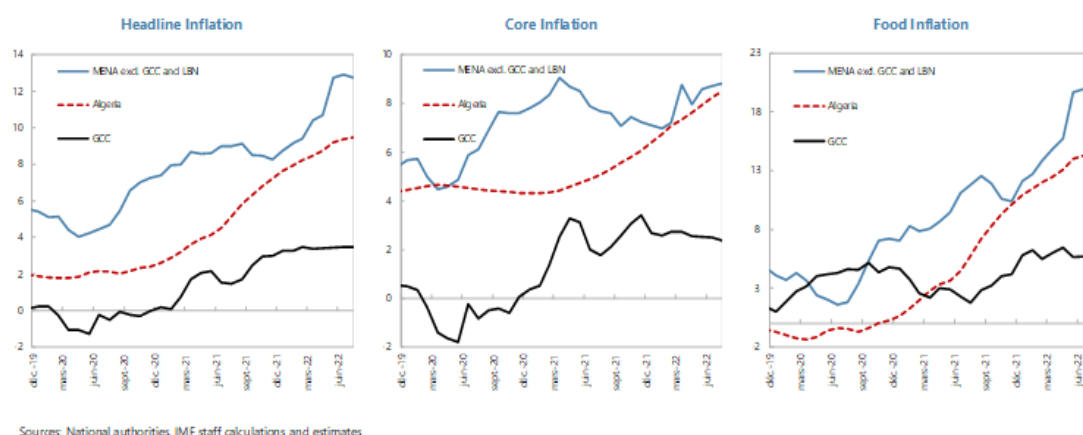


A REEXAMINATION OF INFLATION DYNAMICS AND DRIVERS IN ALGERIA¹

A. Introduction

1. In Algeria, as in the rest of the Middle East and North Africa region, inflation is emerging as a major policy challenge (Figure 1). Headline inflation in Algeria, measured by the change in the average consumer price index (CPI), picked up in late 2020 and continued to accelerate through 2021 and most of 2022, reaching 9.5 percent in August 2022—a level not seen in twenty-five years. It later inched down to 9.2 percent in November. Core inflation, i.e., inflation excluding fresh food products and regulated prices, accelerated to a record high of 8.5 percent in August 2022, well above its long-term average of 4.5 percent. This trend has been broad-based as most sub-components of inflation, including regulated prices, have increased sharply.

Figure 1. Headline, Core and Food Inflation



2. High inflation poses multiple risks. Across the world, inflation has proved to be more persistent than anticipated, raising concerns about inflation expectations becoming unanchored and undermining central banks' success in taming inflation in the last few years. There is also ample evidence that high inflation is associated with lower growth, including because of its effect on investor confidence and incentives to save, as well as its deleterious impact on financial stability (IMF, 2001; Mishkin, 2008). Importantly, the harmful effects of inflation are more acute on lower income groups who have fewer assets which they can draw down when faced with rising prices (Ha, Kose and Ohnsorge, 2019). The Algerian authorities have implemented several measures in 2022 to

¹ Prepared by Mahmoud Harb and Priscilla Muthooru (all MCD). Jarin Nashin has provided excellent research assistance.

protect households against rapidly rising living costs (*see the staff report for the 2022 Article IV consultation with Algeria*).

3. Recent policy debates have focused on the respective roles of supply and demand factors in explaining the recent bout of global inflation.² Output and prices tend to move in the same direction following demand shocks but tend to be negatively correlated following supply shocks (Blanchard and Quah, 1989). As such, inflationary demand and supply shocks raise a different set of challenges for central banks. Monetary policy tightening in response to demand shocks is an obvious policy reaction to attempt to stabilize both output and prices. However, in response to supply shocks, monetary policy is confronted in the short run with a more difficult tradeoff between the imperatives of preserving price stability and protecting growth. Prior to the pandemic, it was generally accepted that central banks can accommodate supply shocks without endangering price stability provided that inflation expectations remain well-anchored, that the shock is temporary and does not lead to second-round effects on prices.

4. The experience of the Covid-19 pandemic has prompted a reconsideration of the appropriate monetary policy response to supply shocks. The post-pandemic experience has indeed shown that supply shocks might give rise to second round effects rapidly and require a proactive monetary policy response. This is particularly the case if the shock is large in magnitude and spills over from initially affected sectors to other sectors and if price pressures had been on the rise prior to the shock, weakening the anchoring of inflation expectations (Gopinath 2022).

5. In Algeria, monetary policy has remained accommodative. The Bank of Algeria (BA) has kept its policy interest rate and the reserve requirement ratio unchanged since May 2020 and February 2021 respectively. Both had been lowered to record low levels in response to the pandemic shock. Reflecting an accommodative monetary policy stance, the interest rate on the interbank market remained low, at around 0.5 percent for the shortest tenures in 2022. The central bank's strategy is based on its view that monetary policy tightening would have limited effectiveness against price pressures stemming mostly from external cost-push factors but could harm growth, at a time when the economy is gradually emerging from the pandemic shock, and credit to the private sector remains subdued. Hence the BA allowed a 10.7 percent appreciation in the nominal effective exchange rate (NEER) over the first eleven months of 2022, which it expects to help reduce price pressures in the near term. Meanwhile, considerable fiscal policy easing has been announced for 2023 to boost purchasing power and growth.

6. In this context, understanding the dynamics of inflation and its recent drivers is important to inform monetary policy. The objective of this paper is to assess the recent drivers and risks of persistence of the recent dynamics of inflation in Algeria. A better understanding of the relative importance of demand and supply factors, whether domestic or external, in driving the acceleration in inflation is critical to inform policy choices. The paper employs several complementary approaches. A univariate analysis sheds light on the trend in inflation as well as on

² See, for example, Adrian and Gopinath (2021).

the role of seasonal factors and exogenous shocks in driving price dynamics. The relative importance of concentrated supply-side sectoral shocks is assessed by analyzing the correlation between inflation and the skewness of relative price changes. Finally, a multivariate analysis based on a triangular augmented Phillips curve provides empirical evidence on the role of demand and supply factors in driving headline inflation and its various subcomponents, and on the persistence of inflation in Algeria. These complementary approaches are followed to circumvent the challenges in the analysis arising from the concomitance of significant shocks and policy shifts, the absence of survey-based or market-based measures of inflation expectations and the lack of data on the labor market and wage dynamics since 2019.

