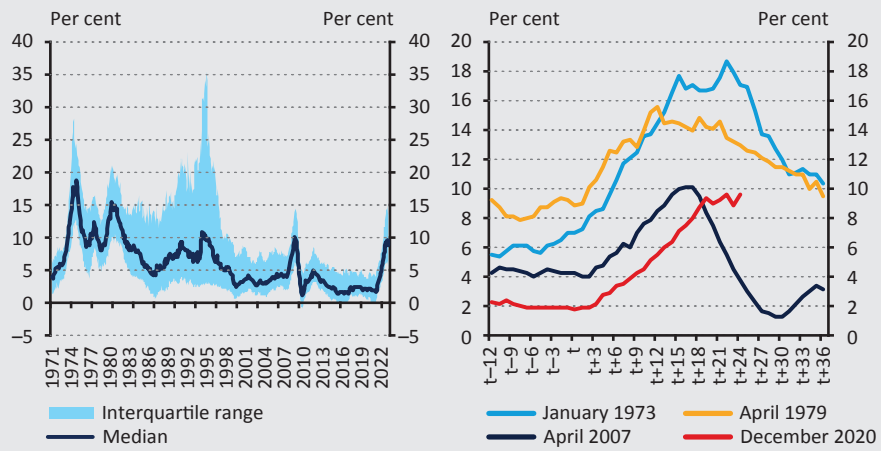
Balázs Spéder: Magyar Nemzeti Bank, Head of Department; John Von Neumann University, Lecturer; University of Pécs, PhD Student. Email: spederb@mnb.hu
Balázs Vonnák: Magyar Nemzeti Bank, Senior Education and Research Expert; John Von Neumann University, Associate Professor. Email: vonnakb@mnb.hu

The first version of the Hungarian manuscript was received on 28 June 2023.

DOI: https://doi.org/10.33893/FER.22.3.26

and the transition from the socialist central planning system to a market economy, accelerating inflation occurred in many countries around the world in the first half of the 1990s, but it remained limited in geographical scope. The economic growth before the global crisis of 2008–2009 was also accompanied by a substantial rise in inflation and, for many countries, double-digit price index increases.

Figure 1
Evolution of global year-on-year inflation 1971–2022 at monthly frequency: quartiles over the whole time horizon (left panel) and medians around major global inflation periods (right panel)



Note: The panel on the right shows the courses of the four largest inflation shocks shown in the panel on the left. The start dates of these shocks (t) were considered as January 1973, April 1979, April 2007 and December 2020.

Source: Based on World Bank data

Today, inflation is persistently stuck above the target and is once again posing a major monetary policy challenge for the world's central banks. It has become a key question whether the shocks of recent years are causing temporary or permanent inflationary pressures. A summary of the experience of past inflation shocks can help answer this question.

In our study, we use a database of data from 201 countries from 1970 to 2022 to investigate the macroeconomic conditions under which inflation rose to high levels and in which cases disinflation occurred. A distinction is made between temporary surges in inflation and inflation dynamics that remain high over the longer term. We examine the relationship between high inflation and growth, and the evolution of output during disinflation. Finally, we turn to the issue of central bank credibility and independence.

Over the past half century or so, there were a number of successful and unsuccessful episodes of disinflation after major inflation shocks. Successful cases of disinflation are usually characterised by a tighter economic policy stance and more favourable commodity price developments. In these cases, economic growth did not typically slow down in the two years following the shock, in contrast to the episodes where inflation remained high. The latter has also proven to be true in general, not only in the case of quick breaks of inflation shocks: disinflation after periods of persistently high inflation was "painless" in most cases.

Our research, which is essentially a collection of stylised facts rather than a causal analysis, connects to the literature on inflation spanning several decades from a number of directions: high inflation and its stabilisation, the real cost of stabilisations, and the role of the central bank in stabilisation are all relevant to our analysis.

Research so far is divided on the impact of stabilisation on the real economy. The classic articles by *Sargent* (*1982*) and *Dornbusch – Fischer* (*1986*), using the European hyperinflation episodes of the 1920s and 1940s, argue that under rational expectations there is no real cost of the stabilisation. Sargent's earlier argument is confirmed by *Kiguel – Liviatan* (*1988, 1992a*) with examples from Latin American countries and by V*égh* (*1995*) with examples from several other countries. They stress, however, that the periods of hyperinflation have special characteristics and that the real impact of the stabilisation of high or even chronic inflation crises is estimated to be substantially negative. *Taylor* (*1979*) and *Fischer* (*1988*) argue that the real costs of inflation may be the result of past price and wage indexing fiscal policies and of not credible policy commitment. In the Hungarian literature, *Darvas* (*1999*) carries out similar analyses using selected European countries as examples. *Reinhart – Végh* (*1994*) go further and compare exchange rate and money-based stabilisation and find that exchange rate-based stabilisation attempts lead to a boom in the economy first and a slowdown later, while money-based stabilisation attempts lead to a recession first and a recovery later. Examining the disinflation periods of 19 developed countries between 1960 and 1990, *Ball* (*1994*) finds that the so-called sacrifice ratio, i.e. the ratio of the cumulative GDP loss during disinflation to the decline in trend inflation, is positive in almost all cases and mostly significant. In contrast, *Easterly* (*1996*) and *Bruno – Easterly* (*1998*), examining high (over 40 per cent) inflation periods between 1961–1994, find no trade-off in the "recession now or later" question: their results show that high-inflation periods are associated with low growth, while inflation stabilisation is associated with high growth, i.e. they find a negative sacrifice ratio. A part of the literature estimates the sacrifice ratio using structural VAR models, such as *Cecchetti – Rich* (*2001*) for the United States in the 1959–1997 period and *Durand et al.* (*2008*) for the euro area in 1972–2003. Their results show that reducing inflation leads to a loss for the real economy. *Katayama et al.* (*2019*) also specify that the longer the duration of the disinflation

process, the higher the sacrifice ratio. The comparability of structural VAR models with our results is limited, since we do not specify what causes the disinflation. More recently, *Tetlow* (*2022*), using Bayesian averaging to evaluate the results of 40 models, finds that the sacrifice ratio is positive and, additionally, increasing in time. The underlying reasons of these real economic effects of inflation crises stabilisation are largely absent in the literature.

