

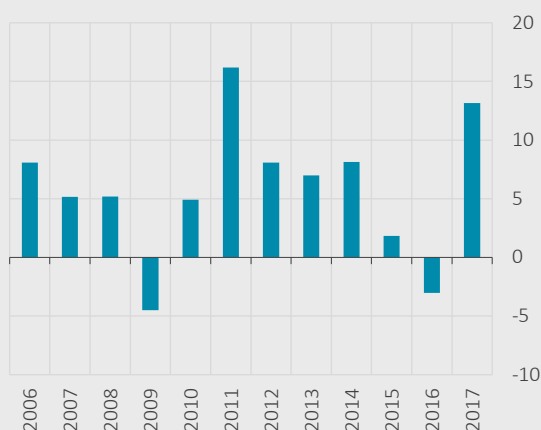
## Box 4.2

### Decomposition of Demand and Relative Price Effects in Exports: A Historical Account

Turkey maintained an outstanding exports performance in recent years and continued to increase its share within the global exports volume. Even though the EU remained as the main export market, market diversity of exports increased (products were largely destined to the Middle East and North Africa region) and the product range improved as well (Charts 1 and 2).

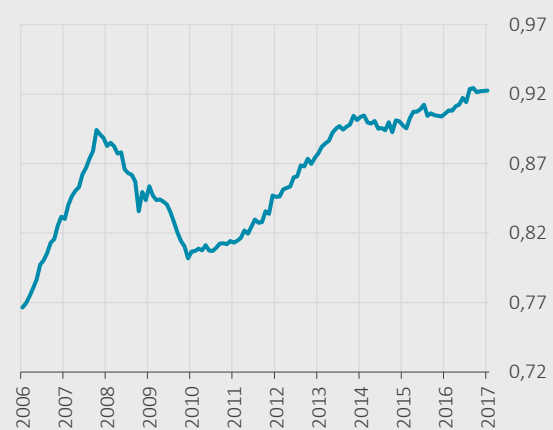
This box discusses the recent exports performance and presents a numerical account of the impact of external demand and real exchange rate movements on exports of goods and services excluding gold, and then the importance of regional differences is mentioned. Empirical findings indicate that real exchange rate movements are partially important in boosting exports performance, but demand developments remain as the main determinant. On the other hand, studies show that effects of foreign demand and relative prices may vary to a large extent among export markets.

**Chart 1: Exports of Goods and Services Excluding Gold (Annual % Change)**



Source: CBRT, TURKSTAT.

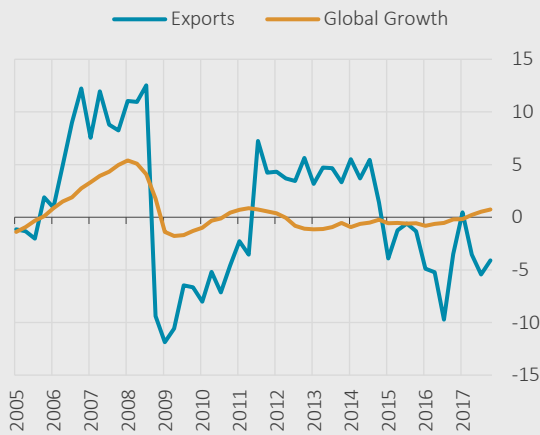
**Chart 2: Share of Turkey's Exports of Goods in Global Exports Volume (% , Excluding Gold)**



Source: CBRT, World Trade Organization.

Exports developments from a historical perspective reveal that two sub-periods stand out in which exports of goods excluding gold followed a rather strong course compared to the long-term trend. The first sub-period is the one before the 2008 crisis, which is marked by an upsurge in global economic activity. In this period, Turkey's exports of goods surged as well and exceeded its trend by around 10 percent in 2007-2008. In addition, real exchange rate developments did not provide a significant support, except in 2006 during the depreciation period. The second sub-period is from 2011 to 2014. Despite the aggravated problems in the Euro area, Turkey's leading exports market, exports grew at a higher rate than implied by its long-term trend in this period. This performance is attributed to rising demand from the Middle East and North Africa due to soaring oil prices and regional political developments coupled with the depreciation of the real exchange rate (Charts 3 and 4). Meanwhile, owing to the feeble course in the Euro area, the deviation of exports from its long-term tendency remained more limited compared to the first period with 5 percent.