7. Our analysis points to risks of inflation persistence in Algeria due to a confluence of external and domestic supply shocks, exacerbated by domestic demand factors. The analysis highlights a broad-based acceleration in trend inflation prior to the current commodity price shocks, underscoring risks of persistent inflationary pressures and de-anchoring of expectations. While the role of external supply factors in driving the rise in inflation is significant, the impact of domestic factors appears to be larger. Some pertain to temporary exogenous developments, for example a drought in 2021, while others could be related to more entrenched factors, such as disruptions to retail markets and trade regulation measures. Although data limitations create uncertainty around point estimates, the results not only suggest cost-push factors have played a significant role in fueling inflation but that demand-pull forces are also at play.

8. These findings suggest highlight the need for swift monetary policy tightening to tame inflation. Broad inflationary pressures prior to the current shock, and inertia highlights the need for withdrawal of current monetary accommodation. Despite data limitations, there are indications that the output gap has substantially narrowed and perhaps even fully closed. Substantial fiscal easing announced under the 2023 budget might add to demand pressures. Public-sector wage increases in 2022 and 2023 might contribute to self-reinforcing price pressures.

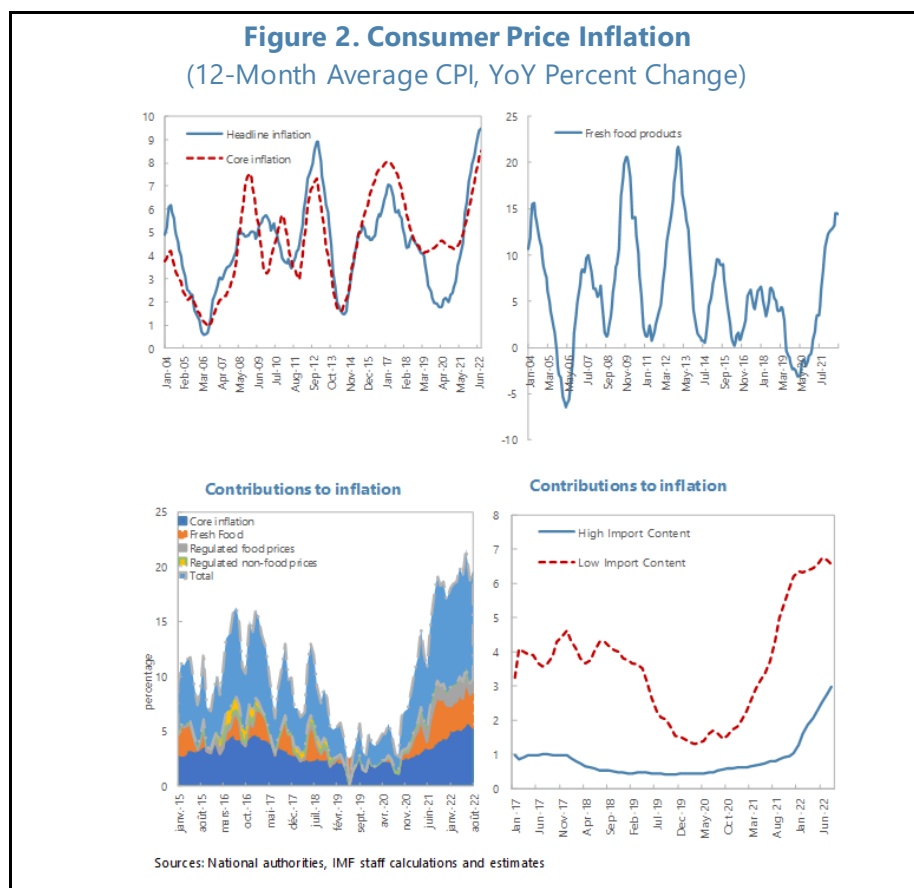
9. The rest of the paper proceeds as follows. First, we discuss some stylized facts about inflation based on the results of the univariate and skewness of relative prices. Then, we present our empirical strategy and the results for the Phillips curve estimation. We discuss policy implications in the final section of the paper.

B. Inflation Dynamics in Algeria: Stylized Facts

10. Algeria is currently experiencing the third episode of high inflation in two decades. During the first episode, annual headline and core inflation peaked at 8.9 percent and 7.3 percent respectively in January 2013, in the wake of the 2011 commodity price shock and large wage increases in 2012. Inflation subsequently receded rapidly in 2013. During the second episode, inflation rose to 7.1 and core inflation reached 8 percent in March 2017 against the background of direct monetary financing of the deficit, a large depreciation of the dinar in 2016, a rise in the VAT

rate and increases in regulated gasoline prices.³⁴ During the current episode, inflation has exceeded its previous peaks, with headline inflation rising to 9.5 percent and core inflation to 8.5 percent at end-August 2022. Inflation eased slightly to 9.2 percent at end-November, mostly owing to slower increase in the prices of fresh produce, poultry and edible oil which had surged in the previous year. This offset further acceleration in most other CPI components.