As the most important components of stabilisation programmes, the literature pays particular attention to the role of monetary and fiscal policy. *Bruno – Fischer* (*1990*), *Kiguel – Neumeyer* (*1995*) and *Fischer et al.* (*2002*) stress the role of seigniorage, i.e. the monetary financing of fiscal deficits in the case of chronic inflation, and highlight the role of fiscal consolidation in the success of stabilisation. Similarly, *Dornbusch et al.* (*1990*) and *Sargent et al.* (*2009*) highlight the need for fiscal consolidation in stabilisation. *Dornbusch – Fischer* (*1993*) stress the importance of abolishing backward-looking wage indexation as a key to breaking the wage-price spiral in the context of a sustained reduction of moderately high inflation rates of between 15–50 per cent. The importance of the exchange rate as a credible nominal anchor is also stressed by *Kiguel – Liviatan* (*1992b*) and *Végh* (*1995*), who argue that exchange rate-based stabilisations are associated with minimal output reduction. *Fischer et al.* (*2002*) find that exchange rate stabilisations are expansive. The role of the inflation targeting system in inflation developments is presented in *Ábel et al*. (*2014*). According to *Fraga et al.* (*2003*), the introduction of inflation targeting significantly contributed to the inflation stabilisation of emerging market economies, while *Driffill – Miller* (*1993*) highlight the introduction of the ERM exchange rate regime in the inflation convergence of European countries, and *Kremers* (*1990*) shows the role of the EMS design specifically in the inflation stabilisation of Ireland. *Garber* (*1981*) emphasises, in the context of large external shocks, the elimination of centrally distorted allocations and the normalisation of intersectoral allocation with reducing the role of the state in it. *Bareith – Varga* (*2022*) use the example of Hungary to show how the introduction of inflation targeting has had an impact on reducing core inflation, while the volume of papers edited by *Cottarelli and Szapáry* (*1998*) discusses the disinflation experiences of the transition countries of Central and Eastern Europe.

Finally, our paper joins the literature on the relationship between inflation stabilisation and central bank credibility. *Sargent* (*1981*) emphasises the commitment and credibility of policymakers in reducing high inflation, while later *Sargent* (*1982*) emphasises the establishment of an independent central bank in stopping hyperinflation. In his model of strong central bankers focusing only on inflation and weak central bankers focusing more on unemployment than inflation, *Ball* (*1995*) shows that only a strong central banker can reduce persistently high inflation. If there is no credible commitment from policymakers, attempts to bring down inflation will fail. *Goodfriend – King* (*2005*) examine the role and credibility of *Paul*

Volcker in the great US disinflation of the 1970s–1980s, while *Nelson* (*2005*), based on the 1970s inflation experiences, highlights strong policymakers as a precondition for credibility and stabilisation. According to the analysis of *Végh* (*1995*), in the case of a lack of credible policymaker commitment, the exchange rate as a nominal anchor is not sufficient and other fiscal anchors are needed to break down chronic inflation. Most recently, *Borio et al.* (*2023*) investigate the dual regime – low or high – nature of inflation. They show that the two regimes differ substantially not only in the average level of inflation, but also in its dynamics: in the high regime, inflation loses its "self-stabilising" character. They point out that early preventive action by the monetary authority is the only way to prevent a shift to a high regime and sticking there. Similar to credibility, *Jácome – Pienknagura* (*2022*) analyse the role of central bank independence and find that central bank independence was a necessary condition for the disinflationary processes in Latin America.

Our analysis contributes to the literature in several ways. On the one hand, we systematically examine past cases similar to the current inflation shock and show the differences in the main macro-variables between successful and unsuccessful disinflationary cases. On the other hand, we analyse the costs of disinflation on a larger database than the studies mentioned above, which includes the experience of the 21st century as well. Finally, the non-linear relationship between the evolution of GDP growth in disinflationary episodes and the relationship between central bank independence and cost-push shocks is demonstrated.

Section 2 of the study describes the data used and the analytical framework chosen. In *Section 3* the characteristics of successful and unsuccessful disinflation from one-off inflation shocks are described. In *Section 4*, we present stylised facts related to the stabilisation of moderately high inflation episodes and discuss the role of central bank independence.

2. Data and methodology

In our analysis, we basically consider the 20 per cent inflation level as the lower limit for moderately high inflation dynamics. *Dornbusch – Fischer* (*1993*) consider inflation dynamics between 15 and 30 per cent to be moderately high, while *Easterly* (*1996*) and *Bruno – Easterly* (*1998*) draw the line at 40 per cent for high inflation. As different levels are considered high in different countries in the light of the tolerance of society, *Végh* (*1995*) defines chronic inflation as being above 20–40 per cent for several years.

Our analysis is based on the World Bank's global inflation database, published for most countries in the world between 1970 and 2022[1] (*Ha et al. 2021*). In our study,

[1] https://www.worldbank.org/en/research/brief/inflation-database

we use the annual average inflation rate – this is consistent with the literature. The database contains annual inflation time series of various length for 201 countries. We note that it would be possible to look at the December annual index of a given year, as in the *Bruno – Easterly* (*1998*) study, but then we would have fewer observations due to the limited availability of monthly time series.

The performance of real economy is identified by the growth rate of real GDP from the World Bank's World Development Indicators database.[2] The fiscal variables, such as the government debt-to-GDP ratio and the fiscal balance, were extracted from the same World Bank database, as well as from *Ali Abbas et al.* (*2011*) and *Mauro et al.* (*2015*). The data series for short-term interest rates are based on the BIS database[3] and the IMF's International Financial Statistics database.[4] Data for unemployment and exchange rates against the US dollar are based on the Penn World Table,[5] while for more recent periods they are based on Bloomberg data (*Feenstra et al. 2015*). Global commodity price trends are captured by the unweighted average of three sub-indices (energy, non-energy and precious metals) from "The Pink Sheet" commodity price index of the World Bank.[6]

In our analysis in *Section 3*, we aim to identify periods of high inflation and to track the evolution of other macroeconomic variables besides inflation. Using data from the past 50 years, we focus on countries and periods where and when inflation started from a level below 10 per cent and rose relatively quickly to a high level of over 20 per cent. For these episodes, we present the distribution of the evolution of the main macro-variables (median and quartiles) in successful and unsuccessful disinflation cases. In *Section 4*, we examine disinflation episodes after inflation was above 20 per cent for at least two years and their impact on real GDP growth rates, also based on the quartiles of the distributions.

