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QUANTITY VERSUS PRICE DYNAMICS: THE ROLE OF ENERGY AND BOTTLENECKS IN THE ITALIAN INDUSTRIAL SECTOR

by Francesco Corsello*, Marco Flaccadoro* and Stefania Villa

Abstract

We assess the impact on the Italian industrial sector of the abrupt increase in energy prices and of shortages in the supply of inputs since the early months of 2021, focusing on production and producer prices and conducting a disaggregated analysis. Producer prices in energy- and non-energy-intensive industries had already exhibited different dynamics at the beginning of 2021. The same pattern characterized industrial production only after the spring of 2022. These developments are consistent with the result of firms' responses to bottlenecks and energy supply shocks, as shown by the Bank of Italy's Business Outlook Survey of Industrial and Service Firms in the second-half of 2022. The majority of firms, which have been affected by higher energy costs or supply bottlenecks, reported having increased their selling prices. Some firms also reduced profit margins and implemented energy-saving measures. Only a small share of firms reported having reduced or discontinued production.

JEL Classification: E23, E31, E32.
Keywords: energy prices, supply bottlenecks, industrial sector.
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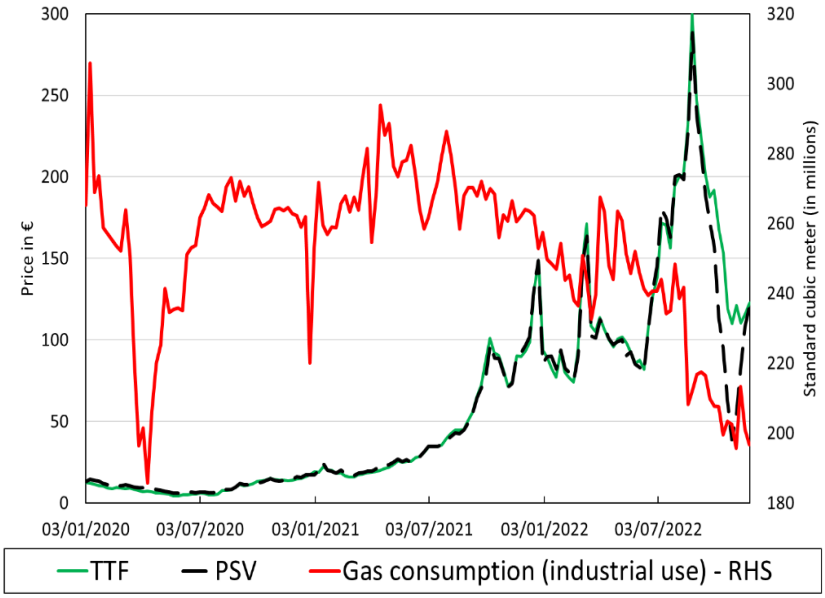
* Bank of Italy, Directorate General Economics, Statistics and Research.

1. Introduction[1]

Since the first months of 2021, energy prices have started to increase, coupled with supply chain bottlenecks. An interesting question is to assess the impact on industrial output and prices. We address this question by focusing on Italian industrial production (IP, henceforth) and producer prices (PPI, henceforth), conditioning on the energy content of the production processes.

As motivating evidence, Figure 1 shows the wholesale price of gas (in the TTF and PSV markets)[2] and gas consumption for industrial use at a weekly frequency. Gas prices started increasing gradually in 2021, and then entered in a volatile sequence of further rises since the outbreak of the conflict in Ukraine (February 2022). After a peak in August 2022 amidst repeated tensions and fears of supply shortages in light of the incoming winter season, gas prices have considerably decreased since September due to high levels storage and a relatively warm autumn. Concerning quantities, since the spring of 2021, the consumption of gas for industrial use has constantly decreased almost reaching the trough observed during the most acute phase of the pandemic in April 2020.