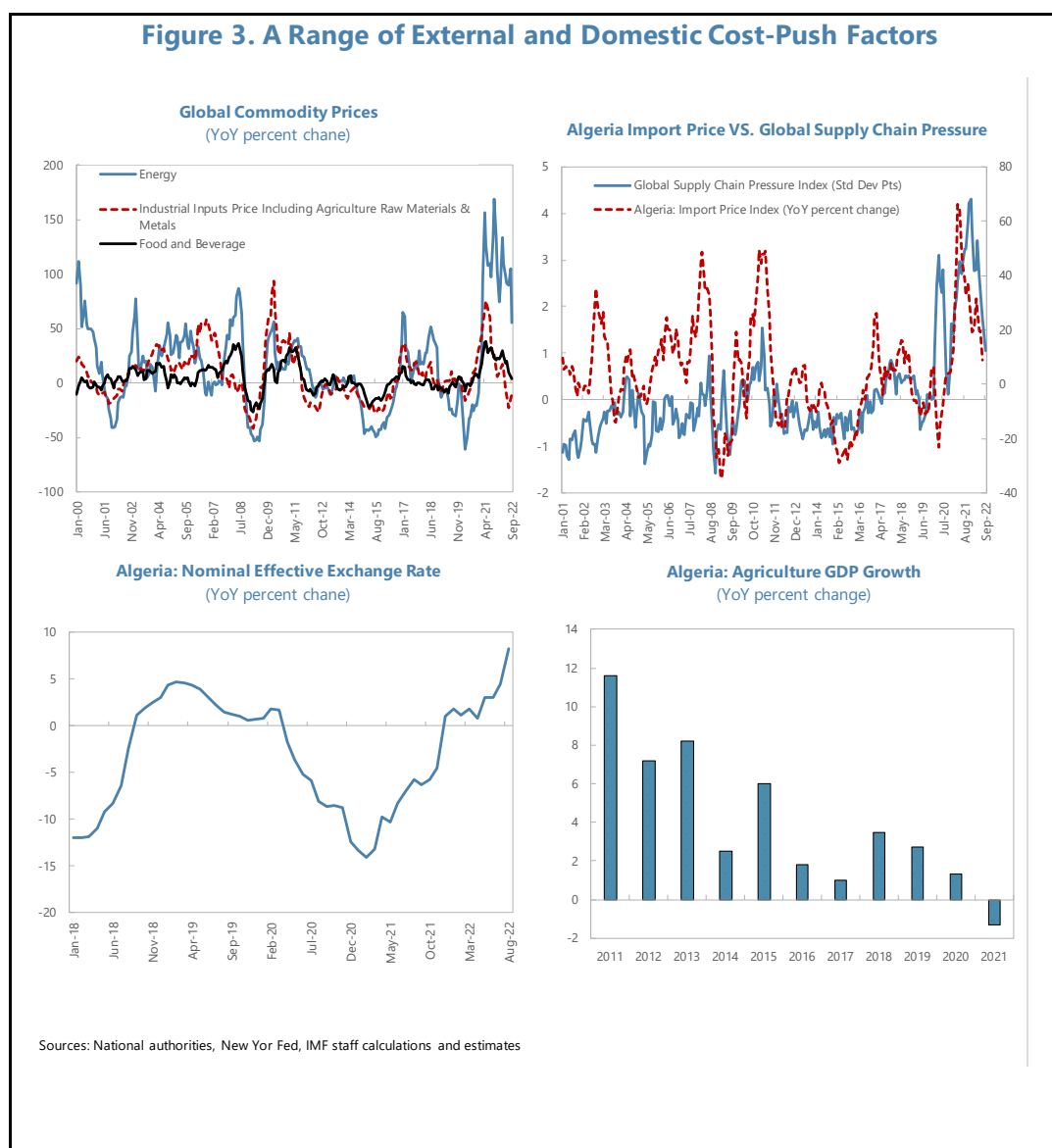
11. The recent acceleration in inflation has been broad-based. Headline inflation has risen steadily since the end of Q3:2020, when the economy started to emerge from the first phase of the pandemic crisis, first driven by higher food prices and then by the acceleration in non-food prices. Between its end-September 2020 trough and August 2022, inflation accelerated by 7.5 percentage points, to 9.5 percent. Around 3.6 percentage points were due to fresh food products and 2.4 percentage points were due to core inflation. Regulated food prices contributed 1.4 percentage points to headline inflation despite an absence of official price hikes and the adoption of measures to broaden the scope of food subsidies following the 2022 commodity price shock. This could possibly suggest anticipations of higher inflation, attempts to avoid a compression in margins or disruptions to domestic supply.



³ See the 2012, 2013 and 2017 staff reports for the Article IV consultation with Algeria for further discussions of inflation dynamics and drivers in recent years.

⁴ Gas prices nonetheless remained heavily subsidized. Inflation subsided in early 2018.

12. External supply factors explain only part of the recent acceleration in inflation. On the supply side, a range of global cost-push factors might have caused price pressures. After the first stages of the Covid-19 outbreak, disruptions to global supply chains continued, the cost of international goods transport rose, and commodity prices bounced back with their rally accelerating after the start of the war in Ukraine (IMF October 2022 WEO). The impact of the rise in import prices was likely amplified by a 13.3 percent depreciation in the dinar's nominal effective exchange rate (NEER) between 2019 and 2021. Reflecting these external developments, import-intensive goods contributed around 2.4 percent to the acceleration in inflation between September 2020 and August 2022. This is, however, less than one-third of the acceleration in total inflation over that period, pointing to more domestic origins of price pressures.

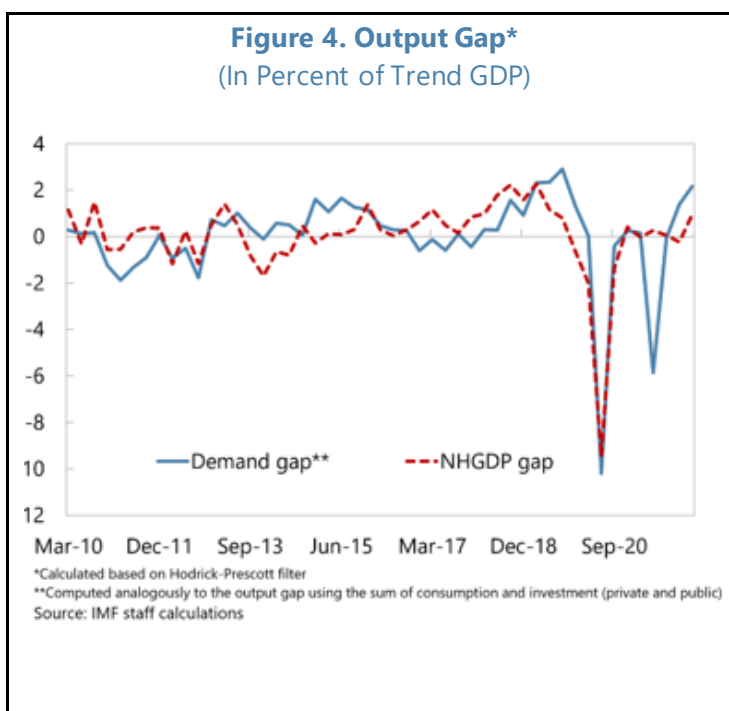


13. Domestic factors have amplified the impact of external cost pressures on inflation. On the supply side, severe drought conditions prompted a rare outright contraction in Algeria's crop

production in 2021, contributing to a rise in the prices of food products. Tight import regulation measures might have affected supply. There were frequent reports of domestic supply disruptions which the authorities have attributed to hoarding and speculation.⁵ The reopening of the economy in the second half of 2020 as sanitary restrictions were lifted constituted a dual positive shock to both supply and demand, with an ambiguous net impact on inflation. A loose policy stance might have resulted in demand-induced pressures on prices as monetary policy remained accommodative through most of 2022. There are indications that the output gap was fully closed in Q1:2022 (Figure 4), despite uncertainty around these estimates as output gap is notoriously hard to measure and statistical filtering techniques used to estimate trend GDP present well-known limitations (Orphanides and Van Norden 2002). Announcement of subsidy reform in the 2022 budget law might also have contributed to expectations of higher inflation.