It is important to emphasise that in our paper we do not seek to identify causal relationships between inflation stabilisation and real growth, nor between the real cost of stabilisation and central bank independence. We do not delve deeper into the causes of inflation surges, which can be increases due to cost-push shocks in the energy markets, price liberalisation or even sudden depreciations of local currencies. Similarly, we do not investigate whether the episodes of disinflation were the result of deliberate economic policy actions or simply of favourable exogenous developments. For these reasons, the figures and stylised facts presented below can be interpreted as correlations, preferably, and in our analysis we aim to provide a narrative description of the joint evolution of these variables. Nevertheless, we

[2] https://databank.worldbank.org/source/world-development-indicators
[3] https://www.bis.org/statistics/cbpol.htm
[4] https://data.imf.org/ifs
[5] https://www.rug.nl/ggdc/productivity/pwt/?lang=en
[6] https://www.worldbank.org/en/research/commodity-markets

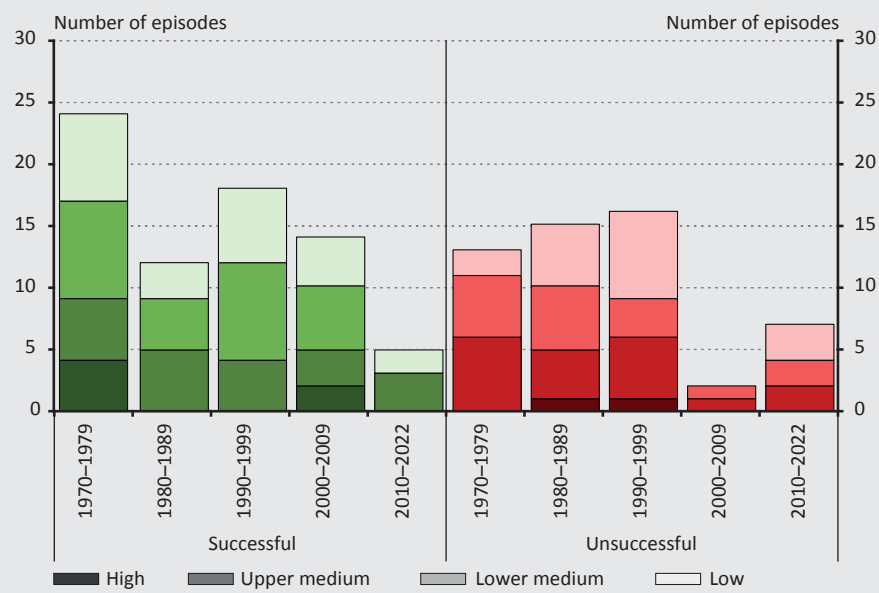
believe that the stylised facts we have found can be informative for economic policymaking as well.

3. Successful and unsuccessful disinflation after major inflation shocks

In the following, we look at episodes where average annual inflation rose above 20 per cent while it was below 20 per cent in the previous year and below 10 per cent in the year before. In some cases, a rapid correction followed, and inflation fell back to the single-digit range. In many cases, however, inflation stabilised at persistently high levels. Successful countries are defined as those where inflation fell below 10 per cent in the second year after a spike in inflation, while the unsuccessful episodes are defined as those where inflation remained above 20 per cent in the second year after a spike in inflation.

There were 73 successful episodes and 53 unsuccessful episodes from 1971 to 2022. There were 40 cases that did not fall into either of these groups (in these cases inflation ranged between 10 and 20 per cent), so they will be excluded from the rest of the analysis. Of the successful episodes, 40 per cent occurred in the early 1970s or in 2008, coinciding with global inflation peaks followed by a global disinflation phase (*Figure 2*). Of the unsuccessful cases, 28 per cent are concentrated in the early 1990s, while the distribution is even between 1970 and 1990.

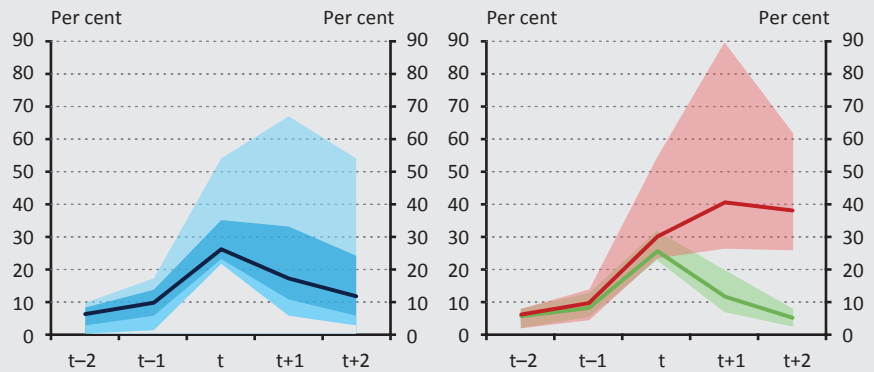
Figure 2
Time distribution of inflation episodes above 20 per cent by income level of countries in 2021 classified by the World Bank



Source: Based on World Bank data

Looking at the annual averages, of the episodes identified as a period of high inflation, inflation fell below 10 per cent in the year following the surge in one quarter of the episodes, while over a two-year horizon it was in the single-digit range in 44 per cent of the episodes (*Figure 3, left panel*). In the cases when inflation remained above 20 per cent, the dispersion is significant. In these unsuccessful cases, the surge in inflation was typically followed by a further rise a year later, and in half of the cases the rate stabilised above 40 per cent (*Figure 3, right panel*).

Figure 3
Inflation episodes above 20 per cent: all episodes (left panel), successful and unsuccessful disinflation episodes (right panel)

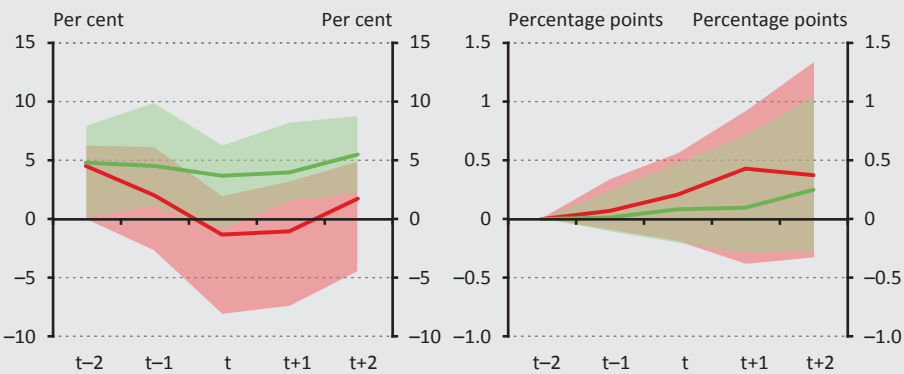


Note: The limits of the bands are the 10th, 25th, 75th and 90th percentiles in the left panel and the 25th and 75th percentiles in the right panel. The solid line is the 50th percentile (median). Green: successful cases; red: unsuccessful cases.

Source: Based on World Bank data

Looking at the performance of the real economy in the successful and unsuccessful episodes, there is a marked difference. In the successful cases, there is no significant change in the growth rate of real GDP either before or after the inflation surge. By contrast, in the high-inflation episodes, economies were already in a slowdown before the surge, and GDP shrank in the year of the surge and thereafter in most episodes (*Figure 4, left panel*). However, there is no significant difference in employment between the two groups, although the median value is slightly more favourable for the unsuccessful cases (*Figure 4, right panel*). This is in line with the results of *Bruno – Easterly* (*1998*), who found that the rebound in growth after disinflation is driven by an increase in total factor productivity.

