INTERNATIONAL MONETARY FUND

Drivers of Inflation

Hungary

Estefania Cohn Bech, Karim Foda, and Agustin Roitman

SIP/2023/004

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Drivers of Inflation, Hungary

Prepared by Estefania Cohn Bech, Karim Foda, and Agustin Roitman

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January 2023

ABSTRACT: Though high and rising inflation has been a challenge for most economies across Europe in 2022 and into 2023, it has accelerated in Hungary to the highest level in Europe. This paper examines how and why Hungary reached historically high inflation. It draws on an augmented Phillips Curve to estimate the impact of common drivers of inflation, examines the role of labor market tightness and policy stances, and analyzes possible changes to the degree of exchange rate pass-through in recent years. Overall, a rapid recovery from the COVID-19 crisis, a series of exogenous shocks, and too loose a policy mix fueled inflation to its highest level in decades. Though monetary and fiscal policies are now tightening, regulatory price caps undermine those efforts. Going forward, a consistently and persistently tight overall policy mix is needed to drive inflation back to the central bank's target.

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HUNGARY

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Approved By
European Department

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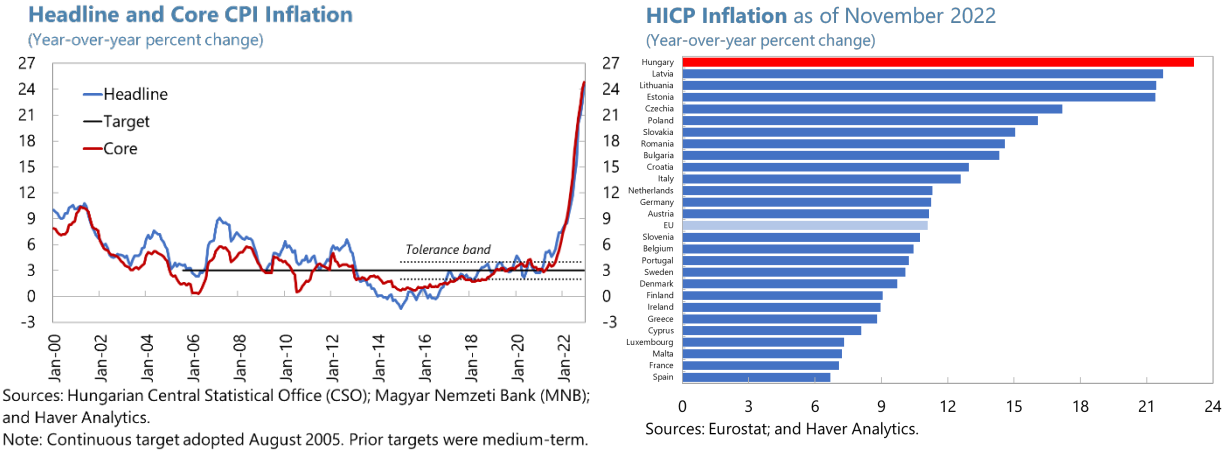
CONTENTS

DRIVERS OF INFLATION[1]

A rapid recovery from the COVID-19 crisis, a series of shocks, and too loose a policy mix have fueled inflation in Hungary to its highest level in decades. Though high and rising inflation has been a challenge for most economies across Europe in 2022 and into 2023, it has accelerated in Hungary to the highest level in Europe. Though monetary and fiscal policies are now tightening, inflation expectations are de-anchored and core inflation dynamics remain strong, reflecting a tight labor market and the lag-effect of loose policies that have boosted domestic demand. Going forward, a consistently and persistently tight overall policy mix is needed to drive inflation back to the central bank's target.

1. Inflation has accelerated to its highest level in decades. It has been rapidly accelerating beyond the central bank's (MNB) target since early 2021, rising from 2.7 percent y/y in January 2021 to 24.5 percent in December 2022. Common external shocks including COVID-related supply chain disruptions and the surge in commodity prices, primarily energy and food, further amplified by Russia's war in Ukraine, have lifted inflation rates across Europe. However, inflation in Hungary has risen to notably higher levels than all other European countries, prompting questions over why inflationary pressures have been stronger in Hungary than in its peers.

Figure 1. Hungary: Inflation in Hungary and Europe



Sources: Hungarian Central Statistical Office (CSO); Magyar Nemzeti Bank (MNB); and Haver Analytics.
Note: Continuous target adopted August 2005. Prior targets were medium-term.

Sources: Eurostat; and Haver Analytics.

[1] Prepared by Estefania Cohn Bech, Karim Foda, and Agustin Roitman. All inflation charts are based on CPI data through December 2022 and cross-country HICP data through November 2022, as available at time of issuance on January 17, 2023. The authors would like to thank authors of Chapter 2 of the IMF Regional Economic Outlook for Europe, October 2022 (Chikako Baba, Philipp Engler, Ting Lan, Svitlana Maslova, Jorge Salas, and Magnus Saxegaard) for analysis that this paper draws on, and counterparts at the central bank (MNB) for helpful comments during a staff presentation.

2. This paper examines how and why Hungary reached historically high inflation. Particular attention is placed on cross-country comparisons to understand where Hungary may stand out, and on domestic drivers that could help explain stronger inflationary pressure in Hungary. Following an overview of inflation developments over the last two years, the paper draws on an augmented Phillips Curve to estimate the impact of common drivers of inflation, examines the role of labor market tightness and policy stances, and analyzes possible changes to the degree of exchange rate passthrough in recent years. Based on the findings, the paper then explores risks to the inflation outlook and draws policy recommendations.

A. Shocks and Recent Developments

3. Multiple shocks and events have fueled inflation since 2020. In response to the COVID-19 pandemic in 2020, an extraordinary loosening of fiscal and monetary policies, globally and in Hungary, took place to protect against short- and long-term economic and human losses. Central banks lowered rates and expanded their balance sheets, and governments loosened fiscal policy with a range of liquidity and solvency measures to support households and firms and preserve employment. This policy support helped foster a stronger-than-expected economic recovery, leading to a tightening of labor markets, rising food and energy prices (exacerbated by Russia's war in Ukraine), drought, and supply bottlenecks. As a result, inflationary pressures intensified worldwide, including in Hungary (IMF 2022). In Hungary, an additional round of fiscal stimulus ahead of the April 2022 elections further compounded inflationary pressures. In addition, a widening external deficit led by high energy prices and sustained demand, tightening global financial conditions, and disputes with the European Union (EU) that added to risk perceptions intensified pressure on the exchange rate and imported inflation.

