

Inflation mechanisms, expectations and monetary policy

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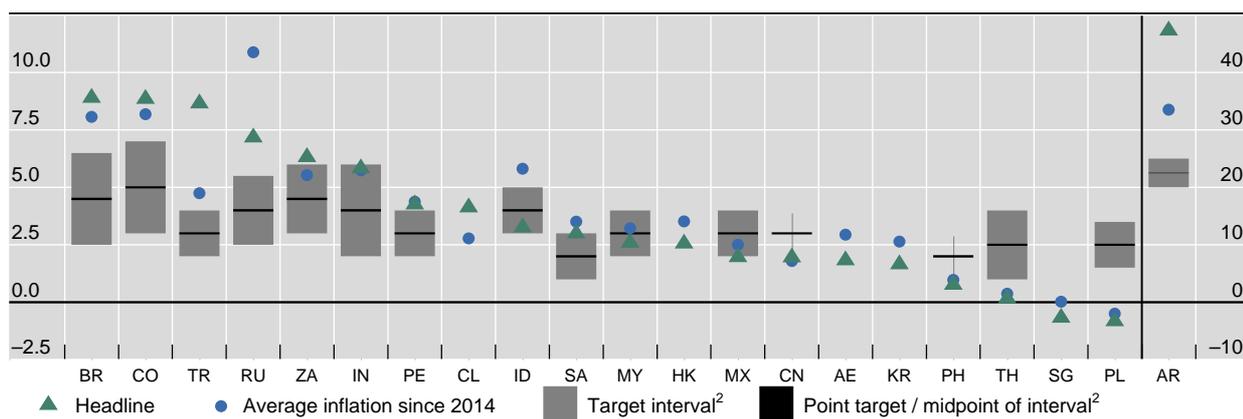
Abstract

Inflation has been off-target for some time in many economies, both advanced and emerging (Graph 1). Whereas advanced economies (AEs) have mostly seen inflation below target, the experience among emerging market economies (EMEs) has been mixed. Inflation has been below target in several EMEs in Asia and central and eastern Europe, but above target in some Latin American economies as well as in Russia, South Africa and Turkey.

Headline inflation and inflation targets¹

In per cent

Graph 1



AE = United Arab Emirates; AR = Argentina; BR = Brazil; CL = Chile; CN = China; CO = Colombia; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MX = Mexico; MY = Malaysia; PE = Peru; PH = Philippines; PL = Poland; RU = Russia; SA = Saudi Arabia; SG = Singapore; TH = Thailand; TR = Turkey; ZA = South Africa.

¹ Annual inflation rate as of June 2016; for Indonesia, Korea, Peru, Thailand and Turkey, July 2016. For Argentina, shown on the right-hand scale, the inflation rate is based on the consumer price index for the City of Buenos Aires. ² For countries following an inflation targeting strategy.

Sources: Datastream; national data; BIS calculations.

This chapter reviews the recent experience of EMEs, drawing heavily on the BIS background notes and central bank contributions prepared for a meeting of EME Deputy Governors held in Basel on 28–29 January 2016 and collected in this volume. The first section discusses two major changes in international prices that influenced inflation in recent years: the drop in commodity prices and the appreciation of the US dollar. The second section takes a step back and looks at the inflation process, ie the dynamics of inflation and its response to shocks. The third section considers inflation expectations and the fourth draws conclusions for policy. Boxes 1 and 2 discuss the measurement of inflation and of inflation expectations, respectively.

Keywords: Inflation, emerging markets, exchange rate pass-through, Phillips curve

