

Box 3

THE ASYMMETRIC RESPONSE OF PRODUCER PRICES TO RISING OIL AND GAS PRICES

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A recent study by the Banco de España¹ analyses developments in Spain's manufacturing sector in recent quarters from the perspective of production. It reveals considerable heterogeneity in recent developments across Spain's manufacturing sub-sectors and suggests that this may be, at least in part, a consequence of the differences observed across sub-sectors in the intensity of their energy consumption and in their exposure to both the recovery in contact-intensive activities and global supply chain bottlenecks.

This box supplements that recent study by analysing producer prices in Spain. The aim is to ascertain whether there are significant differences in the behaviour of these prices across the main manufacturing sub-sectors and to determine the extent to which such differences may reflect sectoral asymmetries in the process of pass-through to producer prices of the pronounced fluctuations in oil and natural gas prices observed in recent quarters (see Chart 1).

According to the producer price index (PPI)² compiled by the Spanish National Statistics Institute (INE), producer prices in Spain (excluding energy) were 22% higher in October 2022 than in January 2021 (see Chart 2). However, both the magnitude and timing of this increase in producer prices have been very heterogeneous across the different manufacturing sub-sectors. In particular, in the sub-sectors producing intermediate goods, the rise in prices occurred earlier than in the other sub-sectors, and in recent months a slight moderation in this upward trend has even been observed. By contrast, in the case of the capital and consumer goods sub-sectors, the increase in prices began later and clear signs of moderation are not yet discernible.

This sectoral heterogeneity in producer price developments may reflect (as documented in the aforementioned study of the recent behaviour of industrial production by sub-sector)

the differing degree of exposure of the various manufacturing sub-sectors to the recovery in demand, global supply chain bottlenecks and higher energy prices. As far as the latter is concerned, a strong positive association is indeed observed between the rise in producer prices and each sub-sector's spending on energy commodities expressed as a percentage of the total value of its output (see Chart 3).³ Also, in order to analyse differences in the timing of producer price developments, two econometric models⁴ are estimated for each sub-sector, which relate producer price developments to those in oil and natural gas prices, respectively. The purpose of this exercise is to characterise the process by which oil and natural gas prices have historically been passed through to the producer prices of each industrial sub-sector.

Table 1 shows the estimated month-by-month response of producer prices in each sector of activity to an increase in oil (left-hand panel) and natural gas (right-hand panel) prices. As with the results obtained for industry as a whole, an increase in the oil price is almost immediately passed through to producer prices, while there is more of a delay in the case of natural gas. In particular, higher oil prices are reflected immediately in month-on-month producer prices, while a rise in wholesale natural gas prices begins to be reflected in producer prices in the third month after it takes place. Furthermore, in the case of oil, inflationary pressures on producer prices appear more short-lived, with effects deemed insignificant after the third month, while fluctuations in natural gas prices continue to be reflected in producer prices after as many as nine months.⁵

There are two main reasons that could explain why natural gas prices take longer to be passed through to producer prices than oil prices. The first is the greater relative importance of long-term contracts between companies and suppliers of energy inputs in the case of natural gas. The existence of these contracts appears to delay the

- 1 See "Manufacturing in Spain: recent developments", Box 2, "Quarterly Report on the Spanish Economy", *Economic Bulletin*, 3/2022, Banco de España.
- 2 The PPI reflects the ex-factory gate prices of manufacturing establishments, excluding transport and marketing costs, VAT and other indirect taxes.
- 3 This percentage includes both the sub-sector's direct spending on energy and its indirect spending through its purchases from suppliers. The *OECD Inter-Country Input-Output (ICIO) Tables* are used for this calculation.
- 4 The models are estimated using the local projections method of Ò. Jorda, "Estimation and inference of impulse responses by local projections", *American Economic Review*, 95(1), 2005, pp. 161-182. The sample spans from January 2016 to October 2022 and all the variables are included in terms of month-on-month changes.
- 5 This outcome appears to be consistent with the sustained increases seen in the pass-through of natural gas price movements to consumer prices. See, for example, "The pass-through of higher natural gas prices to inflation in the euro area and in Spain", Box 4, "Quarterly report on the Spanish economy", *Economic Bulletin*, 3/2022, Banco de España.