14. An analysis of the cross-sectional distribution of inflation components indicates that the acceleration in price dynamics might be due to concentrated sectoral shocks, but also to other factors. Sector-specific shocks tend to increase the variability of relative prices in the presence of nominal rigidities. Given the cost of price adjustment, only a small share of sectors facing large idiosyncratic shocks adjust their prices in any given period, resulting in higher relative price variability when shocks materialize (Ball and Mankiw 1995).

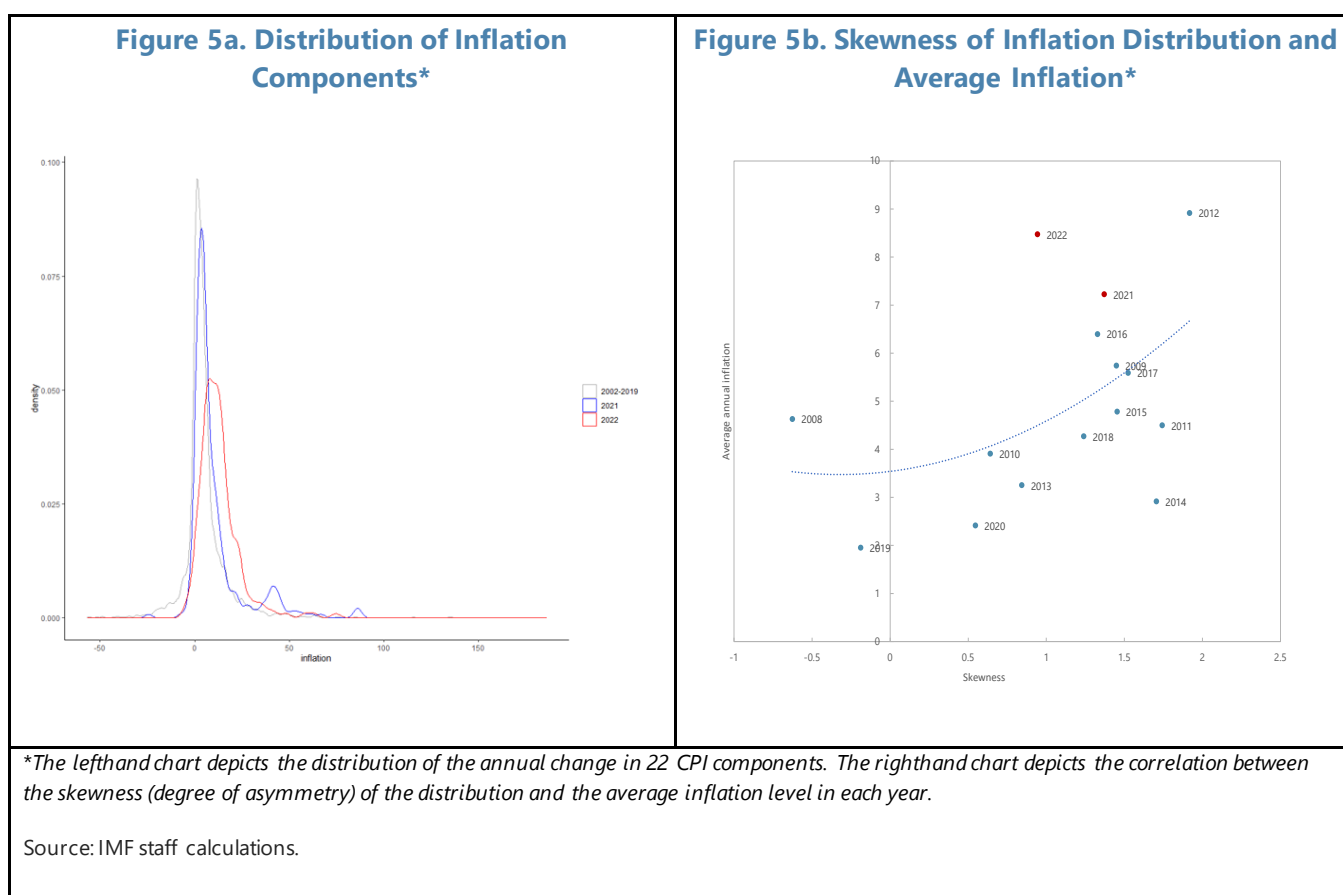
Consequently, an increase in relative price variability—reflected in an increase in the degree of asymmetry of relative price distribution—tends to be associated with an increase in the overall price level and higher inflation (Ratfai 2004). Conceptually, sector-specific shocks and the associated shift in the degree of asymmetry in the distribution of relative prices can stem either from shifts in sectoral costs or in sector-specific demand. However, there is empirical evidence in the literature that an increase in the degree of asymmetry of relative price distribution tends to be associated with idiosyncratic supply shocks (Ball and Mankiw 1995, Suvanto and Hukkinen 2004). Building on these considerations a



⁵ An inquiry by a Parliamentary Commission in early-2022 suggested, for example, that disruptions in the supply of cooking oil was linked to insufficient imports and domestic production. There are also concerns about speculation and smuggling to neighboring countries. More recently, the authorities have announced a renewed crackdown on speculation amid continuing disruptions in the supply of some staples.

graphical analysis of the distribution of relative prices in Algeria, proxied by the distribution of changes in 22 components of the CPI, highlights the following (figures 5.a and 5.b):

- **The asymmetry of relative price distribution increased in 2022.** This could indicate an important role for concentrated, sector-specific shocks, likely on the supply side, in driving the acceleration in inflation.
- **The rise in average inflation has outpaced the increase in the asymmetry of relative price distribution.** There is a statically significant correlation between average inflation and the skewness of relative price distribution. However, it is noteworthy that in 2021 and 2022, average inflation outpaced the increase in the skewness of the distribution of its components. This points to broader price pressures beyond idiosyncratic sectoral shocks and likely contribution of non-supply factors to the acceleration in inflation.