Figure 1. Gas price and gas consumption for industrial use, January 2020-November 2022



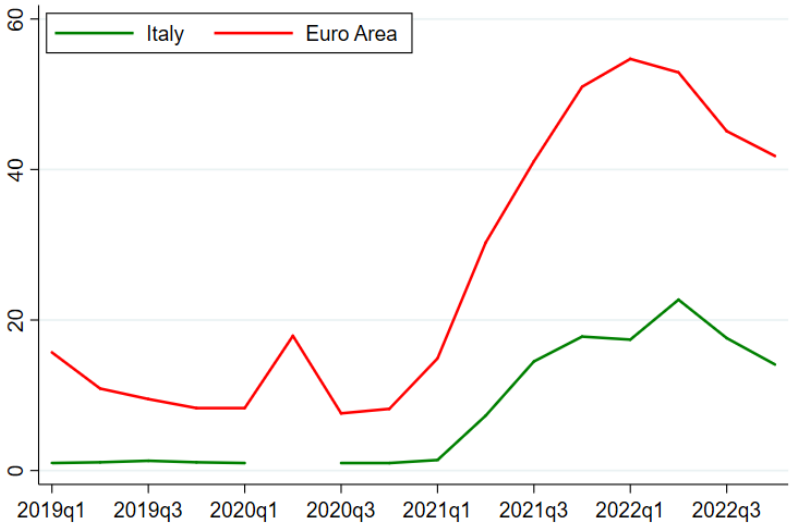
Note: Data on gas consumption for industrial use are seasonally adjusted at a weekly frequency.

In 2021-22, supply shortages hit the manufacturing sectors. Figure 2 shows that the share of firms in both the euro area and Italy reporting shortages of material and/or equipment is on a decreasing path since early 2022, according to the survey conducted by the European Commission. However, this share still remains well above its pre-pandemic level, particularly in the euro area.

[1] We are grateful to Paolo Angelini, Fabio Busetti, Paolo Del Giovane, Simone Emiliozzi, Stefano Neri, Massimiliano Pisani, Tiziano Ropele, Luigi Federico Signorini, Giordano Zevi and Roberta Zizza for helpful comments. All remaining errors are ours.

[2] Wholesale gas prices are represented by the spot prices in two virtual trading points: the TTF, which is the most important market in Europe, and the PSV, the Italian gas market.

Figure 2. Share of firms reporting shortage of material and/or equipment, 2019Q1 – 2022Q4



Note: authors' elaborations on the European Commission Business and consumer surveys. Data are seasonally adjusted. Unit of measure: percentage points.

In light of the above developments, a natural question arises: what are the effects of the surge in energy prices and bottlenecks on the Italian industrial sector, both in terms of output and prices? The note examines the sectoral (i.e. energy- vs. non-energy-intensive) developments in industrial activity until November 2022, and investigates the role of energy price increases and bottlenecks on firm strategies.[3]

Since the spring of 2022, the decreasing trend in production is less pronounced in non-energy-intensive industries, which also exhibit a more moderate increase in prices since 2021. Survey evidence shows that both energy price rises and supply-chain snags contributed to firms' price increases and, to a lower extent, to a reduction in their activity. Moreover, we find that the industries reporting higher energy costs tend not to report severe supply shortages.

Both IP and PPI indices are weighted aggregations of indices by subsectors, which differ in terms of energy intensity. For the purpose of the analysis, we classify these subsectors into three categories: energy-intensive, non-energy-intensive and energy-producing. We follow the classification by Alpino et al. (2022)[4] by considering paper and paper products (C17 in the NACE classification), chemicals and chemical products (C20), other non-metallic mineral products (C23) and basic metals (C24) as energy-intensive industries. Mining and quarrying (B), manufacture of coke and refined petroleum products (C19), electricity, gas, steam and air conditioning supply (D35), and water collection, treatment and supply (E36) all fall in the energy-producing class. The remaining sectors are defined as non-energy-intensive (see Table A.1 in the appendix). The weights across subsectors are different between IP and PPI baskets.[5]

[3] For a study of the heterogeneous effects of the surge in energy prices on firms' production costs, see Accetturo et al. (2022).
[4] Alpino et al. (2022) provide a de-facto measure of the degree of energy intensity for each industrial subsector, given by the ratio between sectoral energy consumption, expressed in terajoule (TJ, hereafter), and valued added, expressed in millions of euro.
[5] Moreover, the sector E36 (water collection treatment and supply) is included only in the PPI and, therefore, it is not considered in our analysis.