Figure 4
Annual growth in real GDP (left panel) and employment compared to the second year before the surge in inflation (right panel) in successful and unsuccessful disinflation episodes



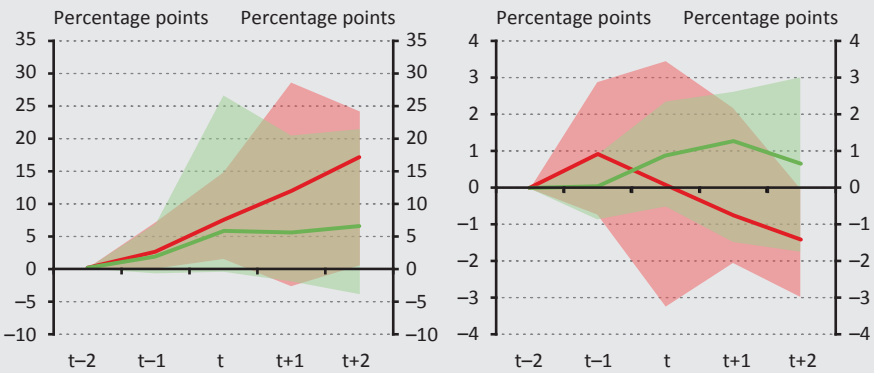
Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median). Green: successful cases; red: unsuccessful cases.

Source: Based on World Bank, Penn World Table and Bloomberg data

The government debt-to-GDP ratio rises similarly in both groups, typically by around 5–7 percentage points, in the period before the surge in inflation (*Figure 5, left panel*). In the years following high inflation, this rise stops in the successful cases, but continues in the unsuccessful cases, with the median increase exceeding 17 percentage points two years later. In the successful group, the fiscal balance typically improves already in the year of the surge in inflation to high levels, and this improvement is sustained (*Figure 5, right panel*). By contrast, in cases of unsuccessful disinflation, the fiscal balance deteriorates significantly from the onset of the surge in inflation, leading to a significant increase in the debt-to-GDP ratio – even relative to the group of countries that successfully disinflated. However, it is important to note, that the difference in the distributions of the two indicators is less significant than in the case of GDP growth and inflation.

Short-term interest rates, which essentially reflect the monetary policy stance, increased in both groups (*Figure 6*). In the successful cases of disinflation, interest rates rose more in the year before the high inflation level was reached and then fell slightly in the disinflation phase. For the unsuccessful countries, short rates continued to rise also in the two years after the surge in inflation. It should be noted, however, that appropriate interest rate data are only available for a limited number of the countries studied, and thus there is considerable uncertainty surrounding this result.

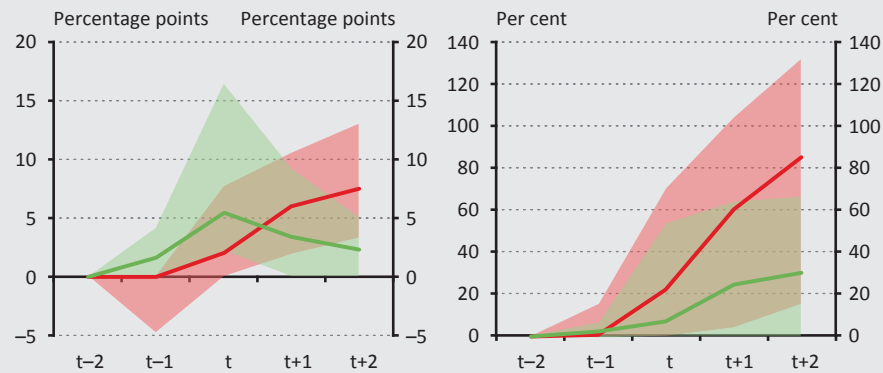
Figure 5
Percentage point change in government debt-to-GDP ratio (left panel) and fiscal balance (right panel) in successful and unsuccessful disinflation episodes compared to the second year before the surge in inflation



Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median). Green: successful cases; red: unsuccessful cases.

Source: Based on World Bank, Ali Abbas et al. (2011) and Mauro et al. (2015) data

Figure 6
Percentage point change in short-term interest rates (left panel) and percentual depreciation of the exchange rate against the dollar (right panel) relative to the second year before the surge in inflation in successful and unsuccessful disinflation episodes



Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median). Green: successful cases; red: unsuccessful cases.

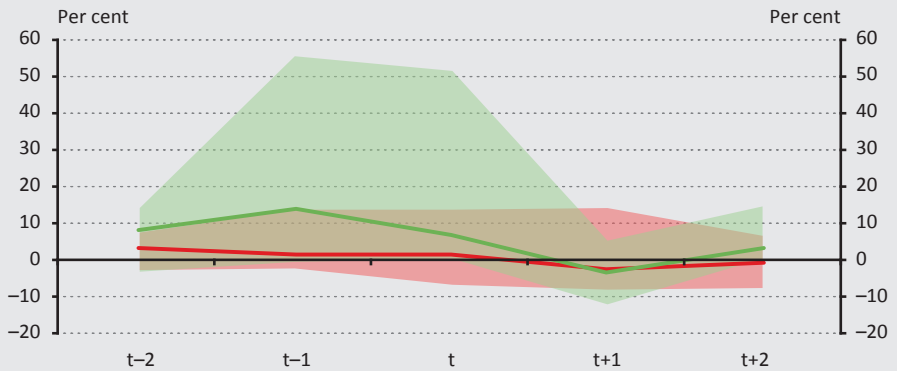
Source: Based on BIS, IMF IFS, Penn World Table and Bloomberg data

The exchange rate depreciated in practically all of the countries surveyed. The depreciation was much larger in the unsuccessful cases than in the successful ones, with the median value of the exchange rate against the US dollar falling by nearly 90 per cent in the former and by 30 per cent in the latter by the end of the period. This is consistent with the literature on exchange rate-based inflation stabilisation: the choice of the exchange rate as a credible nominal anchor leads to less depreciation of the domestic currency in successful cases.

As mentioned earlier, the case study approach we use is not directly suitable for identifying causal relationships. Although we found that earlier interest rate hikes and more disciplined fiscal policy tend to characterise successful disinflation cases, we cannot be sure that they are actually the cause. For example, the global inflationary period immediately preceding the financial crisis was overwhelmingly followed by successful episodes of disinflation (*Figure 2*), but during the global recession that accompanied the crisis, most countries did not need especially restrictive economic policy to bring inflation back down to low levels.

