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The impact of import prices on inflation in the euro area

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We study low consumer price inflation in the euro area between 2013 and the third quarter of 2016, before its recent increase due to higher energy prices. Two main factors identified in Rue de la Banque *No. 6 have continued to contribute roughly equally to low headline inflation up to 2015: imported inflation and domestic slack (output gap). Since 2015, the downward pressure from lower import prices has increased while that from domestic slack has eased noticeably. Focusing on consumer prices of manufactured goods, we find that the pass-through of import prices of manufactured goods is almost complete after a period of six quarters. Import prices of manufactured goods explain a significant part of the 2013-2015 weakness and the subsequent recovery of manufactured goods consumer price inflation.*

Rue de la Banque No. 6 (May 2015) has shown that imported inflation, an external factor, and economic slack, a domestic factor, have contributed roughly equally to the low level of headline inflation[1] in the euro area up to the end of 2014. In a first part, we update this estimation up to 2016Q3.

In a second part, we focus on the transmission of import prices to consumer prices irrespective of the direct impact of oil prices. For this, we look at the transmission of import prices of manufactured goods to their respective consumer prices, as measured by the non-energy industrial goods (NEIG) sub-index of the HICP.[2]

An update of the import price augmented Phillips curve for headline inflation

We update the estimation of the Phillips curve for headline inflation from *Rue de la Banque* No. 6 with data available up to 2016Q3. Table 1 shows that the estimated coefficients have changed very little. Particularly, we find the same medium-term slope (in annual terms) of the Phillips curve of 0.3, as in the previous estimate.

T1 Phillips curve for headline inflation

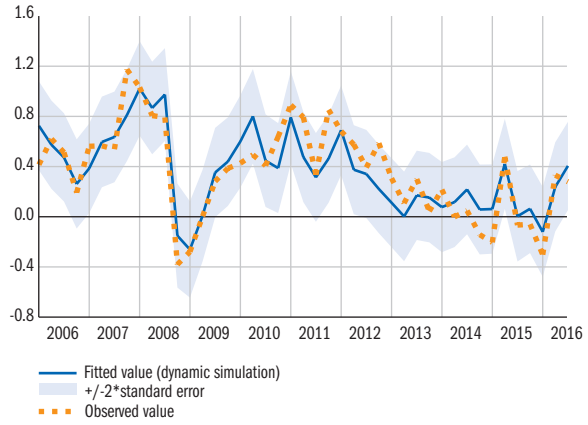
Specification for $\Delta(HICP_t)$	Total sample	Reduced sample
Sample period	**1999Q1-2016Q3**	**2004Q1-2016Q3**
Constant	**0.34***** (5.6)	**0.38***** (8.7)
$\Delta(HICP_{(t-1)})$	**0.25**** (2.5)	**0.20**** (2.6)
$Gap_{(t-1)}$	**0.06***** (2.8)	**0.06***** (4.0)
$\Delta(M_t)$	**0.08***** (3.6)	**0.14***** (8.8)
Adj. R^2	0.54	0.76

Note: *** and ** denote the significance at the 1% and 5%-level respectively. T-Statistics are given in parenthesis.
Gap refers to the output gap estimate (based on quarterly interpolation) of the European Commission and *M* to the extra-euro area import price deflator relative to the GDP deflator. Δ is the quarterly percentage change.

1 *We use the term "headline" for the total Harmonised Index of Consumer Prices (HICP) and the term "core" for the HICP excluding energy and food.*
2 *In 2016, the NEIG component had a weight of 26.5% in the total HICP index and of 37.5% in the HICP index excluding energy and food.*

C1 Observed and simulated headline inflation

(HICP: quarter-on-quarter, sa, in %)

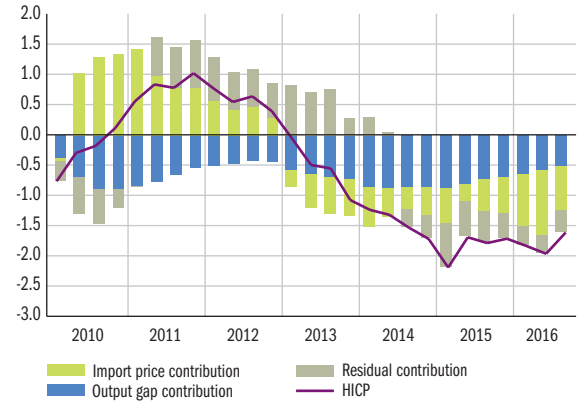


The Phillips curve showed a relatively large negative residual compared to observed inflation between 2014Q2 and 2015Q1 (see quarter-on-quarter inflation in Chart 1). This implies that a substantial part of low headline inflation was unexplained by import price dynamics and domestic slack. An update of the dynamic simulation[3] of the Phillips curve shows that observed inflation has returned to the Phillips curve in 2015-2016. This suggests that the unexplained factors which weighed on headline inflation between 2014Q2 and 2015Q1 were mostly transitory and have now largely disappeared.

