

Box 1.1: Main drivers of growth in 2018 - shock decomposition from an estimated model

GDP growth is expected to continue at a robust pace in 2018. This box uses an estimated, general equilibrium, multi-region, structural macroeconomic model⁽¹⁾ to provide a decomposition of the main drivers of next year's forecast euro area real GDP growth. The model features two regions, the euro area and the rest of the world, and it has been estimated using historical quarterly data for the period from 1999-Q1 to 2017-Q2. The historical time series have been extended with forecast data from the European Commission's autumn 2017 forecast for the set of available variables.

The use of a structural macroeconomic model makes it possible to identify the exogenous factors driving short- and medium-term deviations of real GDP growth from its long-run trend, and to provide their underlying economic interpretation. 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. By implication, these are the factors that would be needed to generate the forecast result in the model.

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. Moreover, within a model of tractable size, not all of the estimated shocks can be interpreted directly as indicating fundamental 'causes'. For instance, changes in financial risk premia and financing costs that affect interest-sensitive demand components (e.g. investment) and the exchange rate may be associated with various behavioural and structural sources that are not specified explicitly and in detail in the model equations, such as changes in (subjective) risk perceptions, financial frictions, or non-standard policies (including quantitative easing).

Developments in the recent past have an impact on growth next year. The estimated persistence in the dynamics of the main variables in the model, which is due to rigidities such as price and wage stickiness, habits, inertia in adjusting the input factors (stock of capital and labour demand), and gradual responses of monetary and fiscal policies,

⁽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.

implies that past events still affect current and future economic outcomes together with current events and expectations about future developments.

Based on the estimated model, Table 1 presents a decomposition of euro area real GDP growth in 2018 as projected by the European Commission's forecast (2.1%) 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.

Table 1:
Shock decomposition for real GDP growth in 2018

	Historical	Forecast	Total
Supply:			
Long-run trend			1.3
TFP	0.0	0.0	0.0
Labour & goods market adjustment	0.0	0.2	0.2
Oil	-0.1	0.0	-0.1
Demand:			
<i>Domestic:</i>			
Consumption	0.4	-0.1	0.3
Investment	0.1	-0.1	0.0
Fiscal spending	-0.1	0.0	0.0
Monetary policy	0.2	0.1	0.3
<i>Foreign:</i>			
World demand and int. trade	0.0	0.2	0.2
Exchange rate	0.0	-0.1	-0.1
Others			0.0
Real GDP growth (from forecast)			2.1

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

The first column ('historical') displays the contribution of shocks that occurred up to 2017-Q2 to the outlook for euro area GDP growth in 2018, 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 from 2017-Q3 on, i.e. over the forecast horizon. The shocks over the forecast horizon are additional changes in exogenous variables that are required by the model to fit the forecast given the historical data and the estimated historical shocks. The contribution of past shocks and of 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 within a specific group of supply- or demand-side factors are included into the residual category of 'others'.

The long-run trend component (1.3%) in Table 1 is the real GDP growth rate that would prevail if the euro area economy was 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

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Box (continued)

exceed trend growth by 0.8 percentage points (pps.) in 2018 due to positive factors outweighing negative ones.

The third column of Table 1 shows that the listed demand-side factors dominate the picture and explain most of the positive deviation of the forecast from trend GDP growth, whereas the contribution of supply-side factors is smaller in size. The dominance of demand shocks is consistent with the closing of the output gap that is projected over the forecast horizon. The overall impact of past demand-side drivers ('historical') on the deviation of GDP growth from trend is large and positive (0.6 pps.) according to the model. The total impact of demand shocks over the forecast horizon ('forecast') is negligible. In other words, using the knowledge of recent data, the judgement-based autumn forecast for 2018 and the projections from the estimated model are aligned.

Regarding the supply side, total factor productivity (TFP) growth is at the long-run average (1999-2017), so that it does not contribute to deviations of the forecast from long-run trend growth.

In 2017, oil prices have risen from their 2016 low. The forecast's technical assumptions include a moderate, continued rise in world-market oil prices in 2018, which the model attributes to a continuation of the upward trend in 2017. The oil price increase dampens GDP growth in 2018 (-0.1 pps.) via its impact on production costs and real disposable income. It is cushioned, however, by the parallel appreciation of the euro, which offsets the price increase in domestic currency terms (see the discussion of the exchange rate impact below).

Supply-side developments in the labour and goods markets play a positive role (0.2 pps.), which the model attributes to the positive net contribution of shocks in 2018 ('forecast'). The contribution is driven by wage developments (0.2 pps.). In particular, the model interprets the moderate real wage growth as the impact of wage moderation. Wage moderation means that wage growth is weaker than suggested by the pace of the recovery and labour productivity growth. In the model, wage moderation is associated with positive employment and GDP effects, which is consistent with an upward revision in potential output growth on the basis of a decline in the NAWRU (non-accelerating wage rate of unemployment). This supply-side view of wage moderation holds regardless of the

near-term negative demand implications of low wage growth.

