1. Introduction

Inflation has surged to levels not seen in multiple decades in many countries due to a strong recovery of demand after the pandemic, supply chain disruptions, and commodity price increases, exacerbated by Russia's war in Ukraine. Inflation has also become broad-based, making it a priority for policymakers to accurately diagnose the drivers of the current upswing in inflation, assess its persistence, and design appropriate policies. In the Western Balkan region,[1] inflation increased to 14.5 percent in December[2] year-on-year, as compared to 9.2 percent in the Euro Area.

The motivation of this paper is to understand the inflation dynamics in the Western Balkans (WB) and discuss policy implications. While much as in the rest of the world, the shocks to global energy and food prices are the main drivers of the current surge in inflation in the WB, we explore how the characteristics of these economies may have interacted with the global shocks. We seek to understand to what extent inflation may be becoming entrenched, and what role domestic factors may play, as we see headline inflation appearing to peak in some countries while core inflation remains elevated. These are relevant questions for policymakers in the region, who face the difficult tasks of carefully calibrating the macroeconomic policy mix to preserve price stability and keep inflation expectations anchored, while protecting vulnerable populations from sharp commodity price shocks and safeguarding the economic recovery.

Our empirical strategy to tackle these questions consists of two complementary approaches. We first employ a reduced-form Phillips curve model, augmented with international food and energy prices as explanatory variables, which, as we show, are particularly relevant for the WB. We estimate the model for different measures of inflation on panel quarterly data, using robust regressions.[3] The use of panel regression is motivated by similarities of shocks in the region, and it helps to get around insufficiencies of data for each country. Next, we use a structural VAR (SVAR) model that allows us to analyze how specific structural shocks affect inflation in each country. Including real GDP growth, inflation, domestic monetary or fiscal policy, and a measure of the external price environment in the SVAR, we use theoretically motivated sign restrictions to identify shocks to aggregate supply, aggregate demand, monetary or fiscal policy, and to the external price pressure. Basing on these two widely used empirical approaches, this paper contributes to the literature by adapting and employing them for the WB economies. While the reduced-form Phillips curve model is useful for describing the overall inflation dynamics in the region, the SVAR gives us some insight on causality and the relative contribution of different shocks to inflation in each country.

Based on the Phillips curve model, we first find that international food prices play an important role in determining inflation in the WB. International food prices not only affect headline inflation through their impact on domestic food prices (which account for a large share of the consumption basket), but also affect core inflation. We further find that domestic food inflation plays a role in determining inflation expectations. This result, combined with the high persistence of inflation, documented in earlier literature and confirmed in this paper, implies that international food price shocks can have a large and lasting impact on inflation in the WB, and that bringing inflation down to its pre-shock levels would be gradual. The policy implications are two-fold:

[1] The Western Balkans include Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia.

[2] Includes Bosnia and Herzegovina data through November 2022.

[3] Robust regression is an alternative to least squares regression when data are contaminated with outliers. The paper uses Huber (1964) M-estimators, a generalized form of median regression.

first, there may be a rationale for temporary policies aiming to moderate the immediate and complete pass-through of international to domestic food prices during the upswings. Careful calibration of such policies, however, is key to ensure that their benefits outweigh the costs and that distortions to price signals and fiscal costs are minimized.[4] Second, increasing the credibility of macroeconomic stabilization policies should be prioritized for reducing inflation persistence in the WB.

We also find that in addition to international food prices, the nominal effective exchange rate and international energy prices are statistically significant determinants of headline inflation in the WB, while core inflation is also affected by inflation expectations. We do not find consistent evidence for measures of slack such as output or unemployment gaps to directly affect inflation, although we find a statistically significant role for them in determining inflation expectations. We interpret the latter result with caution, given the limitations of accurately assessing the output or unemployment gaps in the WB, where informality is high.

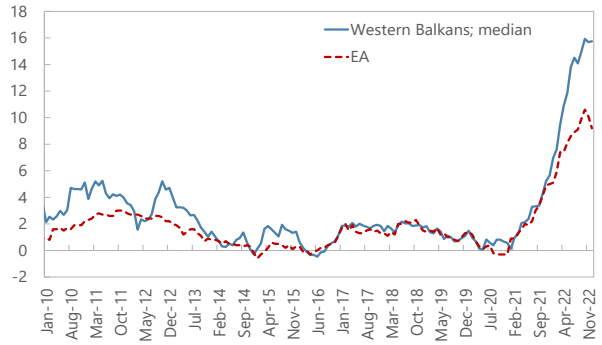
Based on the SVAR analysis, we find that inflation in the WB is not just driven by external shocks, and domestic factors also play an important role in determining inflation. About two-thirds of the inflation variation in the short term and about half of the inflation variation in the medium term can be attributed to domestic shocks on average for the WB over the entire sample period. The current surge in inflation cannot be fully attributed to external shocks, as we find domestic factors also contributing to it, including through strong domestic demand. This result suggests that domestic macroeconomic stabilization policies have an important role in keeping inflation low and stable in the WB. Regarding possible measures to curb the pass-through from international food prices to domestic inflation, the policy implication is that careful design of such policies is needed in order to minimize fiscal costs and avoid fueling demand pressure that can further drive up inflation.

The rest of the paper is structured as follows. Section 2 describes the stylized facts of the inflation dynamics in the WB that inform and motivate our empirical analysis strategy, section 3 summarizes the relevant literature, section 4 presents the panel regression model and results, section 5 presents our structural VAR approach and results, and section 6 concludes.

[4] Specific policies that could be used to limit the pass-through of commodity price shocks to domestic inflation, as well as policy considerations for alleviating the cost-of-living hardship caused by high inflation and the impact on vulnerable groups are beyond the scope of this paper.

2. Stylized Facts

Figure 1. Inflation in the Western Balkans and the Euro Area
(In percent; y/y change)



Sources: Eurostat, Haver Analytics, WB central banks, and IMF staff calculations.

Since mid-2022 the economies in the Western Balkans have been experiencing inflation rates unseen in the recent past. After the dramatic hyper-inflation episodes of the 1990s, a relatively low-inflation environment was enjoyed in the region.[5] Notably, this relative stability was maintained in the context of a variety of exchange rate regimes, ranging from unilateral euroization in Montenegro and Kosovo, currency board in Bosnia and Herzegovina, stabilized arrangement in Serbia and North Macedonia, and floating exchange rate regime in Albania.[6] With formal or informal euroization, average inflation in the WB as a whole had been tracking the Euro Area inflation increasingly closely, until accelerating faster and exceeding it in 2022. Further, while both EA and WB inflation have moderated somewhat in the recent moths, the gap between the two does not appear to be shrinking (Figure 1).

As in the rest of the world, the recent surge in inflation in the WB was triggered by the shocks to global energy and food prices (Figure 2).[7] Nevertheless, the interactions of these shocks with specific characteristics of the economies in the region merit further attention. As a start, comparing the WB with the EU, it is evident that food inflation has had a relatively larger role while energy inflation a relatively smaller role in the WB (Figure 2).[8]

The relatively large share of food in the CPI basket stands out as an important feature of the WB economies (Figure A1.2). The simple average of the weight of food in the CPI basket for the region is around 42 percent, which is consistent with a negative correlation between income levels and weight of food in the CPI basket that is suggested by the literature (Figure A1.3). Moreover, food inflation has been higher in the WB compared to the EU but similar to the emerging economies in the EU (EUEE)[9] (Figure 2). We conjecture three main reasons behind this: (i) a higher pass-through from international to local food prices, due to the higher share within the food category of the CPI basket of staple foods that experienced the immediate global shocks, such as cereals and vegetable oils, which have a combined share in the food basket averaging around 9.4 percent in the WB, as compared to 3.2 percent in the EU;[10] (ii) less government regulation of the food and agriculture sector in the WB compared to the EU, which can contribute both to higher pass-through from international to local food

[5] The exceptions were short-lived episodes of double-digit inflation in Serbia in 2011 and 2013 driven by sharp exchange rate fluctuations.

[6] The classification is based on the IMF Annual Report on Exchange Arrangements and Exchange Restrictions, 2021.

[7] See Appendix I, Figure A1.1 on contributions of various components of the CPI to headline inflation in individual WB economies

[8] We use a uniform definition of core, energy, processed and unprocessed food inflation throughout the paper. See Appendix II for details.

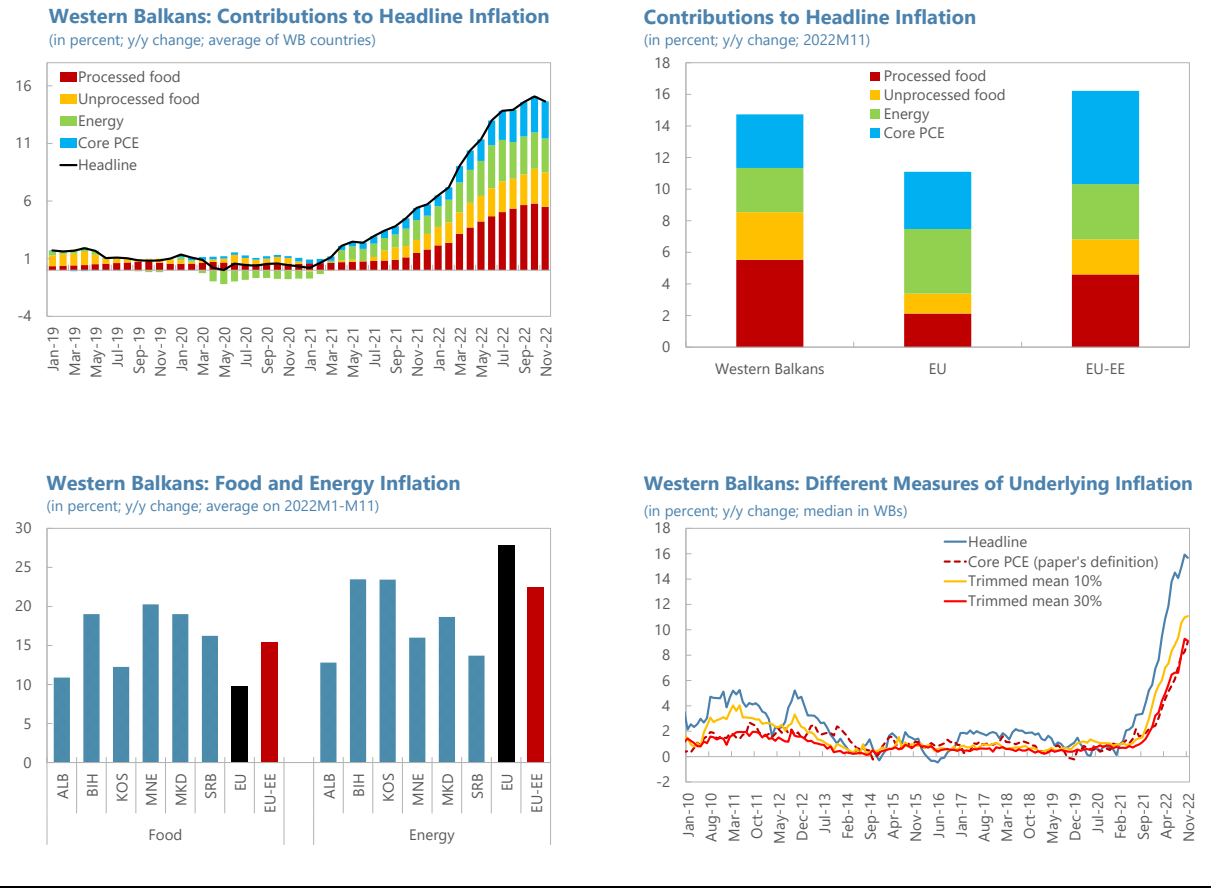
[9] EUEE includes Bulgaria, Croatia, Hungary, Poland, and Romania.