Figure 2. Hungary: Inflationary Shocks and Events

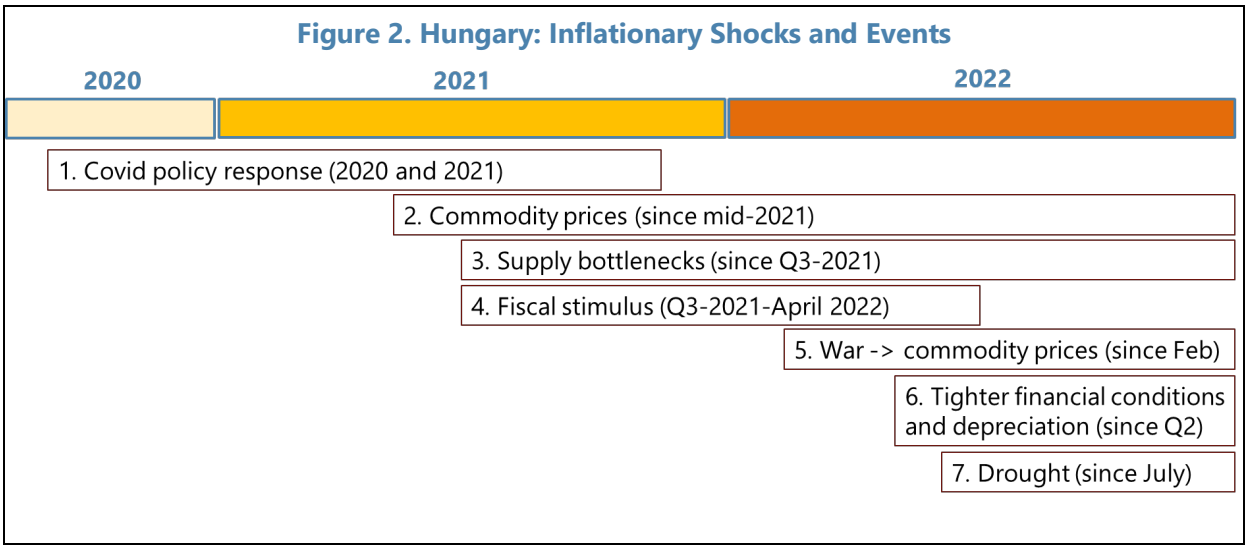
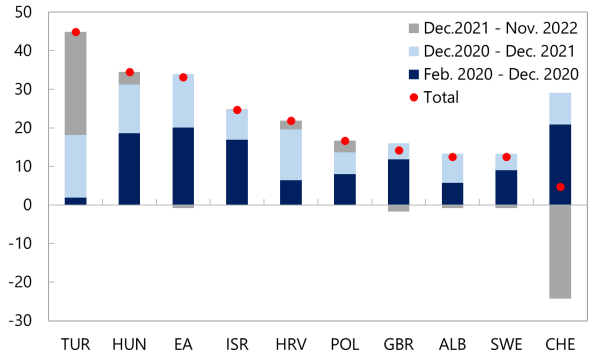


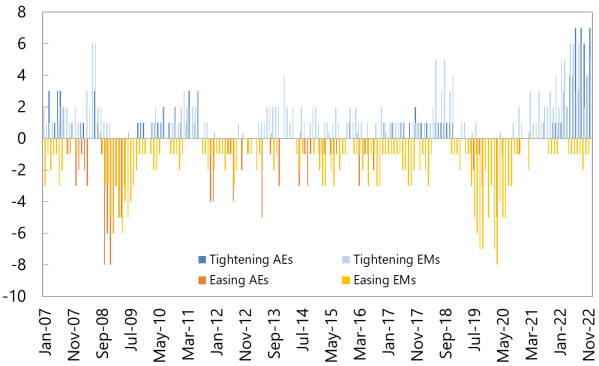
Figure 3. Hungary: Policy and External Shocks

Balance Sheet Expansion by Central Banks
(Percent of 2020 GDP)



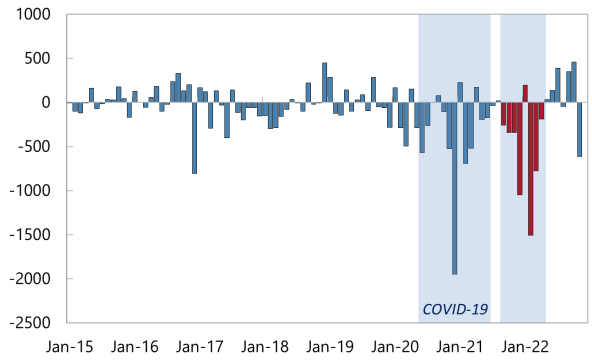
Sources: Central Banks; Haver Analytics; and IMF, World Economic Outlook.
Note: Expansion is calculated as difference between CB's assets value.

G20: Monetary Policy
(Number of changes in policy rates)



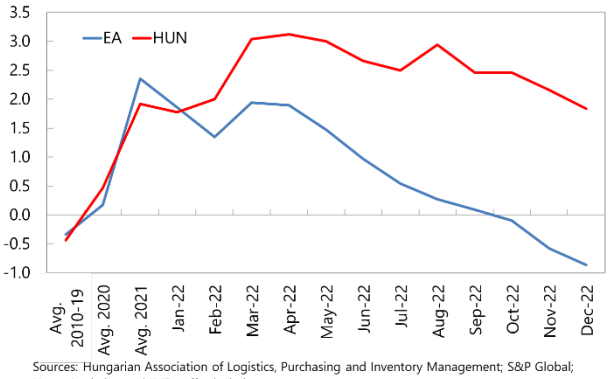
Sources: National Central Banks; and IMF staff calculations.

General Government Primary Balance, Cash
(Billion HUF)



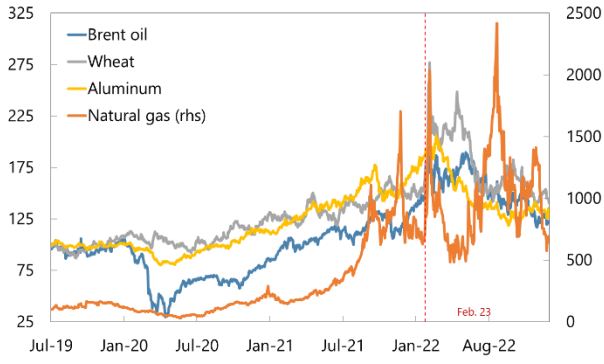
Sources: Ministry for National Economy; Haver Analytics; and IMF staff calculations.

Suppliers Delivery Times
(Normalized; positive denotes increase)



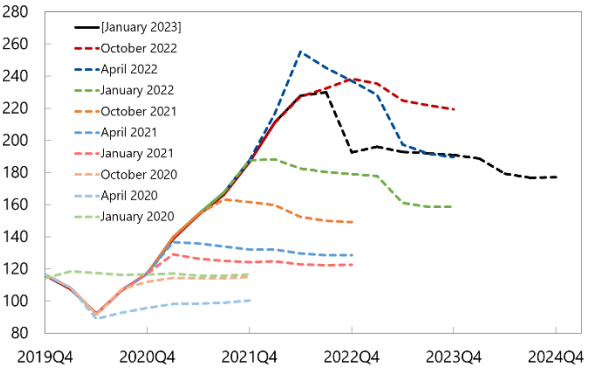
Sources: Hungarian Association of Logistics, Purchasing and Inventory Management; S&P Global; Haver Analytics; and IMF staff calculations.

Global Food and Energy Prices
(Index, July 1, 2019=100)



Source: Bloomberg Finance L.P.