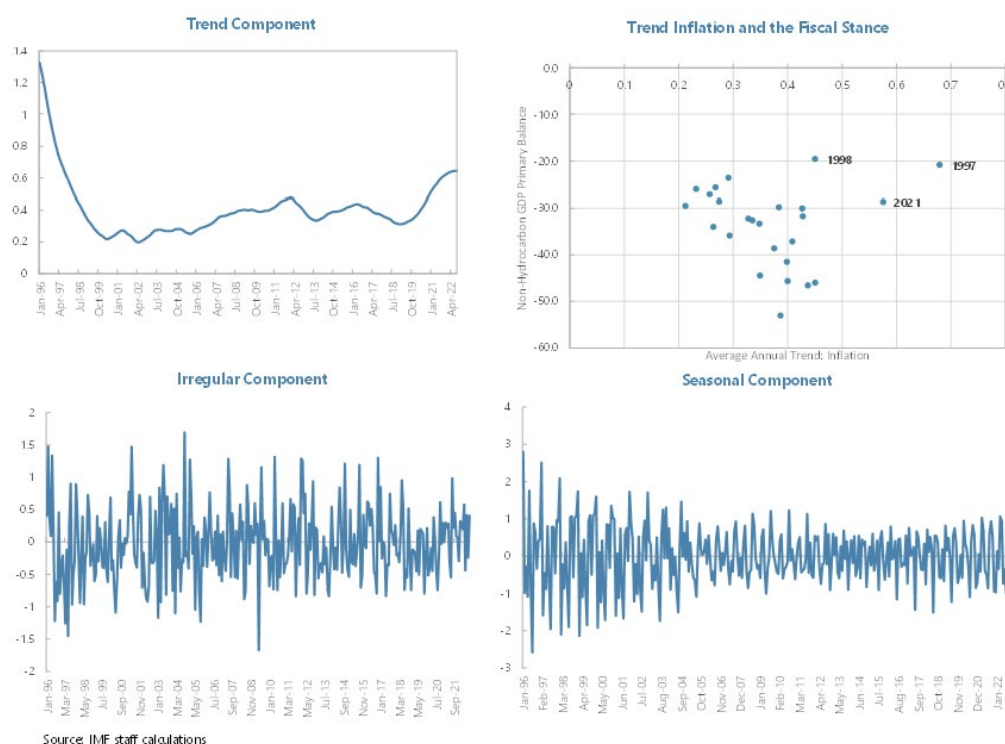
15. A univariate decomposition of the inflation process highlights a broad acceleration in inflation prior to the current shock and risk of persistence of current price pressures. We follow the approach presented in Koranchelian (2003) which decomposes Algeria's inflation process into three unobserved components: (i) a trend reflecting "underlying inflation" influenced by policy shifts; (ii) a seasonal component, which is largely influenced by holidays or the agricultural cycle and its implications for food prices; and (iii) an irregular component reflecting exogenous shocks. We use

an ARIMA-based model to update the analysis and find similar results for the period considered in that paper (i.e.1996-2003). For more recent years, we note the following (Figure 6):

- ***Trend inflation has been rising since 2019.*** Trend inflation bottomed out in 2019 and its acceleration gathered momentum in the second half of 2020. It appeared to be stabilizing at high levels in mid-2022. Trend monthly inflation has been around 0.63 percent over the last year, which would translate into a high annual inflation of around 7.8 percent. The rise in trend inflation well above its peaks during the previous episodes of high inflation in 2012 and 2017 points to broad-based price pressures and risk of persistence of elevated inflation amid a loose monetary policy stance and projected easing in fiscal policy.
- ***Trend inflation is correlated with shifts in the fiscal policy stance,*** as shown in Figure 6.⁶ It is noteworthy that 2021 is an outlier for the historical correlation between inflation and the fiscal deficit (alongside 1997 and 1998): inflation in that year was much higher than the level that could be expected based on its historical correlation with the fiscal deficit. One possible reason is a larger-than-usual role of supply factors in igniting price pressures in addition to policy-driven demand.
- ***The irregular component points to deflationary pressures in 2019-2020 which have recently dissipated.*** These deflationary pressures were concomitant with the “Hirak” unrest in 2019 and a number of exogenous developments in 2020 such as the collapse in international commodity prices and abundant domestic harvests on the supply side, and the pandemic-related hit to income which weighed on demand. These downward pressures appear to have subsided once the economy emerged from the first stages of the pandemic, in late 2020. More generally, the irregular component has been sizeable over the years and points to a build-up of price pressures around some developments such as the public sector salary increase in 2012 and the VAT hike in 2017. Public sector wages and pensions were increased in 2022 and an additional adjustment has been announced for 2023, which could aggravate price pressures.

16. In summary, our descriptive and univariate analysis provides preliminary insights into recent inflation trends in Algeria which have been mostly driven by domestic factors. A broad-based pick-up in trend inflation started in late 2019 and accelerated in 2021 and 2022 among a concomitance of global and domestic shocks, both on the demand and supply side. While global factors have likely played a role in driving the rise in inflation, the contribution of domestic forces appears to be larger. There are indications that cost-push factors have played a significant role in fueling inflation, but other shocks, possibly demand-pull forces, are also at play. The acceleration in trend inflation points to significant risks of persistence, particularly amidst indications that the output gap has closed, sizeable fiscal easing and announced wage increases.

⁶ Correlation with the growth in M2 growth—which would reflect changes in the monetary policy stance—is weak and statistically insignificant (not shown).

Figure 6. A Decomposition of Monthly Inflation into Three Unobserved Components

C. Drivers of Inflation: Demand and Supply Factors

Selective Review of the Literature

17. The analysis in this paper adds to a rich literature studying to analyze the role of demand and supply factors, both domestic and external, in inflation dynamics. The Phillips curve is the workhorse framework in empirical analyses. Early versions of the Phillips curve focused on the inflation-unemployment trade-off, but subsequent extensions to the framework over time have allowed an examination of the role of additional variable. The triangular Phillips Curve (Gordon, 2011) capture three sets of determinants: (i) inertia; (ii) domestic demand; and (iii) cost-push factors. This framework has been used, for example, by Lanau, Robles and Toscani (2018) to analyze the dynamics of inflation in Colombia. Another recent study (IMF 2022), based on an augmented triangular Phillips curve (i.e. including also forward-looking inflation expectations), examines the role of external and domestic factors in inflation in the Middle East and Central Asia and finds that external factors have been the main driver of price dynamics for the region—both historically and in the current episode of inflation. The analysis also suggests that pass-through of international food prices is estimated to have the strongest impact on domestic inflation dynamics in most countries, while that of supply-chain disruptions appears to affect domestic inflation with the longest lag. By contrast, international oil prices have had a smaller impact, given the prevalence of energy-related subsidies. Another result is that inflation expectations have also historically been an important driver

of inflation while domestic factors do not appear to have a statistically significant effect on inflation, in part because of measurement errors. However, in the current episode, domestic factors have played a role in driving inflation dynamics in some countries, including expansionary fiscal and monetary policies and the strength of the ongoing recovery.