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pass-through of fluctuations in wholesale gas prices to companies' production costs and, therefore, to the selling prices of their products.

The second reason is that, in most Spanish manufacturing sectors, the energy mix is skewed towards the direct consumption of oil products, which

Chart 1
Oil and natural gas prices (a)

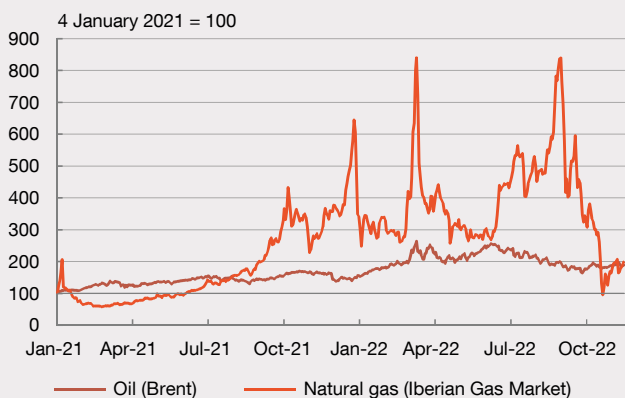


Chart 2
Producer price index (b)

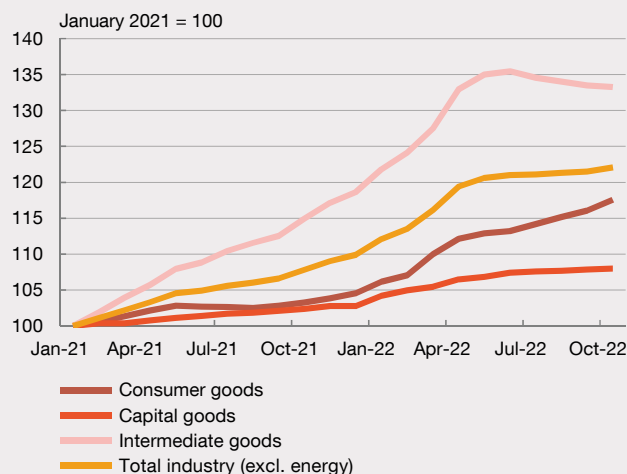


Chart 3
Energy dependence and changes in producer prices (c)

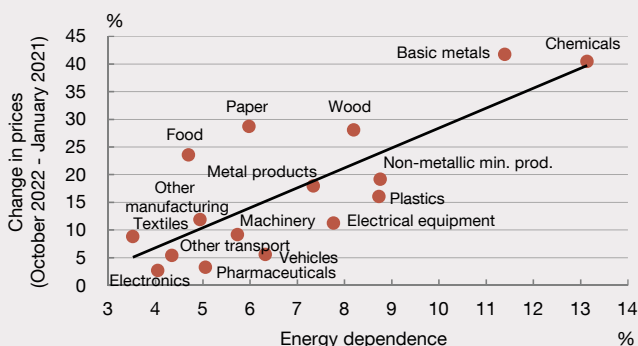
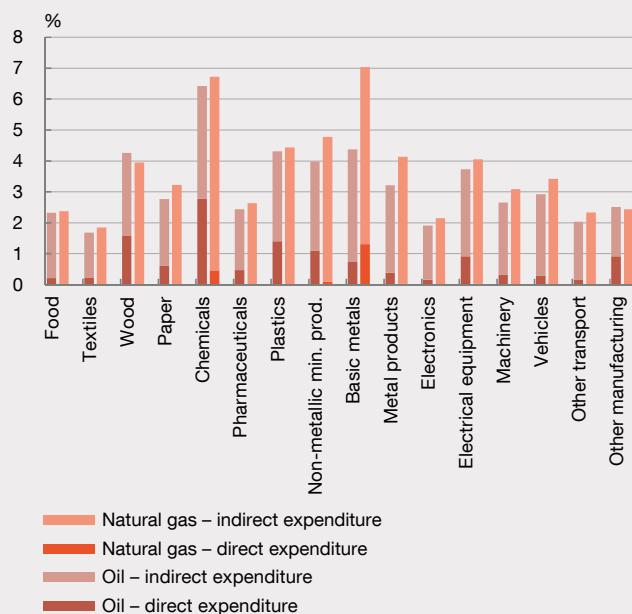