The importance of exogenous, global effects can be illustrated by comparing the evolution of commodity prices during successful and unsuccessful episodes of disinflation. The *right panel of Figure 1* illustrates that commodity price shocks played a dominant role in the development of the four global inflation waves. Indeed, the episodes of successful disinflations were characterised by initially high commodity inflation, especially in the year before the inflation peak, when the median was 14 per cent and the top quartile was 56 per cent (*Figure 7*). In the peak year, the rate of increase in commodity prices typically slows down and in the following year it starts to decline. It can be inferred that the improving trend in global commodity prices played a role in many of the successful disinflationary cases. Although there is an improvement in the year after the inflation peak in the unsuccessful cases as well, it is not nearly as large as in the successful cases. On the whole, while in most of the successful episodes cost-push shocks played an important role both in the surge and in the subsequent moderation of inflation, in cases where inflation was stuck at a high level, their role was typically secondary.

Figure 7
Annual growth rates of global commodity prices during successful and unsuccessful cases of disinflation



Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median). Green: successful cases; red: unsuccessful cases.

Source: Based on World Bank data

4. The cost of disinflation

In the previous section, we showed that inflation that rises from an initially low level often gets stuck in a high range. The initial surge was often caused by a (global) cost-push shock, such as the oil price shocks of the 1970s. The current wave of inflation is also partly driven by supply-side effects, such as disruptions in supply chains, as well as energy and food price shocks. The direct effect of such shocks is a change in relative prices, which, even if it causes inflation, should only be temporary. But how can high inflation persist after a one-off shock, or in other words, how can a sustained rise in *price levels* lead to a persistent rise in *inflation*?

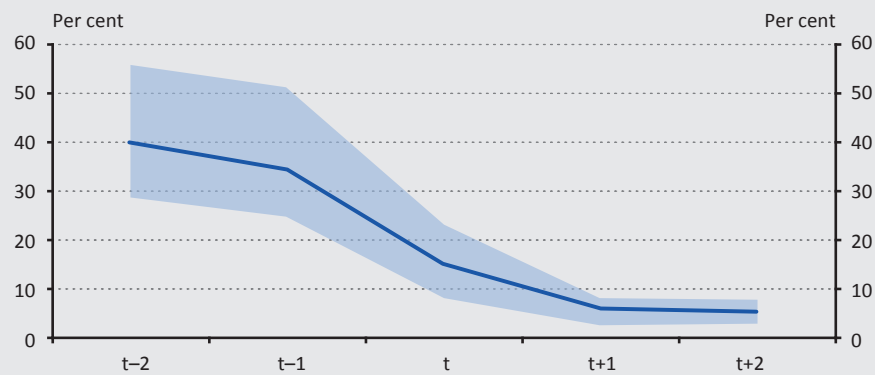
One possible explanation is that inflation expectations are adaptive, i.e. economic agents formulate their expectations for the future based on past inflation. In this case, it is irrelevant what causes inflation and whether this factor results in permanent or temporary inflationary pressures. The automatic rise in expectations may create a situation in which the central bank will have to consider whether to allow inflation to stagnate or to try to lower it. In the case of adaptive expectations, this may imply significant real economy costs.

Another possible explanation is wage indexation. If indexation is typical in the economy, i.e. prices and wages are set using past inflation rates, this has an effect similar to adaptive expectations. Although in this case expectations are not necessarily adaptive, the real economy cost of disinflation can be significant.

Ball (*1995*) shows the possibility that high inflation can persist without indexation under rational expectations. In his model, after an initial inflation shock, if the policymaker deems the potential real economy costs of disinflation too costly, it leads to inflation being locked in at a high level, and only a painful tightening can later restore price stability.

We now examine whether disinflation after periods of moderate inflation has a detectable effect on the path of GDP. In line with the stylised facts in *Section 3*, we look at the period 1970–2022. The year of disinflation (*t*) is defined so that the average annual inflation rate is above 20 per cent in *t*–2 and *t*–1 and below 10 per cent in *t*+1 and *t*+2.

Figure 8
Evolution of annual inflation in disinflation episodes from above 20 per cent to below 10 per cent



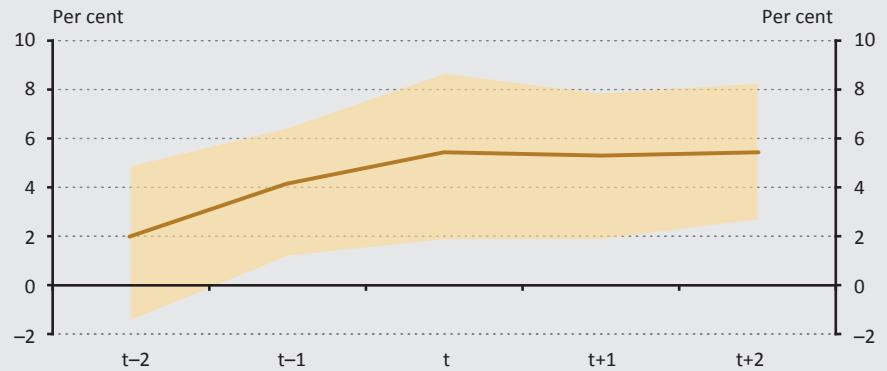
Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median).

Source: Based on World Bank data

Our sample contains 65 such cases, two thirds of which (44 cases) occurred in the two decades between 1990 and 2009. The median of the annual inflation rates is 40 per cent in the second year before disinflation, falling to 5 per cent in the second year after disinflation starts (*Figure 8*). The distributions suggest that the disinflation process typically starts earlier, and only a decline from above 20 per

cent to below 10 per cent takes place from year *t*–1 to year *t*+1. In the low inflation period (between *t*+1 and *t*+2), inflation no longer falls significantly.

Figure 9
Evolution of GDP growth in cases of disinflation from above 20 per cent to below 10 per cent



Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median).
Source: Based on World Bank data

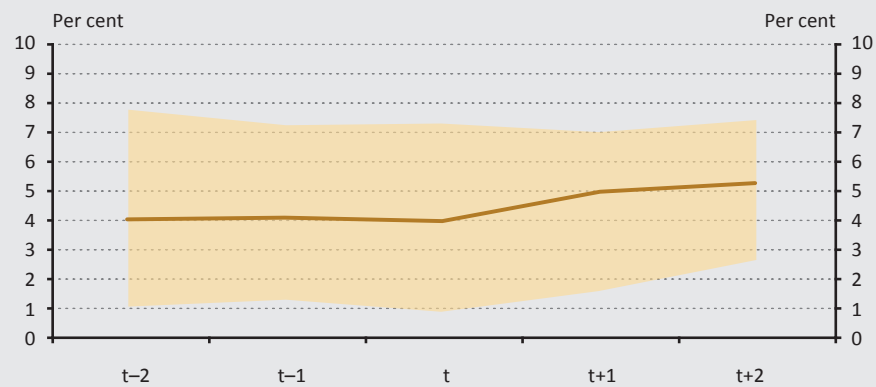
The annual growth rate of real GDP rises gradually from a lower level in the first two years (the median is close to 2 per cent in *t*–2) and stabilises at a higher level than previously after a successful case of disinflation (the median is 5.4 per cent in *t*+2; *Figure 9*). The temporary slowdown found by *Ball* (*1994*) is not present in our sample. Of the 51 episodes of disinflation for which real GDP growth data are available for all the five years under review, 35 have a higher average growth rate in the last two years than in the two years preceding the disinflation. Our result therefore seems to refute the main conclusion of *Ball* (*1994*) that there is a significant real economy cost in reducing inflation (permanently). There may be several reasons for this discrepancy. One is that *Ball* (*1994*) examines industrialised countries for the period 1960–1991. By contrast, we use data from 1970 to 2022, and for the widest possible range of countries. The identification of disinflation periods is also different: while we consider periods below 10 per cent for two years after two years of inflation above 20 per cent (allowing for a one-year transition period) as disinflation, *Ball* (*1994*) considers a decline of at least 2 percentage points from a peak in moving average trend inflation as disinflation.