18. Several studies focus on understanding the inflationary process in Algeria, finding that money supply is an important determinant. Ben Naceur (2013) estimates a Vector Error Correction Model (VECM) to analyze the short- and long-run determinants of inflation in Algeria between 2002 and 2011. He finds that over this period, the non-oil GDP output gap was the only determinant of headline inflation in the short run, while money supply and real GDP growth are the most important determinants in the long run. Souissi (2017) also uses a VECM to analyze the determinants of quarterly core inflation over 2003–16. The results indicate that in the short run, inflation is highly persistent and tends to be driven more by money supply than other policy factors. In the long run, however, both domestic macroeconomic policies and external factors influence inflation. More recently, a study by the Bank of Algeria (2022) employs an Autoregressive Distributed Lag Model (ARDL) to examine the determinants of monthly inflation over the period 2011–21. The results suggest that money supply, unitary import prices and the nominal effective exchange rate are important determinants of long-run inflation, with the latter two factors accounting for 91 percent of predicted inflation over the period.

19. The analysis in this paper combines the insights from the various papers cited above to re-examine the drivers of inflation in Algeria. We follow Lanau, Robles and Toscani (2018) in adopting the triangular Phillips Curve as our conceptual framework and estimating this relationship for the various subcomponents of inflation. Section II provides details.

Empirical Strategy

20. We first examine a basic Phillips curve equation to analyze the relationship between inflation and demand factors in Algeria. Due to data limitations, the estimation equation does not augment the Phillips curve with an explicit (forward-looking) inflation expectations term as explanatory variable. Nevertheless, lagged inflation (inertia) can capture to some extent any backward-looking component to inflation expectations. Queyranne, Lafarguette and Johnson (2022) in fact show that the IMF's 5-year ahead projections as measure of forward-looking inflation expectations for Algeria cannot explain the distribution of future core inflation. By contrast, lagged core inflation has a significant predictive power for future core inflation, especially when inflation is high.

Our model specification is as follows:

$$\pi_t = c + \alpha(L)\pi_{t-1} + \beta(L)(y_t - y_t^*) + u_t \quad (\text{model 1})$$

In this specification:

- π_t is a measure of year-on-year inflation⁷,
- $(y - y_t^*)$ is a measure of slack in the economy at time t and captures demand pressures,
- $\alpha(L)$, $\beta(L)$ and $\delta(L)$ are lagged polynomials, and
- u_t is a vector of shocks.

21. We then specify a triangular Phillips curve to examine the effect of demand and supply factors on inflation in Algeria. For this purpose, we add a vector of supply-side variables, s_t , to model 1. Our model specification is as follows:

$$\pi_t = c + \alpha(L)\pi_{t-1} + \beta(L)(y_t - y_t^*) + \gamma(L)s_t + u_t \quad (\text{model 2})$$

22. Empirically, we estimate the model as an autoregressive distributed lag ARDL(p,q) process as follows:

$$\pi_t = c + \sum_{i=1}^p \alpha_i \pi_{t-i} + \sum_{k=1}^m \sum_{j=0}^q \beta_{k,j} X_{k,t-j} + \epsilon_t$$

In this specification:

- $X_{k,t-j}$ is the vector of regressors including the output gap $(y - y_t^*)$ and other supply-side variables chosen based on the dependent variable (headline, core, non-food and non-regulated non-food inflation)
- and ϵ_t a white noise process.

23. The estimation of an ARDL allows for estimation with variables which have different orders of integration. It avoids the constraints on the interpretation of common cointegration tests due to data limitations and structural breaks. ARDL processes also allow a degree of flexibility in modelling by permitting differences in the lag length across variables—with optimal lag length determined based on an analysis of common information criteria—and have good small sample performance.

⁷ We estimate the equation for headline, core, non-food, and non-regulated non-food products inflation.

Data

24. The data for the empirical analysis are at quarterly frequency and are available for most variables for the period 2002Q1 to 2022Q2. The main variables are measured as follows:

- *Inflation*: is at quarterly frequency measured using the quarter-on-quarter change in the CPI. We first use alternative measures of inflation based on headline, core (i.e. excluding fresh food and regulated prices), non-food and non-regulated non-food products price indices. We focus the analysis on measures of non-food inflation which are less volatile and more strongly related to demand pressures.
- *Demand pressures*: are captured using measures of slack estimated using univariate filters (Hodrick-Prescott, HP, and Christiano-Fitzgerald, CF). Our preferred measure, in line with the analysis in IMF(2022) is the output gap for non-hydrocarbon GDP (NHGDP). However, given data limitations, we also use alternative measures including the output gap for total GDP and a domestic demand gap, which is computed analogously to the output gap using the sum of consumption and investment (private and public) to proxy for domestic demand.
- *Cost-push factors*: are proxied using various indicators. External supply pressures are captured using commodity import prices adjusted for changes in the nominal effective exchange rate as a proxy for import prices in dinar, global supply chain tensions as measured by the New York Federal Reserve's (NY Fed) Global Supply Chain Pressure Index. Data on rainfall from the World Bank is considered as proxy for weather shocks and lagged values of the producer price index are considered as proxy for domestic supply pressures. In addition, following Mankiw and Ball (1995), we include an index of Relative Price Variability (RPV) index as a proxy for supply shocks in the presence of significant domestic nominal rigidities. For a given period t (quarter), the index is defined as: $RPV = [\sum_{i=1}^m w_i (\pi_i - \bar{\pi})]^2$ where w_i is the weight of the i -th component in the CPI, π_i is the inflation of the i -th component and $\bar{\pi}$ is total CPI inflation during the period.
- *Dummy variables* to control for policy shocks such as the VAT hike in 2017 or exogenous shocks such as the 'Hirak' protests of 2019.

Summary statistics and the results of unit root tests are presented in Appendix tables A1 and A2.