JEL classification: E31, E52, F62

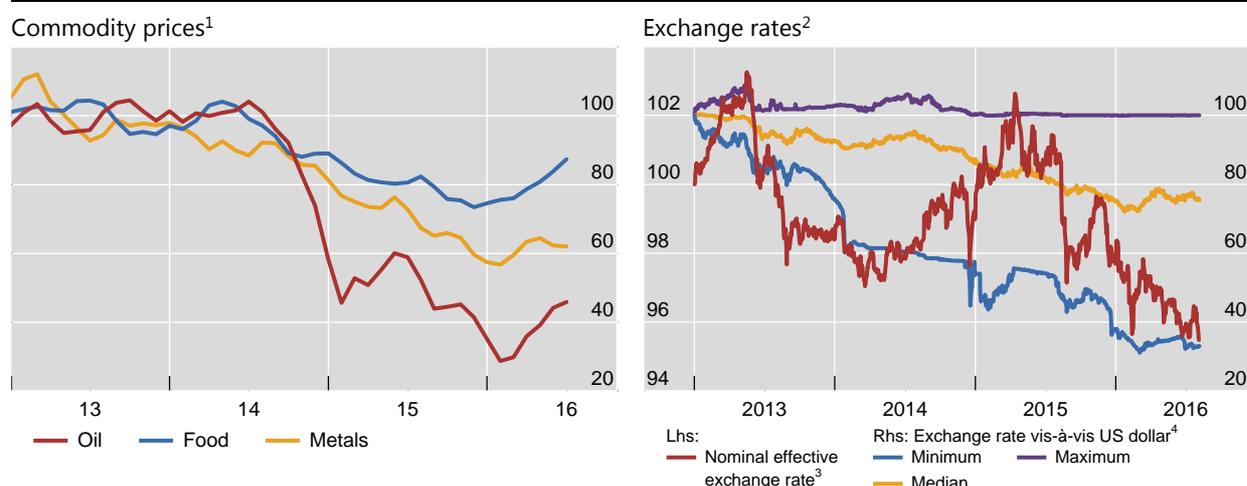
Inflation: proximate global determinants

The sharp decline in commodity prices, in particular that of oil, has pushed down inflation around the world. But in many EMEs, a sharp depreciation of currencies since the taper tantrum of 2013 has more than offset this force, pushing inflation well above target.¹ In several countries, this has added to domestic factors driving inflation outside the central bank's comfort zone.

Commodity prices, in particular that for oil, fell sharply between mid-2014 and early 2016, although they rebounded somewhat afterwards (Graph 2, left-hand panel). Part of the decline probably reflected weaker demand, but supply factors also played a key role.

Commodity prices and exchange rates

Graph 2



¹ The IMF's primary commodity prices; oil = crude oil (petroleum), price index: 2005 = 100, simple average of three spot prices: Dated Brent, West Texas Intermediate and Dubai Fateh; for food, food price index: 2005 = 100, which includes price indices of cereal, vegetable oils, meat, seafood, sugar, bananas and oranges; for metals, metals price index: 2005 = 100, which includes price indices of copper, aluminium, iron ore, tin, nickel, zinc, lead and uranium. ² An increase means an appreciation of the local currency. ³ Aggregate for emerging market economies; weighted average based on the GDP and PPP exchange rates of Argentina, Brazil, Chile, China, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, the Philippines, Poland, Russia, Saudi Arabia, Singapore, South Africa, Thailand and Turkey. ⁴ Bilateral exchange rates; beginning of 2013 = 100.

Sources: IMF, Primary Commodity Prices Database; national data; BIS calculations.

Against the backdrop of a generalised strengthening of the US dollar in the wake of the anticipated and actual normalisation of US monetary policy, most EME currencies depreciated in recent years. They fell sharply against the dollar during the taper tantrum of 2013 and continued to trend down until early 2016 (Graph 2, right-hand panel). In trade-weighted terms, the depreciation was generally much smaller, as most trading partners' currencies also weakened. That said, most trade tends to be