[10] See Table A1.1 in Appendix I, which includes data on 3 out of the 6 WB economies.

prices and to higher volatility of domestic food prices in the WB compared to the EU; [11] and (iii) adverse weather conditions for domestic agricultural production in 2022 - a drought in Bosnia and Herzegovina and Serbia - that significantly affected several key crops, leading to higher domestic food prices.

The share of energy products in the CPI basket in the WB is similar to that in the EU and other European peers (Figure A1.3). At the same time, most of the WB countries experienced lower overall energy price inflation compared to the EU, although the average for the WB region was similar to EUEE (Figure 2). The relatively lower energy inflation in the WB can be attributed to the higher reliance on domestically generated energy, especially electricity in Albania, Bosnia and Herzegovina, and Montenegro. Reliance on natural gas, the growing prices of which have been an important contributor to inflation in many European countries, is low in the WB. Nevertheless, higher international gasoline prices did pass through to domestic markets, also resulting in higher prices in the transport sector in all the WB countries.[12]

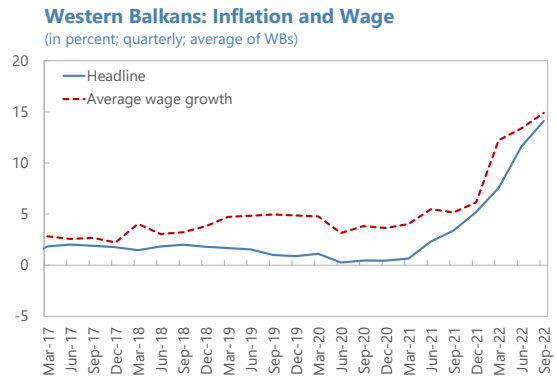
Figure 2. Inflation Developments in the Western Balkans

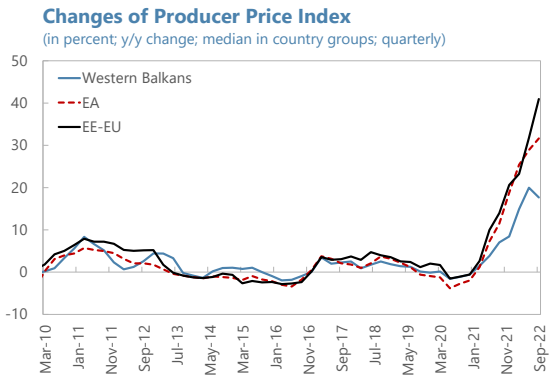


[11] As a proxy for government regulation, public spending on agriculture in percent of agricultural GDP is about 10% on average in the WB versus 21% in the EU. See Table A1.2 in Appendix I for details.

[12] Note that in our definition of "energy" we include "operation of personal transport equipment" that is part of the "transport" group in COICOP classification of CPI.

Figure 2. Inflation Developments in the Western Balkans (Concluded)





Sources: Eurostat, WB central banks, Haver Analytics, and IMF staff calculations.

Looking beyond food and energy prices, inflation has become increasingly broad-based. Even if headline inflation appears to be moderating in some of the countries, driven by decline of international food and energy inflation in the last few months, core inflation is not, and an increasing share of CPI components are showing large price increases. (Figure 2).[13] There are various channels through which inflation may be becoming both broad-based and persistent. On input costs, the growth of producer prices in the WB has been lower than in the EU, in part due to the relatively lower energy price inflation. Wages, on the other hand, have been increasing in the region. Labor markets are generally decentralized in the WB, with little to no role for collective bargaining. At the same time, informal employment and wages are quite prevalent, making official data less informative. Nevertheless, average wage data show a pick-up in growth in the region overall, catching up with the headline inflation in recent months (Figure A1.7). Minimum wage increases enacted prior to the global commodity price shocks in Montenegro and Albania and in the course of 2022 in Bosnia and Herzegovina and Serbia, played a role as well, adding potentially both to cost and to demand pressures. As a result of the strong recovery from the COVID-19 pandemic, by 2022 most WB economies were operating very close to, or above potential, which possibly contributed to building up demand pressures.

Inflation expectations based on central bank surveys in Albania and Serbia have started to pick up, exceeding the respective central bank targets, as early as February 2022 in Albania and December 2021 in Serbia, although lagging behind actual inflation. In Montenegro, while numerical results are not available, in a survey conducted by the central bank in May, all bank responders and the majority of nonbank responders indicated their expectation for inflation to go up. Using Consensus Forecast data, one-year ahead inflation expectations, available for the 4 out of 6 WB economies also show a pick-up from February 2022 (Figure A1.8).

Rising inflation prompted country authorities in the region to take action to slow inflation and dampen its impact on households and firms. In countries with independent monetary policy (albeit with limited effectiveness on the credit channel largely due to high euroization), policy rates were increased several times since early 2022. Albania, Bosnia and Herzegovina, Kosovo, and Serbia implemented one-off assistance packages to mitigate

[13] See Figures A1.4-A1.6 in Appendix I for details on individual WB economies.

the impact of high inflation, somewhat targeted at vulnerable groups. Bosnia and Herzegovina also introduced sizable public wage and pension increases. Household electricity tariffs are regulated and have been partially adjusted so far only in Kosovo, North Macedonia, and Serbia, where the adjustments were accompanied with some subsidies to mitigate the impact of higher tariffs on households. In Bosnia and Herzegovina and North Macedonia, to support the stable tariffs, subsidies to the energy sector were allocated. Only Montenegro did not need to directly subsidize the energy sector, although the state-owned electricity company was allowed not to transfer its dividends to the budget. Other measures included VAT and excise tax cuts for some food and fuel items in Montenegro, North Macedonia, and Serbia; price caps and profit margin limits for critical staple food and fuel items in all WB countries; export bans or quotas for some critical items in Serbia and Bosnia and Herzegovina.

3. Literature Review

Increasing inflation all around the world has led to a renewed interest in explaining the determinants of inflation and shifted the focus of researchers from low and stable inflation or deflation to high inflation. This paper relates to the literature studying the inflationary impacts of the multiple shocks of COVID-19, supply chain disruptions, and commodity price surges, especially in Europe. While historical analysis suggests that past pandemics had led to a significant decline in trend inflation (Bonam and Smadu, 2021), COVID-19 appeared to be different, given the unprecedented policy response, fast vaccination, and the adaptation of a large part of the economy to virtual work environment in advanced and, partly, emerging market economies.[14] At the same time, pandemic-related supply chain disruptions became a major contributor to inflation. Celasun et al. (2022) estimate that in the Euro Area half of the producer price inflation of manufactured goods in 2021 was explained by supply bottlenecks due to disruptions in production facilities and shortage of intermediate inputs while the other half was explained by higher demand.[15]

On the current surge of inflation in Europe, IMF (2022a) estimates that rising commodity prices explain around two thirds, while the cross-country heterogeneity in inflation dynamics can be explained by differences in food and energy weights in CPI baskets, differences in the energy mix, price regulations, policy measures, and exchange rate developments.[16] Initially timid policy responses to the emerging inflationary pressures could also have played a role, as the impact of the strong recovery in 2021 may have been underestimated, supply shocks were observed as temporary rather than persistent, and inflation expectations were believed to be anchored based on experience in the past two decades (Reis, 2022). On second-round effects of commodity price hikes on inflation, Baba and Lee (2022) finds that the level of pass-through of commodity price shocks to wages in Europe is larger if the overall inflation is higher when the commodity price shock hits, and, in addition, the pass-through is estimated to be larger for emerging than advanced European economies.[17] On the Western Balkans,

[14] At the beginning of the pandemic, with stumbled oil prices and depressed labor market, inflation was expected to stay low, and even a pent-up demand after the lifting of the lockdowns was not expected to lead to higher inflation (Blanchard, 2020). Increasing inflation with the lift of lockdowns in the second half of the 2021 was often seen as temporary (Blanchflower, 2021).

[15] Carriere-Swallow et al. (2022) find that shocks to global shipping costs that create supply bottlenecks tend to have a more persistent impact on domestic inflation compared to the shocks to global commodity prices.

[16] Inflation differences across European countries are also explained by differentiated impact of the pandemic, and the widening spreads in core inflation (Goujard and Beynet, 2022).

[17] Relatedly, Boranova et al. (2021) analyzed the pass-through from wage growth to core inflation for 27 European countries for the period between 1995Q1-2019Q1 and showed that wage growth historically led to high inflation but since the Global Financial Crisis, the impact of the wage shock on inflation weakened. Further, the pass-through is shown to be significantly higher in periods of high inflation.

World Bank (2022) notes that headline inflation started to increase in the region through supply side pressures, while strong consumer demand and high passthrough effects also contributed to higher core inflation.

To study the drivers of the recent inflation surge, an augmented Phillips curve, including global commodity prices, has been widely used. In addition to past and expected future values of inflation and economic slack, recent studies included foreign price developments, such as foreign price indices, exchange rates, and global energy and food prices as explanatory variables. In a study covering 24 advanced and 7 emerging European economies, IMF (2022a) estimates the Phillips curve individually for each economy and shows that inflation is strongly associated with lower economic slack (or lower unemployment rate), and higher past and expected future price developments. It further finds that in emerging European economies inflation responds more strongly to foreign price developments than in advanced European economies. In this analysis, the Phillips curve could explain up to 60 percent of the recent surge in inflation, leaving the remaining 40 percent unexplained. Further regressing the residuals on variables that are not covered in the Phillips curve model, IMF (2022a) finds that around 30 percent of the recent surge in inflation could be associated to pandemic-driven supply bottlenecks.

Vector auto regression (VAR) analysis is also widely used for analyzing inflation dynamics, and structural vector autoregressive (SVAR) models in particular, have become one of the primary tools in the literature. One limitation of reduced-form Phillips curve models is that evaluating causal relationships is difficult when the variables are inherently endogenous. The SVAR framework, which allows to model endogenous interdependencies, can complement a traditional Phillips curve analysis. As compared to models using the recursive ordering of the VAR, SVAR analysis does not need impose a chain of causation, but instead sign and zero restrictions are used to identify structural shocks and all variables are allowed to respond to the shocks simultaneously. The sign restriction approach dates back to Faust (1998) and Uhlig (2005) and since then has been applied frequently to identify a broad set of macroeconomic shocks (Fry and Pagan, 2011). The sign restrictions approach used in this paper was developed in Rubio-Ramirez et al. (2010) and the Bayesian method of estimation follows Uhlig (1994). Our SVAR analysis relates closely to IMF (2022c), which finds that in New Zealand domestic shocks have a slightly larger role in determining inflation, but external shocks contributed more to the recent surge in inflation. Celasun et al. (2022) use SVAR for a group of countries including the Euro Area aggregate and find that supply bottlenecks had an important impact on inflation.[18] Baba and Lee (2022) and Binici et al. (2022) use the local projection method, which is econometrically equivalent to a VAR, and find that inflation in Europe has become more responsive to both domestic and global shocks in the post-pandemic period.