Results

25. The estimation results suggest that cost-push factors have played a significant role in fueling inflation but that demand-pull forces are also at play. We first estimate the equations for the basic Phillips curve equation (model 1) using alternative measures of inflation and the output gap. We find some statistically significant results for measures of nonfood inflation. We then extend the analysis to a triangular Phillips curve (model 2) by adding supply side variables to the five Phillips curve specifications yielding statistically significant results for the relationship between inflation and the output gap. The results are presented in Tables 1 and 2 and are broadly in line with

those in previous studies for a broader sample of countries in the Middle East and Central Asia.⁸ They can be summarized as follows:

- *Domestic demand has likely contributed to nonfood inflation.* Under the basic Phillips curve model, i.e model 1, there is a positive association between measures of non-food inflation and the output gap based on five of the 12 tested specifications. These results should still be interpreted with caution due to data limitations and difficulties in computing the output gap reliably using statistical filters. The existence of a relatively large informal sector in Algeria could be another factor affecting the statistical relationship between inflation and the output gap.
- *Supply shocks, both domestic and external, seem to be important drivers of inflation in Algeria.* External supply pressures, as measured by the NY Fed Global Supply Chain Index, and import prices are also statistically significant for non-food non-regulated inflation. Rainfall, lagged measures of the PPI and the RPV did not yield statically significant results.
- *There is a lot of inertia in non-food inflation, which suggests that inflation becomes harder to eradicate once it reaches high levels.* Although the econometric specification does not explicitly identify the role of expectations, significant inertia is consistent with the idea that people start making price decisions based on past inflation dynamics, contributing to self-fulfilling acceleration in prices.

26. Taken together, these results suggest that policy should be tightened to help reduce current inflationary pressures. The easing of external supply pressures and commodity prices, the appreciation of the dinar in the latter part of 2022 as well as base effects following sharp increases in the prices of a narrow range of food prices in late 2021 might have contributed to the slight deceleration in inflation between September and November 2022. However, significant inertia and broad price pressures suggest the supply shocks may have a persistent effect on the price level and it may be more difficult to reduce inflation once it reaches high levels. The continuation of an accommodative monetary policy stance and announced sizeable fiscal easing and wage increases at a time when the output gap appears to have closed could exacerbate price pressures. This calls for immediate monetary policy tightening to protect price stability alongside gradual fiscal policy tightening to avoid exacerbating price pressures.

⁸ We focus the results on non-food and non-food non-regulated inflation which are the measures of inflation which tend to be more significantly associated with the output gap.

Table 1. Algeria: ADRL Regression Results for a Basic Phillips Curve Specification

	Non-food inflation		Non-food non-regulated inflation		
	NHGDGP output gap (Filter CF)	Domestic demand gap (filter HP)	GDP output gap (filter HP)	GDP output gap (filter CF)	Domestic demand gap (filter HP)
L.inflation ¹	1.067*** (0.112)	1.068*** (0.111)	0.526*** (0.116)	0.623*** (0.090)	0.606*** (0.089)
L2.inflation	-0.242** (0.112)	-0.271** (0.110)	0.026 (0.131)		
L3.inflation			0.187 (0.113)		
Output gap	0.175* (0.045)	0.029* (0.017)	0.069* (0.039)	0.17* (0.102)	0.065* (0.073)
L.Output gap	-0.323** (0.16)		-0.062 (0.041)	-0.178* (0.100)	
L2.Output gap	0.183* (0.09)		-0.074* (0.040)		
C	0.189*** (0.07)	0.219*** (0.07)	0.302** (0.125)	0.418*** (0.114)	0.442***
Observations	78	78	77	79	79
R-squared	0.769	0.765	0.49	0.435	0.435
Adjusted R-squared	0.753	0.755	0.45	0.412	0.420
Log likelihood	0.792	0.009	-54.74	-59.627	-59.610
Residual sum of squares	4.475	4.566	18.69	20.928	20.920
F-statistic	48.049	80.180	11.31	19.212	29.231
Number of models evaluated	12	12	12	12	12

Notes:

1. Lagged values of the measure of inflation used on the lefthand side of the equation specification.

The Akaike Information Criteria is used to select the optimal lags.

Source: IMF staff.

Table 2. Algeria: ADRL Regression Results for a Triangular Phillips Curve Specification

	Non-food inflation		Non-food non-regulated inflation		
	NHGDGP output gap (Filter CF)	Domestic demand gap (filter HP)	GDP output gap (filter HP)	GDP output gap (filter CF)	Domestic demand gap (filter HP)
L.inflation ¹	1.052*** (0.113)	1.031*** (0.111)	0.523*** (0.115)	0.637*** (0.088)	0.613*** (0.084)
L2.inflation	-0.218* (0.115)	-0.223** (0.112)	0.037 (0.127)		
L3.inflation			0.212* (0.113)		
Output gap	0.020 (0.027)	0.034* (0.017)	0.069* (0.039)	0.033 (0.053)	0.075** (0.034)
L.Output gap			-0.043 (0.041)		
L2.Output gap			-0.058 (0.041)		
Δ Supply chain index	0.071 (0.080)	0.091 (0.059)	0.218 (0.132)	0.243** (0.121)	0.284** (0.118)
L.Δ Supply chain index	0.081 (0.081)	0.081 (0.059)		0.267** (0.123)	0.283** (0.118)
Adjusted Import price index ²	-0.002 (0.009)	-0.003 (0.009)	-0.026 (0.018)	-0.027 (0.018)	-0.026 (0.017)
L.Adjusted Import price index	0.016* (0.009)	0.013 (0.009)	0.029 (0.022)	0.035** (0.018)	0.032* (0.017)
L2.Adjusted Import price index			-0.008 (0.023)		
L3.Adjusted Import price index			0.042* (0.022)		
L4.Adjusted Import price index			-0.046** (0.018)		
C	0.150** (0.071)	0.182** (0.070)	0.256** (0.128)	0.366*** (0.116)	0.394*** (0.113)
Observations	78	78	77	79	79
R-squared	0.78	0.79	0.58	0.51	0.54
Adjusted R-squared	0.76	0.77	0.50	0.47	0.50
Log likelihood	2.97	4.73	-47.24	-54.05	-51.70
Residual sum of squares	4.23	4.05	15.38	18.17	17.12
F-statistic	35.85	37.97	7.43	12.44	13.94
Number of models evaluated	500	500	500	500	500

Notes:

1. Lagged values of the measure of inflation used on the lefthand side of the equation specification.

2. Adjusted for the change in the nominal effective exchange rate

The Akaike Information Criteria is used to select the optimal lags.

Source: IMF staff.

