Box I.3: Main drivers of growth in 2017 - shock decomposition from an estimated model

This box uses an estimated, multi-region, structural macro model [1] in order to provide a model-based quantification of the main drivers of real GDP growth in the euro area, in 2017. The model has been estimated on historical quarterly data for the period from 1999-Q1 to 2016-Q4 and extended with forecast data from the European Commission's Spring 2017 forecast for the set of available variables.

The use of a structural macroeconomic model makes it possible to analyse the specific shocks that drive short- and medium-term deviations from the long-run trend of real GDP growth. The decomposition provided in this box takes the European Commission's forecast as an input and recovers the factors that explain it in a model-consistent way. Hence, the analysis presents the exogenous factors ('shocks') that provide a model-consistent interpretation of the forecast.

The advantage of decomposing economic dynamics with an estimated structural macroeconomic model is that such models use all the information provided by the dataset. In particular, the size of the various domestic and foreign demand and supply shocks (including financial, saving, and productivity shocks) is determined by the ability of these shocks to fit not only GDP, but also the other variables (including investment, consumption, the exchange rate, and employment) and the correlations between them (e.g. correlations between GDP and inflation, employment and wages, or GDP and the trade balance).

It should be noted, however, that the model-based decompositions are not necessarily identical to the impact that the same factors would have in the European Commission's forecast. The driving factors that are recovered in the model-based analysis are conditioned on the structure of the model and the estimated parameter values, which have been obtained by fitting the model on eighteen years of quarterly data.

Not all estimated shocks can be interpreted directly as indicating fundamental 'causes' within a model of tractable size. For instance, changes in financial risk premia and financing costs that affect interest-sensitive demand, such as investment, and the exchange rate, can emanate from various behavioural and structural sources that are not

analysed in more detail in the model, such as changes in (subjective) risk perception, financial frictions, or non-standard monetary policies (including quantitative easing). The simplified structure of the multi-region macro model and most other dynamic macroeconomic models alone does not identify the specific events behind the shock in such cases. The interpretation of shocks is easier for fiscal and standard monetary policy, where decisions are directly observed at the macro level.

The estimated persistence of variables in the model, which is related to price and wage stickiness, habit persistence, inertia in adjusting the stock of capital and labour demand, and gradual adjustment of monetary and fiscal policies, implies that past events affect future economic outcomes together with current news and expectations about future developments.

Based on the estimated model, Table 1 presents a decomposition of euro area real GDP growth in 2017, as projected by the European Commission's forecast (1.7%) into its principal drivers. The table summarises the large number of shocks into main groups of supply- and demand-side drivers and separates the contribution of past and future shocks. The first column ('historical') shows the contribution of shocks that occurred up to 2016-Q4 to the outlook for euro area GDP growth in 2017, a contribution that is due to the persistence in the transmission channels embodied in the model. The second column ('forecast') shows the contribution of shocks in 2017, i.e. over the forecast horizon. Shocks over the forecast horizon are additional changes in exogenous variables that the model requires to fit the forecast given the historical data and the estimated historical shocks. The contribution of past shocks and additional shocks over the forecast horizon combines to give the total impact of the various supply and demand factors that is shown in the third column. Shocks that are not listed separately in one of the groups of supply- and demand-side drivers are included into the 'others' group.

The long-run trend component (1.4%) in Table 1, is the growth rate that would prevail if the euro area economy were to grow at the average growth rates of total factor productivity (TFP) and the working-age population as observed over the period since 1999. Real GDP growth is forecast to exceed trend growth by 0.3 percentage points (pps.) in 2017 due to positive factors that outweigh negative ones.

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[1] These results are based on the Global Multi-Country (GM) DSGE model developed by DG ECFIN and the Joint Research Centre of the European Commission.

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Table 1 shows that demand-side factors dominate the picture and explain the positive deviation of the forecast from trend GDP growth. The supply-side contributions, on the contrary, are smaller in size and negative. The overall impact of past demand-side developments ('historical') on the deviation of GDP growth from trend is largely positive (0.7 pps.). Model-implied demand shocks over the forecast horizon ('forecast') contribute to stronger growth, but to a lesser extent.

Table 1:

Shock decomposition for real GDP growth in 2017

	Historical	Forecast	Total
Supply:			
Long-run trend			1.4
TFP	-0.1	0.0	-0.1
Labour & goods market adjustment	0.0	-0.1	-0.1
Oil	-0.1	0.0	-0.1
Demand:			
Domestic:			
Consumption	0.0	0.4	0.4
Investment	0.1	0.1	0.2
Fiscal spending	-0.1	0.1	0.0
Monetary policy	0.1	0.0	0.1
Foreign:			
World demand and int. trade	0.6	-0.4	0.2
Country risk premium	0.0	-0.1	-0.1
Others			-0.2
Real GDP growth (from forecast)			1.7

Note: The contributions of historical shocks and shocks over the forecast horizon do not at up to total in some cases due to rounding to the first digit.