Commodity Price Index
(Vintages of WEO Global Assumptions, 2016=100)

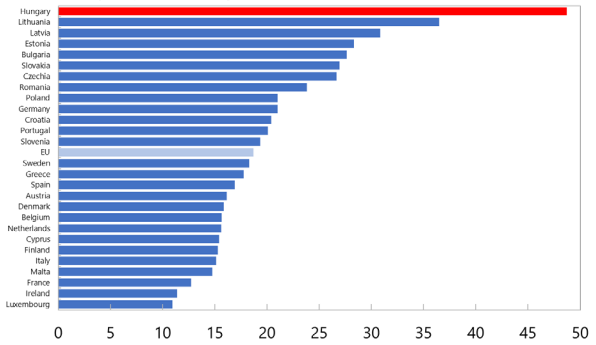


Source: IMF, Global Assumptions.

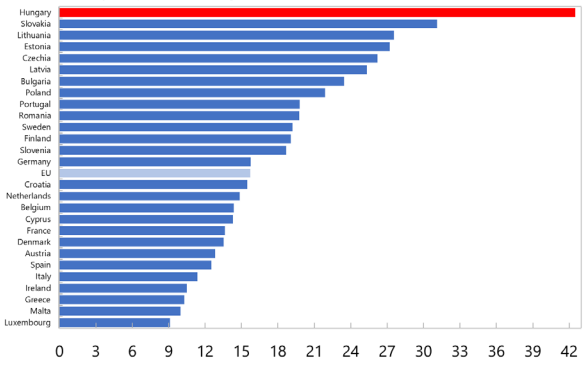
Composition of Inflation

4. Food inflation in Hungary is the highest in the EU. Food prices have risen significantly faster in Hungary than in other EU countries. Domestically, a drought significantly curtailed agriculture production in Hungary in 2022, adding extra pressure of unprocessed food prices (Hungary is a net exporter of food). Further, a relatively high degree of passthrough from unprocessed to processed foods, driven in part by stronger bargaining power of food producers than retailers and by low productivity in the food processing sector (MNB 2022), led to exceptionally high processed food inflation. In response, the government introduced in February 2022 price caps on six specific food products (granulated sugar, wheat flour, sunflower oil, pork leg, some chicken breast and backs, and 2.8% cow milk) at their October 15, 2021 levels. The cap was extended several times and expanded to two additional food products (eggs and potatoes). It is now set to expire in April 2023. These caps have been ineffective in slowing food inflation as distributors and retailers raised prices on other products to preserve their margins and food inflation continued to surge.

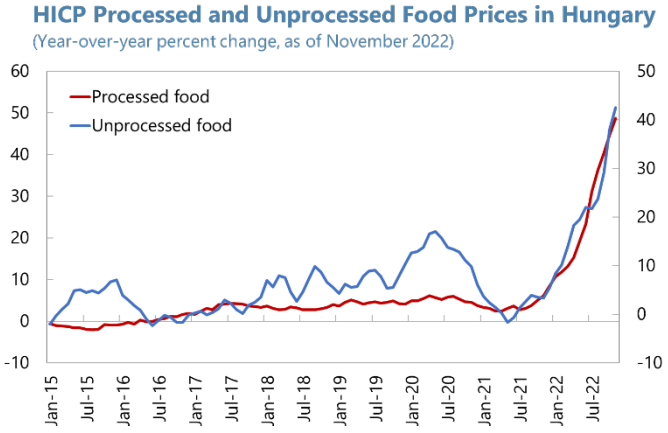
Figure 4. Hungary: Food Inflation



Sources: Eurostat; and Haver Analytics.
Note: Processed food excludes alcohol and tobacco.



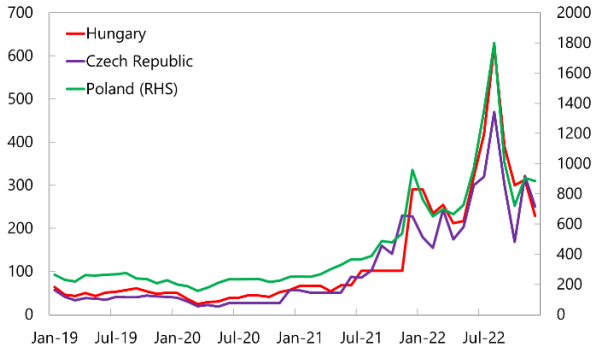
Sources: Eurostat; and Haver Analytics.



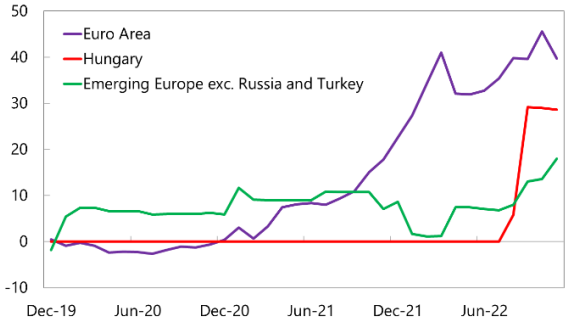
Sources: Eurostat, and Haver Analytics.
Note: Processed food excludes alcohol and tobacco.

5. Meanwhile, high energy price inflation was only allowed to pass through to consumer prices in 2022:H2. The household energy utility price caps in place since 2014 initially fully shielded households from soaring wholesale electricity and gas prices. In August 2022, the cap was increased for consumption above the national average to price levels closer to market rates, resulting in increased energy utility prices for around one quarter of households, according to government estimates.[2] Following the change, electricity and gas consumer price inflation jumped from zero to nearly around 30 and 115 percent y/y, respectively, in September and together contributed close to 3 percentage points to overall CPI headline inflation that month, and remaining around similar levels through December. Still, price levels remain among the lowest in Europe, and consumption below the national average is still priced at the original capped level. Furthermore, the government capped the motor fuels price between November 15, 2021 and December 6, 2022 well below market prices, further preventing passthrough of wholesale energy prices onto consumer retail prices. After the motor fuels price cap was lifted in December, fuel prices jumped by 27 percent y/y and contributed close to 2 percentage points to headline CPI inflation y/y that month.

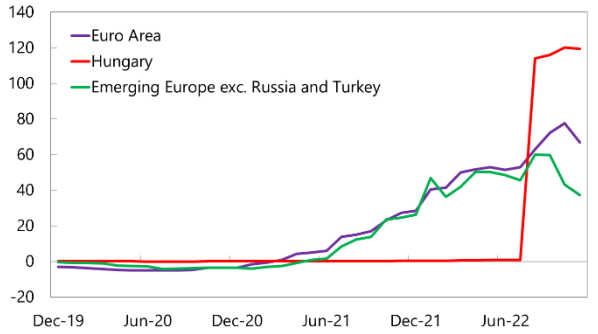
Figure 5. Hungary: Consumer and Household Energy Prices



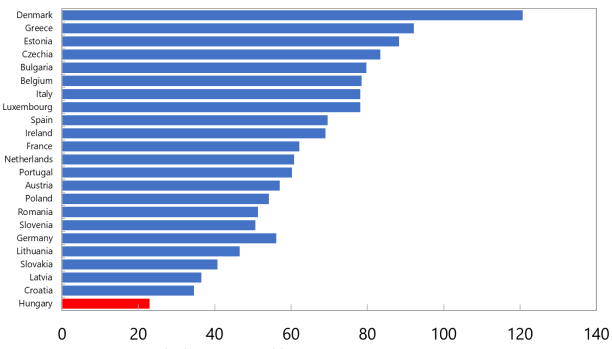
Source: Bloomberg Finance L.P.



