Box 1
Inflation Persistence in the Current Environment

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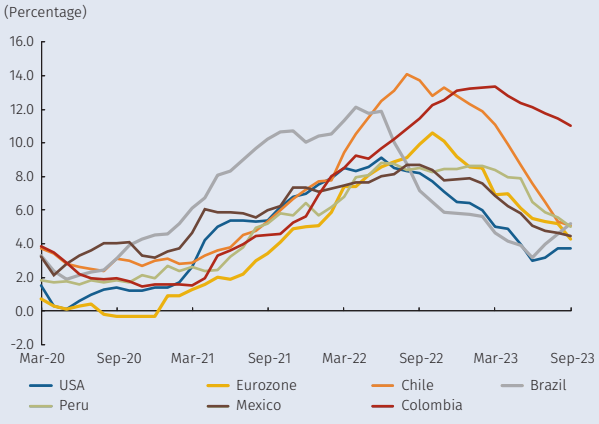
1. Introduction

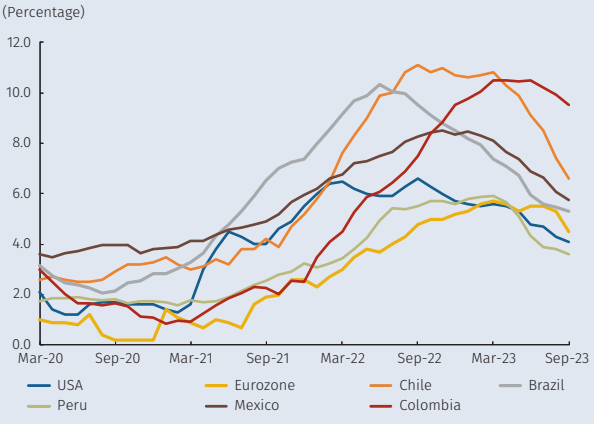
Inflation persistence[1] is highly relevant in monetary policy discussions because as inflation rises, its deviation from the central bank's target becomes more difficult to correct, with potentially higher costs to a nation's economic activity. While Colombia has experienced recent decreases in annual CPI changes, it continues to experience remarkably high inflation levels. When comparing headline and core inflation levels with those of other countries, Colombia stands out for its exceptionally elevated figures and lower and slower inflation decline than those experienced by other economies (Graph B1.1).

Graph B1.1
Inflation in Colombia and other countries

A. Annual headline inflation



B. Annual core inflation[a/]



a/ Is the measurement of inflation excluding food and fuel or, as the case may be, the core inflation measured by the Central Bank. For Brazil, it is the average of three core inflation measurements monitored by the central bank (exclusion method, trimmed means, and double weighted). For Colombia, inflation excluding food and regulated items is used.
Sources: National central banks and statistical entities of each country.

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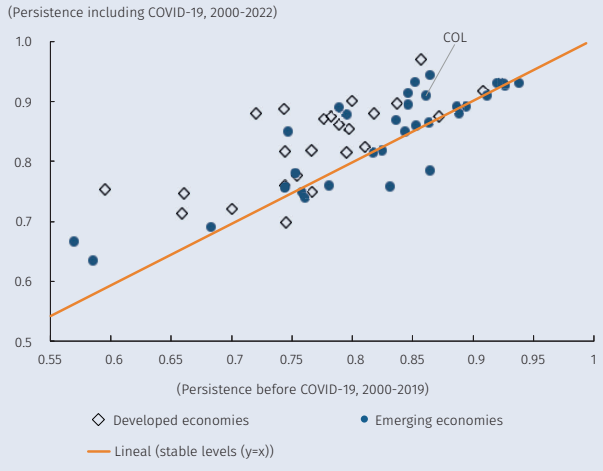
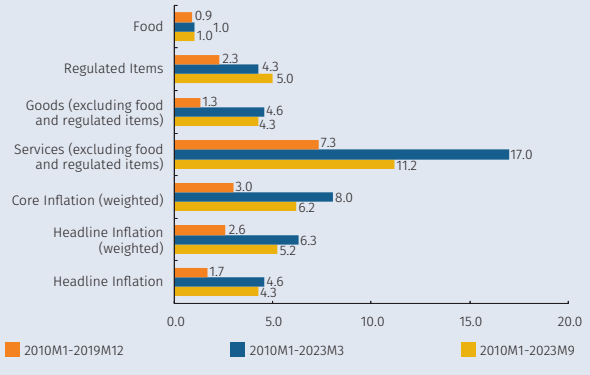
1 The persistence of an economic variable can be understood as the analog of "inertia" in physics (Fuhrer (2010)). Once a process is started, it tends to last over time unless there are one or several forces that stop it.