Regarding the supply side, negative productivity (TFP) developments in recent years still hold growth down in 2017 (-0.1 pps.) according to Table 1. TFP trend growth has recovered from a low of 0.4 pps. in the first years after the crisis to 0.5 pps. but is still 0.1 pps. below the sample average. Furthermore, the recent recovery in oil prices, which raises firms' production costs and lowers real disposable household income, affects growth negatively in 2017, despite the absence of significant further oil price increases in the external assumptions for the 2017 forecast.

Deducting the impact of lower TFP on 2017 GDP growth from the long-term trend growth (1.4%) gives a growth rate of 1.3%, which is only 0.1 pps. above the current-vintage estimate for euro area potential output growth in 2017. The remaining difference can be explained by below average capital contribution due to a decline in the investment rate relative to pre-crisis levels.

Supply-side developments in labour and goods markets play only a small, but negative role (-0.1 pps.), which the model attributes to negative short-term demand effects of sluggish wage growth as projected over the forecast horizon. The historical component of product market factors, by

contrast, makes a slightly positive (0.1 pps.) contribution to growth. This positive contribution is associated with GDP deflator growth below unit labour cost growth, which the model interprets as a decline in the price mark-up.

As mentioned above, demand-side factors are more important for explaining the deviation of the GDP forecast from long-term trend growth according to the model. The positive factors are predominantly domestic. A relatively stable saving rate keeps the contribution of historical consumption shocks small. This continues in 2017 and the decline in the saving rate of households in the ECFIN forecast can only be met by a positive shock to consumption in 2017. This contributes positively to GDP growth.

Investment growth in the forecast for 2017 is above the long-term average. According to the model, a strong supportive element is the improvement of investment specific factors, visible in the model by a decline in the model-consistent investment premium as the gap between the required return on investment and the risk-free interest rate. This wedge, which captures factors such as higher investment risk and financing costs, peaked in 2013 and has come down continuously since, but still remains above pre-crisis levels. According to the model, the Commission's forecast for investment implies a stronger decline of the wedge, compared to the recent trend, increasing the contribution of investment to growth by 0.1 pps. in 2017. The improvement in investment conditions incorporated in the forecast reflects the forecast narrative of gradually fading crisis legacies and diminishing political uncertainty in the euro area. As such, the investment forecast is also subject to downside risks.

While a negative growth contribution of 0.1 pps. is recorded for historical shocks to fiscal policy, the slight discretionary fiscal expansion that is embedded in the fiscal forecast for 2017 adds 0.1 pps. to GDP growth. The underlying definition of fiscal impulse in the estimated model corresponds to the fiscal impulse as measured by the primary government balance.

The model assigns a total positive contribution of 0.1 pps. to monetary policy shocks. This is to a large extent a carryover of the implied persistence in interest rate setting captured in the model. Although inflation is picking up and the output gap is gradually narrowing, short-term policy rates are expected to remain low over the forecast horizon, reflecting the forward guidance given by the ECB

to keep interest rates low. This contributes to higher growth.

It should be noted that the impact of unconventional monetary policy is not captured by the monetary policy shock in Table 1, which relates only to short-term interest rates and the Taylor rule (an approximation of the responsiveness of interest rates set by the central bank to changes in inflation, output or other economic conditions). Quantitative easing (QE), as an unconventional monetary policy instrument, actually contributes positively to the consumption (less saving), investment (lower long-term rates and capital costs) and exchange rate (lower yield on euro assets and euro depreciation for given short-term rates) components in Table 1.

World demand and trade have a modest positive net contribution to GDP growth in the euro area. The model distinguished demand and supply factors behind the pick-up in world growth. The demand side leads to positive momentum from the recovery of the world economy ('historical' contribution of 0.6 pps.). In 2017, the impact of more attractive investment opportunities in the rest of the world dominates in the model, and this leads to capital outflows from the euro area.

Medium-term effects of the US dollar's appreciation against the euro in 2014-2015 dampen GDP growth (-0.1 pps.) in 2017. The estimated model attributes part of the euro depreciation to a preference shift towards US dollar assets (country risk premium). The associated outflow of capital from the euro area lowers investment and GDP in the medium term, following an initially positive impact through improved competitiveness. Matching the exchange rate assumption in the forecast for 2017 does not require additional portfolio reallocation that would be large enough to significantly affect the outlook for GDP growth.

In sum, the overall contribution of the listed supply and demand factors to projected real GDP growth in 2017 is positive (0.4 pps.) and dominated by private consumption and investment growth. Investment growth in the forecast is based on a substantial improvement in investment conditions over the forecast horizon according to the model. The aggregate impact of foreign shocks is positive but small, whereas supply-side factors affect the projection on the downside.