4. Panel Regression Analysis

This section presents empirical analysis of inflation drivers in the Western Balkans using a reduced-form Phillips curve model, which is augmented with explanatory variables to cover foreign price developments particularly relevant for the WB. Formally, we estimate the equation:

$$\pi_{i,t} = \beta_1 \pi_{i,t-1} + \beta_2 \pi_{i,t}^{CF} + \beta_3 \tilde{y}_{i,t} + \beta_4 NEER_{i,t} + \beta_6 Food_t + \beta_7 Energy_t + FE_i + \varepsilon_{i,t},$$

[18] A related study is Ha et al. (2021), which uses a factor-augmented VAR to analyze the evolution and drivers of inflation during the pandemic for a large dataset including several countries from Europe. This model allows employing higher frequency data, including a set of narrative restrictions for the periods of large oil price fluctuations on top of standard sign restrictions, and allows for time-varying volatility in the global variables to reflect large fluctuations around global recessions and shocks.

where $\pi_{i,t}$ denotes the quarter-over-quarter (annualized) inflation in country i at time t; $\pi_{i,t}^{CF}$ denotes the expected inflation in country i at time t, $\tilde{y}_{i,t}$ is a measure of output gap or unemployment gap (depending on the specification), $NEER_{i,t}$ is the quarterly change in nominal effective exchange rate, $Food_t$ denotes the quarterly growth in international food price, and $Energy_t$ denotes the quarterly growth in international energy price. FE_i corresponds to country fixed effects and $\varepsilon_{i,t}$ to the error term.

The model is estimated on quarterly data covering the period of 2007Q1-2022Q3 for six economies of the WB,[19] using robust panel regression and correcting the standard errors for heteroscedasticity and autocorrelation.[20] Our preferred specification includes country fixed effects but not time fixed effects.

It should be noted that the results of this analysis may be affected by the quality of data, especially on some variables, as well as the short span of the time series. Measures of slack (both output gap and unemployment gap) are particularly challenging to estimate in the WB economies due to large informality as well as the difficulty of assessing the impact of the recent shocks on potential output and unemployment. Further, reliable and consistent data on inflation expectations are not available for all of the WB countries. Instead, we use as a proxy one-year inflation expectation from Consensus Forecast, data on which are available for four out of the six countries.[21]

The augmented Phillips curve estimates for headline inflation, core inflation, and trimmed-mean inflation at 10% and 30% are presented in Table 1. For all measures of inflation, the results show strong persistence, with the lagged dependent variable coefficient averaging around 0.5 across specifications. The estimated coefficients are roughly in line with the literature on empirical Phillips curves augmented with global factors.[22] Our next key result is that international food prices have a statistically significant impact on all measures of inflation. While their impact on headline inflation is unsurprising, reflecting the large share of food items in the consumption basket, a notable result is that international food prices also appear to affect core inflation (defined as non-food, non-energy inflation).[23] This may be due to food items being important inputs for the services sector, such as restaurants and tourist accommodation. Another reason could be that, because of their large share in the CPI basket, food prices play a key role in price-setting more broadly, including in determining wages, which in turn affect core inflation. Unfortunately, because of the prevalence of informality in the WB, wage data are not very reliable which makes it difficult to examine how wages are affected by food prices.

Results in Table 1 also show that the nominal effective exchange rate is another important driver of inflation. For countries with an autonomous currency, this reflects exchange rate pass-through, while for those with a fixed exchange rate or no separate legal tender this suggests a relative price passthrough. International energy price inflation is also found to be statistically significant in all regressions. Inflation expectations appear to be significant for core inflation. Finally, the coefficient associated with the output gap is not found to be statistically

[19] See Appendix II for data sources and definitions.

[20] Robust regression is an alternative to least squares regression when data are contaminated with outliers. The paper uses Huber (1964) M-estimators, a generalized form of median regression. This allows an increase in Gaussian efficiency while keeping robustness with respect to vertical outliers. See Verardi and Croux (2009) for an implementation of robust regression estimation in Stata.

[21] For this reason, some of the specification exclude Kosovo and Montenegro.

[22] The magnitude of the lagged inflation coefficient is similar to the estimate for Eastern European economies in Chapter 2 of the IMF October 2022 European Regional Economic Outlook. The persistence is higher than that in advanced European economies.

[23] Except for the specification in column 4 of Table 1.

significant in any of the equations. We attribute this result to the difficulty of accurately measuring output gaps in the WB.

Table 1. Headline, Core and Trimmed-mean Inflations Determinants

	Headline inflation		Core PCE		Headline inflation Trimmed-mean 10%		Headline inflation Trimmed-mean 30%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependant variable	0.510***	0.590***	0.213***	0.421***	0.690***	0.684***	0.272***	0.708***
	(0.043)	(0.033)	(0.056)	(0.042)	(0.052)	(0.038)	(0.036)	(0.029)
1y inflation expectation $_{(t-1)}$	0.027		0.426***		-0.001		0.017**	
	(0.082)		(0.092)		(0.020)		(0.008)	
Output gap	0.054	0.013	-0.002	0.026	0.003	-0.004	-0.001	0.002
	(0.061)	(0.042)	(0.069)	(0.054)	(0.014)	(0.008)	(0.005)	(0.003)
NEER	0.075***	0.073***	0.049*	0.088***	0.020***	0.019***	0.007***	0.001
	(0.026)	(0.024)	(0.028)	(0.031)	(0.006)	(0.005)	(0.002)	(0.002)
Int.l' food price inflation	0.021***	0.023***	0.021**	0.012	0.008***	0.006***	0.002***	0.001***
	(0.007)	(0.006)	(0.008)	(0.009)	(0.002)	(0.001)	(0.001)	(0.001)
Int.l' energy price inflation	0.016***	0.018***	0.009***	0.016***	0.001**	0.001***	0.001**	0.001**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	1.005***	0.894***	1.001***	1.265***	0.135**	0.141**	0.079***	0.055**
	(0.305)	(0.300)	(0.318)	(0.366)	(0.064)	(0.058)	(0.025)	(0.023)
Observations	221	331	185	265	183	278	183	278
R-squared	0.636	0.673	0.438	0.474	0.713	0.689	0.588	0.783
Number of countries	4	6	4	6	4	6	4	6
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	No
Missing countries	KOS; MNE		KOS; MNE		KOS; MNE		KOS; MNE	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

These results are robust to different specifications. Appendix Table A3.2 presents the results of alternative specifications where the unemployment gap is used as a measure of slack instead of the output gap. The unemployment gap is not found to be statistically significant, which can be attributed to large informality and poor data on employment in the WB. In these specifications the NEER is not found to be consistently statistically significant, therefore we opt for the model presented in Table 1 as our baseline. Appendix Table A3.3 reports the estimation results of a fixed effect OLS, which are in line with Table 1, except that the NEER is not found to be consistently statistically significant. Appendix Table A3.4 uses the external price pressure index (EPPI), a variable commonly used in the literature, instead of the NEER, however in most of the specifications the coefficient of EPPI is not found to be statistically significant.[24]

Because of the central role of food prices in the WB, we look into the determinants of domestic food price inflation, analyzing separately processed and unprocessed food prices, as the dynamics of these two groups may be driven by different factors. Results presented in Table 2 show that unprocessed food prices are affected by the NEER and international food prices, while processed food prices are primarily affected by international food prices. Also presented in Table 2 are the results on domestic energy price inflation, which show that international energy prices are statistically significant. In all three regressions summarized in Table 2, the coefficient of persistence of inflation is high and statistically significant.

[24] See Appendix II for the definition of the external price pressure index.

Table 2. Determinants of Domestic Processed and Unprocessed Food and Energy Prices

	Processed food		Unprocessed food		Energy	
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged dependant variable	0.547***	0.473***	0.150**	0.248***	0.160***	0.216***
	(0.038)	(0.033)	(0.067)	(0.050)	(0.049)	(0.041)
1y inflation expectation $_{(t-1)}$	-0.276**		-0.061		0.468**	
	(0.130)		(0.335)		(0.197)	
Output gap	0.059	-0.020	-0.024	0.051	0.284*	0.147
	(0.095)	(0.069)	(0.268)	(0.159)	(0.154)	(0.108)
NEER	0.056	0.074*	0.260**	0.201**	0.189***	0.212***
	(0.040)	(0.040)	(0.109)	(0.092)	(0.061)	(0.061)
Int.l' food price inflation	0.034***	0.029***	0.055*	0.077***	-0.009	-0.007
	(0.011)	(0.011)	(0.032)	(0.026)	(0.019)	(0.017)
Int.l' energy price inflation	0.004	0.006	-0.003	-0.003	0.083***	0.094***
	(0.004)	(0.004)	(0.013)	(0.010)	(0.007)	(0.007)
Constant	1.036**	0.851*	4.197***	3.451***	0.876	1.420**
	(0.430)	(0.459)	(1.244)	(1.084)	(0.691)	(0.713)
Observations	185	265	185	265	185	269
R-squared	0.644	0.550	0.117	0.168	0.593	0.587
Number of countries	4	6	4	6	4	6
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No
Missing countries	KOS; MNE		KOS; MNE		KOS; MNE	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Finally, our analysis sheds some light on how inflation expectations are formed in the WB. Results of two regressions are presented in Table 3: column 1 shows that higher headline inflation leads to an increase in one-year ahead inflation expectations, suggesting a backward-looking component to inflation expectations. The NEER coefficient is also statistically significant and positive, implying that agents expect more inflation when the nominal effective exchange rate depreciates. Notably, the output gap is found to have a statistically significant positive coefficient, suggesting that when the economy is above its potential, agents tend to expect higher inflation. Column 2 of Table 3 presents the results of an alternative model where the components of headline inflation[25] are included in the regression as explanatory variables instead of the aggregate. Consistent with the empirical literature on inflation expectations,[26] the coefficient of core inflation is estimated to be positive and statistically significant, however in addition, domestic food inflation (both unprocessed and unprocessed) is also found to be associated with higher inflation expectations. This suggests that the current increases in domestic food prices could have a more long-lasting impact on domestic inflation through inflation expectations.

[25] Components of the headline inflation include processed and unprocessed food inflation, energy inflation and core PCE.
[26] Stock and Watson (2007), Koenig and Atkinson (2012), among others.

Table 3. Determinants of Inflation Expectations

	1y inflation expectation	
	(1)	(2)
Headline inflation	0.086***	
	(0.021)	
Processed food inflation		0.064***
		(0.019)
Unprocessed food inflation		0.012**
		(0.005)
Energy inflation		0.009
		(0.013)
Core PCE		0.054**
		(0.024)
Output gap	0.111**	0.078
	(0.047)	(0.048)
Log diff. of NEER	0.124***	0.120***
	(0.019)	(0.019)
Constant	1.207***	1.242***
	(0.222)	(0.238)
Observations	221	185
R-squared	0.496	0.605
Number of countries	4	4
Missing countries	KOS; MNE	KOS; MNE

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In sum, our results suggest that in the WB headline inflation is driven by its own persistence, international food and energy prices, and the nominal effective exchange rate, while for core inflation, inflation expectations also play a role. Another important finding is that all measures of inflation are highly persistent. Somewhat consistent with this is the result that the current level of inflation, and food inflation in particular, play a role in the formation of inflation expectations. Finally, the only potential role we are able to find for the output gap in determining inflation is through inflation expectations.

These results lend themselves to the following policy implications. First, the high pass-through of international food prices to headline inflation as well as their importance for core inflation and inflation expectations means that international food price shocks can have a large and lasting impact on inflation. Accordingly, policies that aim to curb the pass-through from international to domestic food prices may have merits, as reducing the high inflation triggered by a large food price shock only through conventional monetary and fiscal policies may be more costly and difficult. Such policies, however, can have high fiscal costs and distort price signals. While this is beyond the scope of our paper, it can be argued that, in general, measures aiming to moderate the pass-through of international food and energy prices to end users should remain as temporary and as targeted as possible and be designed efficiently to minimize distortions to price signals.[27] Second, we attribute the lack of statistical significance of the coefficient associated with estimated output or unemployment gaps to the difficulties of measuring economic slack in the WB. Nevertheless, the estimated statistically significant impact of the output gap on inflation expectations suggests that macroeconomic policies aiming to stabilize aggregate demand may be effective in stabilizing inflation through the channel of inflation expectations.