Graph B1.2
Global changes in the level of inflation persistence (autocorrelation parameter)



Note: Emerging economies do not include Argentina, Russia, Ukraine, Turkey, and Venezuela. Persistence was obtained using AR models.
Sources: Calculation by the authors using quarterly inflation obtained with the seasonally adjusted CPI. Inflation data was obtained from the World Bank for 69 countries (23 developed and 46 emerging economies).

Graph B1.3
Monthly inflation persistence derived from a half-life computation (number of months it takes for 50% of the initial shock to dissipate)



Sources: Calculation by the authors using monthly inflation obtained with the seasonally adjusted CPI.

As shown in Graph B1.2, when studying one of the conventional measures of inflationary persistence (the autocorrelation parameter[2]) for a broad spectrum of countries before (x-axis) and after the COVID-19 pandemic (y-axis), it is evident that Colombia's inflation exhibits more remarkable persistence, which exacerbated after the health crisis. In this context, this Box seeks to analyze the dynamics of inflation persistence in Colombia following the sharp increase in inflation experienced since 2021.

2. Inflation persistence in Colombia

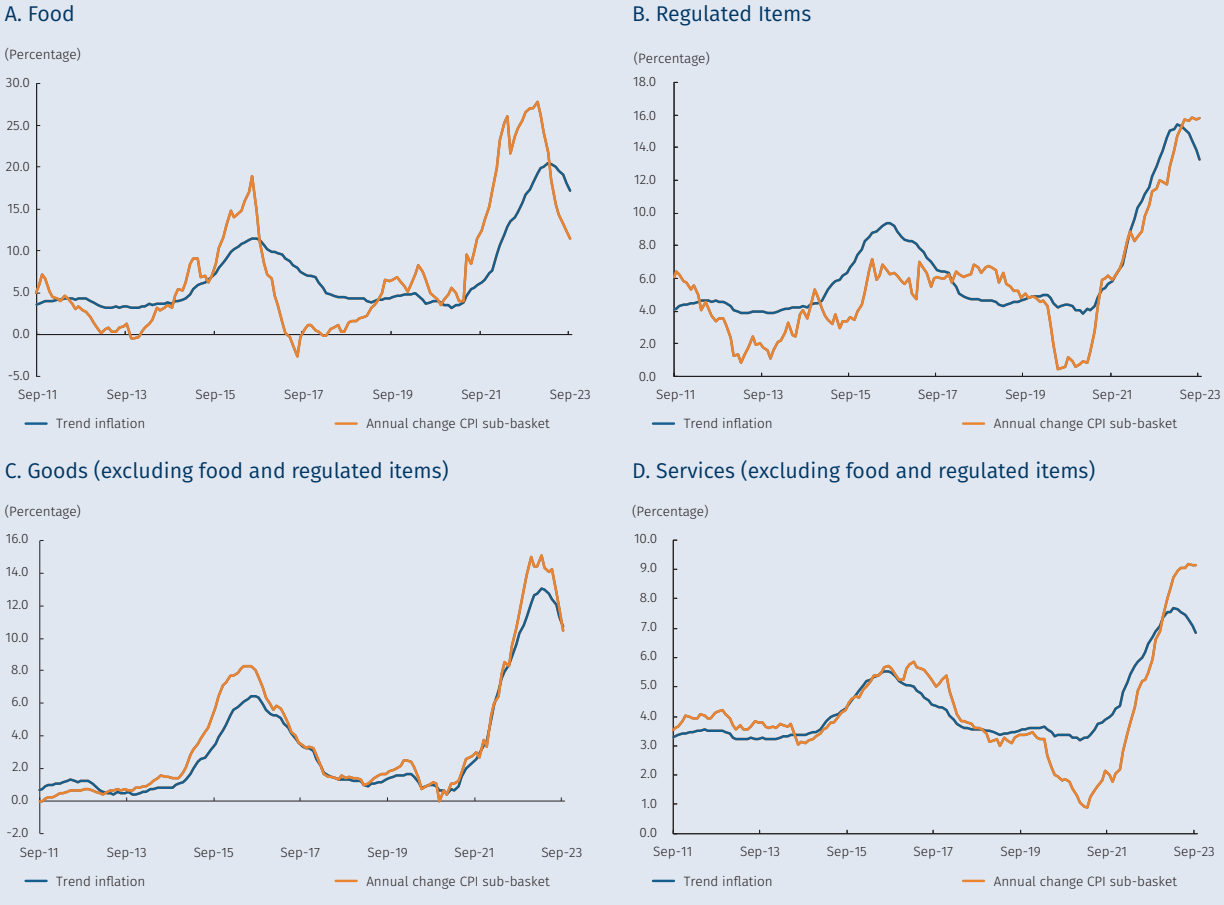
There are several methodologies to measure inflation persistence.[3] In this section, we use two. The first one estimates the half-life of the shocks affecting inflation. This metric seeks to determine how long it takes for half of the effect of a shock on inflation to dissipate. In this analysis, we apply the methodology proposed by Barrero et al. (2023), focusing on the food, regulated items, and goods and services (excluding food and regulated items) sub-baskets in Colombia. In this case, we modeled an autoregressive model (AR(p)) for monthly seasonally adjusted inflation for each of the CPI sub-baskets and three periods beginning from 2010: 1) up to the COVID-19 pandemic; 2) up to the first quarter of 2023; and 3) up to the third quarter of the same year. Subsequently, we calculated the inverse roots of the autoregressive polynomial for each subclass (persistence measure) and aggregated the results using their CPI weights. The half-life in months was computed assuming a shock of 1 percentage point (pp) in each sub-basket, calculating the number of months it takes for 50% of the initial shock to dissipate. Graph B1.3 illustrates how the inflationary persistence in the different groupings experienced a significant increase after the 2020 health crisis, particularly for the basket of goods. Concerning headline inflation, the half-life of an inflationary shock increased from 1.7 months at the close of 2019 to 4.6 months by the close of the first quarter of 2023. Although this trend has reversed somewhat, and inflation half-life levels have declined, current persistence values remain higher than those observed before the pandemic.