Energy-intensive sectors account for a similar share in IP and PPI (13% and 12%, respectively); non-energy-intensive sectors instead account for 75% of IP and for only 48% of PPI; energy-producing sectors for 12% of IP and 40% of PPI. The prominent role of energy-producing industries in the PPI basket is partly explained by the dramatic increase in energy prices already in 2021.[6] The classification by Alpino et al. (2022) provides rankings for energy intensity in terms of electricity, gas and both. The sectors mentioned above (C17, C20, C23 and C24) are top-ranked across all the proposed dimensions of energy intensity.

We restrict the analysis to the manufacturing sector, thus disregarding the energy-producing industries. The rationale for disregarding the latter is that an increase in energy prices acts as a contractionary supply shock for manufacturing firms (both energy and non-energy-intensive), as it increases their input costs. For energy-producing firms, instead, rising energy prices have positive effects on revenues, assuming that the demand for energy is relatively inelastic, in line with the results by Alpino et al. (2023) who show that the average infra-annual price elasticity of demand for energy is very close to zero.[7]

The remainder of the note is organized as follows. Section 2 looks at the dynamics of PPI while Section 3 at that of IP. Section 4 rationalizes the evidence obtained by examining the results of the latest release of the Bank of Italy Business Outlook Survey of Industrial and Service Firms, conducted between September and October 2022. Section 5 briefly concludes.

2. Price developments

As reported in Section 1, prices of energy inputs for industrial firms have been markedly increasing since the beginning of 2021. In the summer of 2022 the wholesale prices of electricity and gas were about four times than those registered one year before (Figure 3, panel a). Moreover, also oil price has roughly doubled in the same period, inducing a consequently large increase in the price of fuels.

Using the disaggregate indexes at the sub-sectoral level and the relative weights provided by Istat, we have built PPIs for the two subgroups of energy- and non-energy-intensive sectors.

Since 2021, PPIs have accelerated more markedly for the energy-intensive components than for the non-energy-intensive ones (Figure 3, panel b). Indeed, as of November 2022 energy-intensive PPI was roughly 40% higher than its level in January 2021, against around 17% for the non-energy-intensive PPI, as the result of the greater role of energy inputs in the cost structure of firms classified as energy-intensive. However, other factors could have been playing a role, such as the different extent of competitive pressures to which firms in the two groups are exposed.

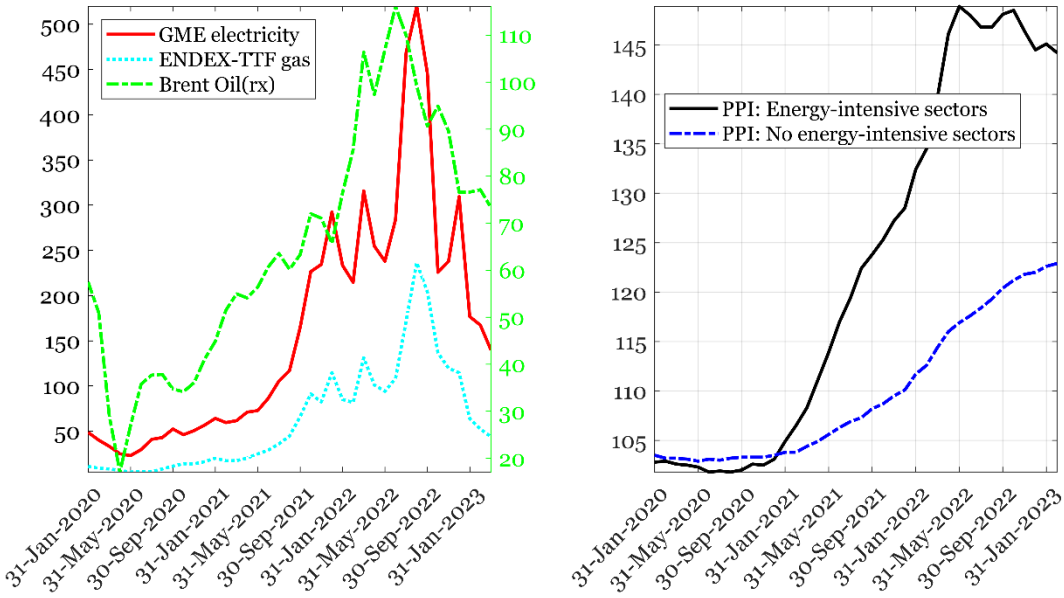
A similar picture emerges for the four energy-intensive industries at the euro area level. We use the Italian classification by Alpino et al. (2022) - under the hypothesis that energy intensity is largely a technological characteristic, which applies to countries with a similar level of development – and show that firms in the energy-intensive subsectors have increased their prices to a larger extent than those in the whole manufacturing sector (net of energy producing industries; Figure A.1).