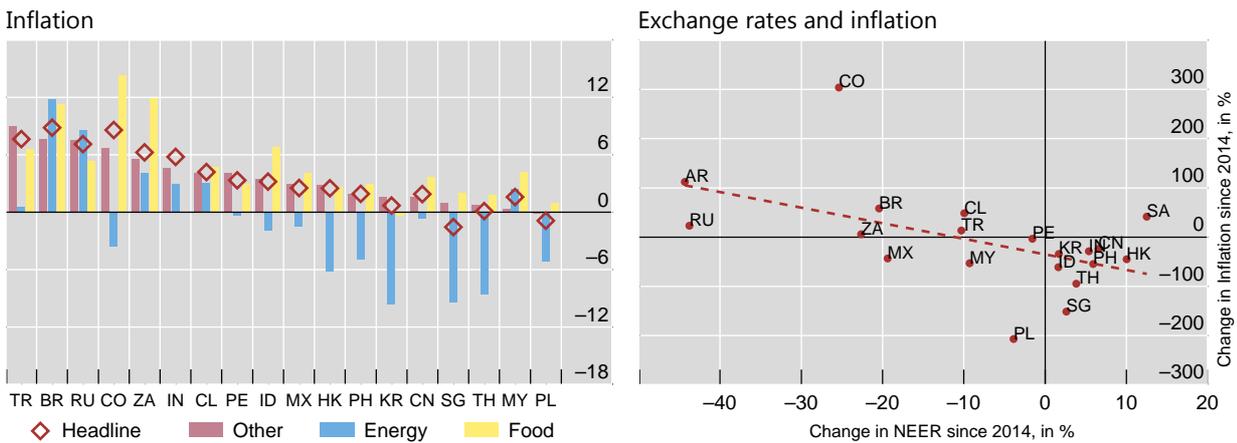
¹ These two international price developments are not independent. A key factor behind the depreciation of EME currencies against the US dollar was the increase in the risk premia facing commodity exporters. In some cases, this was compounded by domestic weaknesses.

invoiced in US dollars, so trade-weighted exchange rates may understate the inflationary pressures resulting from the depreciation, at least in the short term.

Tumbling energy prices dragged down headline inflation in most Asian EMEs, but inflation in other goods categories also tended to be low (Graph 3, left-hand panel). In part, this reflected the (relative) strength of the currencies of those economies² (right-hand panel) as well as other factors, such as the policy response and characteristics of the inflation process.

Exchange rates and inflation

Graph 3



AR = Argentina; BR = Brazil; CL = Chile; CN = China; CO = Colombia; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MX = Mexico; MY = Malaysia; PE = Peru; PH = Philippines; PL = Poland; RU = Russia; SA = Saudi Arabia; SG = Singapore; TH = Thailand; TR = Turkey; ZA = South Africa. NEER = nominal effective exchange rate.

Sources: National data; BIS calculations.

The picture looks very different in countries that experienced sharp exchange rate depreciations. There, energy prices actually increased in domestic currency terms, often at rates exceeding headline inflation.

Interestingly, lower international food prices appear to have had a negligible impact on headline inflation. In fact, food prices rose in all countries, in most cases by more than the headline inflation rate. In some countries, especially in South America, food production fell for weather-related reasons (see Vargas-Herrera, in this volume). The wedge between domestic and global prices might have reflected trade barriers or the fact that food was mostly produced and consumed locally, with international markets affecting only a limited subset of prices.

² Overall, the relationship between exchange rate depreciation and inflation shown in the right-hand panel of Graph 3 is robust to the use of bilateral exchange rates against the US dollar. The main change is that the depreciations tend to be larger, ie countries tend to move somewhat to the left.

Measuring inflation

Measuring inflation is a highly technical issue that only rarely captures the public's, or even economists', attention. At the same time, it involves many choices that could have significant consequences for policies and outcomes.

In practice, most central banks tend to use the consumer price index (CPI) as their main gauge of inflation, although they usually also look at a variety of other inflation measures. This is not only the case in most AEs but also in EMEs. In fact, 16 out of the 22 EME central banks surveyed for this volume target the consumer price index (see Patel and Villar, in this volume). If anything, the dominance of the CPI as the central measure of inflation has strengthened in recent years. For example, the Bank of Thailand switched from targeting core inflation to the CPI, although it still uses the core rate in both internal analysis and communication with the public.

Central banks also use other price indices when assessing economic conditions. These could be producer prices, the deflator for consumption expenditure or various types of core measures, constructed using statistical tools or by simply excluding certain prices from the index. The various indices can send very different signals. At the moment, several countries, including China and the Czech Republic, are seeing a wide divergence between the CPI and the PPI, reflecting the very different composition of the two indices (Skořepa et al, in this volume). In the case of China, less than half of the CPI basket consists of consumer goods and the remainder is made up of services, which by construction are not part of the PPI. In addition, the PPI is heavily tilted towards capital goods, with consumer goods making up less than one quarter of the index. This can make the PPI a good measure of slack in the manufacturing sector but not of the cost of consumption.¹ Many central banks also construct a variety of core measures to gauge underlying inflation pressures.² But often it is not clear which index is preferable. For example, the Bank of Israel has done extensive work on core measures but was not able to find one that dominated the others (Baudot-Trajtenberg and Offenbacher, in this volume). Instead, it is now increasingly looking at disaggregated prices.

