

## Box 3.1

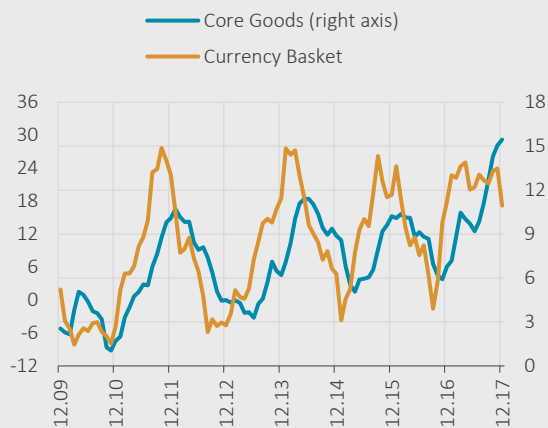
### A Look at Core Inflation Dynamics

The C index, one of the special CPI aggregates, is a measure of core inflation that excludes food, energy, alcoholic beverages and tobacco products. The index consists of two subcategories, the core goods and services, and the dynamics of C index inflation varies substantially across these subcategories. This box presents a numerical estimation of core goods and services inflation based on key determinants and identifies core inflation dynamics. To capture the differences in pricing pattern between these two categories, one should analyze how each key macroeconomic variable contributes to the respective inflation rates. Previously, Kara et al. (2017) analyzed the contribution of macroeconomic variables, such as exchange rates, import prices, output gap and real unit wages, to headline inflation by using a Phillips curve with time-varying parameters. On the other hand, this box estimates the contribution by using a fixed-parameter model in order to perform a historical analysis of the two main components of core inflation, core goods and services.

Core goods inflation is closely linked to exchange rates (Chart 1). Average contributions between 2009 and 2017 reveal that the change in the exchange rate added 5.1 points to core goods inflation, recording the largest contribution (Chart 2). The studies carried out by the CBRT show that there is significantly higher pass-through of exchange rates to prices of core goods than to consumer prices. In fact, the cumulative Turkish lira depreciation played the greatest role in core goods inflation, hitting as high as 15.5 percent at the end of 2017. Another driver of the escalating core goods inflation in this period was higher import prices. Although the sizeable exchange rate contribution in 2015 was partially offset by falling import prices, especially of oil, both import prices and the exchange rate put upward pressure on core goods inflation in 2017. In fact, import prices and the exchange rate added a total of about 10 points to core goods inflation in 2017.

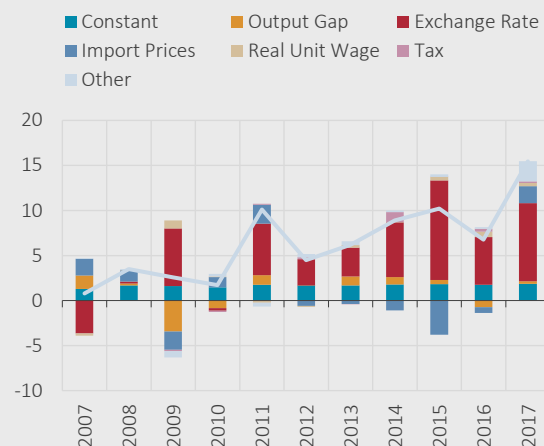
The output gap had no significant impact on inflation as, by definition, its long-term average nears zero. Nevertheless, real unit wages provided a boost to core goods inflation, particularly because of massive wage hikes unwarranted by productivity (Chart 2). After putting downward pressure on core goods inflation due to subdued economic growth in 2016, the output gap turned supportive of inflation amid stronger aggregate demand in 2017. On the other hand, having added an average contribution of 0.2 points during the period under examination, tax adjustments pushed core goods inflation up by 1.1 points in 2014. Among macroeconomic variables, exchange rates, import prices, wages and the output gap seem to explain most of the fluctuations in core goods inflation. Thus, core inflation inertia is estimated to be quite low at 1.7 percent in the absence of cost and demand shocks.

**Chart 1: Core Goods Inflation and Currency Basket**  
(Y-o-Y Change, %)



Source: CBRT, TURKSTAT.

**Chart 2: Contributions to Core Goods Inflation**  
(% Point)



Source: TURKSTAT, Authors' calculations.

However, it should be noted that the variables in the estimation model fail to fully explain the dynamics of core goods inflation in 2017. This pattern, which can be captured by the error term, might be attributed to certain factors that are not included in the model but had cyclical effects on core goods inflation. These can be listed as the excluded effects of customs duty adjustments and the deteriorated pricing behavior caused by mounting expectations for a weaker Turkish lira and higher inflation. In addition, it is also possible that demand conditions in certain industries such as white goods, furniture and clothing are stronger than implied by the output gap used in the above calculations that reflects the overall economy.