[27] See October 2022 Regional Economic Outlook on the general rationale for limiting the immediate and complete pass-through of commodity price shocks to end-users and fiscal policy recommendations (IMF 2022a).

Finally, the high persistence of inflation and the backward-looking nature of inflation expectations imply that increasing the credibility of macroeconomic policies is a priority in the WB.[28] This suggests another indirect channel for macro stabilization policies to affect inflation by reducing its persistence and anchoring inflation expectations. In the current environment of elevated inflation on the back of commodity price shocks, the implication for countries with independent monetary policy is the need to maintain appropriately tight monetary policy, and, for all WB countries, to keep fiscal policy in check to cool down domestic demand, thereby helping to keep inflation expectations anchored.

5. Structural VAR Analysis

In this section, we present the results of SVAR analysis for each of the WB economies separately using quarterly data through 2022 Q3.[29] Country SVAR specifications vary according to whether or not the country in question has independent monetary policy. The common variables for all countries are real GDP growth, headline CPI inflation rate, and the external price pressure index (or Euro Area inflation in alternative specifications). For Albania, Serbia, and North Macedonia, which have independent monetary policies, we include a proxy for the monetary policy rate[30] as one of the variables in the system. For Montenegro and Kosovo that are unilaterally euroized, and Bosnia and Herzegovina, which has a currency board, we instead include government spending (in percent of GDP) as a measure of fiscal policy. With this setup of the SVAR model, we assume that real GDP growth, inflation rate, a measure of external inflation, and monetary policy or fiscal policy, constitute an interdependent system of variables. Our choice of variables is in line with the literature that seeks to identify domestic and external shocks affecting inflation,[31] however due to the short time series, we opt for a more parsimonious model. As in case of our Phillips curve, it should be noted that the results of our SVAR analysis may be affected by the short span of the time series. One advantage of our SVAR analysis, however, is that it does not rely on measures of the output gap or on inflation expectations estimating which is particularly difficult for the WB economies.

Our identification scheme for structural shocks is based on theoretically motivated sign restrictions.[32] Following a common approach in the literature, we first estimate a reduced form VAR with four variables, using a Bayesian approach. We then find some random structural decomposition of shocks and check if the impulse responses satisfy the sign restrictions. If they do, we save the iteration as one model, and if not, we discard the iteration, and repeat. Finally, the results are interpreted based on a large number of draws. The intuition of the identification scheme is to consider all possible permutations of SVAR models corresponding to the reduced-form representation, but only to retain those that yield “economically reasonable" impulse responses.[33]

[28] As Erceg and Levi, 2003 and others have shown, inflation persistence is dependent on the credibility of macroeconomic stabilization policies.

[29] As countries differ in the time span of available data, the starting point of the sample for each country varies as follows. Albania: 2009, BIH: 2006, Kosovo: 2011, Montenegro 2009, North Macedonia: 2007 and Serbia: 2007.

[30] See Appendix II for variable definitions for each country.

[31] For example, IMF (2022c), “Transitory or persistent? The Recent Surge in New Zealand’s Inflation”.

[32] This approach was developed in Rubio-Ramirez et al. (2010). The method used in this paper is closely related to Forbes et al. (2018) and IMF (2022c). For theoretical background, please refer to Kilian, L and Lütkepohl, H for example.

[33] Breitenlechner et al. (2019)

Table 4. Identification of Structural Shocks for Countries with Independent Monetary Policy

	Supply shock	Demand shock	Monetary policy shock	External price shock
Real GDP growth	+	+		
CPI inflation	-	+	-	+
Domestic monetary policy rate			+	
External price pressure index				+

*Blank cells imply no restriction.

For countries with independent monetary policy, we identify three domestic shocks and one foreign shock, which are summarized in Table 4. The first domestic shock is the aggregate supply shock, which is identified as the shock that increases output and simultaneously suppresses inflation. This shock can reflect, for example, changes in domestic productivity, supply disruptions, or changes to labor supply. Next, we have the non-monetary demand shock, that is identified as the shock that increases output and inflation at the same time. This shock can reflect factors that boost aggregate demand, such as domestic consumption, exports, or fiscal spending. The domestic monetary shock increases the domestic monetary policy rate and suppresses inflation rate at the same time. Finally, the foreign shock is identified by an increase in the external price pressure index (EPPI) that also causes an increase in domestic inflation. The EPPI is defined as the import-weighted producer price index of countries from which the subject country imports, converted to local currency using the nominal effective exchange rate, and relative to the percent change of the subject country's GDP deflator. The external price shock, therefore, can capture relative price movements with import-source countries as well as changes the relative exchange rates and is informative regardless of whether the subject country has a separate legal tender.[34]

Table 5. Identification of Structural Shocks for Countries without Independent Monetary Policy

	Supply shock	Private demand shock	Fiscal policy shock	External price shock
Real GDP growth	+	+	+	
CPI inflation	-	+	+	+
Government spending			+	
External price pressure index or Euro Area inflation				+

*Blank cells imply no restriction.

For Kosovo and Montenegro that are unilaterally euroized and BiH that has a currency board to the euro, the interpretation of the domestic supply shock and the external price shock are the same as described above. However, our external price variable of choice is the Euro Area inflation instead of the EPPI (Table 5). The rationale for this choice is that, due to these countries' exchange rate regimes, Euro Area inflation is the key external price variable, affecting these economies not just through the trade channel. Our macroeconomic

[34] For example, exchange rate depreciation or an increase in imported commodity prices would be captured as an external price shock.

policy shock is the fiscal shock, which is identified by increasing CPI inflation and real GDP growth at the same time and increasing government spending. The fourth shock in this system is the domestic private demand shock, which is identified as the shock that increases both output and inflation but does not affect the government spending. Not imposing any restriction on the impact of the domestic private demand shock on government spending helps us distinguish the domestic private demand shock from the fiscal policy shock. We believe that this assumption is reasonable because of the limited role of automatic stabilizers in the WB economies.

Forecast error variance decompositions are shown in Figure 3.[35] The notable result for all countries is that domestic factors, especially the domestic demand and macro policy shocks, play a significant role in determining inflation, alongside the external price shock. About two-thirds of the inflation variation in the short term and about half of the inflation variation in the medium term is attributed to domestic shocks in average for the WB. For Albania[36] and North Macedonia, aggregate demand and monetary policy shocks appear as the most relevant domestic shocks, while for Serbia, supply shocks play a larger role in the short term. For Kosovo and BIH, fiscal shocks stand out as the most important domestic driver of inflation, while for Montenegro private aggregate demand shocks appear to matter more. Figure 4 presents historical decompositions[37] of the deviations of inflation from their trend and illustrates the contributions from different factors to inflation at any point in history. Focusing on the recent episode of the inflation surge, the impact of the external shock is clear, however, domestic factors also seem to be contributing to inflation in all countries, albeit to different degrees. Another common feature that can be seen from the historical decomposition is the collapse of aggregate demand which dragged inflation down during the COVID-19 pandemic.

In sum, our results from the SVAR model suggest that inflation in the Western Balkans is not just diven by external shocks, and that the role of domestic factors is important. Furhter, domestic macroeconomic stabilization policies, despite the lack of monetary policy autonomy in some of the countries, have an important role in keeping inflation low and stable in the WB. This implies that, while commodity price shocks are clearly contributing to the current surge of inflation in the WB, as these shocks moderate, maintaining adequately tight macroeconomic policies will be important to help reduce inflation.

[35] The forecast variance decomposition measures how much of the forecast error variance or prediction mean squared error for the variable at a specific forecast horizon is accounted for by each structural shock.

[36] Given the lack of two-way variability of monetary policy rate in the sample, results might overestimate the impact of monetary policy on inflation dynamics in Albania. Both IMF staff research and Bank of Albania estimate a more prominent role of exchange rate fluctuations than of monetary policy in Albania in the recent past.

[37] Historical decompositions tell us how much a given structural shock explains the historically observed fluctuation in the VAR variables.

Figure 3. SVAR Results: Forecasts Error Variance Decomposition for Inflation
(Share of shocks, percent)