Sources: Eurostat; Haver Analytics; and IMF staff calculations.
Note: Emerging Europe includes Bulgaria, Croatia, Hungary, North Macedonia, Poland, Romania and Serbia. HICP indicators for Belarus, Moldova and Montenegro are not available.



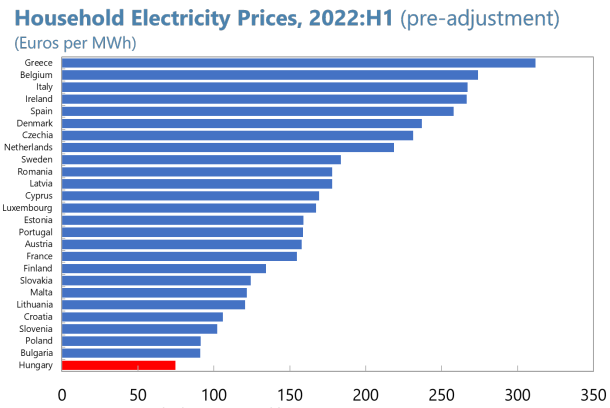
Sources: Eurostat; Haver Analytics; and IMF staff calculations.
Note: Emerging Europe includes Bulgaria, Croatia, Hungary, North Macedonia, Poland, Romania and Serbia. HICP indicators for Belarus, Moldova and Montenegro are not available.



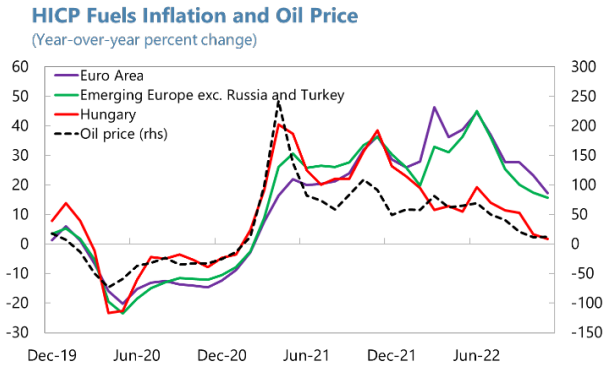
Source: Eurostat (excludes taxes and levies).
Note: Prevailing prices prior to addition of a higher-tiered tariff in August 2022.

[2] The price level for consumption above average remains administered, but it is calculated in references to market prices and set to be adjusted quarterly. The consumption level is per meter (as opposed to per households).

Figure 5. Hungary: Consumer and Household Energy Prices (concluded)



Source: Eurostat (excludes taxes and levies).
Note: Prevailing prices prior to addition of higher-tiered tariff in August 2022.

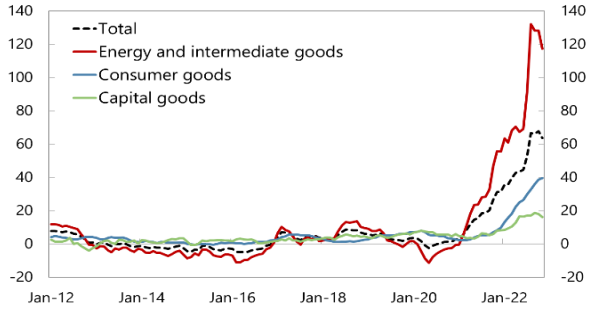


Sources: Eurostat; Haver Analytics; and IMF staff calculations.
Note: Fuels include liquid fuels and lubricants for personal transport equipment.
Emerging Europe includes Bulgaria, Croatia, Hungary, North Macedonia, Poland, Romania and Serbia. HICP indicators for Belarus, Moldova and Montenegro are not available.

6. Producer prices have risen rapidly with soaring energy prices. Domestic producer price inflation reached a high of nearly 68 percent y/y in October 2022 before slightly declining to 63.7 percent in November 2022, led by energy and intermediate good prices. A historically high correlation between producer and consumer prices suggests that the passthrough of high production costs from energy prices has mostly already occurred (MNB 2022).

Figure 6. Hungary: Domestic Producer Price Inflation

(Year-over-year percent change)

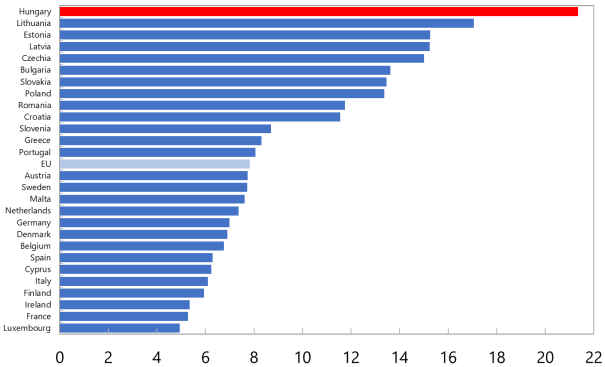


Sources: CSO and Haver Analytics.

7. Core inflation is the highest in the EU and is broad-based. Measures of core inflation that exclude unprocessed food or both unprocessed and processed foods are higher in Hungary than all other EU countries. Underlying inflation has been accelerating, with services and nonenergy, nonfood goods inflation contributing around 40 percent of headline CPI inflation through December 2022. Second round effects of high energy producer prices have led nonenergy, nonfood goods inflation to rise faster than peers in Emerging Europe. In parallel, services inflation has also surged into double-digit territory, accelerating at a faster pace than peers since mid-2022.

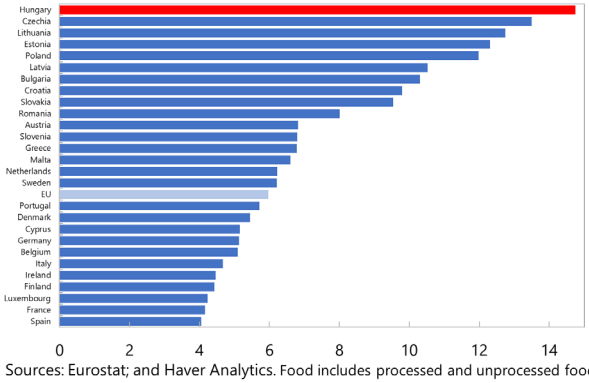
Figure 7. Hungary: Decomposition of Core Inflation

HICP Core Inflation (excl. energy and unprocessed food)
(Year-over-year percent change, as of November 2022)



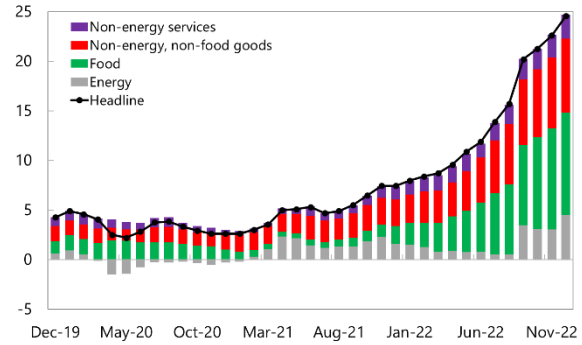
Sources: Eurostat; and Haver Analytics.