The results of *Easterly* (*1996*) and *Bruno – Easterly* (*1998*) are consistent with ours. For example, *Bruno – Easterly* (*1998*) found that the GDP growth rate increases by an average of 3.3 percentage points compared to the years before the disinflation, which is very close to the result shown in *Figure 9*. An important methodological

difference, however, is that the data in these two studies run from the 1960s to 1994, and that disinflation is defined as year-on-year inflation in December being above 40 per cent for at least two years and then falling below 40 per cent for at least two years thereafter. Examining the experience of several years of disinflation in countries with moderate inflation, *Darvas* (*1999*) also concludes that in most cases there were no real economy costs. Despite the methodological differences, these analyses all suggest that the cost of disinflation in the double-digit range, which is less typical of the most advanced countries, is substantially lower than what *Ball* (*1994*) found.

In any case, we have also identified periods of disinflation using a set of criteria that may be more relevant for developed countries in the current inflationary environment. We looked for cases where inflation was above 10 per cent for at least two years and then fell below 5 per cent for at least two years after a transition year. We found 92 such cases, nearly two thirds of which occurred in the 1980s and 1990s.

Figure 10
Evolution of GDP growth in cases of disinflation from above 10 per cent to below 5 per cent



Note: The limits of the bands mark the 25th and 75th percentiles. The solid line is the 50th percentile (median).

Source: Based on World Bank data

The growth rate of real GDP did not typically slow during cases of disinflation from above 10 per cent to below 5 per cent, although there was also no significant improvement (*Figure 10*). In just over one half of the cases, growth was higher on average in the two years after the disinflation than in the two years before. Since the inflation levels considered here are closer to the cases of *Ball* (*1994*), our results

suggest that, contrary to the conclusions of *Tetlow* (*2022*), the cost of disinflation may have fallen significantly in recent decades.

According to *Ball* (*1995*), inflation may also become anchored at high levels because economic agents understand that the central bank, fearing real costs, is not doing all it can to suppress the inflation, and thus inflation expectations rise and disinflation becomes really costly for the central bank. This, however, is just a bad equilibrium outcome. If market perceptions are that the central bank gives little weight to real costs, they assign a higher probability to a firm disinflation and thus expect low inflation. In this good equilibrium, the cost of disinflation becomes low. But on what basis does the system arrive at a good or bad equilibrium?

Moving away from rational expectations and assuming adaptive expectations, however, the model of *Gibbs – Kulish* (*2017*) highlights the case of imperfect central bank credibility. The lower the credibility, the less responsive the economy is to the monetary authority's decision, and hence the higher the value of the sacrifice ratio.

In the following, we examine how the evolution of GDP growth during cases of disinflation depends on the credibility of the central bank and cost-push shocks. If the central bank's commitment to price stability is credible, the likelihood of a good equilibrium and a low sacrifice is higher.[7] If cost-push shocks are favourable, a small monetary tightening is sufficient for disinflation, and so the central bank is more likely to support disinflation, again increasing the probability of a low sacrifice and a good equilibrium.

The real economy cost is measured as the decline in the growth rate of real GDP after disinflation, i.e. the average of years $t+2$ and $t+1$ is subtracted from the average of years $t-1$ and $t-2$. In the following, we look again at the episodes of disinflation starting from levels above 20 per cent presented earlier. Central bank credibility is approximated by central bank independence, using *Romelli*'s (*2022*) index of central bank independence, which measures independence on a scale of 0 to 1 (1 = fully independent) by summing up a number of sub-indices. The evolution of cost-push shocks is captured by the commodity price inflation used earlier. The value of central bank independence in t is assigned to a given episode (*CBI*). In the case of commodity price inflation, the average of years $t-2$ and $t-1$ is subtracted from the average of years t and $t+1$, i.e. the change is measured in the first two years after the start of disinflation on average compared to the average of the two years before (*DCOM*). As before, we expect that the real cost is reduced by the *CBI* variable, but increased by *DCOM*.

[7] Again, it is important to stress that since we have not necessarily only looked at episodes where the economic policy performed deliberate disinflation, when we talk about real economy cost, it does not necessarily imply a causal relationship.

Table 1
Explanation for the loss of GDP growth

	(1)	(2)	(3)	(4)
CBI	–5.53 (5.44)	–11.27*** (3.90)	–11.09*** (3.99)	–9.30** (3.93)
DCOM	–	–	–0.015 (0.055)	0.283* (0.155)
CBI * DCOM	–	–	–	–0.532* (0.266)
Constant	–0.11 (3.35)	3.41 (2.30)	3.34 (2.35)	2.47 (2.26)
R^2	0.023	0.162	0.164	0.218
Number of observations	38	36	36	36

*Note: The dependent variable in each regression is the decline in the average annual GDP growth rate from the two years before the start of disinflation (t–2 and t–1) to the two years after (t+1 and t+2). Regression (1) used all observations for which GDP data and central bank independence index were available. In regressions (2) to (4), we have excluded from the sample the two extreme observations in terms of GDP loss. Explanatory variables: CBI: central bank independence index; DCOM: the change in average annual commodity price inflation between the two years preceding disinflation (t–2 and t–1) and the two years following it (t and t+1). In parentheses, White's heteroskedasticity-consistent standard errors are shown. ***, ** and * indicate significant estimates at 1, 5 and 10 per cent, respectively.*

Table 1 summarises the results of four estimates. The coefficients of each linear regression model were estimated by ordinary least squares, and their standard errors were estimated using White's heteroskedasticity-consistent estimator. The dependent variable in each case was the real cost. The explanatory variable in the first two cases is the independence index. In the first model, all observations were used for estimation, while in the second case we dropped two outlier observations, where the real cost was the highest (7.04 percentage points, Argentina, 1993) and the lowest (–23.65 percentage points, Azerbaijan, 1996). By dropping the extreme observations, the independence index that was insignificant in case (1) became significant at the one per cent level in estimation (2) with the sign we expected: higher independence is associated with lower real cost. Commodity inflation is not found to be significant in estimation (3). However, when the product of the two variables was included as a further explanatory variable in estimate (4), it became significant at 10 per cent with the expected sign. Furthermore, the interaction term is close to being significant at 5 per cent (P-value: 0.054).

