

Box 4

THE PASS-THROUGH OF HIGHER NATURAL GAS PRICES TO INFLATION IN THE EURO AREA AND IN SPAIN

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In recent quarters, the tensions in wholesale natural gas markets – which have intensified following Russia’s invasion of Ukraine – have had a considerable impact on the Spanish economy and the euro area. These tensions have been reflected, in particular, in surging wholesale gas prices, which have doubled since January 2022 and risen ninefold since early 2021 (see Chart 1). Against this backdrop, this box aims to offer a first estimation of the impact – direct and indirect – that this rise in gas prices has had on recent inflation developments in Spain and in the euro area.

Broadly speaking, increases in wholesale natural gas prices can pass through to consumer prices via direct and indirect effects. The direct effects stem from the higher prices that consumers pay for gas used in the home. These effects can be estimated based on changes in the gas component of the harmonised index of consumer prices (HICP). The weight of this component in the HICP is 2% for the euro area as a whole and 1.4% for the Spanish economy (see Chart 2).

The indirect effects are associated with the higher prices of products that use natural gas in their production processes or whose prices are highly influenced by gas prices.¹ Importantly, wholesale natural gas prices have a very significant bearing on wholesale electricity prices, since gas is generally the marginal energy resource used in electricity production.² Wholesale prices ultimately also pass through to the final electricity prices paid by firms and consumers. The intensity of this pass-through varies depending on the regulations in place and the types of contract used in each country’s retail electricity market.³

To quantify the direct and indirect effects of the recent increase in wholesale natural gas prices on inflation in Spain and in the euro area, for each region an econometric

model is estimated. The model includes three variables: a measure of consumer inflation (either headline HICP or the natural gas and electricity components of HICP), wholesale natural gas prices and oil prices.⁴

When the model is estimated using headline HICP as the measure of inflation, which allows us to estimate the “total” impact of higher gas prices on consumer prices, the results suggest that a permanent increase of 10% in gas prices would be associated with a maximum rise in the euro area inflation rate of 0.19 percentage points (pp) after 19 months and of 0.16 pp after two years (see Chart 3). The effects are similar, albeit somewhat less persistent, for Spain, with inflation rising by up to 0.20 pp 14 months after the shock and by 0.13 pp after two years.

A second exercise is conducted to estimate the same econometric model, but using the natural gas component of the HICP as a measure of inflation rather than the headline index. This enables us to proxy the “direct” impact that higher gas prices have on consumer prices. The results of this alternative exercise suggest (see Chart 4) that this direct impact may account for 21% and 5% of the total effects identified, in the euro area and in Spain, respectively, after one year. The effect observed in Spain is lower because natural gas accounts for a smaller proportion of household expenditure and because, since 2008, Spain has a regulated natural gas tariff,⁵ with retail gas prices being set by the Government quarterly.

In a third exercise, the econometric model presented here is estimated using the electricity component of the HICP as a measure of inflation. This approach allows us to proxy the scale of the “indirect” impact that an increase in wholesale gas prices has on consumer prices through its direct impact on retail electricity prices. As Chart 4 shows, this channel accounts for 17% of the total effects