D. Conclusion and Policy Implications

27. The Bank of Algeria, like many other central banks, is grappling with the complex question of the effectiveness of monetary policy tightening when inflation appears to be at least partly driven by supply shocks. Results from an investigation of the drivers of inflation in Algeria suggest that global supply shocks, such as supply chain disruptions during the pandemic followed by the war in Ukraine, are important determinants of non-food inflation in Algeria. However domestic factors have played a more important role in driving the upsurge in inflation. These domestic factors relate to both supply shocks, such as a recent drought and reported disruptions to domestic supply of some basic goods, and demand, with the continuation of an accommodative monetary policy stance amid indications of closure of the output gap.

28. Concerns that post-pandemic price pressures could be more persistent than in the recent past are prompting a rethink of the role of monetary policy. More precisely, the robustness of policy strategies to “run the economy hot” and “look through” temporary supply shocks” have been called into question in a context where risks to inflation are on the upside (Gopinath, 2022). Of note, the current supply shocks have occurred in the context of an accommodative monetary policy stance to support economic recovery. A multitude of factors (the pandemic, war and climate change) may also usher in a new inflationary era in which supply shocks are larger and more frequent, and in which inflation expectations may be less well-anchored. Moreover, the recent episode of inflation in Algeria has been characterized by price adjustments by producers despite the absence of changes in regulated prices, possibly suggesting anticipations of higher inflation, attempts to avoid a compression in margins or disruptions to domestic supply. Thus, supply shocks can spillover and become persistent, especially in the light of significant inertia. Thus, fiscal and monetary policy tightening are indeed appropriate to rein in inflationary pressures and prevent a de-anchoring of inflation expectations, although their pace will need to be calibrated to domestic economic conditions. Early action on the monetary policy can help contain spillovers and avert more abrupt future adjustments.

Appendix I. Statistical Appendix

Table A1. Algeria: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Headline inflation	82	1.1	1.0	-1.5	4.1
Core inflation	81	1.1	0.8	-2.2	2.6
Nonfood inflation	82	1.0	0.5	0.1	2.6
Nonfresh food inflation	82	1.0	0.6	-0.3	2.9
Nonregulated nonfood products inflation	81	1.2	1.3	-2.9	5.3
Nonregulated products inflation	81	1.1	0.7	-0.4	2.4
Food inflation	82	1.2	2.1	-4.8	6.7
Regulated products inflation	81	0.7	1.3	-4.1	6.0
Fresh food inflation	84	1.4	4.2	-11.5	14.4
Relative price variability index	83	2.5	0.7	1.3	4.6
Nominal effective exchange rate (NEER) index	86	-0.6	2.5	-5.5	7.2
NY Fed supply chain index	87	0.1	1.0	-1.2	4.2
Commodity import price index	84	1.1	4.0	-8.9	9.9
Rainfall index	80	0.3	9.4	-17.5	37.8
PPI	82	0.8	0.8	-0.9	3.1
<i>Output gaps (percent)</i>					
Industrial production (HP filter)	88	0.0	2.5	-13.3	5.3
Industrial production (CF filter)	88	0.0	1.8	-7.0	5.2
Manufacturing (HP filter)	88	0.0	3.6	-17.2	8.4
Manufacturing (CF filter)	88	-0.1	2.3	-8.8	8.0
Nonhydrocarbon GDP (HP filter)	89	-0.1	1.7	-10.2	2.9
Nonhydrocarbon GDP (CF filter)	89	0.0	1.2	-3.4	3.0
GDP (HP filter)	89	-0.1	1.7	-9.5	2.8
GDP (CF filter)	89	0.0	1.1	-4.4	2.5
Demand gap (HP filter)	89	-0.1	1.6	-9.5	2.7
Demand gap (CF filter)	89	0.0	1.4	-4.7	2.9
Source: Algerian and Authors' calculations.					
Notes:					
Data for most variables cover the period 2002Q1 to 2022Q3					
The growth rates of the variables are calculated where appropriate, using the quarter-on-quarter change.					

Table A2. Algeria: Unit Root Tests

Variable	ADF test	Phillips-Perron test		KPSS Test
	Z-statistic(1)	Z(rho)	Z(r)	
Headline inflation	-5.073***	-66.655***	-7.387***	0.0604
Core inflation	-4.258***	-42.297***	-5.247***	0.0429
Nonfood inflation	-3.105**	-15.531*	-2.852*	0.07
Nonfresh food inflation	-4.641***	-38.575***	-5.063***	0.0409
Nonregulated nonfood products inflation	-5.217***	-85.669***	-8.725***	0.0628
Nonregulated products inflation	-3.431***	-27.46***	-4.097***	0.0655
Food inflation	-5.698***	-92.702***	-9.792***	0.0895
Regulated products inflation	-6.101***	-70.371***	-8.06***	0.0392
Fresh food inflation	-7.037***	-94.76***	-10.886***	0.0578
Relative price variability index	-6.464***	-91.208***	-9.689***	0.12
Nominal effective exchange rate (NEER) index	-6.397***	-53.874***	-6.192***	0.0384
NY Fed supply chain index	-2.226	-10.213	-2.273	0.275
Commodity import price index	-4.944***	-25.908***	-3.736***	0.128
Rainfall index	-5.744***	-87.698***	-9.307***	0.0305
PPI	-5.128***	-66.03***	-7.065***	
<i>Output gaps (percent)</i>				
Industrial production (HP filter)	-5.828***	-64.419***	-7.132***	0.0312
Industrial production (CF filter)	-13.048***	-32.328***	-4.125***	0.0215
Manufacturing (HP filter)	-6.529***	-64.945***	-7.451***	0.0404
Manufacturing (CF filter)	-11.337***	-31.779***	-4.015***	0.0298
Nonhydrocarbon GDP (HP filter)	-5.489***	-60.929***	-6.845***	0.0559
Nonhydrocarbon GDP (CF filter)	-8.81***	-24.637***	-3.533***	0.0395
GDP (HP filter)	-4.493***	-49.275***	-5.779***	0.0667
GDP (CF filter)	-9.211***	-25.298***	-3.601***	0.0414
Demand gap (HP filter)	-4.558***	-43.236***	-5.225***	0.0485
Demand gap (CF filter)	-9.08***	-23.801***	-3.487***	0.0401

*** indicate rejection of the null hypothesis at the 10%, 5% and 1% level of significance.

The null hypothesis under the ADF and Phillips-Perron test is that the series has a unit root.

The null hypothesis under the KPSS test is that the series is stationary. The critical values for the KPSS test are as follows:

10%: 0.119 5%: 0.146 2.5%: 0.176 1%: 0.216

Source: Authors' calculations.

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