The results of model (4) are worth evaluating in detail. The independence index remains significant (although now only at 5 per cent), and we continue to find that greater independence reduces the cost of disinflation. The dynamics of commodity prices also have the expected effect: their falling price dynamics reduces the real cost. One implication of the interaction term's coefficient is that for a central bank that is average in terms of independence in the regression sample (*CBI*=0.56),

the evolution of cost-push shocks does not affect the cost of disinflation, as the second (*DCOM*) and third members (*CBI*∗*DCOM*) essentially cancel each other out (0.283–0.56∗0.532=–0.015). However, in the case of a central bank that is less independent than the average, the impact of the third term will be smaller in absolute terms than that of the second, so that the fall in commodity inflation will affect the real cost as expected.

On the whole, the historical experiences of the real economy costs associated with disinflation suggest that output losses are far from typical, and that it is more common for real GDP growth rates to rise as inflation falls. Significant real costs occur in the cases when central bank independence is below average and global commodity price dynamics do not support disinflation.

At first glance, our results contradict the theoretical consensus emerging in recent years that expectations are not fully rational and that the Phillips curve has flattened (*Szentmihályi – Világi 2015*). Theoretically, our results could be explained if the evolution of cost-push shocks dominates our observations of disinflation, rather than the action of the monetary authority. This would be supported by the result shown in *Figure 7* that in the successful cases commodity prices evolve more favourably than in unsuccessful cases. The regression above, however, paints a more nuanced picture, as it suggests that central bank credibility/independence appears to substitute for the effect of commodity prices. This suggests that only in the case of less independent central banks can the evolution of the sacrifice ratio be a function of commodity prices. In the case of independent central banks, however, it is no longer true that the sacrifice ratio is lower where commodity prices develop more favourably.

5. Conclusions

In our study, we investigated the macroeconomic consequences of major inflation shocks and the course of disinflation using data from 201 countries between 1970 and 2022. Two questions were analysed: (1) Under what circumstances do inflation shocks lead to persistently high inflation? and (2) What are the real economy consequences of high inflation falling into the single-digit range?

Over the past half century or so, there were a number of successful and unsuccessful episodes of disinflation after major inflation shocks. Successful cases of disinflation have mostly been characterised by faster rises in short interest rates, more disciplined fiscal policy and more favourable commodity price dynamics. In these cases, economic growth did typically not slow, in contrast to episodes where inflation remained high. This latter result has also proved to be true in general, not only when inflation shocks were quickly reversed: disinflation after periods of

persistently high inflation was not associated with a slowdown in GDP growth in most cases.

Although the stylised facts we have collected are not directly suitable for identifying causal relationships, there are a number of lessons that can be drawn for economic policy. Successful responses to inflation shocks have been characterised by tighter monetary and fiscal policy and favourable developments in global cost factors. This suggests that there is a good chance of overcoming global inflation shocks such as the current one when commodity price rises are halted or reversed, but that this opportunity can be seized with a greater scope if tighter monetary conditions and disciplined fiscal policy are applied. Another important lesson is that disinflation does not necessarily imply a real economy cost, and this is true both for the reduction of inflation from the higher to the single-digit range and from the double-digit range to below 5 per cent. Moreover, in the former cases, accelerating economic growth is typical. The relationship we find between real cost and central bank independence suggests that a higher credibility of the disinflation commitment is more likely to lead to an acceleration of economic growth in the course of disinflation.

References

Ábel, I. – Csortos, O. – Lehmann, K. – Madarász, A. – Szalai, Z. (2014): *Inflation targeting in the light of lessons from the financial crisis.* Financial and Economic Review, 13(4): 35–56. https://en-hitelintezetiszemle.mnb.hu/letoltes/2-abel-en.pdf

Ali Abbas, S. – Belhocine, N. – El-Ganainy, A. – Horton, M. (2011): *Historical Patterns and Dynamics of Public Debt—Evidence From a New Database*. IMF Economic Review, 59: 717–742. https://doi.org/10.1057/imfer.2011.24

Ball, L. (1994): *What Determines the Sacrifice Ratio?* In: Mankiw, N.G. (ed.): Monetary policy. The University of Chicago Press, pp. 155–193.

Ball, L. (1995): *Time-Consistent Policy and Persistent Changes in Inflation*. Journal of Monetary Economics, (36)2: 329–350. https://doi.org/10.1016/0304-3932(95)01218-4

Bareith, T. – Varga, J. (2022): *Az inflációs célt követő rendszer hozzájárulása az infláció mérsékléséhez Magyarországon (The contribution of the inflation targeting system to reducing inflation in Hungary)*. Közgazdasági Szemle (Economic Review), 69(9): 989–1008. https://doi.org/10.18414/KSZ.2022.9.989

Borio, C. – Lombardi, M. – Yetman, J. – Zakrajšek, E. (2023): *The Two-Regime View of Inflation*. BIS Papers 133, Bank for International Settlements. https://www.bis.org/publ/bppdf/bispap133.pdf

Bruno, M. – Easterly, W. (1998): *Inflation Crises and Long-Run Growth*. Journal of Monetary Economics, 41(1): 3–26. https://doi.org/10.1016/S0304-3932(97)00063-9

Bruno, M. – Fischer, S. (1990): *Seigniorage, Operating Rules, and the High Inflation Trap*. The Quarterly Journal of Economics, 105(2): 353–374. https://doi.org/10.2307/2937791

Cecchetti, S.G. – Rich, R.W. (2001): *Structural Estimates of the U.S. Sacrifice Ratio*. Journal of Business & Economic Statistics, 19(4): 416–427. https://doi.org/10.1198/07350010152596664

Cottarelli, C. – Szapáry, Gy. (eds.) (1998): *Mérsékelt infláció: Az átalakuló gazdaságok tapasztalatai* (*Moderate inflation: the experience of transition economies*). Magyar Nemzeti Bank – International Monetary Fund.

Darvas, Zs. (1999): *A mérsékelt inflációk nemzetközi összehasonlítása* (*International comparison of moderate inflation*). Statisztikai Szemle (Hungarian Statistical Review), 77(7): 569–595.