Using measures other than the CPI raises communication problems, especially if the discrepancy with headline inflation is large.³ Some central banks therefore limit their communication relating to core measures and focus instead on headline inflation. Others, for instance the Bank of Thailand, are quite happy to refer to different measures. In Thailand, this is undoubtedly made easier by the fact that the central bank used to target core inflation in the past.

There are a number of both conceptual and practical issues arising from the measurement of inflation.

First, no single measure of inflation is representative of the behaviour of the whole population. Consumption baskets differ across individuals and households, and any price changes short of a uniform increase in all prices in the economy will have distributional effects. This may undermine the credibility of inflation measures, as the experience of individual groups may differ significantly from the picture painted by the aggregate price index. Research by the Bank of Israel shows that different types of household indeed face very different price changes, but these tend to wash out over time. Unfortunately, this is not the case everywhere. In Turkey, the prices of food, alcohol and tobacco have outpaced headline inflation over the last 10 years. This has penalised poor households, which tend to spend more of their income on such items. The higher inflation rate faced by the poor has also prompted a sizeable increase in the minimum wage, which is expected to feed into overall inflation.

¹ Some countries, for instance Chile, do not look at the PPI at all. The PPI mainly reflects the prices of a number of very specialised goods, few of which are consumed domestically. ² Core measures of inflation tend to be constructed either by excluding certain prices from the index or through statistical filtering techniques, although model-based measures are also used. For example, the Colombian central bank uses a DSGE model to filter out supply shocks from the headline inflation rate (Vargas-Herrera, in this volume). ³ Analysis based on disaggregated prices is even more difficult to communicate.

Second, changes in administered or regulated prices may not reflect the state of the economy, especially in the short term. This opens up a wedge between any measure linked to welfare – which should include such price changes – and one intended to capture economic conditions that can be influenced by monetary policy. That said, the problem goes away over longer horizons, because most administered prices do follow other prices over the medium to long term.

Third, the treatment of housing remains an open and important issue (see Patel and Villar, in this volume). In Hong Kong, housing rents explain approximately one half of inflation variability (Hong Kong Monetary Authority, in this volume). Since changes in house prices take one to two years to feed into actual rents, house prices tend to be a good predictor of inflation. In addition, they are correlated with commercial rents, which feed through to the prices of services.

The inflation process

The inflation process, which captures the dynamics of inflation and its response to shocks, has changed considerably in recent decades. This section discusses four important developments that have been observed in many EMEs: (i) a decline in inflation persistence; (ii) a flatter Phillips curve (ie a lower responsiveness of inflation to domestic slack); (iii) an increased role of inflation expectations; and (iv) a lower exchange rate pass-through.

Econometric estimates generally find a decline in ***inflation persistence***. For a broad panel of EMEs, Arslan et al (in this volume) find that the autoregressive component of quarterly inflation fell from an estimated 0.5 in the period from 2000 to mid-2008 to around 0.25 in the period from mid-2008 to 2015. This finding is broadly consistent with the responses to a survey of central banks conducted for the meeting: seven institutions reported a decline in persistence and only two an increase – with 10 reporting no significant change.

The exact causes of the decline are not clear. One possible explanation is the decline in inflation itself. Inflation persistence tends to be highly correlated with the level of inflation, perhaps because of inflation inertia reflecting explicit or implicit contract indexation or (backward-looking) expectations. There are some signs that the degree of inertia has come down, although it is still far from negligible in some economies, such as Brazil (Volpon, in this volume). In addition, a more credible anti-inflation commitment could also have played a role. But one cannot rule out that at least part of the decline was the result of a string of favourable shocks driving down both inflation and persistence.