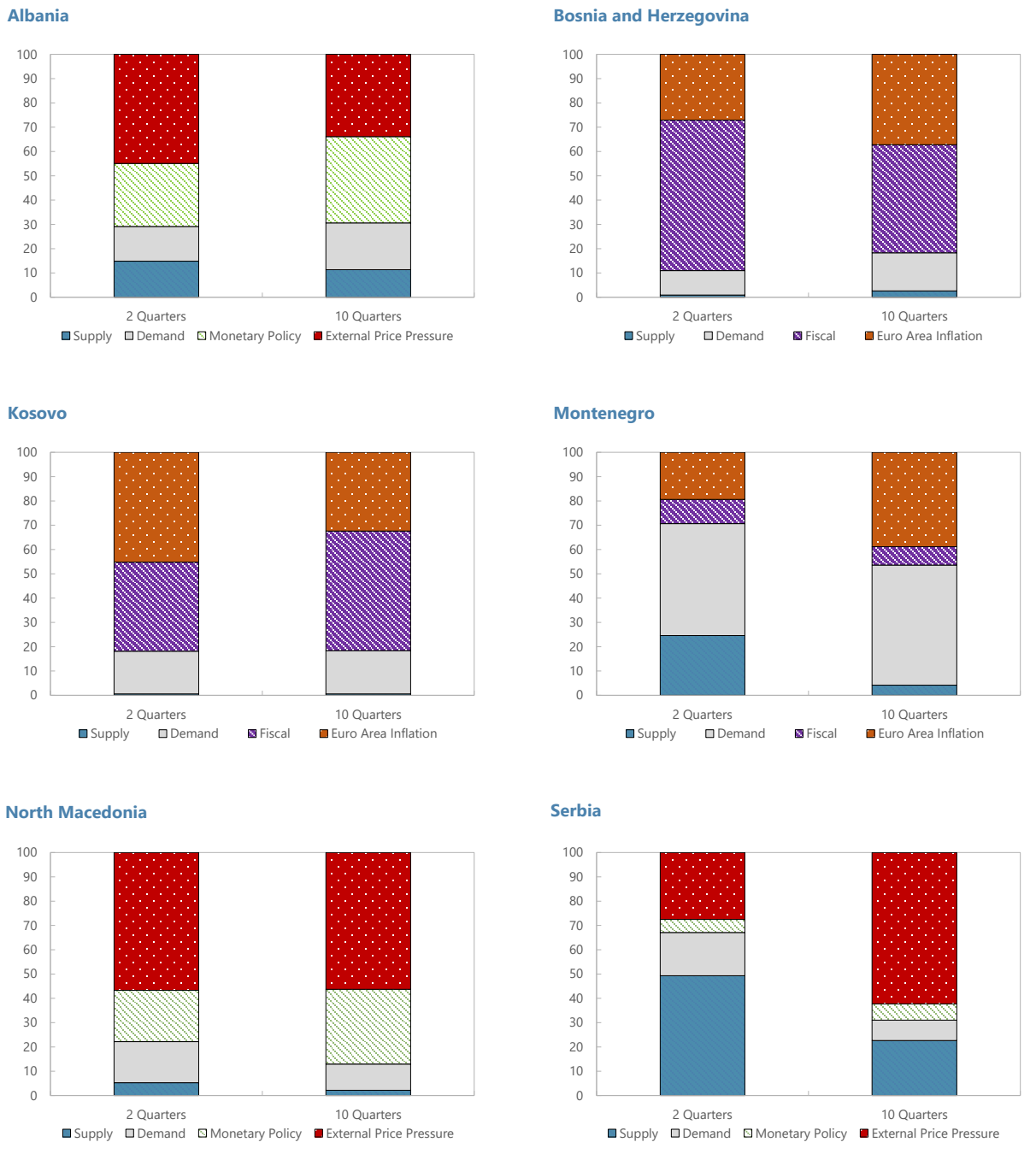
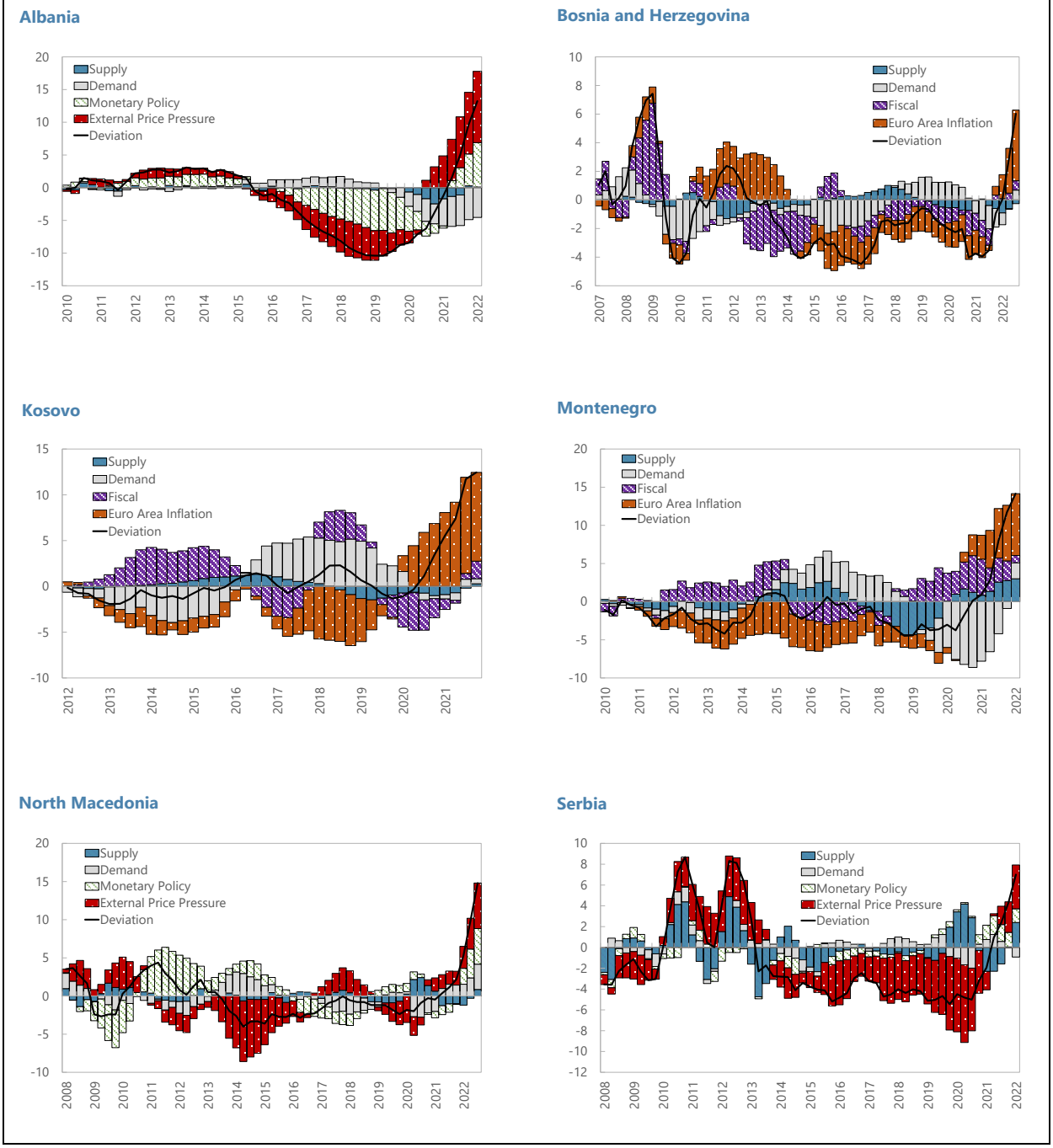


Figure 4. SVAR Results: Historical Decomposition for Inflation
(Deviation from trend, percentage point)



6. Conclusions

While the recent surge in inflation is a global phenomenon, we explore how the characteristics of the Western Balkan economies (described in our stylized facts) may be interacting with global shocks and what role domestic factors may play in driving the inflation dynamics in the region. This paper contributes to the literature by employing two widely used empirical approaches, an augmented Phillips curve and structural VAR and adapting them to the specificities and data limitation of the WB economies.

We find that international food prices play an important role in determining inflation in the WB not only due to a pass-through from international to domestic food prices and a large share of food in the CPI basket, but also due the impact of food prices on core inflation and inflation expectations. Combined with the high persistence of all measures of inflation in the WB that we document, this means that international food price shocks can have a large and lasting impact on inflation. We also find that inflation in the WB is not only driven by external shocks and that domestic shocks are associated with a large fraction of inflation variation. In particular, the results from our SVAR analysis show that the current surge in inflation cannot be fully attributed to external price shocks, as we find domestic factors also contributing to it, including through strong domestic demand.

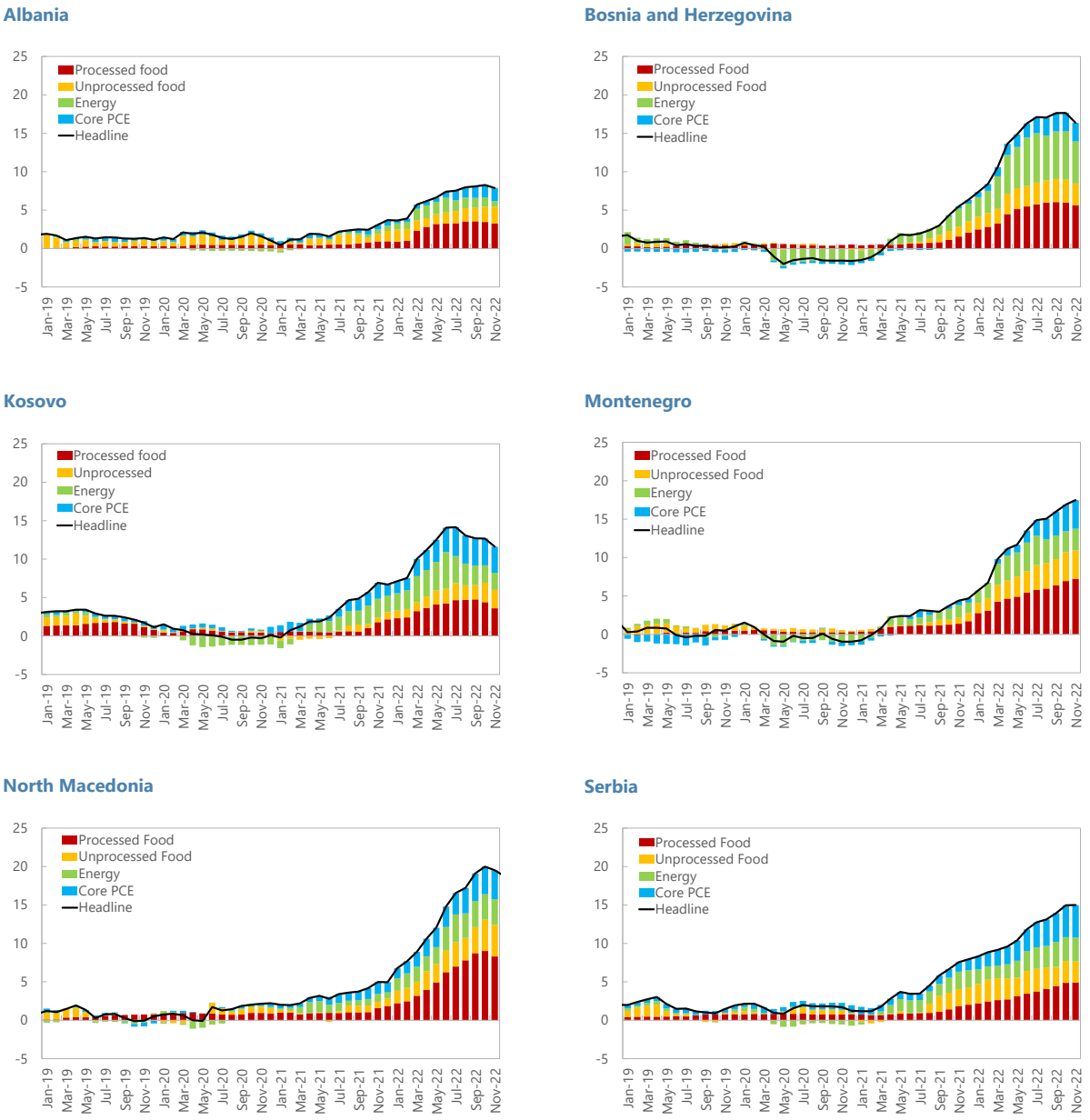
We draw two broad policy implications from these findings. First, temporary policies aiming to moderate the immediate and complete pass-through of international to domestic food prices may be appropriate, provided that they are carefully calibrated to minimize fiscal costs and distortions to price signals. Such policies can help prevent inflation from rising sharply over a short period of time and becoming entrenched, thereby easing the burden of conventional macroeconomic stabilization policies. Second, a consistent macroeconomic policy mix is important for keeping inflation low and stable in the WB. Careful calibration of the macroeconomic policy mix also implies ensuring that any policies of moderating the pass-through from international food prices avoid fueling demand pressures that can exacerbate inflation. Further, increasing the credibility of macroeconomic stabilization policies should be prioritized for anchoring inflation expectations and reducing inflation persistence in the WB, which would also help improve the effectiveness of macro policies in reducing inflation.

As international food prices moderate, headline inflation is expected to decline in the WB, albeit more slowly than in the Euro Area. Core inflation is likely to stay elevated for longer. Future research could look into factors contributing to inflation persistence in the WB, and the role of macroeconomic policies in reducing inflation, as external shocks dissipate. Another useful future research direction would involve assessing specific policies to reduce the pass-through from international to domestic food prices, comparing their effectiveness in reducing inflation, as well as their fiscal costs or any distortions they may cause.

Appendix I. Stylized Facts Charts and Tables

Figure A1.1 Contributions to Headline Inflation

(In percent; y/y change)

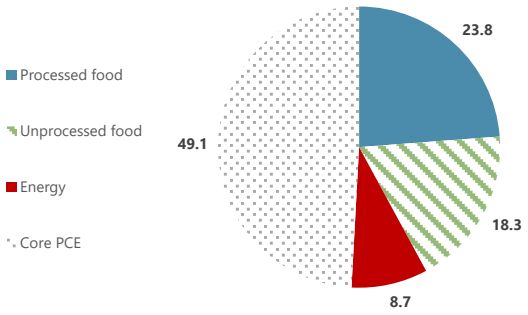


Sources: Eurostat, WB central banks, Haver Analytics, and IMF staff calculations.

Figure A1.2. CPI Basket Composition

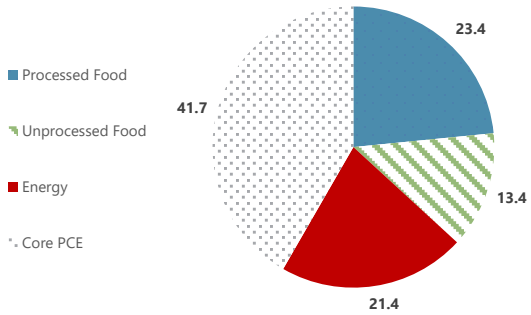
(In percent)

Albania



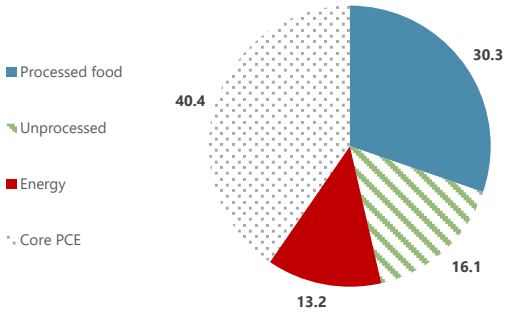
Note: Data above shows the average level between 2008M1 and 2022M11.