In Chart 2 observed year-on-year inflation (in deviation from its mean) is decomposed into the three components of the import price augmented Phillips curve: the output gap, relative import prices and the residual. It shows that import prices and the output gap contributed roughly equally to low inflation relative to its mean from 2013 to 2015. In the last quarters, the downward pressure from domestic slack has however decreased while that from import prices has increased.

C2 Decomposition of headline inflation into its explanatory components

(HICP: year-on-year, in %, absolute deviation from mean)



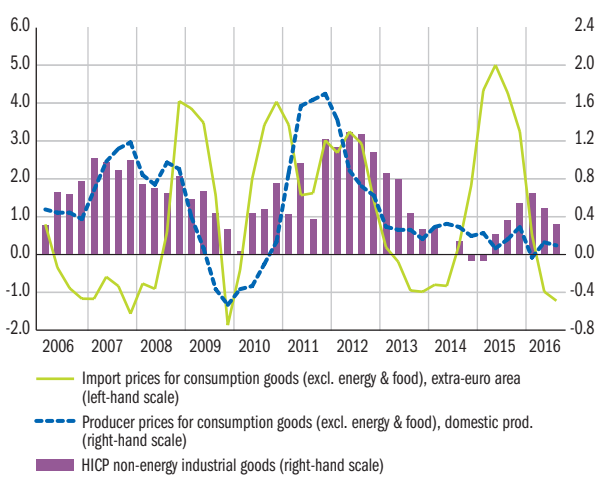
The impact of import prices on consumer prices of manufactured goods

This section looks at the transmission of external and domestic prices to consumer prices of manufactured goods, as measured by the NEIG sub-index of the HICP. Import prices can influence NEIG prices both directly, via the prices of imported final consumption goods, as well as indirectly, via the prices of imported intermediate inputs used in the domestic production of these goods. Chart 3 shows that import prices of consumption goods and NEIG prices moved broadly in line while producer prices have been rather flat in recent years.

As a Phillips curve equation for the NEIG sub-index cannot show a significant effect from the output gap (see Table 2), we estimate a markup model frequently used in forecasting to quantify the impact of imported and domestic inflation

C3 Manufactured goods inflation on different price levels

(year-on-year, in %)



3 *In a dynamic simulation, the explanatory variables take their observed values and the lagged dependent variable takes its predicted value.*

on NEIG inflation. In this model, NEIG prices are supposed to be determined by a markup applied to import prices and domestic producer prices:

$$NEIG_t = \alpha\ (Prod_t)^{\beta} \times (Imp_t)^{\gamma}$$

where *NEIG* stands for the sub-index of (non-energy) industrial goods, *Prod* is the domestic industrial producer price index for (non-food) consumption goods, *Imp* is the extra-euro area industrial import price index for (non-food) consumption goods, α is the markup coefficient.

We estimate the equation in error-correction form (ECM) as residual-based tests indicate the existence of a long-run relationship between domestic producer and import prices of manufactured goods and their final consumer price. We add lagged NEIG inflation and the average euro area value added tax rate (VAT) to the short-term part of the equation to control for inertia and tax effects.

We estimate the equation over the period 2005Q2 to 2016Q3 using data at a quarterly frequency. We find a long-run pass-through of import prices of consumption goods to their consumer prices of 0.12 and of producer prices of consumption goods to consumer prices of 0.87. The coefficient estimates of the short-run dynamics are shown in Table 2: the error-correction parameter of 0.16 suggests that the pass-through occurs within six quarters.

T2 Equation for NEIG inflation

Specification for $d(NEIG_t)$	Baseline	Phillips Curve
Sample period	2005Q2-2016Q3	2005Q2-2016Q3
Constant	**0.06**** (2.5)	**0.07**** (2.6)
$NEIG_{t-1} - 0.87 \times Prod_{t-1} - 0.12 \times Imp_{t-1}$	**-0.16***** (-3.5)	
$d(NEIG_{t-2})$	**0.38***** (3.4)	**0.37***** (2.9)
$d(Imp_t)$	**0.05**** (2.4)	**0.05**** (2.3)
$d(VAT_t)$	**0.38***** (3.6)	**0.34***** (2.9)
Gap_{t-1}		**0.01** (1.5)
Adj. R^2	0.45	0.33

Note: *** and ** denote the significance at the 1% and 5%-level respectively. T-Statistics are given in parenthesis. All variables, except for the VAT rate and the output gap, are expressed in logs.

The import price pass-through of 0.12 might seem weak. However, the size of the pass-through has to be compared to the import content of NEIG consumption. The direct share of imports in NEIG consumption is 15% on average over the estimation period and hence only slightly higher than the estimated pass-through. This suggests that import prices are passed on to a large extent, by 80% according to our estimation, to consumer prices of manufactured goods over a period of up to six quarters.