[6] The PPI weights have been very volatile in the recent years, due to the erratic behavior of prices since the pandemic outbreak in 2020.

[7] Throughout this note, we have also removed the sector of manufacture of tobacco products (C12) since Istat does not publish the relative data due to confidentiality reasons (as there are few companies active in the industry). Note that this sector accounts only for 0.1% of IP and for 0.05% of PPI, as reported in Table A.1.

Figure 3. Energy commodities and Italian PPI, January 2020-November 2022

(a) Energy commodity prices (b) PPI indexes



Note: authors' elaborations on the Refinitiv Datastream and ISTAT data. Panel (a): prices of the Italian electricity market (€/MWH), the Endex TTF gas benchmark for the euro area (€/MWH), and the Brent raw oil (€/Barrel); Panel (b): PPI indexes computed used disaggregated data, December 2014=100.

3. Quantity developments

Similarly to the previous section, we investigate whether IP exhibits different dynamics between the energy-intensive and non-energy-intensive subgroups, with the sub-indices built as explained in Table A.1. While, qualitatively, the dynamics of both indices are similar, the non-energy-intensive sectors experienced a more pronounced contraction during the initial phase of the pandemic, largely due to the closures of non-essential activities imposed by the Government during the national lockdown,[8] and a weaker recovery thereafter (Figure 4). The decreasing trend is more pronounced for energy- versus non-energy-intensive firms after spring 2022. Compared with PPI developments, the divergence in IP became visible with a delay.

Adopting the same classification applied to the Italian industrial sector, Figure A.2 in the Appendix shows a divergent dynamics of euro-area industrial production between the two groups a few months before, at the beginning of 2022.

We examine whether there are other variables related to activity showing different trends between the two groups (energy- and non-energy-intensive), using Istat survey data on the intensity of capital utilization (Figure 5). Measures of capacity utilization are indeed important indicators of business cycle fluctuations. In the latest quarters, the utilization rate is on a decreasing path; more strongly so for energy-intensive sectors plausibly due to a combination of reduced demand,[9] which

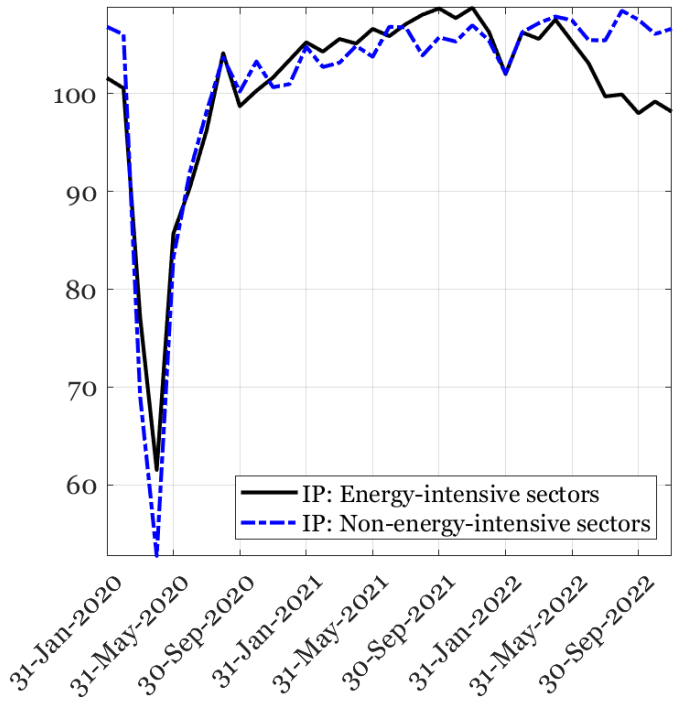
[8] In fact, sectors C10, C11, C17, C20 and C23.19 have been classified as essential activities and they were allowed to operate during the national lockdown according to the DPCM of 22 March 2020.