Bosnia and Herzegovina



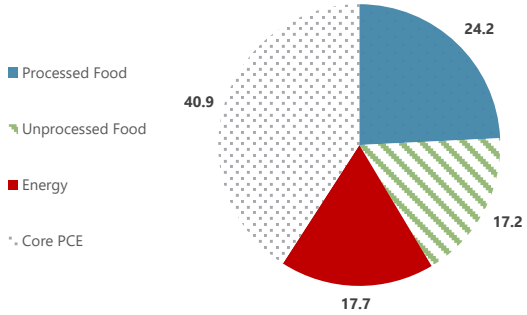
Note: Data above shows the average level between 2016M1 and 2022M11.

Kosovo



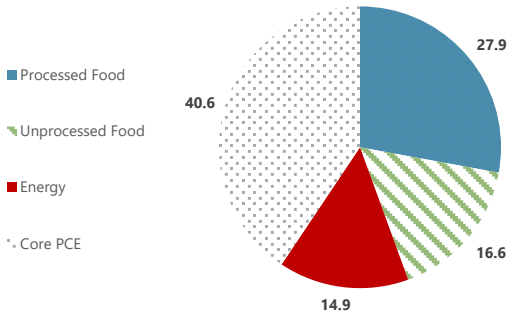
Note: Data above shows the average level between 2007M1 and 2022M11.

Montenegro



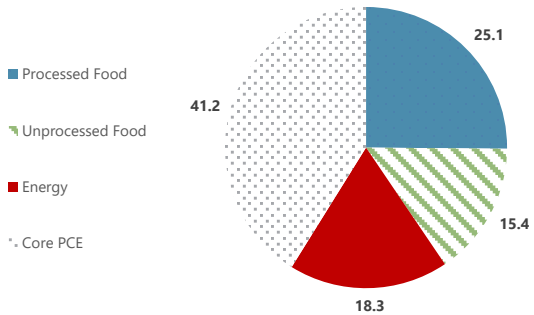
Note: Data above shows the average level between 2011M1 and 2022M11.

North Macedonia



Note: Data above shows the average level between 2010M1 and 2022M11.

Serbia

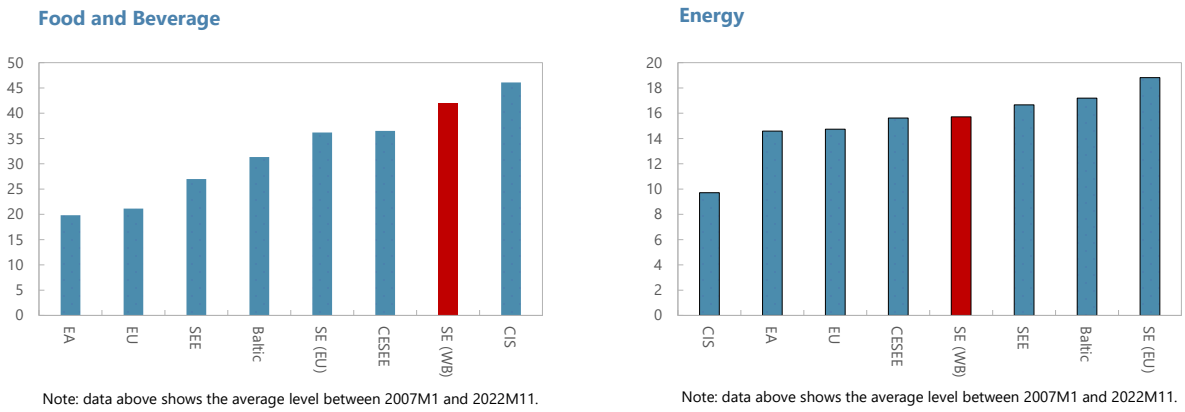


Note: Data above shows the average level between 2007M1 and 2022M11.

Sources: Eurostat, WB central banks, Haver Analytics, and IMF staff calculations.

Figure A1.3. Food and Energy Weights in the CPI Basket Comparison with Peer Countries

(In percent, in CPI basket)



Note: data above shows the average level between 2007M1 and 2022M11.

Note: data above shows the average level between 2007M1 and 2022M11.

Sources: Haver Analytics and IMF staff calculations.

Table A1.1. Share of Basic Commodities in CPI, 2022

	Items	ALB	BIH	MNE	EU
Share in CPI basket	Cereal	2.0	2.2	1.7	0.4
	Wheat	1.1	1.6	1.2	0.1
	Vegetable oil	2.1	1.6	1.5	0.3
	Overall	4.0	3.8	3.2	0.7

	Items	ALB	BIH	MNE	EU
Share in "Food and Beverage" category	Cereal	4.9	5.8	4.4	1.6
	Wheat	2.7	4.1	3.1	0.5
	Vegetable oil	5.1	4.2	3.7	1.5
	Overall	10.0	9.9	8.2	3.2

Sources: Haver Analytics, WB central banks, and IMF staff calculations

Table A1.2. Public Spending on Agriculture

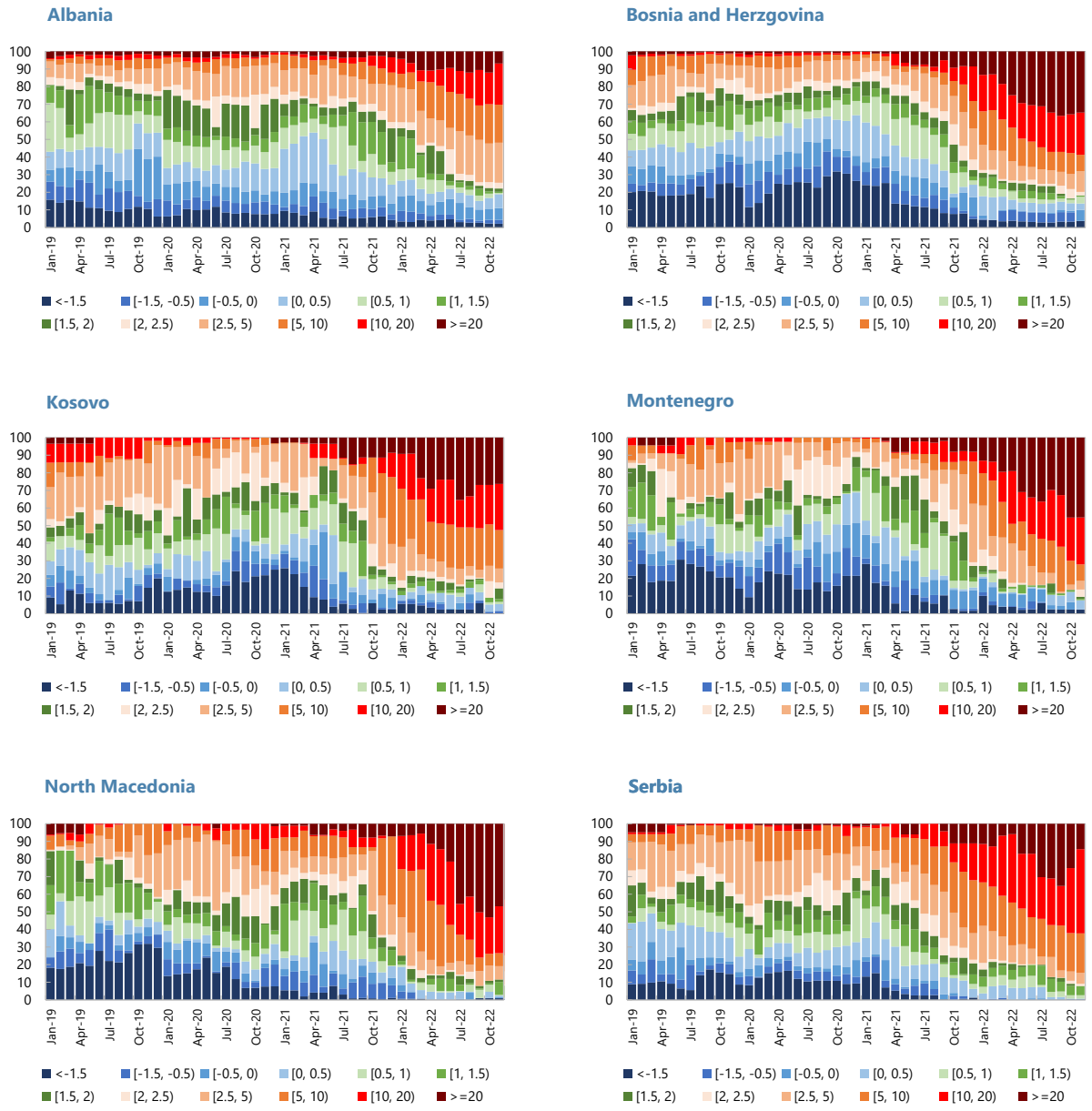
(Average for recent years)

	ALB	BIH	KOS	MKD	MNE	SRB	EU
In percent of Agricultural GDP	3.0	8.0	9.3	16.2	8.1	12.5	20.5

Sources: IMF FAD, Haver Analytics, WB central banks, and IMF staff calculations

Figure A1.4. Inflation Heat Map

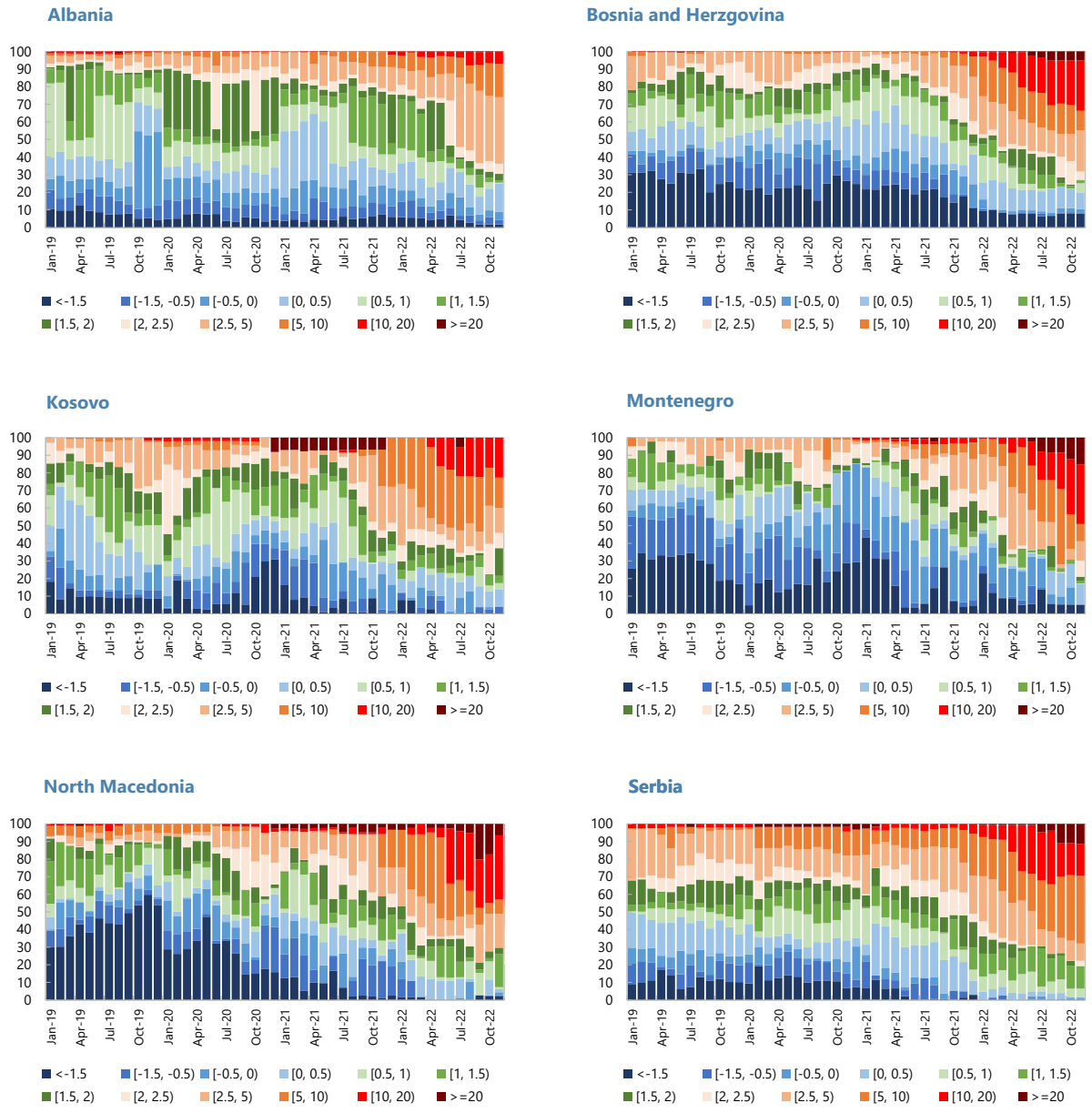
(CPI share of items in different inflation brackets)



Sources: Haver Analytics, WB central banks and IMF staff calculations.