Regarding the demand side, the post-crisis recovery of private consumption combined with a declining saving rate is interpreted by the model as a normalisation of savings behaviour after a period of deleveraging. Based on historical data, the model projects a further decline in the saving rate in 2018 that would strengthen consumption and GDP growth (0.4 pps.). The autumn forecast, to the contrary, is more cautious than the model and projects a weaker rise in consumption. In technical terms, the more cautious forecast implies that the model would require additional negative consumption shocks in 2018 to match the autumn forecast for consumption growth, contributing negatively to GDP over the 'forecast' horizon (-0.1 pps.).

The forecast for private investment in 2018 is strong compared to the 1999-2017 average, but also indicates some decrease in investment growth in real terms. The estimated model associates the steady investment growth with the improvement of investment specific factors, notably a decline in the investment premium, defined as the gap between the (required) return on investment and the risk-free interest rate after the crisis (0.1 pps.). The estimated model projects further normalisation of investment conditions over the forecast horizon towards the 1999-2017 mean. Investment growth in the autumn forecast is weaker than the model's projection, which is based on continuously improving investment conditions. In the logic of the model, the more moderate outlook for investment growth in the autumn forecast is associated with an upward correction of investment premia in 2018, which accounts for the negative contribution (-0.1 pps.) of investment shocks in the 'forecast' column of Table 1.

The overall contribution of fiscal policy to GDP growth in 2018 in Table 1 is quantitatively minor, despite the projected slight decline in the structural primary balance in 2018. The absence of a quantitatively important fiscal impulse can be attributed by the particular composition of the change in the structural primary balance, which is mainly due to lower structural revenues that have a small fiscal multiplier in the model.

The model assigns a positive contribution of 0.3 pps. overall to monetary policy shocks. This is largely (0.2 pps.) associated with pre-2018 policy decisions that have been shaping future interest rates due to the expected persistence in interest rate

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Box (continued)

setting in the model. With the output gap moving into positive territory in 2018 and prices growing faster than in recent years, the model's policy rule would imply a tapering of monetary accommodation, which is not reflected in the technical assumptions. Instead, the short-term policy rate is expected to remain low over the forecast horizon, which translates into additional monetary stimulus (0.1 pps.) compared to the model projections.

Unconventional monetary policy measures, such as quantitative easing, are not captured by the monetary policy shock in Table 1, which relates in the model to a Taylor rule, an approximation of the responsiveness of interest rates set by the central bank to changes in inflation and output gaps. Quantitative easing enters the model through its impact on savings behaviour (consumption), long-term interest rates and capital costs (investment) and the exchange rate. Quantitative easing would therefore, be one of the factors behind the positive growth contributions from lower saving and normalising investment conditions in Table 1.

The technical assumptions of the autumn forecast include strong output and import growth in the rest of the world (RoW). The assumption exceeds the model's projection for RoW growth that is based on historical information and a gradual return to the historical mean. Hence, the model indicates a positive contribution (0.2 pps.) of world demand and trade shocks that are needed in 2018 to align the model projections with the forecast.

The effective euro appreciation that is incorporated in the technical assumptions for 2018, dampens GDP growth in the short term to some extent

compared to the model projection of a weaker euro exchange rate. The euro's appreciation weakens the price competitiveness of goods and services produced in the euro area compared to the rest of the world. It also reduces the price of imported commodities in euros and production costs in the euro area. The gradual response of trade volumes to price changes (i.e. a moderate short-term price elasticity of trade) in the model also attenuates the negative short-term effect of euro appreciation on GDP growth in 2018 (-0.1 pps.).

In sum, the overall contribution of the supply and demand factors in Table 1 is positive (0.8 pps.). The (cyclical) demand shocks (0.7 pps.) dominate the picture, which is consistent with the closing of the output gap in 2018. In particular, private consumption and continuously accommodative monetary policy on the domestic side account for most of the positive deviation of the 2018 forecast from trend growth according to the model-based decomposition. Wage moderation, which is needed to reconcile moderate wage growth with the projected strength of the recovery, adds to euro area GDP growth according to the model, which is consistent with an upward revision in potential output growth on the basis of a decline in the NAWRU. The strong world output and international trade growth embedded in the technical assumptions of the forecast contribute positively through higher euro area exports, whereas the built-in euro appreciation, as well as the moderate recovery of world-market commodity prices, dampen the growth outlook. Taken together, the deviations of the autumn forecast from the model projection with respect to foreign and world-market factors neutralise each other in their impact on euro area GDP growth in 2018.