[9] This is also consistent with the business survey questionnaire on the current level of order books and overall demand. Energy-intensive sectors have been recently facing a decline in demand, which is larger for non-energy intensive firms, as shown in Figure A.4 in Appendix.

has been affected by a relatively higher increase in their selling prices, and of higher utilization costs of their stock of capital.[10]

Figure 4. Indexes of industrial production for energy- and non-energy-intensive sectors in Italy, January 2020-November 2022

(index, 2015=100)



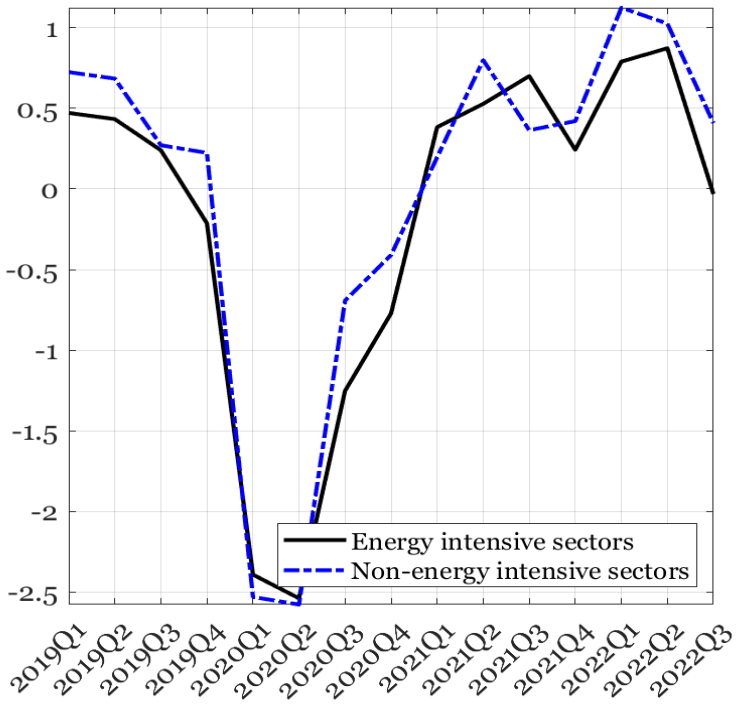
Note: authors' elaborations on ISTAT data. IP indexes computed used disaggregated seasonally adjusted data, 2015=100.

4. Inspecting the mechanism

In this section, we rationalize the dynamics of Italian producer prices and manufacturing activity since the spring of 2022 by relying on the latest release of the Bank of Italy Business Outlook Survey of Industrial and Service Firms conducted between September and October 2022. In particular, we focus on industrial firms with more than 20 employees and investigate the contribution of energy cost increases and supply-chain snags to their price and production decisions, using qualitatively results drawn from the survey.[11] First, we discuss the findings related to the increase in energy prices, disentangling the heterogeneous impact across sectors and the different strategies implemented by energy- and non-energy-intensive industries. Then, we present evidence related to supply-chain bottlenecks that affected firms' price and production decisions in the recent months.

[10] Data on business climate index, reported in Figure A.3 in Appendix, show a pattern similar to that of capacity utilization.
[11] In the analysis we apply sampling weights, thus our findings refer to the reference population. Additional information on the methodology is available at https://www.bancaditalia.it/pubblicazioni/metodi-e-fonti-note/metodi-note-2017/metodologia_sondaggio_impr_industr_serv.pdf.

Figure 5. Capacity utilization for energy- and non-energy-intensive sectors, 2019Q1- 2022Q3
(*seasonally adjusted and standardized*)