Figure A1.5. Core Inflation Heat Map

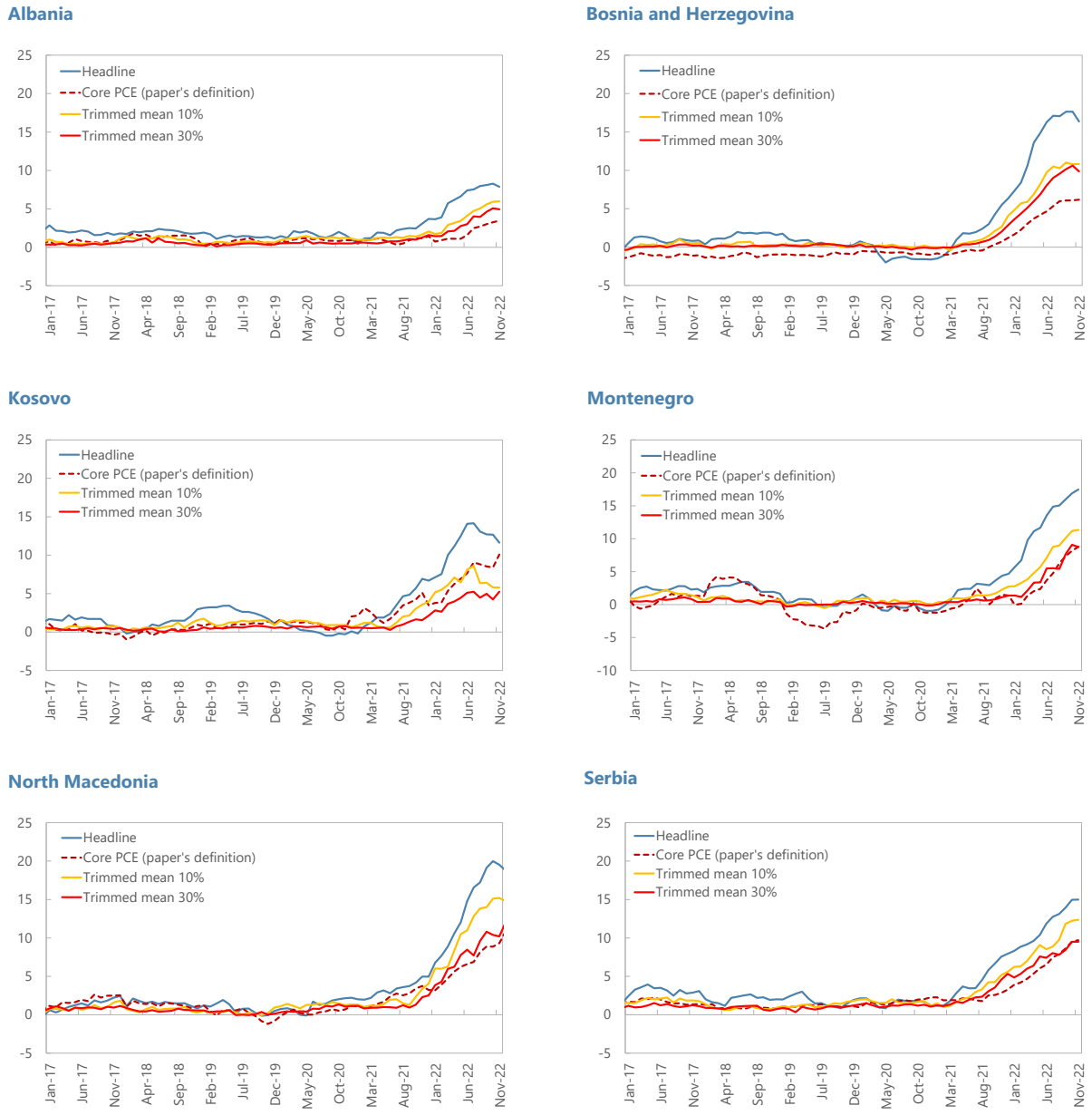
(Share of core category items I different inflation brackets)



Sources: Haver Analytics, WB central banks and IMF staff calculations.

Figure A1.6. Different Measures of Underlying Inflation

(In percent; y/y/ change)

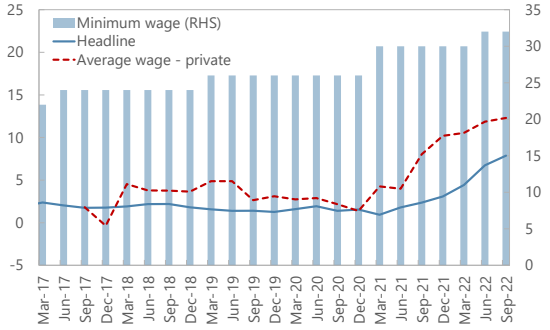


Sources: Haver Analytics, WB central banks, and IMF staff calculations.

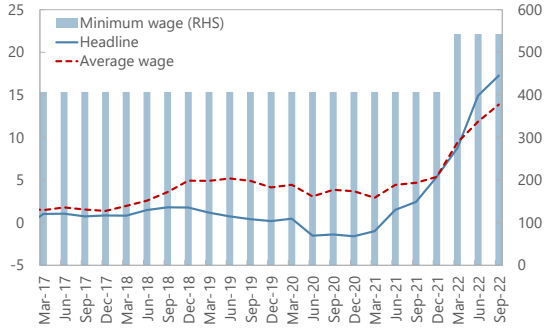
Figure A1.7. Inflation and Wage Growth

(In percent, LHS in national currencies, RHS quarterly)

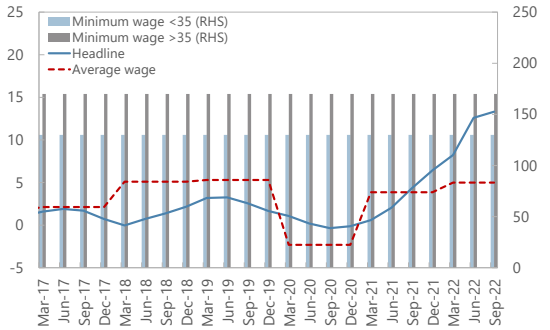
Albania



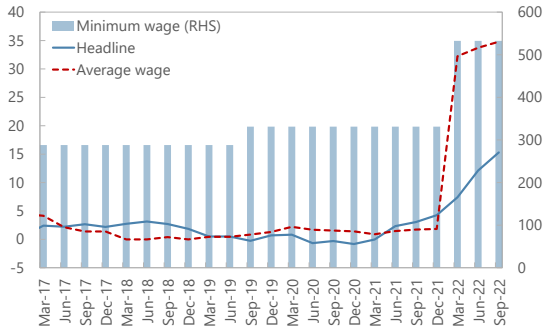
Bosnia and Herzegovina



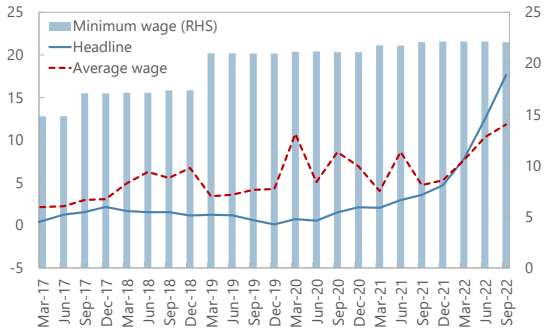
Kosovo



Montenegro



North Macedonia



Serbia

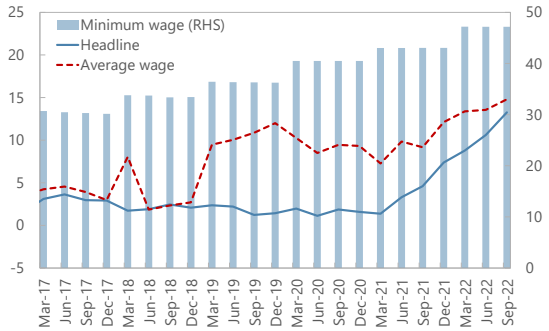
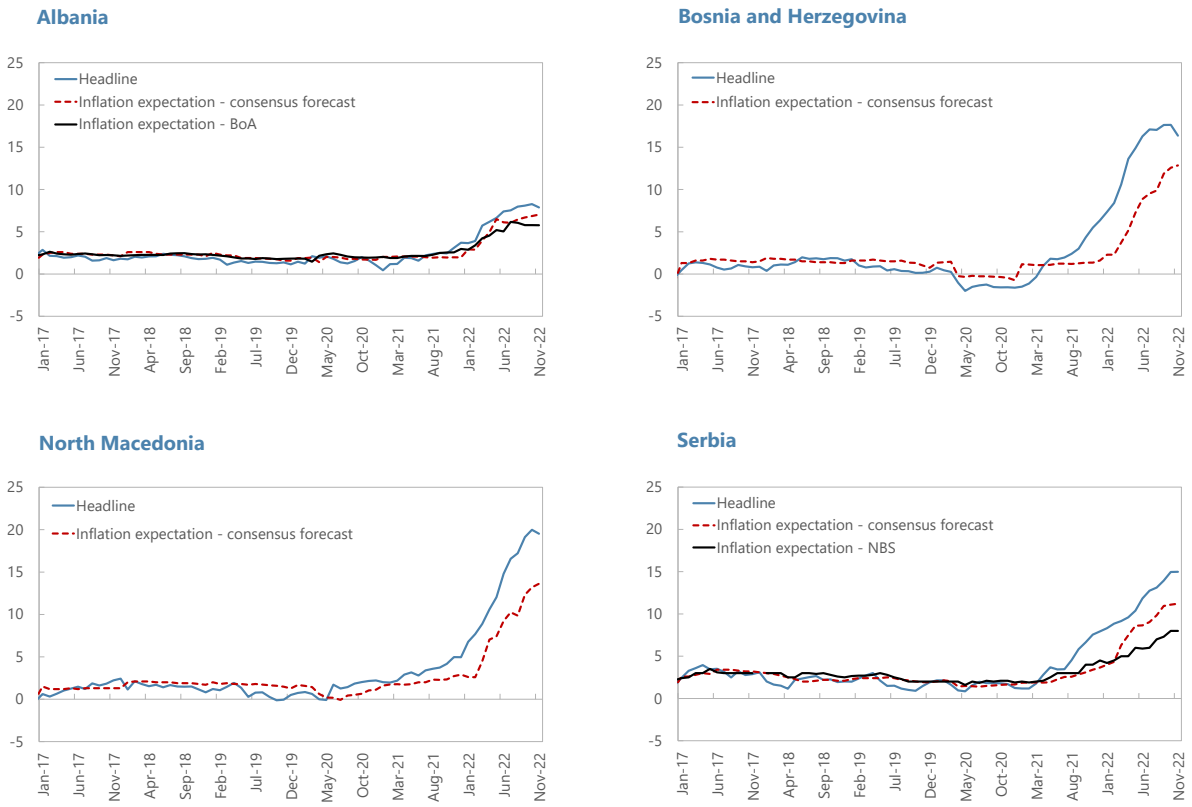


Figure A1.8. Headline vs. Inflation Expectation

(In percent)



Note: inflation expectation shows 12-month ahead situation.