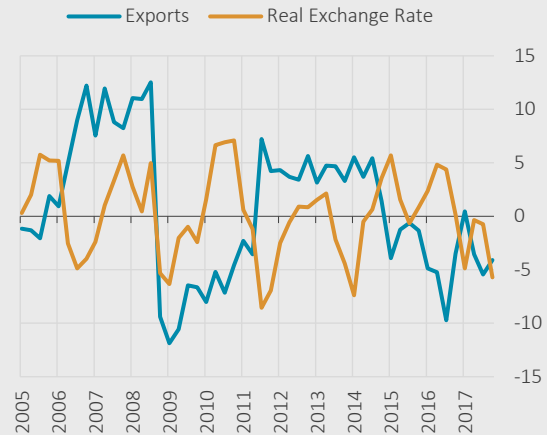
**Chart 3: Exports of Goods Excluding Gold and Global Growth\* (% Deviation from Tendency)**



Source: CBRT, TURKSTAT.

\* Export-weighted global production index.

**Chart 4: Exports of Goods Excluding Gold and Real Exchange Rate\* (% Deviation from Tendency)**



Source: CBRT, TURKSTAT.

\* PPI-based real exchange rate.

In order to quantify the effects of foreign demand and relative price (real exchange rate) on the export performance, an error correction model is adopted for exports of goods and services excluding gold (*EXP*), utilizing quarterly data covering the 2003-2017 period. The explanatory variables are export-weighted global production index (*EWGPI*), CPI-based real effective exchange rate (*REER*) and oil prices (*OIL*). Given the rising significance of the Middle East and African countries, the issue of underrepresentation of these countries in the export-weighted global production index was tried to be solved by including oil prices into the estimation. The model was estimated using seasonally adjusted data where  $\ln$  shows the natural logarithm and  $d$  stands for the difference operator. Moreover, in the short-term equation, dummy variables were included for the global financial crisis in 2008 (*d08*) and aggravated geopolitical turmoil in 2016 (*d16*).

**Table 1: Exports Equation\***

**Long-Term**

$$\ln(EXP)_t = -4,4 + 2,67 * \ln(EWGPI)_t - 0,59 * \ln(REER)_t + 0,08 * \ln(OIL)_t + u_t$$

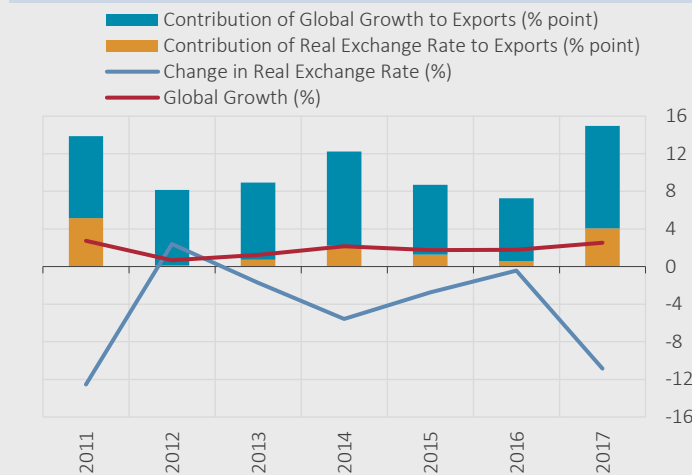
**Short-Term**

$$d(\ln(EXP))_t = 0,01 - 0,22 * u_{t-1} + 1,90 * d(\ln(EWGPI))_t - 0,39 * d(\ln(REER))_t - 0,25 * d(\ln(EXP))_{t-1} - 0,15 * d08 - 0,05 * d16 + \varepsilon_t$$

\* In the long term equation, all variables are significant at 0.1 percent, whereas in the short term equation, the variables are significant at 1 percent. Adjusted R<sup>2</sup> value of the long term equation is 96 percent, while it is 60 percent in the short term equation.  $u_t$  and  $\varepsilon_t$  show the error terms in the long and short term equations, respectively.