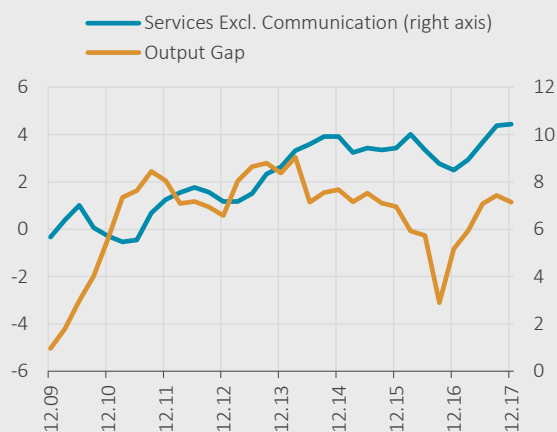
In order for a better description of the pricing dynamics, clearer picture might be obtained by excluding communications, whose pricing behavior and inflation rate differ from the rest of the services industry. Accordingly, the inertia in services inflation is estimated to be as high as 5.2 percent, which cannot be explained by key macroeconomic variables but probably by structural factors. In other words, even when key macroeconomic determinants exert no upward or downward pressure, inflation can only fall to as low as 5 percent. One of the reasons for this high inertia is the absence of competitiveness in services due to its relatively insulated and non-tradable nature. The sticky services inflation can also be explained by the wage-inflation spiral and the backward indexation mechanism in services like rents and education. These create a persistence in inflation and also lead to a higher inflation-output trade-off.

Another variable that put significant upward pressure on services inflation in the analyzed period was food inflation, which stood at 1.7 percentage points on average. Food prices are major determinants of prices in restaurants and hotels via many items associated with catering services (meat, tea, bread, beverages, etc.). The exchange rate pass-through to services inflation is historically much lower than that to core goods. Major exchange-rate-sensitive subcategories include transport, maintenance and repair services and package tours. The output gap and real unit wages are much likelier to affect the pattern of services inflation than core goods as the services industry is more labor intensive (Chart 3). In fact, according to historical averages, these two components provide a higher contribution to services inflation. In addition, with nominal wage increases accelerating and the partial labor productivity slowing in recent years, services inflation has been facing more pressure from unit wages.

In 2017, food prices and exchange rates pushed services inflation up by 2.4 and 1.4 points, respectively, above historical averages. Meanwhile, output gap and real unit wages made a historically higher contribution of 0.9 points in total, with the output gap providing a much larger

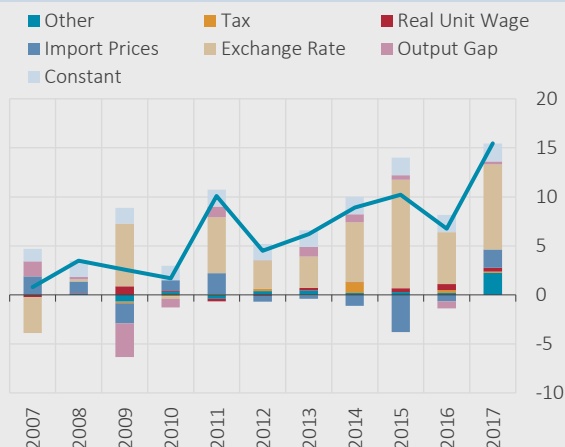
inflationary boost than the previous year (Chart 4). Accordingly, services inflation excluding communications hit 10.4 percent, ending the year at a much higher level than historical averages, which stand at 8.4 percent.

**Chart 3: Annual Services Inflation Excluding Transport and Output Gap (%)**



Source: TURKSTAT, Authors' calculations.

**Chart 4: Contributions to Services Inflation (% Point)**



Source: TURKSTAT, Authors' calculations.

In conclusion, there is a major difference between core goods and services, the two key components of core inflation, in terms of pricing dynamics. In core goods, which mostly consist of tradable goods, exchange rates and import prices are the major determinants, and inflation inertia is relatively small. However, in services, which is rather insulated due to absence of tradability, the pass-through from exchange rates and international prices is somewhat lower, yet wages and sensitivity to business cycles are significantly higher. Additionally, inflation inertia is strikingly high for services due to the relatively isolated nature of the industry, the wage-price spiral and the presence of strong indexation behavior.