Sources: Haver Analytics, WB central banks, Consensus Forecast Database, and IMF staff calculations.

Appendix II. Data Definitions and Sources

Table A2.1 Definitions and Sources of Data used in Empirical Analysis

Variable	Description	Source	Model
Headline inflation	Annualized quarter-over-quarter, seasonally adjusted (panel) and year-on-year (SVAR) inflation, all CPI items, 3-month average	Haver Analytics, WB central banks	Panel; SVAR
Core inflation	Annualized quarter-over-quarter, seasonally adjusted inflation, non-food and non-energy CPI items, 3-month average	Haver Analytics, WB central banks	Panel
Trimmed-mean 10% and 30%	Annualized quarter-over-quarter, seasonally adjusted inflation, non-top 10% (or 30%) and non-bottom 10% (or 30%) yoy inflation CPI items in each month, 3-month average	Haver Analytics, WB central banks	Panel
Processed food inflation	Annualized quarter-over-quarter, seasonally adjusted inflation, processed food CPI items (Bread and Cereals, Milk, Cheese and Eggs, Oils and Fats, Sugar, Jam, Honey, Chocolate and Confectionery, Food Products n.e.c., Non-Alcoholic Beverages, Alcoholic Beverages and Tobacco), 3-month average	Haver Analytics, WB central banks	Panel
Unprocessed food inflation	Annualized quarter-over-quarter, seasonally adjusted inflation, unprocessed food CPI items (Meat, Fish and Seafood, Fruit, Vegetables), 3-month average	Haver Analytics, WB central banks	Panel
Energy inflation	Annualized quarter-over-quarter, seasonally adjusted inflation, energy-related CPI items (Electricity, Gas and Other Fuels, Operation of Personal Transport Equipment)	Haver Analytics, WB central banks	Panel
Inflation expectations	One year ahead fixed horizon expectations on headline inflation	Consensus Forecast	Panel
Output gap	Deviation from the Hodrick-Prescott filtered, seasonally adjusted GDP, in percent	World Economic Outlook, IMF staff estimates	Panel
Unemployment gap	Deviation from the Hodrick-Prescott filtered unemployment rate, in percent	WB authorities, IMF staff estimates	Panel
NEER	Annualized quarter-over-quarter, seasonally adjusted growth rate of Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index	IMF STA EER database	Panel
International food price	Annualized quarter-over-quarter growth rate of Commodity Food and Beverage Price Index, includes Food and Beverage	Global Assumptions database	Panel

International energy price	Annualized quarter-over-quarter growth rate of Commodity Fuel (energy) Index, includes Crude oil (petroleum), Coal Price, Natural Gas and Propane	Global Assumptions database	Panel
External Price Pressure Index	Sum of the percent change in the import-weighted producer price index (PPI) of countries j from which country i imports, the relative changes in bilateral exchange rates against the US dollar in country i and j, weighted by country j's share in country i's total imports minus the percent change in country's i GDP deflator, annualized quarter-over-quarter growth rate (panel) or year-on-year growth rate (SVAR). Constructed following Chapter 2 of the October 2021 World Economic Outlook and Chapter 2 of the October 2022 Regional Economic Outlook for EUR.	IMF staff calculations	Panel; SVAR
Euro Area inflation	Year-on-year growth CPI inflation, 3-month average	Haver	SVAR
GDP growth	Year-on-year growth, quarterly data	Haver	SVAR
Monetary policy rate	Albania: Overnight Credit Rate, quarterly average, percent. North Macedonia: 1-Month Interbank Offer Rate, quarterly average, percent. Serbia: Belgrade Overnight Index Average, quarterly average, percent.	Haver	SVAR
Government spending	Central or General government expenditures as a share of GDP, quarterly	Haver, IMF staff estimates	SVAR

Appendix III. Additional Tables on Empirical Results

Table A3.1. Descriptive Statistics of the Panel

Variable	Obs.	Mean	Stand. Dev.	Min	Max
Headline inflation	370	3.4	5.2	-7.7	28.6
Core inflation	290	3.4	5.8	-8.2	40.8
Trimmed-mean 10%	308	0.7	0.9	-1.0	4.9
Trimmed-mean 30%	308	0.2	0.5	-0.4	2.7
Processed food inflation	323	5.5	10.2	-8.3	74.0
Unprocessed food inflation	323	11.5	22.0	-27.8	144.9
Energy inflation	327	5.5	14.6	-33.3	97.3
Inflation expectation	224	2.3	2.4	-1.0	10.7
Output gap	354	0.0	2.9	-19.6	10.4
NEER	371	-0.6	5.1	-17.8	32.1
International food price	371	5.6	21.2	-47.8	60.2
International energy price	371	6.5	54.8	-178.3	109.8

Table A3.2. Using the Unemployment Gap Instead of Output Gap as a Measure of Economic Slack

	Headline inflation		Core PCE		Headline inflation Trimmed-mean 10%		Headline inflation Trimmed-mean 30%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependant variable	0.648***	0.664***	0.161***	0.413***	0.769***	0.621***	0.256***	0.633***
	(0.054)	(0.041)	(0.057)	(0.050)	(0.064)	(0.046)	(0.040)	(0.033)
1y inflation expectation $_{(t-1)}$	0.031		0.515***		-0.006		0.016**	
	(0.099)		(0.090)		(0.023)		(0.008)	
Unemployment gap	0.119	0.088	-0.100	0.092	-0.004	0.003	-0.006	0.005
	(0.116)	(0.093)	(0.107)	(0.108)	(0.024)	(0.017)	(0.009)	(0.007)
NEER	0.074**	0.069**	0.020	0.060*	0.014**	0.013**	0.008***	0.001
	(0.033)	(0.029)	(0.028)	(0.034)	(0.007)	(0.005)	(0.002)	(0.002)
Int.l' food price inflation	0.022**	0.021***	0.017*	0.002	0.008***	0.005***	0.001*	0.001**
	(0.009)	(0.008)	(0.009)	(0.010)	(0.002)	(0.002)	(0.001)	(0.001)
Int.l' energy price inflation	0.011***	0.013***	0.007**	0.014***	0.001*	0.001**	0.001**	0.000**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	0.803**	0.793**	1.087***	1.284***	0.122	0.160**	0.082***	0.060**
	(0.355)	(0.352)	(0.325)	(0.411)	(0.074)	(0.064)	(0.027)	(0.026)
Observations	172	252	164	236	165	234	165	234
R-squared	0.654	0.655	0.426	0.377	0.680	0.610	0.548	0.743
Number of countries	4	6	4	6	4	6	4	6
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	No
Missing countries	KOS; MNE		KOS; MNE		KOS; MNE		KOS; MNE	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A3.3. Using FE OLS Regressions Instead of Robust Regression

	Headline inflation		Core PCE		Headline inflation Trimmed-mean 10%		Headline inflation Trimmed-mean 30%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependant variable	0.648***	0.664***	0.161***	0.413***	0.769***	0.621***	0.256***	0.633***
	(0.054)	(0.041)	(0.057)	(0.050)	(0.064)	(0.046)	(0.040)	(0.033)
1y inflation expectation $_{(t-1)}$	0.031		0.515***		-0.006		0.016**	
	(0.099)		(0.090)		(0.023)		(0.008)	
Unemployment gap	0.119	0.088	-0.100	0.092	-0.004	0.003	-0.006	0.005
	(0.116)	(0.093)	(0.107)	(0.108)	(0.024)	(0.017)	(0.009)	(0.007)
NEER	0.074**	0.069**	0.020	0.060*	0.014**	0.013**	0.008***	0.001
	(0.033)	(0.029)	(0.028)	(0.034)	(0.007)	(0.005)	(0.002)	(0.002)
Int.l' food price inflation	0.022**	0.021***	0.017*	0.002	0.008***	0.005***	0.001*	0.001**
	(0.009)	(0.008)	(0.009)	(0.010)	(0.002)	(0.002)	(0.001)	(0.001)
Int.l' energy price inflation	0.011***	0.013***	0.007**	0.014***	0.001*	0.001**	0.001**	0.000**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	0.803**	0.793**	1.087***	1.284***	0.122	0.160**	0.082***	0.060**
	(0.355)	(0.352)	(0.325)	(0.411)	(0.074)	(0.064)	(0.027)	(0.026)
Observations	172	252	164	236	165	234	165	234
R-squared	0.654	0.655	0.426	0.377	0.680	0.610	0.548	0.743
Number of countries	4	6	4	6	4	6	4	6
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	No
Missing countries	KOS; MNE		KOS; MNE		KOS; MNE		KOS; MNE	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A3.4. Using Measure of External Price Pressure Instead of NEER

	Headline inflation		Core PCE		Headline inflation Trimmed-mean 10%		Headline inflation Trimmed-mean 30%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependant variable	0.720***	0.645***	0.233***	0.496***	0.786***	0.662***	0.194***	0.686***
	(0.067)	(0.042)	(0.084)	(0.049)	(0.070)	(0.045)	(0.040)	(0.032)
1y inflation expectation $_{(t-1)}$	0.094		0.528***		0.007		0.030***	
	(0.114)		(0.100)		(0.024)		(0.008)	
Output gap	0.044	-0.016	-0.018	-0.003	0.007	-0.004	-0.006	0.000
	(0.096)	(0.049)	(0.083)	(0.061)	(0.019)	(0.009)	(0.006)	(0.004)
External Price Pressure	0.044	0.022	0.017	0.052*	0.008	0.004	0.003	0.002
	(0.030)	(0.023)	(0.025)	(0.029)	(0.006)	(0.004)	(0.002)	(0.002)
Int.l' food price inflation	0.031***	0.026***	0.020*	0.010	0.010***	0.006***	0.002**	0.001*
	(0.012)	(0.008)	(0.010)	(0.011)	(0.002)	(0.002)	(0.001)	(0.001)
Int.l' energy price inflation	0.007*	0.013***	0.004	0.010***	0.000	0.001*	0.001**	0.000**
	(0.004)	(0.003)	(0.004)	(0.004)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	0.501	0.671*	1.077***	1.021**	0.111	0.157**	0.107***	0.069**
	(0.423)	(0.400)	(0.372)	(0.489)	(0.085)	(0.076)	(0.027)	(0.029)
Observations	135	236	134	213	135	229	135	229
R-squared	0.673	0.662	0.474	0.465	0.702	0.633	0.567	0.778
Number of countries	4	6	4	6	4	6	4	6
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	No
Missing countries	KOS; MNE		KOS; MNE		KOS; MNE		KOS; MNE	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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