- 1 See V. Gunnella, V. Jarvis, R. Morris and M. Tóth (2022), “Natural gas dependence and risks to euro area activity”, Box 4, *Economic Bulletin* 1/2022, European Central Bank.
- 2 Under the EU’s marginal pricing mechanism, the market price is determined, directly or indirectly, by the most expensive technology needed to meet demand in a specific period. See M. Pacce, I. Sánchez and M. Suárez-Varela (2021), “Recent developments in Spanish retail electricity prices: the role played by the cost of CO2 emission allowances and higher gas prices”, *Occasional Paper* No 2120, Banco de España.
- 3 The magnitude of the indirect effects also depends on profit margin developments in the face of rising energy input costs.
- 4 In particular, a Bayesian Vector Autoregression (BVAR) model is estimated using a sample from July 2004 to May 2022, with the variables expressed in year-on-year changes. The natural gas price is the Dutch TTF, which has become the European benchmark price, while the oil price is the Brent barrel price. Both prices are in euro. The Brent price is included to factor into the estimates the historical relationship between natural gas and oil prices, which was very strong in the early stages of the European natural gas market. See L. López, F. Odendahl and S. Párraga (forthcoming), “The pass-through to inflation of oil and natural gas price shocks”.
- 5 See F. Kuik, J. F. Adolfsen, E. M. Lis and A. Meyler (2022), “Energy price developments in and out of the COVID-19 pandemic – from commodity prices to consumer prices”, *ECB Economic Bulletin* 4/2022. This analysis finds that retail market gas prices are more highly regulated in Spain than in other euro area countries.

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identified, after one year, in the euro area, and for 23% in Spain. Unlike the majority of the euro area countries, Spain has a regulated retail electricity tariff – the regulated rate for small consumers (PVPC, by its Spanish acronym), in force since 2014 – which links hourly retail electricity prices to hourly wholesale prices. This may explain why the effects are larger during the first year, and also why they are less persistent.

Combining the results of all three exercises, Chart 4 illustrates the quantitative importance of the indirect

effects of higher wholesale gas prices on consumer prices in the euro area and in Spain. These indirect effects become particularly significant six months after the gas price shock, and are relatively persistent, especially in the euro area.

All the above estimates have been made based on a permanent increase of 10% in gas prices. If the same exercises are conducted, but taking the real increase in wholesale gas prices since January 2021, the results suggest that those higher prices accounted for around

Chart 1
Natural gas prices (a)

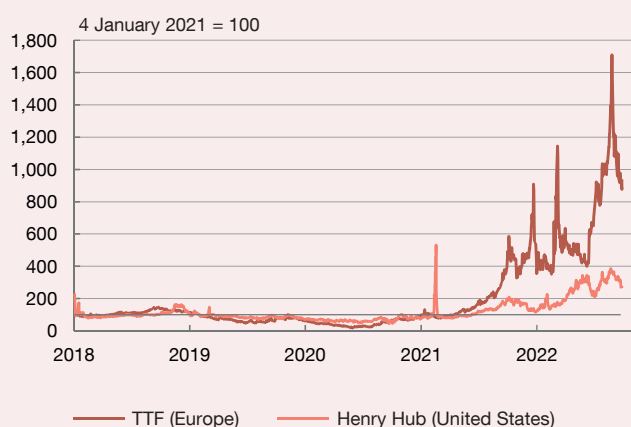


Chart 2
Weight of natural gas in the HICP (2021)