Chart 4
Direct and indirect expenditure on energy commodities (d)



SOURCES: Federal Reserve Economic Data (FRED), Iberian Gas Market (MIBGAS), INE and Inter-Country Input-Output tables (ICIO-2018, OECD).

- a Change in the price of a barrel of Brent crude and in the MIBGAS index with respect to 4 January 2021.
- b Change in the level of the producer price index (PPI) according to the economic use of the goods between January 2021 and October 2022.
- c Total direct and indirect expenditure on oil and natural gas divided by the value of total output.
- d Direct expenditure on each commodity and expenditure included in purchases from other suppliers.

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leads to a clear and direct transmission of oil price fluctuations to production costs. This is in contrast to natural gas prices, where the impact of increases on production costs is fundamentally indirect, inasmuch as inputs are used in manufacturing that originate in other sectors that do make heavy use of natural gas (see Chart 4). Indeed, the fact that natural gas accounts for a relatively high share of the energy mix in industries that produce intermediate goods, and particularly so in the cases of the manufacture of basic metals and chemical products, could help to explain the earlier and sharper reaction of producer prices in these sectors to

increases in the price of this input. This can be seen in the disaggregated results shown in Table 1.

In summary, this box demonstrates that, in recent quarters, producer prices have risen considerably in Spain, although their behaviour has displayed significant heterogeneity across the various manufacturing sub-sectors. This heterogeneity may be explained, in part, by the fact that the pass-through of an increase in energy prices – whether of oil and/or natural gas – to producer prices also varies notably depending on the sub-sector involved, largely as a consequence of asymmetries in their energy mix.

Table 1
The response of producer prices to changes in energy commodity prices

Months elapsed	Oil (Brent)										Natural gas (MIBGAS)									
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Total (excl. energy)	0.5	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.4	0.3	0.3	0.2
Consumer goods																				
Food	0.0	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.4	0.4	0.3	0.3
Textiles	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.1	0.1
Pharmaceuticals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
Intermediate goods																				
Wood	0.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2
Paper	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.4	0.4	0.4	0.3
Chemicals	3.3	2.3	1.4	0.9	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.7	0.9	1.0	1.1	1.1	0.9	0.5
Plastics	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.3	0.3	0.3	0.1
Non-metallic mineral products	0.5	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.4	0.3	0.2
Basic metals	2.4	1.9	1.3	0.8	0.6	0.4	0.2	0.0	0.0	0.0	0.0	0.4	0.6	0.7	1.1	1.4	1.4	1.1	0.7	0.3
Metal products	0.8	0.5	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.4	0.4
Capital goods																				
Electronics	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Electrical equipment	0.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.5	0.4
Machinery	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.1
Vehicles	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Other transport	0.0	0.0	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.6	0.4	0.3	0.1	0.1	0.2
Other manufacturing	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.2

SOURCES: Own calculations based on data from INE, Federal Reserve Economic Data (FRED) and Iberian Gas Market (MIBGAS).

NOTES: The table shows the change, in percentage points, in the month-on-month growth of producer prices in each sector as a consequence of a 100% increase in the price of a barrel of Brent crude (left-hand panel) or in the MIBGAS index (right-hand panel). Each column shows the estimated results of a regression of the month-on-month growth of the producer prices of each sector on the change in energy prices that took place a number of months earlier, as indicated by the number at the head of the column. The darker the cell shading the greater the estimated impact.