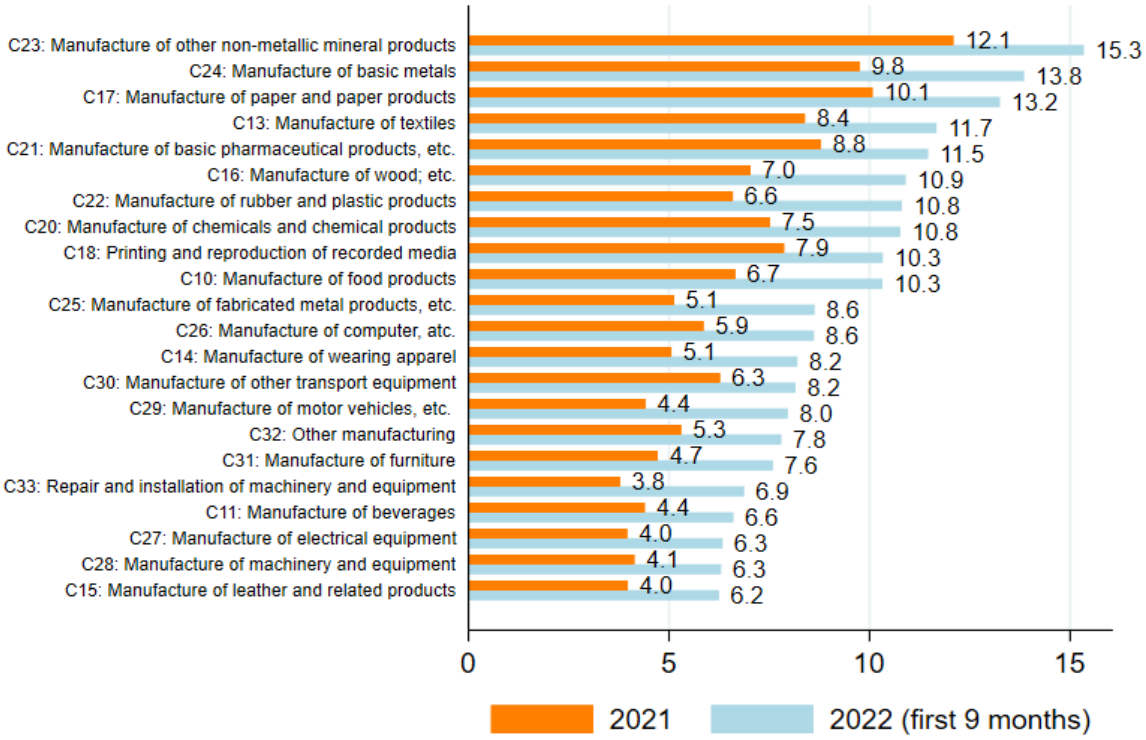
Note: authors' elaborations on the Istat Business survey. Firms can provide a number in percentage, between 20% and 100%, regarding their capacity utilization over the quarter. Data shown in the figures have been standardized according to their long-run mean and standard deviation.

According to the survey, in the first 9 months of 2022, firms across all manufacturing sectors reported a significant rise of electricity and gas expenditures over total costs for purchasing goods and services, with a more robust increase for energy-intensive industries (C17, C20, C23 and C24; Figure 6). The ratio of energy and gas expenditure over total costs provides a classification of energy intensity that partially differs from Alpino et al. (2022), as C20 is not ranked among the most exposed subsectors. This can be plausibly ascribed to the latter classification relying on subsector value added rather than its costs, and to the significant rise of transportation expenditures for the chemical industry throughout this year. In response to energy price rises, a large majority of firms in energy-intensive industries reported to have increased their prices in that period, while this fraction is lower for non-energy-intensive firms (56% and 39%, respectively; Figure 7).

As far as real activity developments are concerned, the fraction of firms cutting production is lower than those increasing selling prices both in energy-intensive and non-energy-intensive industries (19% and 12, respectively). Also in this case the share of firms reducing production is growing with the degree of exposure to energy price pressures. Conversely, the shares of firms reporting either to have reduced their profit margins or to have implemented energy-efficiency measures differ only slightly across those two groups. These survey-based results confirm the impact of higher energy costs on nominal and real variables in Italy, which we have documented above.

Figure 6. Share of electricity and gas expenditures over total costs

(*per cent*)