Another major change in the inflation process concerns the relationship between economic slack and inflation, ie the ***Phillips curve***. That said, the evidence is less solid. The Phillips curve appears to have become flatter only in some economies. For instance, Chang et al (in this volume) present evidence that in Korea the Phillips curve broke down around 2012. Likewise, inflation in Indonesia also seems to have become less responsive to domestic demand (Hendar, in this volume). By contrast, the Phillips curve seems to be alive and well in Singapore (Choy, in this volume). The panel estimates in Arslan et al do not show any significant change in recent years: both pre- and post-crisis estimates of the relationship between the output gap and inflation yield a coefficient that is statistically indistinguishable from zero, although the post-crisis estimates gain in precision. It is unclear whether this reflects differences across countries or difficulties in estimating potential output.

The typical marginal influence of domestic slack on inflation may be a consequence of globalisation. For example, Arslan et al provide evidence that increasing trade integration has raised the role of global factors in the inflation process. Adding a measure of the global output gap to the Phillips curve often increases considerably the explanatory power in single country regressions (Borio and Filardo (2007), Choy (in this volume), Direkudomsak (in this volume)). This, however, could not be detected in the panel estimates obtained by Arslan et al, where the coefficient on a global output gap turned out to be insignificant.

In Asia, the global factors determining the inflation process seem to be complemented, or even superseded, by regional factors. In Singapore, global factors ceded some ground to regional factors as production networks in Asia have become more integrated and business cycles more synchronised (Choy, in this volume).

By contrast, the evidence for a **greater role of inflation expectations** is somewhat stronger. For instance, econometric results for the Philippines find a clear increase in their impact (as measured by the AP Consensus Forecast) from around 2010, alongside a decline in inflation persistence (Guinigundo, in this volume). In addition, inflation expectations themselves appear to have become more forward-looking. Moreover, the weight of such expectations seems to have increased in Korea (Chang et al, in this volume). Central banks have recognised this development and are collecting more numerous and diverse measures of expectations than in the past (see Box 2).

Box 2

Measuring inflation expectations

EME central banks appear to be using more numerous and diverse measures of inflation expectations than in the past, as indicated by the survey results presented in Sousa and Yetman (in this volume). Most central banks use surveys of professional forecasters, households and, to a lesser extent, non-financial firms' inflation forecasts in their policy analysis. Countries with an active market for inflation-indexed financial instruments also use the prices of these contracts to extract inflation expectations.

The expectations of inflation held by households and firms are often criticised as poor predictors of inflation outcomes. As shown by Sousa and Yetman, most measures of inflation expectations are biased and do not take into account all information available at the time. In some countries, expected inflation is more closely related to current and past inflation than to actual outturns. In Colombia, the discrepancy between expected inflation and outcomes is related to movements in oil and food prices prior to the time at which the survey was conducted but it is not clear whether this is because of persistent shocks or the imperfect credibility of the central bank (Vargas-Herrera, in this volume). In the Philippines, the correlation between expected and actual inflation has gone up since the implementation of inflation targeting (Guinigundo, in this volume). The most important variable for explaining forecast errors is the deviation of inflation from target, although wage growth, past inflation and inflation volatility also play a role in this regard.

The **decline in exchange rate pass-through** is well documented. Traditionally, exchange rate pass-through, over both the short and the long term, has been higher in EMEs. A key driver was higher, more volatile and more persistent inflation. With inflation now low and stable, prices and wages tend to change less frequently, which should reduce pass-through. Estimates in Arslan et al find that the pass-through appears to have fallen in the early 2000s and to have remained stable since the onset of the Great Financial Crisis (GFC) of 2007–09. Admittedly, estimates using a linear model show some increase in pass-through after the taper tantrum of 2013. But this

appears to reflect large exchange rate depreciations rather than a structural change: large depreciations, such as the ones experienced by many EMEs in recent years, tend to feed more quickly into domestic prices. For example, Quispe and Rossini (in this volume) estimate that the pass-through of depreciations is more than twice as large as that of appreciations. Similarly, the sharp depreciation of the Chilean peso in 2008–09 was passed on almost one-to-one into consumer prices, whereas the pass-through that followed smaller changes in the exchange rate was much more contained in 2002–14 (Naudon and Vial, in this volume). This could reflect menu costs – the benefits of small price adjustments may not exceed their costs – as well as market power that allows price setters to keep the windfall gains of higher profits on imports after an appreciation but protect margins after a depreciation. So, even if pass-through is structurally lower today than it was 20 years ago, it could still be sizeable. For example, the recent depreciation of the ringgit led to a rise in the inflation expectations of Malaysian households. There is also evidence that firms are resetting their prices more frequently than in the past, with some retailers passing on depreciations one-to-one (Singh, in this volume).