HICP Core Inflation (excl. energy, food, alcohol and tobacco)
(Year-over-year percent change, as of November 2022)



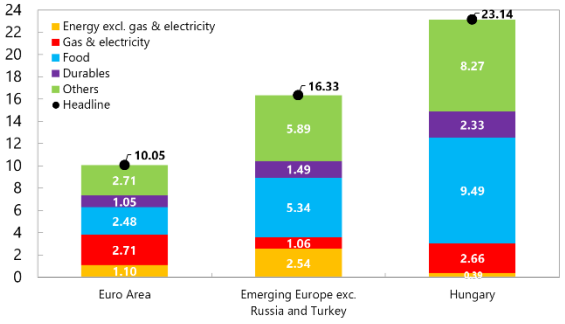
Sources: Eurostat; and Haver Analytics. Food includes processed and unprocessed food.

CPI Inflation Decomposition for Hungary
(Year-over-year percent change, as of December 2022)



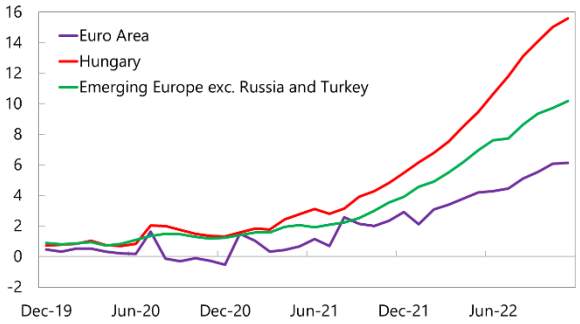
Sources: Central Statistical Office; Haver Analytics; and IMF staff calculations.

HICP Inflation Decomposition, Nov. 2022
(Year-over-year percent change, end of period)



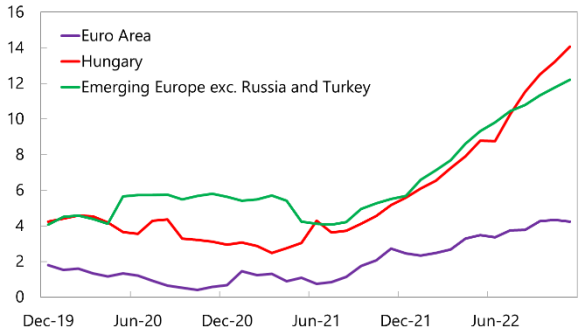
Sources: Eurostat; National Authorities; Haver Analytics; and IMF staff calculations.
Note: Emerging Europe includes Bulgaria, Croatia, Hungary, North Macedonia, Poland, Romania and Serbia. HICP indicators for Belarus, Moldova and Montenegro are not available.

HICP Non-Energy, Non-Food Goods Inflation
(Year-over-year percent change)



Sources: Eurostat; Haver Analytics; and IMF staff calculations.
Note: Non-energy, non-food goods includes durable, semidurable and non-durable goods. Emerging Europe includes Bulgaria, Croatia, Hungary, North Macedonia, Poland, Romania and Serbia. HICP indicators for Belarus, Moldova and Montenegro are not available.

HICP Non-Energy Services Inflation
(Year-over-year percent change)



Sources: Eurostat; Haver Analytics; and IMF staff calculations.
Note: Emerging Europe includes Bulgaria, Croatia, Hungary, North Macedonia, Poland, Romania and Serbia. HICP indicators for Belarus, Moldova and Montenegro are not available.

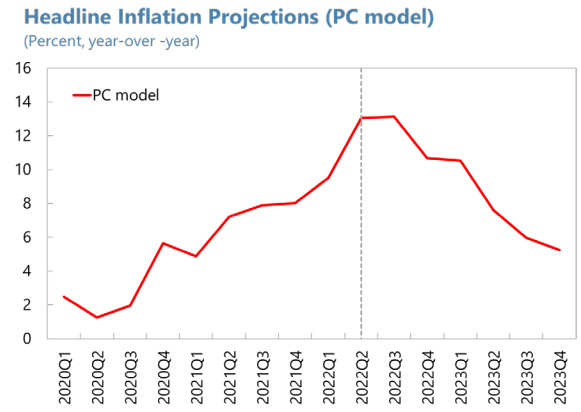
B. Inflation Drivers

8. Model estimates and stylized facts suggest that, in addition to external supply shocks, domestic demand, boosted by policy, has added to inflationary pressures. Workhorse inflation models such as the Phillips Curve that draw on historical data are subject to greater-than-usual residuals when inflation dynamics are analyzed at times of large exogenous shocks. Complementing model-based analysis with stylized facts provide suggestive evidence of specific relationships that may not be well captured by model estimates. In this section, a standard augmented Phillips Curve is estimated to identify structural features of inflation dynamics in respective European economies. In addition, stylized facts on recent labor market dynamics and on the evolution of the fiscal and monetary policy stances are used to understand additional sources of inflationary pressure that may not be well-captured by the Phillips Curve analysis. In addition, model estimates of exchange rate passthrough for emerging markets, including Hungary, are analyzed to assess non-linearities during episodes of large exchange rate movements.

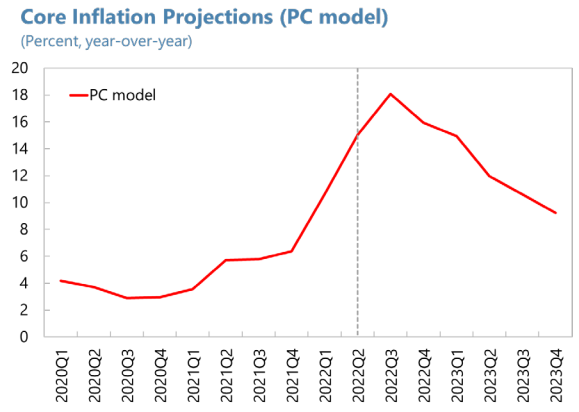
9. A Phillips Curve estimation suggests that past core inflation and inflation expectations are important inflation drivers. A Phillips Curve is estimated for each of 21 advanced and 5 emerging European economies with comprehensive data over 2000Q1-2022Q2.[3] Headline and core inflation are regressed against lagged inflation, three-year ahead inflation expectations based on consensus forecasts, unemployment gap estimates based on trend unemployment, and measures of external prices including commodity food and energy prices, foreign producer prices and exchange rates (IMF 2022). The results for Hungary suggest that past core inflation and medium-term inflation expectations are important drivers in explaining the prevailing levels of core and headline inflation (Appendix I). External price pressures are also statistically significant. Based on the model results, average quarterly inflation is expected to decelerate but remain elevated through 2023. However, the coefficient for the unemployment gap based on historical trends is statistically insignificant for Hungary (as for peer countries including Bulgaria, Croatia, and Poland), likely due to the sample being a period of price stability as labor market slack remained while unemployment was declining from high levels. More recent labor market data suggests that this relationship may have changed over the last two years (see below).

[3] Emerging European economies include Bulgaria, Croatia, Hungary, Poland, and Romania. Advanced European economies include Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Latvia, the Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the UK.