The second methodology we employ to measure persistence consists of estimating underlying trend inflation following the Stock and Watson (2016) model, which was applied recently to the United States case (Almuzara, 2023) and the Colombian case in a simplified version (Rojas-Martinez et al., 2022). Its implementation consists of utilizing a Kalman filter to estimate the common (or "permanent") components among 24 different CPI categories (disaggregation of the various CPI expenditure divisions) and the idiosyncratic (or "transitory") component of each sub-basket. Graph B1.4 isolates trend inflation among the primary *Banco de la República* analysis sub-baskets (González-Molano et al., 2020). After running the model with the 24 initial categories using the CPI weights, the results were grouped according to the following classifications: food, regulated items, goods (excluding food and regulated items), and services (excluding food and regulated items). This methodology allows us to determine whether inflation dynamics are short-lived or persistent and whether they are concentrated in particular economic sectors or generalized. In this

2 To obtain a cross-country comparison, the autocorrelation parameter derived from an AR(1) model with seasonally adjusted quarterly data was used. Data before and after the COVID-19 health crisis (2000-2019) up to the first quarter of 2023 were considered.

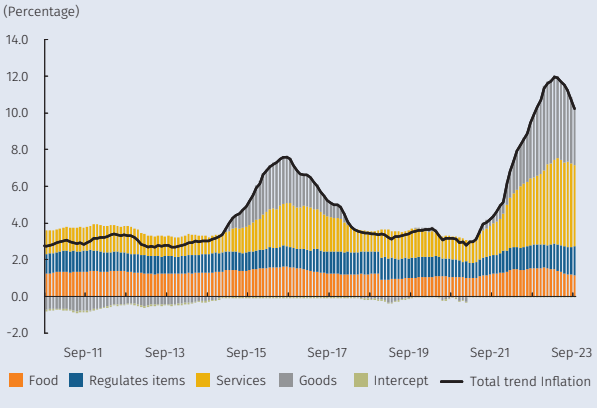
3 For Colombia, the leading academic research that analyzes inflation persistence can be found in González and Hamann (2011) and Echavarría et al. (2011A; 2011B).