A related question is which exchange rate matters most. Conceptually, one would expect a trade-weighted exchange rate to matter more than any bilateral exchange rate. Under the current circumstances, this would mean that the recent appreciation of the dollar might have been largely offset by the parallel depreciation of the euro. In practice, things are not so clear. For example, recent research (eg Gopinath (2015)) suggests that the currency of invoicing matters more than the currency of the trade partner. Since much of world trade is denominated in US dollars, the dollar may matter more than what is suggested by its share in trade-weighted effective exchange rate indices. This is supported by research by the Turkish central bank, which found that a rough mix of two thirds US dollar and one third euro generates larger pass-through estimates than trade-weighted nominal effective exchange rates (NEERs).

Another factor affecting the extent of exchange rate pass-through is the degree of dollarisation (or “euroisation” in central and eastern Europe). In Peru, as a legacy of the hyperinflation experienced a quarter of a century ago, some CPI items are directly indexed to the US dollar, which pushes up pass-through. In addition, about one half of all economic contracts are denominated in US dollars, which boosts pass-through even further (Quispe and Rossini, in this volume).

Policy implications

In recent years, the inflation process in EMEs appears to have become more similar to that in AEs. All four changes documented in the previous section – lower persistence, a flat(ter) Phillips curve, a stronger role for inflation expectations and a lower exchange rate pass-through – are reminiscent of the experience of AEs since the 1990s. To the extent that they represent a fundamental change in how the economy responds to shocks, they have a bearing on how policy should be set.

With lower inflation persistence, the effects of transitory shocks to inflation fade away more quickly. Similarly, a flatter Phillips curve and lower exchange rate pass-through imply that fluctuations in domestic output and exchange rates have a smaller impact on inflation. All this should increase central banks’ ability to “see through” shocks to inflation and react only to possible second-round effects – as long as medium-term inflation expectations remained anchored around the target.

But the greater importance of inflation expectations could be a mixed blessing: it could create the potential for sharp swings in inflation (and presumably output) should price setters lose confidence in the ability or willingness of the central bank to deliver price stability. In such a situation, a flat Phillips curve and low exchange rate pass-through could make monetary policy less effective in stabilising the economy. If, for instance, inflation expectations were to rise, a sharper fall in economic activity would be needed to contain inflation.

Long periods of off-target inflation increase the risk that inflation expectations become unanchored. While long-term inflation expectations generally appear to be anchored (Sousa and Yetman, in this volume), there are signs in some countries that medium-term expectations are becoming less sticky. For instance, inflation expectations three to five years ahead, extracted from the yield curve of break-even inflation rates in Israel, dropped sharply in late 2015–early 2016, which could indicate that market participants do not expect the central bank to bring inflation back into the target range even at longer horizons (Baudot-Trajtenberg and Offenbacher, in this volume). At the other end of the spectrum, Vargas-Herrera (in this volume) reports a rapid increase in the probability that long-term inflation expectations could become unanchored.

Central banks have responded to the risk of unanchoring in different ways. Many have adjusted interest rates swiftly to bring inflation back to target. The Czech Republic introduced an exchange rate commitment to boost inflation, although this measure has not succeeded so far in bringing inflation back to target (Skořepa et al, in this volume). In Korea, the central bank has lowered its inflation target from 2.5% to 2%, despite criticism that this is too low for a country with high potential growth (Chang et al, in this volume). In Latin America, the central banks of Chile, Mexico and Peru repeatedly raised their policy rates in order to defend the value of their currencies and quell inflation, despite moderate to weak growth.

Hungary provides an interesting example of what it takes to get inflation expectations anchored. Inflation expectations in that country used to be higher than those in other countries in the region and predominantly backward-looking (Gábrriel et al, in this volume). This reflected persistent upward pressure on inflation from the large fiscal deficit and tax increases aimed at containing it. This changed after the GFC, when the government cut the deficit and was able to reduce administered prices. As a result, household inflation expectations fell to levels below the inflation target, similarly to what happened in neighbouring countries, and remained at that level despite fluctuations in headline inflation rates.

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