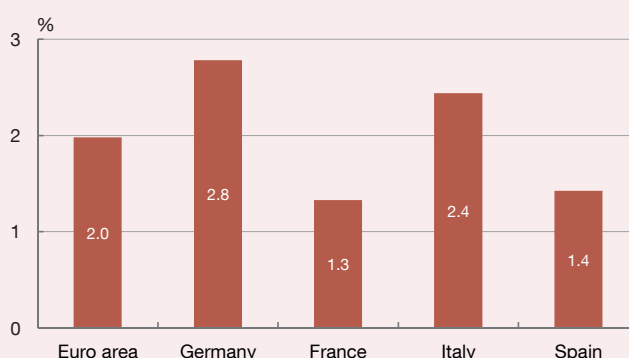
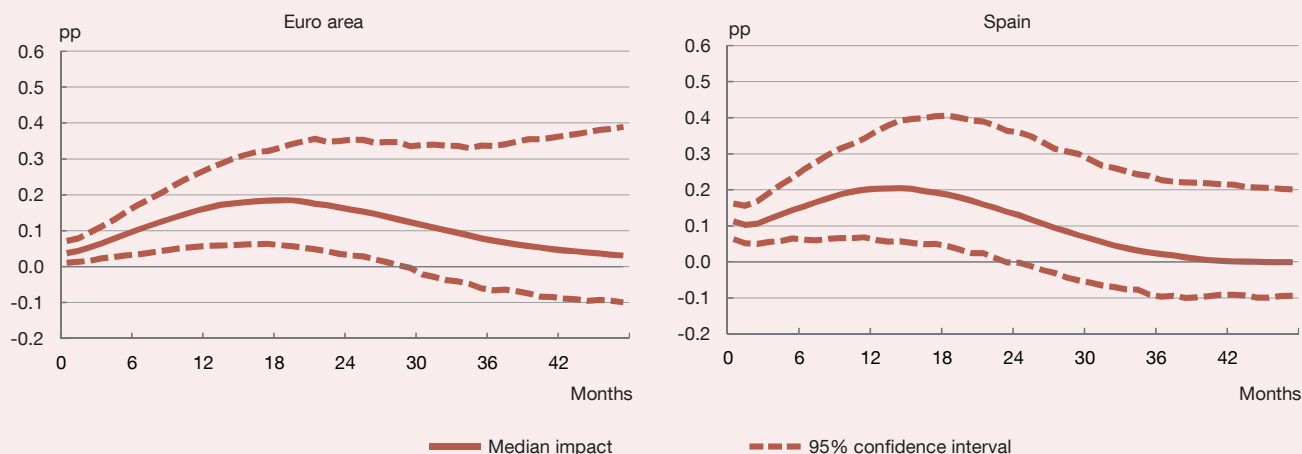


Chart 3
Effect on HICP inflation of a permanent 10% increase in natural gas prices (b)



SOURCES: Refinitiv, Eurostat and own calculations.

- a Spot prices in both markets expressed in euro for comparability.
- b Impulse-response functions to a permanent 10% increase in natural gas prices, expressed in euro, estimated through a Bayesian Vector Autoregression (BVAR) model that includes year-on-year changes in the HICP (in Chart 4, headline HICP, the electricity component and the gas-derived products component), in natural gas prices in Europe and in oil prices. The contributions are calculated using the HICP weights for 2022.

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3.1 pp of total inflation in August 2022 in the euro area (of the 9.1% registered that month), and for around 3.4 pp of total inflation in Spain (of 10.5%) at the same date (see Chart 5).

To conclude, it is important to consider that the estimates presented in this box are based on the historical relationships between the different variables analysed over the sample period which started in 2004.

However, certain specific aspects of the present situation could mean that the effects of higher gas prices on inflation may now differ in intensity from those estimated drawing on the historical relationships observed. On the one hand, the effects during the current inflationary episode could be lower, because in some jurisdictions – such as Spain – highly significant fiscal measures (in historical terms) have been introduced to contain rising consumer prices, and

Chart 4
Effects contributing to the impact on HICP inflation of a permanent 10% increase in natural gas prices (b)