Coefficients obtained from model estimations are shown in Table 1, and the contributions to exports are depicted in Chart 3. In calculating the contributions, changes at any point are assumed to be affecting the dependent variable until the end of the period given the dynamic nature of the model. The analysis indicates that the significant depreciation of the real exchange rate in the recent years had only a limited effect on exports compared to global growth. Relative prices had the most pronounced effect on exports during 2011 and 2017, which is marked by high-rate depreciation of the real exchange rate. On the other hand, increasing global demand is the main determinant of exports.

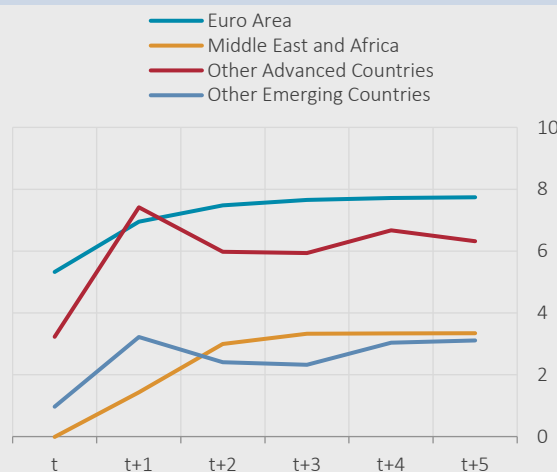
Chart 5: Accounting of Exports



Source: CBRT.

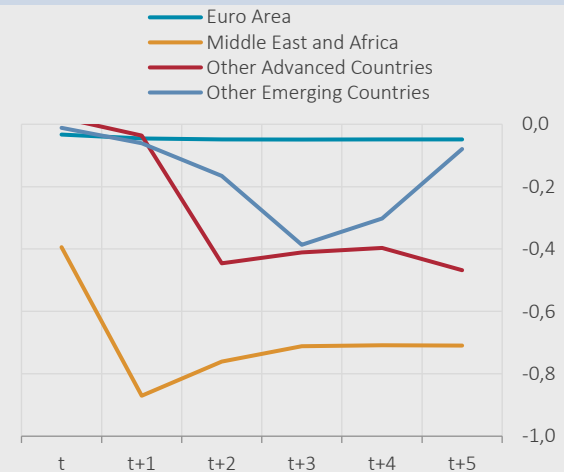
This analysis based on macro data may fail to capture the varying tendency and sensitivity of sub-components of exports, and thus may be subject to aggregation bias. In fact, in a study by Çulha and Kalafatçılar (2014) that analyzes regional differences in exports, it is concluded that income elasticity of exports to advanced economies is substantial, whereas the effect of real exchange rate on exports is not statistically significant. In particular, the contemporaneous income elasticity of exports to the Euro area countries is estimated to be 5.3 percent, which implies that exports to these countries would increase considerably in times of high economic growth. On the other hand, it is also found out that the coefficient of real exchange rate is high and statistically significant for exports to Middle East and African countries (Charts 6 and 7).

Chart 6: Foreign Demand Elasticity of Exports by Region



Source: Çulha and Kalafatçılar (2014).

Chart 7: Real Exchange Elasticity of Exports by Region



Source: Çulha and Kalafatçılar (2014).

In a study by Gül (2018) that analyzes exports on a country basis, it is reported that demand and relative price elasticities of export are heterogeneous across countries. In particular, Gül (2008) constructs singular-country models for 48 countries, which have major shares in exports, and finds a significant long-term relationship between exports and the real exchange rate in these countries, which account for almost half of Turkey's exports. As for income elasticities, their

absolute values are found to be higher than real exchange rate elasticities in line with the estimations presented in Table 1.

In sum, the analysis of exports in this box indicates that despite the contribution of real exchange rate to exports in recent years, exports continue to be mainly determined by demand developments. In fact, owing to strengthening global demand especially stemming from the EU, exports gained considerable momentum and offered a high contribution by 2.6 percent to annual growth of 7.4 percent in 2017.

### References

Çulha, O., Kalafatçılar, M.K., 2014, Türkiye’de İhracatın Gelir ve Fiyat Esnekliklerine Bir Bakış: Bölgesel Farklılıkların Önemi (in Turkish), CBT Research Notes in Economics No. 05/14.

Gül, S., 2018, Reel Kur Hareketlerinin İhracat Üzerine Etkileri: Türkiye için Asimetrik Bir Bakış (in Turkish), Work in progress.