Figure 8. Hungary: Model Projections



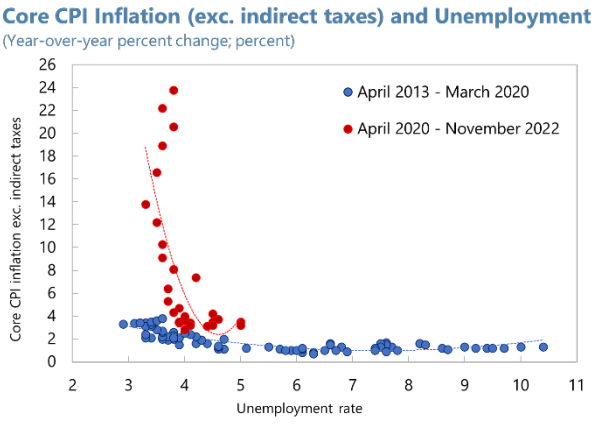
Sources: IMF, REO, October 2022; IMF, World Economic Outlook; and IMF staff calculations.



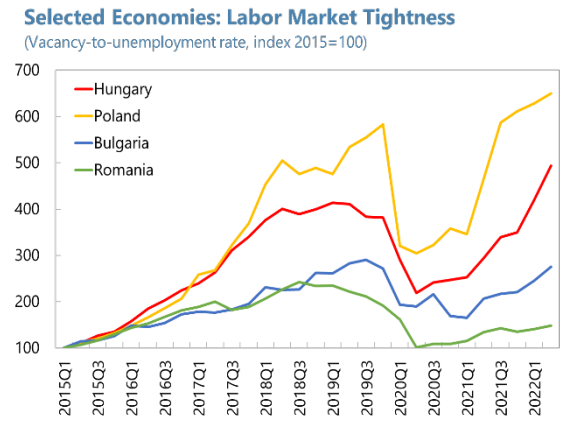
Sources: IMF, REO, October 2022; IMF, World Economic Outlook; and IMF staff calculations.

10. Tight labor markets appear to be adding pressure on wages as core inflation rises. Since the COVID-shock in 2020:Q2, core inflation rates have been notably more correlated with the unemployment rate than pre-COVID (Figure 9 and MNB 2022). During this time, labor market tightness, measured as the ratio of job vacancies to the unemployment rate, have rapidly increased to historically high levels, suggesting historically low labor market slack. At the same time, private sector wages were growing in double digits (faster than most EU countries but in line with some peers in Emerging Europe at similar or higher positive output gaps), outpacing productivity growth which has also lagged peers in recent years.

Figure 9. Hungary: Labor Market Indicators



Sources: CSO; MNB; and Haver Analytics.

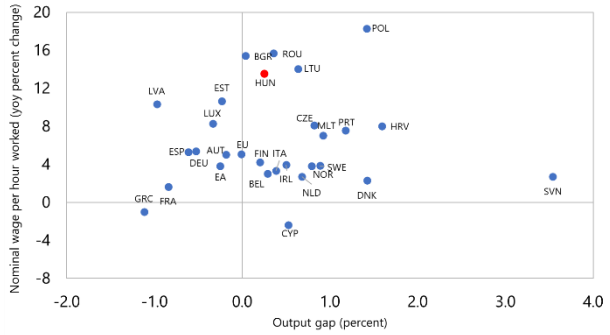


Sources: Eurostat; Haver Analytics; and IMF staff calculations.

Figure 9. Labor Market Indicators (concluded)

Nominal Wage per Hour Worked Growth in Private sector and Output Gap

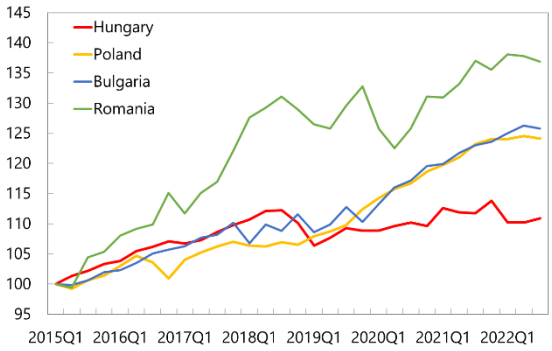
(Year-over-year percent change 2022Q2; percent 2022)



Sources: IMF World Economic Outlook; Eurostat; National Authorities; Haver Analytics; and IMF staff calculations.

Real Labor Productivity (Output per hour worked)

(Index 2015Q1=100)



Sources: Eurostat; Haver Analytics and IMF staff calculations.

11. Macroeconomic policies in recent years were among the most expansionary in the EU and persisted to be so even as the unemployment rate became very low. Fiscal policy loosened in 2020 in response to the COVID crisis and then again in late 2021-early 2022 when another round of fiscal stimulus was provided despite a strong-than-expected economic recovery from the COVID crisis was. Monetary policy also significantly loosened in 2020 and, although the MNB began to increase policy rates in mid-2021, inflation was becoming one of the highest in the region. As a result, over 2020-22, both the fiscal and monetary stances were among the most expansionary across the EU, with cyclically-adjusted fiscal balances and real interest rates below most other countries with similar or more negative output gaps. Using a simple normalized policy stance index that combines the fiscal balance and the real policy rate (measured as the average policy rate minus projected inflation one year ahead) in a simple average, the overall policy mix between 2020 and 2022 was the loosest in over two decades and persisted to be loose even as unemployment was close to record lows and inflation accelerated to historical highs.[4] Though the MNB began to raise its policy rates in mid-2021, it continued adding liquidity through its asset purchase program until end-2021. By mid-2022, the fiscal-monetary policy mix in Hungary tightened as fiscal policy reversed course and began to pull in the same direction as monetary policy.

[4] For the average policy rate in 2022, we used the average base rate between January and September and 18 percent for October. For inflation, we used our current one year ahead average CPI inflation forecast.

Figure 10. Hungary: Policy Stance Indicators

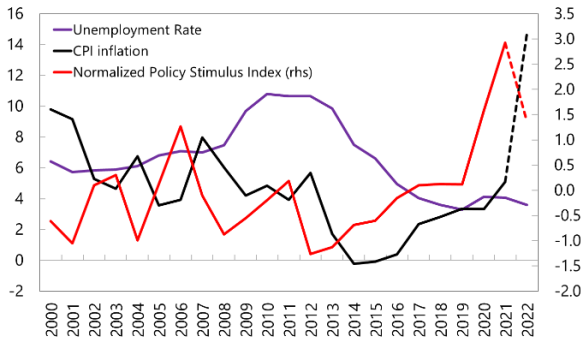
Fiscal Deficit and Real Policy Rate

(Percent of GDP, percent)

Sources: IMF, World Economic Outlook; Hungarian Central Statistical Office; Haver Analytics; and IMF staff calculations.

Inflation and Policy Stimulus

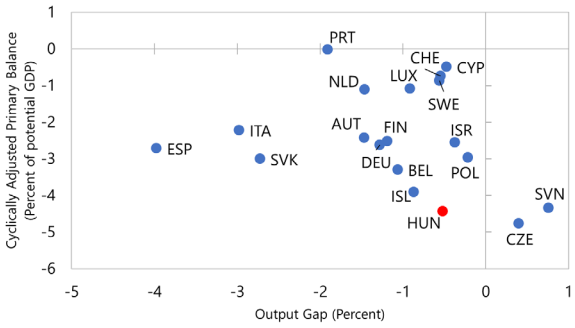
(Percent, year-over year percent change, index)



Sources: IMF, World Economic Outlook; Hungarian Central Statistical Office; Haver Analytics; and IMF staff calculations.