Graph B1.4
Persistence of inflation sub-baskets measured through the trend component



Fuentes: DANE y cálculo de los autores.

Graph B1.5
Total trend inflation and contributions



Sources: Calculation by the authors.

context, trend component increases may be associated with a more marked inflation persistence.

Between the second half of 2021 and the first half of 2023, trend-level inflation registered a notable increase in the food, regulated items, goods (excluding food and regulated items), and services (excluding food and regulated items) sub-baskets. Said trend increase was even more significant than the episode of 2015-2016, characterized by several external and supply shocks. Graph B1.4 shows a partial reversal in the four sub-baskets in recent months, but the trend estimates are still far from the levels observed before the 2020 health crisis. Graph B1.5 shows the total trend inflation following this methodology and the contributions of the different baskets. Accordingly, the trend level of headline inflation, despite the corrections observed in recent months, continues at historically high levels and has been defined by the substantial contribution of the baskets that constitute core inflation, i.e., goods (excluding food and regulated items), and services (excluding food and regulated items).

3. Conclusions

The inflation episode that began in the second half of 2021 in Colombia is characterized by unusual levels of persistent inflation. Applying metrics such as half-life or trend inflation indicators, we find their levels to be currently high and above those observed before the COVID-19 health crisis despite recent inflation decreases.

The increase in inflation persistence may result from the more significant and numerous shocks that have successively impacted inflation. Moreover, upward price shocks may have generated longer-lasting effects through domestic propagation mechanisms, such as a heightened sensitivity of the economy to shock or increases in the economy's indexation levels. These two phenomena are known in the literature as "inherited" and "intrinsic" persistence, respectively (Fuhrer 2010; Barrero et al. 2023). The increase in intrinsic persistence may be more worrisome to the monetary authority since it may arise from a change in the economy's structure and price formation. Given the current high inflation, the risk that the degree of indexation of the economy has changed or will change in the future persists. Therefore, it is essential to continue to monitor inflation persistence and its determinants carefully.

References

Almuzara, Martin, Babur Kocaoglu, and Argia M. Sbordone. "Where Is Inflation Persistence Coming From?" Social Science Research Network. (July 6, 2023). Rochester, NY. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4502850.

Barrero, Alfonso, Carlomagno, Guillermo, Concha, Pedro, Eterovic, Nicolás, and Kirchner, Markus. "Longer duration of high inflation" Monetary Policy Report Box 1.3., Banco Central de Chile. (March 2023) https://www.bcentral.cl/documents/33528/4107325/MPR-March-2023.pdf/d1f77c83-809f-4e9b-13fc-f9588e849e9b

Echavarría S., Juan José, López, Enrique, and Misas, Martha. "The Statistical Persistence of Inflation in Colombia." RePEc - Econpapers. (2013). https://econpapers.repec.org/RePEc:cml:incocp:2en-6.

Echavarría, Juan José, Rodríguez N., Norberto, and Rojas, Luis. "The Target of the Central Bank and Inflation Persistence in Colombia." RePEc - Econpapers. (2013). https://econpapers.repec.org/RePEc:cml:incocp:2en-5.

Fuhrer, Jeffrey C. "Inflation Persistence," in: Benjamin M. Friedman & Michael Woodford (ed.), Handbook of Monetary Economics, (2010), Elsevier: edition 1, volume 3, chapter 9: 423-486.

Gonzalez, Andres and Hamann, Franz, "Lack of Credibility, Inflation Persistence and Disinflation in Colombia." Revista Desarrollo y Sociedad. Vol. 67. (2011) Pages 61-97. 10.13043/dys.67.2.

González-Molano, Eliana R., Hernández-Ortega, Ramón, Caicedo-García, Edgar, Martínez-Cortés, Nicolás, Romero, José Vicente, and Grajales-Olarte, Anderson. "Banrep's new classification of the CPI basket and revision of core inflation measures in Colombia," Borradores de Economía, *Banco de la República*, No. 1122 (2020).

Rojas-Martínez, Carlos D., Martínez-Cortés, Nicolás, and Galeano-Ramírez, Franky Juliano. "Common Inflationary Trends in Colombia" Box 2, Monetary Policy Report, *Banco de la República* (July 2022).

Stock, James H., Watson, Mark W., "Core inflation and trend inflation," Review of Economics and Statistics; (2016) Vol. 98, No. 4. pp. 770-784.