Dornbusch, R. – Fischer, S. (1986): *Stopping Hyperinflations: Past and Present*. Weltwirtschaftliches Archiv, 122(1): 1–47. https://doi.org/10.1007/BF02706284

Dornbusch, R. – Fischer, S. (1993): *Moderate Inflation*. The World Bank Economic Review, 7(1): 1–44. https://doi.org/10.1093/wber/7.1.1

Dornbusch, R. – Sturzenegger, F. – Wolf, H. (1990): *Extreme Inflation: Dynamics and Stabilization*. Brookings Papers on Economic Activity, 1990(2): 1–84. https://doi.org/10.2307/2534504

Driffill, J. – Miller, M. (1993): *Learning and Inflation Convergence in the ERM*. The Economic Journal, 103(417): 369–378. https://doi.org/10.2307/2234775

Durand, J.-J. – Huchet-Bourdon, M. – Licheron, J. (2008): *Sacrifice ratio dispersion within the Euro Zone: what can be learned about implementing a single monetary policy?* International Review of Applied Economics, 22(5): 601–621. https://doi.org/10.1080/02692170802287672

Easterly, W. (1996): *When Is Stabilization Expansionary? Evidence from High Inflation*. Economic Policy, 11(22): 65–107. https://doi.org/10.2307/1344522

Feenstra, R.C. – Inklaar, R. – Timmer, M.P. (2015): *The Next Generation of the Penn World Table.* American Economic Review, 105(10): 3150–3182. https://doi.org/10.1257/aer.20130954

Fischer, S. (1988): *Real Balances, the Exchange Rate, and Indexation: Real Variables in Disinflation*. Quarterly Journal of Economics, 103(1): 27–49. https://doi.org/10.2307/1882641

Fischer, S. – Sahay, R. – Végh, C.A. (2002): *Modern Hyper- and High Inflations*. Journal of Economic Literature, 40(3): 837–880. https://doi.org/10.1257/002205102760273805

Fraga, A. – Goldfajn, I. – Minella, A. (2003): *Inflation Targeting in Emerging Market Economies*. NBER Macroeconomics Annual, 18: 365–400. https://doi.org/10.1086/ma.18.3585264

Garber, P.M. (1981): *Transition from Inflation to Price Stability.* National Bureau of Economic Research Working Paper No. 728. https://doi.org/10.3386/w0728

Gibbs, C.G. – Kulish, M. (2017): *Disinflations in a model of imperfectly anchored expectations*. European Economic Review, 100: 157–174. https://doi.org/10.1016/j.euroecorev.2017.08.003

Goodfriend, M. – King, R.-G. (2005): *The Incredible Volcker Disinflation*. Journal of Monetary Economics, 52(5): 981–1015. https://doi.org/10.1016/j.jmoneco.2005.07.001

Ha, J. – Kose, A. – Ohnsorge, F.L. (2021): *One-Stop Source: A Global Database of Inflation*. Policy Research Working Paper WPS9737, World Bank. https://doi.org/10.1596/1813-9450-9737

Jácome, L.I. – Pienknagura, S. (2022): *Central Bank Independence and Inflation in Latin America—Through the Lens of History*. IMF Working Paper No. WP/22/186, International Monetary Fund. https://doi.org/10.5089/9798400219030.001

Katayama, H. – Ponomareva, N. – Sharma, M. (2019): *What Determines the Sacrifice Ratio? A Bayesian Model Averaging Approach*. Oxford Bulletin of Economics and Statistics, 81(5): 960–988. https://doi.org/10.1111/obes.12304

Kiguel, M.A. – Neumeyer, P.A. (1995): *Seigniorage and Inflation: The Case of Argentina*. Journal of Money, Credit and Banking, 27(3): 672–682. https://doi.org/10.2307/2077742

Kiguel, M.A. – Liviatan, N. (1988): *Inflationary Rigidities and Orthodox Stabilization Policies: Lessons from Latin America*. The World Bank Economic Review, 2(3): 273–298. https://doi.org/10.1093/wber/2.3.273

Kiguel, M.A. – Liviatan, N. (1992a): *Stopping Three Big Inflations (Argentina, Brazil, and Peru)*. Policy Research Working Paper No. WPS999, The World Bank. https://documents1.worldbank.org/curated/en/412391468741390708/pdf/multi0page.pdf

Kiguel, M.A. – Liviatan, N. (1992b): *The Business Cycle Associated with Exchange Rate-Based Stabilizations*. The World Bank Economic Review, 6(2): 279–305. https://doi.org/10.1093/wber/6.2.279

Kremers, J.J.M. (1990): *Gaining Policy Credibility for a Disinflation: Ireland's Experience in the EMS*. IMF Economic Review, 37(1): 116–145. https://doi.org/10.2307/3867306

Mauro, P. – Romeu, R. – Binder, A. – Zaman, A. (2015): *A Modern History of Fiscal Prudence and Profligacy*. Journal of Monetary Economics, 76: 55–70. https://doi.org/10.1016/j.jmoneco.2015.07.003

Nelson, E. (2005): *The Great Inflation of the Seventies: What Really Happened?* Advances in Macroeconomics, 5(1), Article 3. https://doi.org/10.2202/1534-6013.1297

Reinhart, C. – Vegh, C. (1994): *Inflation stabilization in chronic inflation countries: The empirical evidence*. MPRA Paper 13689, University Library of Munich. https://mpra.ub.uni-muenchen.de/13689/1/MPRA_paper_13689.pdf

Romelli, D. (2022): *The political economy of reforms in central bank design: evidence from a new dataset*. Economic Policy, 37(112): 641–688. https://doi.org/10.1093/epolic/eiac011

Sargent, T. – Williams, N. – Zha, T. (2009): *The Conquest of South American Inflation.* Journal of Political Economy, 117(2): 211–256. https://doi.org/10.1086/599014

Sargent, T.J. (1981): *Stopping Moderate Inflations: The Methods of Poincaré and Thatcher*. Federal Reserve Bank of Minneapolis Working Papers 1. https://doi.org/10.21034/wp.w

Sargent, T.J. (1982): *The Ends of Four Big Inflations*. In: Hall, R.E. (ed.): Inflation: Causes and Effects. University of Chicago Press, pp. 41–98. https://doi.org/10.21034/wp.158

Szentmihályi, Sz. – Világi, B. (2015): *The Phillips curve – history of thought and empirical evidence*. Financial and Economic Review, 14(4): 5–28. https://en-hitelintezetiszemle.mnb.hu/letoltes/1-szentmihalyi-vilagi-en.pdf

Taylor, J. (1979): *Staggered Wage Setting in a Macro Model*. American Economic Review, 69(2): 108–113.

Tetlow, R.J. (2022): *How Large is the Output Cost of Disinflation?* Finance and Economics Discussion Series 2022-079, Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/FEDS.2022.079

Végh, C.A. (1995): *Stopping High Inflation: An Analytical Overview*. In: Siklos, P.L. (ed.): Great Inflations of the 20th Century: Theories, Policies, and Evidence. Edward Elgar Publishing, pp. 35–94. https://doi.org/10.4337/9781781956359.00010