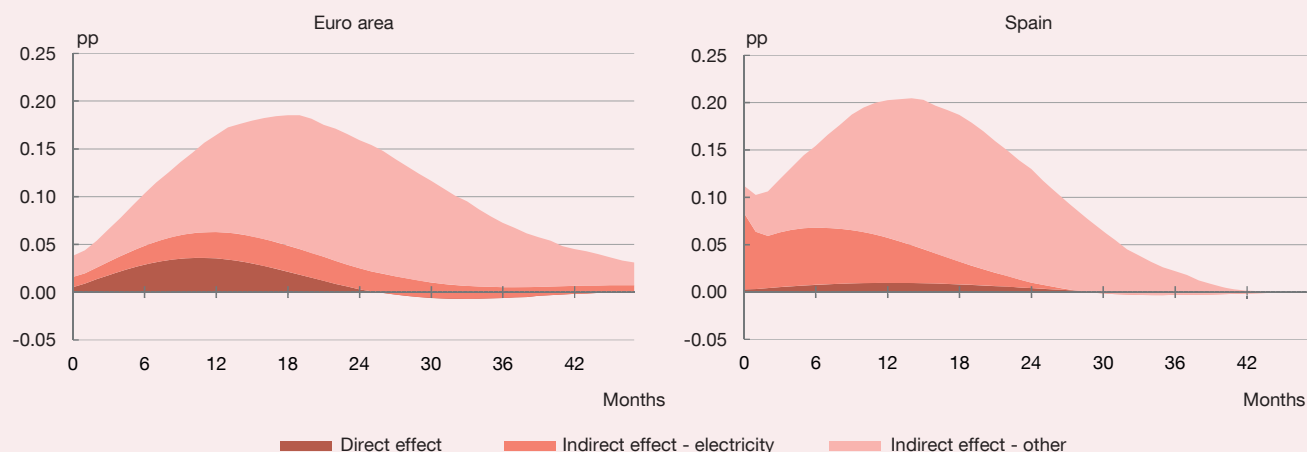
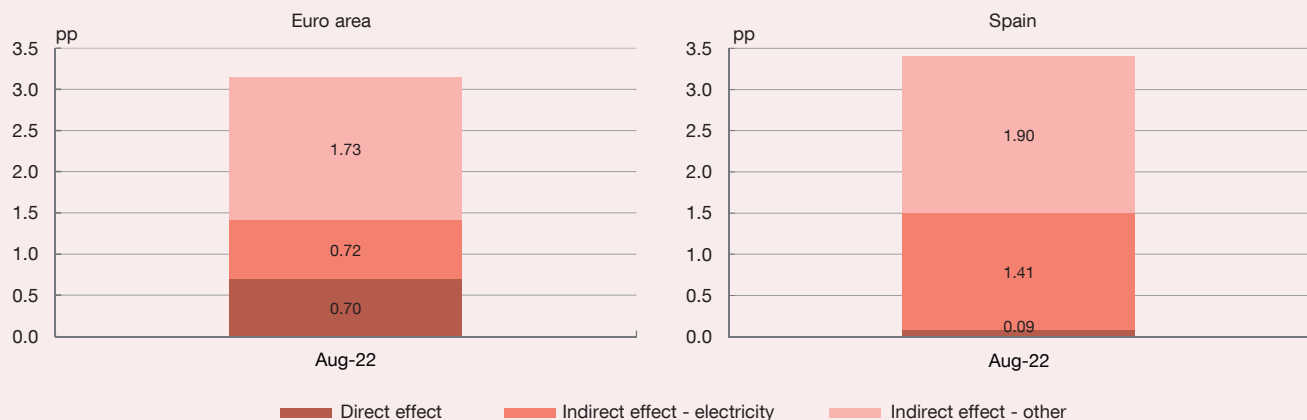


Chart 5
Effect on HICP inflation of the increase in natural gas prices observed since January 2021



SOURCE: Refinitiv, Eurostat and own calculations.

b Impulse-response functions to a permanent 10% increase in natural gas prices, expressed in euro, estimated through a Bayesian Vector Autoregression (BVAR) model that includes year-on-year changes in the HICP (in Chart 4, headline HICP, the electricity component and the gas-derived products component) in natural gas prices in Europe and in oil prices expressed in euro. The contributions are calculated using the HICP weights for 2022.

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certain key regulatory aspects have been amended to temper the link between gas and electricity prices.⁶ On the other hand, the effects could be greater, owing to possible non-linearities stemming from the scale and persistence of the current surge in gas prices, unprecedented in recent history. At the same time, the estimates presented here are based on the extreme

assumption that the increase in gas prices is permanent. In consequence, were part of this increase to reverse in the future, the effects on inflation in the medium and long term would be correspondingly lower. Therefore, the estimates presented here should be taken with due caution, and not as a future projection of developments in either natural gas prices or inflation.

6 Notably the Iberian mechanism to cap gas prices and reduce electricity prices in Spain and Portugal.