Fiscal Stance, Average 2020-22

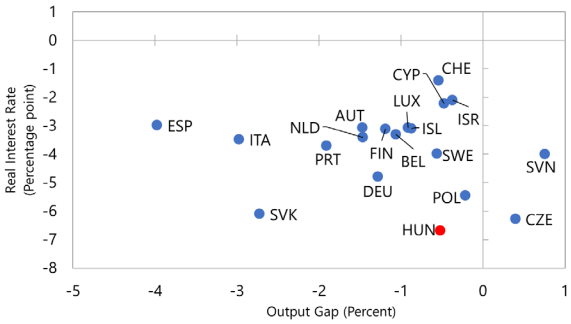
(Percent of potential GDP, percent)



Sources: IMF, World Economic Outlook; Hungarian Central Statistical Office; Haver Analytics; and IMF staff calculations.

Monetary Stance, Average 2020-22

(Percent of potential GDP, percent)

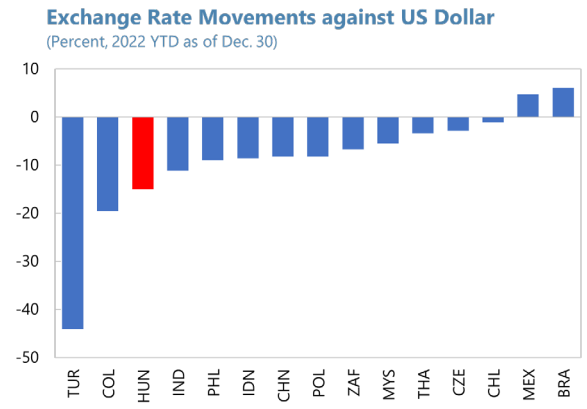


Sources: IMF, World Economic Outlook; Hungarian Central Statistical Office; Haver Analytics; and IMF staff calculations.

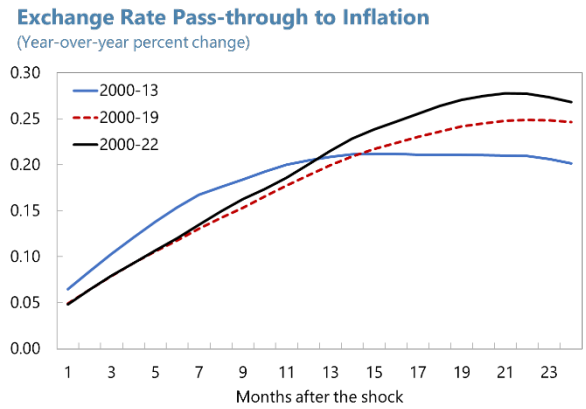
12. Exchange rate depreciation has also added to domestic inflation. During 2022, the forint depreciated against the US dollar by more than most emerging markets' currencies globally. As a benchmark, past estimates of the exchange rate passthrough to inflation in emerging markets ranged from around 6 percent in the first month after a shock to around 20 percent after about one year.[5] Updating this analysis using longer time series until 2019 and 2022 suggest that the exchange rate pass through to inflation has increased (Figure 10). Estimates for Hungary in the literature are broadly similar—Hajnal 2015 estimated a passthrough of up to 30 percent after two years and Vonnák 2010 estimated a passthrough of 10 to 20 percent after two years. However, non-linearities (including asymmetries related to depreciation vs. appreciation, and more than proportional impacts on inflation, the larger the depreciation shocks) have been documented in the literature and may have been amplified by the recent multiple shocks that have hit the global economy, emerging markets, and Hungary.

[5] See Caselli and Roitman (2019). A passthrough of 6 percent indicates that a 1 percent shock to the exchange rate translates in a 0.06 percentage point increase in inflation.

Figure 11. Hungary: Exchange Rate Developments and Passthrough



Sources: Bank for International Settlements; Haver Analytics and IMF staff calculations



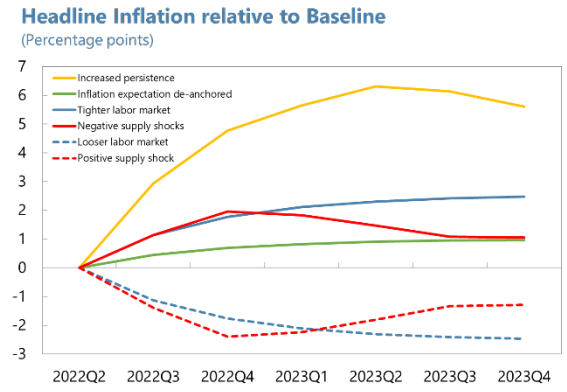
Sources: Caselli, F., Roitman, A., 2019; IMF, Information Notice System (INS) from Statistics Department; and IMF staff calculations.

Inflation Outlook and Risks

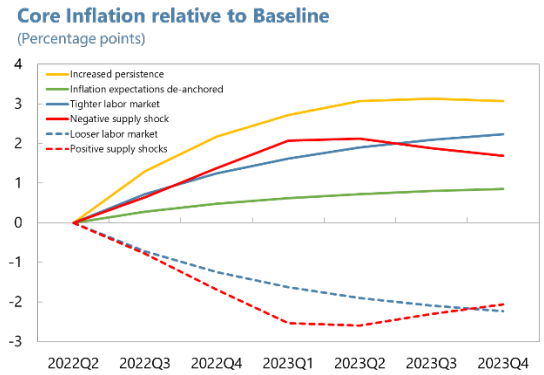
13. Under IMF staff's baseline, headline and core inflation are expected to peak in early 2023. They then slow as commodity prices retreat, domestic demand cools because the policy mix tightens, and high inflation erodes households purchasing power (Companion Staff Report). However, with persistent core inflation and tight labor market, inflation is expected to remain elevated and above the MNB's target until end-2025.

14. Labor market developments and increased persistence present the largest risks to the outlook. A high degree of uncertainty surrounds the outlook, as many risks can affect the inflation path, including renewed supply-side shocks notably from higher commodity prices, smaller-than-expected slack, or more entrenched inflation persistence. Simulating the impact of these possible shocks using the estimated Phillips Curve model suggests that the largest risks to inflation come from larger-than-expected persistence and tighter labor markets (see Appendix II for a description of shocks). Greater persistence could add up to 3 percentage points to core inflation in 2023. It could result from more backward or less forward-looking expectations and the pressure that this would put on wages, potentially resulting in a wage-price spiral. Tighter labor markets could add up to 2 percentage points over the same period. The model suggests that de-anchored inflation expectations present also a clear risk to inflation, but less potent possibly because past inflation expectations have been relatively well-anchored around the central bank's target, suggesting stronger risks from other factors.

Figure 12. Hungary: Inflation Risks



Source: IMF, REO, October 2022; Consensus Economics; IMF, World Economic Outlook database; and IMF staff calculations.



Source: IMF, REO, October 2022; Consensus Economics; IMF, World Economic Outlook database; and IMF staff calculations.

C. Policy Implications

15. Expansionary policies and external shocks boosted Hungary's inflation. Hungary's high inflation rates have been driven by both supply and demand-side factors. On the supply side, unprecedented spikes in commodity prices significantly affected food prices. On the demand side, significant fiscal policy stimulus, strong domestic demand, tight labor markets, and rapid wage growth contributed to increasing core inflation, which was further fueled by second-round effects from energy prices. In turn, core inflation's own persistence reinforced its strong dynamics. Meanwhile, energy retail inflation, which was repressed until recently, has begun to pass through and will soon create additional inflation pressures.