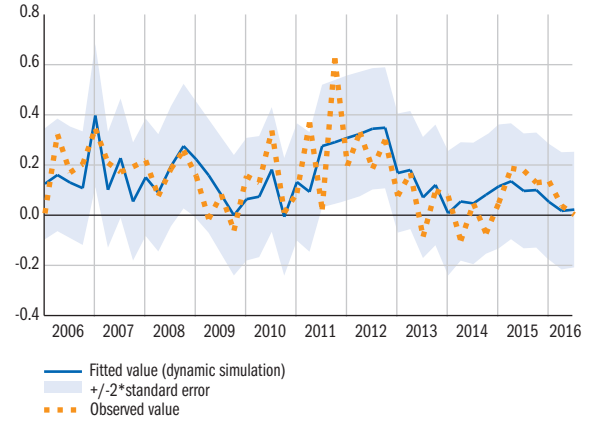
How to explain low manufactured goods inflation in recent years?

Chart 4, which compares observed NEIG inflation to a dynamic simulation, shows that the overall fit of the equation to the data is quite good. Observed NEIG quarter-on-quarter inflation fell however short of the predicted value for a period of four quarters from 2014Q2 to 2015Q1. It was slightly higher than the predicted value from 2015Q2 to early 2016 and is now broadly in line with it.

The period of unexplained low NEIG inflation between 2014Q2 and 2015Q1 coincides with the negative residual of the Phillips curve for headline inflation (see first section). This result suggests that part of the unexplained low headline inflation during this period comes from low manufactured goods inflation. Both, headline inflation and manufactured goods inflation moved however back in line with their predicted trajectory in 2015-2016.

C4 Observed and simulated NEIG inflation

(HICP NEIG: quarter-on-quarter, sa, in %)



C5 Contribution of explanatory variables to NEIG inflation

(HICP NEIG: year-on-year, in %)

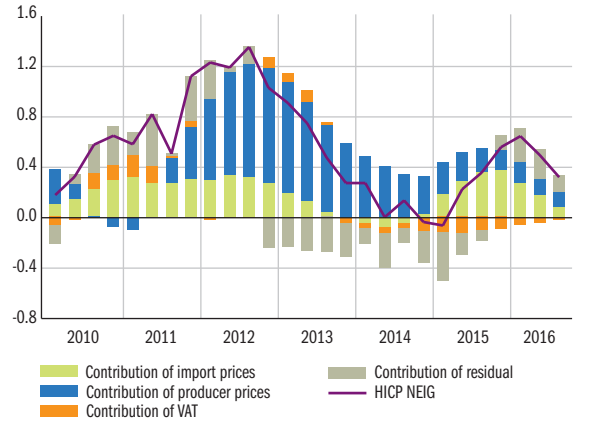


Chart 5 shows the contribution of the explanatory variables to year-on-year NEIG inflation. The deceleration of import prices explains around 30% of the slowdown of NEIG inflation between 2012 and 2014. This means that 30% of the slowdown of goods inflation was directly imported. The deceleration of domestic producer prices is responsible for around 40% of the slowdown. Subsequently, the increase of NEIG inflation in 2015 and early 2016 is almost entirely due to the increase of import prices, in line with the strong depreciation of the euro in 2014 and in early 2015 and its supportive impact on import prices. In contrast, the slowdown of producer prices continued to drag on NEIG inflation in 2015-2016.

In our analysis, the contribution of external factors to manufactured goods inflation only captures direct effects via imported final consumption goods. We do not account separately for indirect effects coming from the impact of imported raw and intermediate input prices on domestic producer prices and, eventually, on consumer prices (see Ahn et al., 2016, for a detailed discussion). However, even considering only direct effects and given the large swings in import price dynamics, imported inflation contributed significantly to manufactured goods inflation in the euro area in recent years.

Comparison to a pricing chain VAR

The exchange rate pass-through, which is closely related to the import price pass-through, is frequently studied in the literature using a Vector Autoregression (VAR) approach (see McCarthy, 2000, and Hahn, 2003). The VAR approach accounts better for the interactions between the different price levels than the single equation approach. We therefore estimate a simple VAR model and compare it to our baseline results. The model includes six endogenous variables, the three price variables from the baseline equation, and three other variables which control for the oil price, the state of the economy and monetary policy, as well as the average VAT rate as an exogenous variable. The VAR is estimated in first-difference in quarterly frequency over the period 2006Q1 to 2016Q3:

$$y_t = Bx_t + \epsilon_t$$

with: $y_t = (dOil_t, dImp_t, i_t, Gap_t, dProd_t, dNEIG_t)'$

where Oil stands for the oil price (in euro), i for the 3-month Euribor, Gap for the European Commission's output gap estimate and the other variables are the three price variables from the baseline equation. Data are in first-differences of logarithm, except for the interest rate (in levels) and the output gap (as a % of potential GDP). A structural identification of the shocks is achieved using a Choleski decomposition and following broadly the ordering of variables in Hahn (2003).[4]

The impulse-response function of NEIG prices to a one percent shock in import prices is small and rises gradually over the next four quarters. The maximal degree of pass-through of 0.09 is reached after four quarters. The size of the pass-through is only slightly lower and the speed of adjustment slightly faster than in our baseline equation. The uncertainty surrounding these VAR estimates is however relatively high and the responses are not significantly different from zero.

4 *We place the import price variable earlier on the VAR than Hahn (2003) to allow for a contemporaneous impact of this variable on all other variables, except for the oil price. The results are largely robust to other orderings of the variables.*

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