16. Credible, persistent, and consistently tight economic policies are needed to reduce inflation and drive it towards its target. Fiscal and monetary policies need to remain consistently tight and complement each other in dampening demand and reining in inflation. The exchange rate should remain free to adjust as needed while fiscal and monetary policies should remain persistently tight over time. Changes in the policy stance should depend on actual data on underlying inflationary pressures and the nature of any future shocks. Supply shocks that increase inflation would call for tighter monetary policies and for fiscal policies to remain tight while making space to support vulnerable groups impacted by higher costs of living. Demand shocks that lower both output and inflation may prompt a less tight stance to support economic activity while allowing inflation to fall towards the target range. Due to the persistence of core inflation and to lags between policy actions and an ultimate impact on inflation, maintaining a tight and consistent policy stance, with flexibility in responding to future shocks, is important to ensure that inflationary pressures consistently and sustainably ease.

17. Price and interest rate caps are costly, ineffective, and undermine monetary and fiscal policy's efforts to reduce inflation. In response to rising inflation and costs of living, the government relied on a series of caps on energy and food prices and selected retail interest rates. These regulatory measures have been counterproductive, working at cross purposes with the fiscal

and monetary policy tightening. First, sustaining artificially low prices prevents the demand adjustment that is needed to cool underlying pressures. Second, they have not been effective in fighting inflation. For example, price caps on selected food produces have resulted in higher prices on other products to compensate losses, and energy price caps have prevented demand adjustment and led to wider external deficits and greater exchange rate depreciation which, in turn, increased inflationary pressure. Third, because they are not sustainable, they will eventually need to be removed, as was the case for the motor fuel price cap, which was abruptly terminated on December 6, 2022 after it had led to widespread fuel shortages. By delaying the inevitable inflationary impact, price caps risk ultimately entrenching expectations higher, for longer. Moreover, the interest rate caps undermine the effectiveness of monetary policy by disconnecting key channels of transmission, eventually requiring greater tightening to achieve the same outcome.

18. In assessing policy trade-offs under high uncertainty, the costs of under-tightening exceed those of over-tightening. The potential costs of under-tightening (including entrenched high inflation and a higher eventual cost of controlling it) outweigh the risks of excessively lowering output through over-tightening. On balance, it seems better to over- than under-tighten to stabilize inflation, re-anchor inflation expectations, and enable a stable environment for recovery. To best complement monetary policy in its efforts to support the inflation target, the consistency of fiscal policy is crucial while administrative measures should not undermine policy tightening.

Appendix I. Model Results

Table A.I. Hungary: Phillips Curve Model Results

Variables	Europe	Emerging Europe	Advanced Europe	BGR	HRV	HUN	POL	ROU
Unemployment Gap	-0.374***	-0.676***	-0.337***	-0.259	-0.207	-0.361	-0.139	-0.477
	(0.078)	(0.179)	(0.097)	(0.246)	(0.170)	(0.415)	(0.089)	(0.376)
Lag of Core Inflation	0.431***	0.581***	0.287*	0.807***	0.786***	0.723***	0.920***	0.426***
	(0.127)	(0.105)	(0.161)	(0.094)	(0.121)	(0.128)	(0.056)	(0.106)
Inflation Expectations: 3 Years Ahead	0.569***	0.419***	0.713***	0.193**	0.214*	0.277**	0.080	0.574***
	(0.127)	(0.105)	(0.161)	(0.094)	(0.121)	(0.128)	(0.056)	(0.106)
Lag of External Price Pressure	0.020***	0.037**	0.009*	0.016	0.054	0.061***	0.010	-0.023
	(0.006)	(0.015)	(0.005)	(0.017)	(0.044)	(0.020)	(0.012)	(0.018)
Food price	0.127***	0.181***	0.065***	-0.003	0.028	-0.042	0.042**	0.109***
	(0.034)	(0.054)	(0.015)	(0.042)	(0.066)	(0.046)	(0.018)	(0.035)
Lag of Food Price	0.078***	0.075***	0.054***	0.031	0.088	0.132***	0.018	-0.009
	(0.020)	(0.027)	(0.020)	(0.046)	(0.056)	(0.045)	(0.021)	(0.033)
L2 of Food Price	0.032	-0.001	0.045***	-0.004	-0.060	0.049	0.034**	0.001
	(0.022)	(0.030)	(0.015)	(0.048)	(0.053)	(0.032)	(0.015)	(0.035)
L3 of Food Price	0.070***	0.065**	0.077***	0.023	0.107*	0.003	0.010	0.009
	(0.021)	(0.032)	(0.018)	(0.049)	(0.054)	(0.032)	(0.017)	(0.029)
L4 of Food Price	0.042**	0.053**	0.040**	0.061	-0.003	0.056	0.027	0.061*
	(0.017)	(0.026)	(0.019)	(0.047)	(0.045)	(0.038)	(0.017)	(0.035)
Energy Price	0.016	0.021	0.032***	0.058	0.048	0.053*	0.028*	-0.035
	(0.011)	(0.022)	(0.008)	(0.050)	(0.036)	(0.028)	(0.015)	(0.036)
Observations	2,210	503	1,707	60	60	86	86	86
Country FE	Yes	Yes	Yes	No	No	No	No	No
Time FE	No	No	No	No	No	No	No	No

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: IMF Regional Economic Outlook for Europe, October 2022.

Note: Emerging Europe includes Bulgaria, Croatia, Hungary, Poland, Romania, Russia and Türkiye. Advanced Europe includes Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Israel, Italy, Lithuania, Latvia, the Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. Europe includes Emerging Europe and Advanced Europe.

Appendix II. Risk Scenarios

Table A.II. Hungary: Illustrative Inflation Risk Scenarios

	Shocks	Phillips Curve Simulations 1/	DSGE Model Simulations
0	Baseline (WEO)	July WEO GAS (energy inflation 69% in 2022, -14.1% in 2023; food inflation 19% in 2022, 2.8% in 2023)	Cost shock raises inflation to WEO baseline in 2022Q2
1	Negative supply shocks	20 percent rise in energy and food prices	Additional inflationary cost shock matching initial shock in Phillips curve simulation
2	Positive supply shocks	20 percent fall in energy and food prices	Deflationary cost shock matching initial shock in Phillips curve simulation
3	Looser labor market (More slack than estimated)	2 percentage points lower unemployment gap	2 percentage points lower output gap than assumed by in monetary policy rule
4	Tighter labor market (Less slack than estimated)	2 percentage points higher unemployment gap	2 percentage points higher output gap than assumed in monetary policy rule
5	Inflation expectations de-anchored	1 percentage point higher expected inflation	Inflation expectations increase inflation in the first period by 1 percentage point
6	Increased persistence (Wage-price spiral)	A rise in the coefficient on lagged inflation to 0.95	A rise in the coefficient on lagged inflation to 0.8

Sources: IMF, Regional Economic Outlook for Europe, October 2022; IMF, World Economic Outlook database; and IMF staff.
Note: DSGE = dynamic stochastic general equilibrium.
1/ All shocks persist throughout the simulation periods of 6 quarters in the Phillips curve simulation exercise.

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