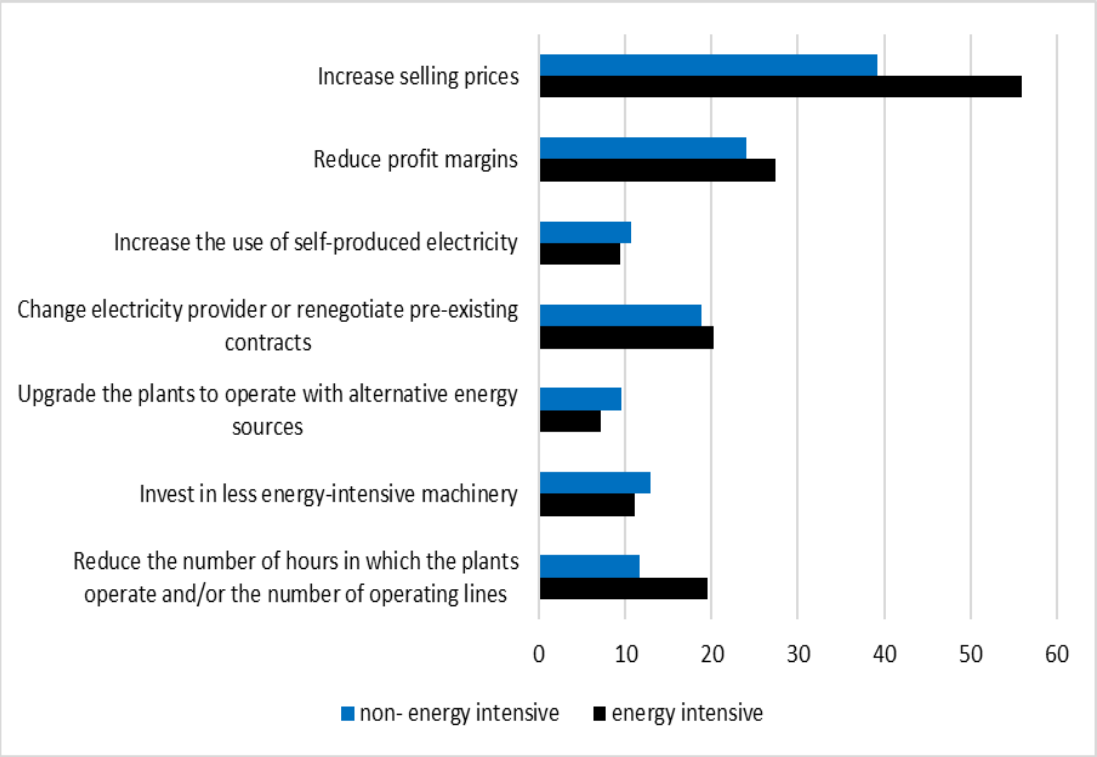


Notes: Surveyed firms are asked the share of electricity and gas expenditures over total costs for purchasing your firms' goods and services in 2021 and in the first 9 months of 2022: (a) up to 3%; (b) between 3.1 and 5%; (c) between 5.1 and 10%; (d) between 10.1 and 15%; (e) between 15.1 and 20%; (f) more than 20%; (g) do not know, do not wish to answer. We discard the observations in (g) and attribute to the observations in (a)-(e) the intermediate value of the interval (e.g. 4% for the interval 3.1-5%); while we use 22.5% for (f) (i.e. we add to the lower bound of 20% half of the interval size of the preceding bucket). Our results show the average value across industrial subsectors. Unit of measure: percentage points.

Finally, similar results are reported for the final part of 2022 and the beginning of 2023 (i.e. expectations over the following six months), with a higher share of firms opting for increasing prices and reducing quantities in energy-intensive sectors (Figure A.5); the share of firms opting for different reaction strategies in the first period versus the second period is overall very limited (Table A.4).

As far as supply-chain bottlenecks are concerned, a large majority of firms reported, among others, shortages of inputs different from energy, delays in suppliers' delivery times, and an increase in the costs of commodities and intermediate goods (Figure 8). For each subsector, we also show the average share of firms reporting a "*somewhat significant*" or "*very significant*" impact of sourcing difficulties for the following categories: (a) unavailability of commodities / intermediate goods; (b) increase in the cost of commodities / intermediate goods (excluding electricity and gas); (c) delays in supplier processing times; (d) increase in transport or logistical costs and/or delays; and (e) agreed credit lines are inadequate. It is worth noting that the energy-intensive subsectors (C17, C20, C23 and C24) are not the ones mostly affected by supply-chain bottlenecks in the first 9 months of 2022, plausibly as a result of the shortage of intermediate inputs (e.g. semiconductors and electrical components) that affected more intensively firms in downstream industries, such as transport, machinery and electrical equipment (Figure 9).

Figure 7. Firms' strategy over the *first 9 months of 2022* to cope with the increase in gas and/or electricity prices by energy intensity
(*per cent*)

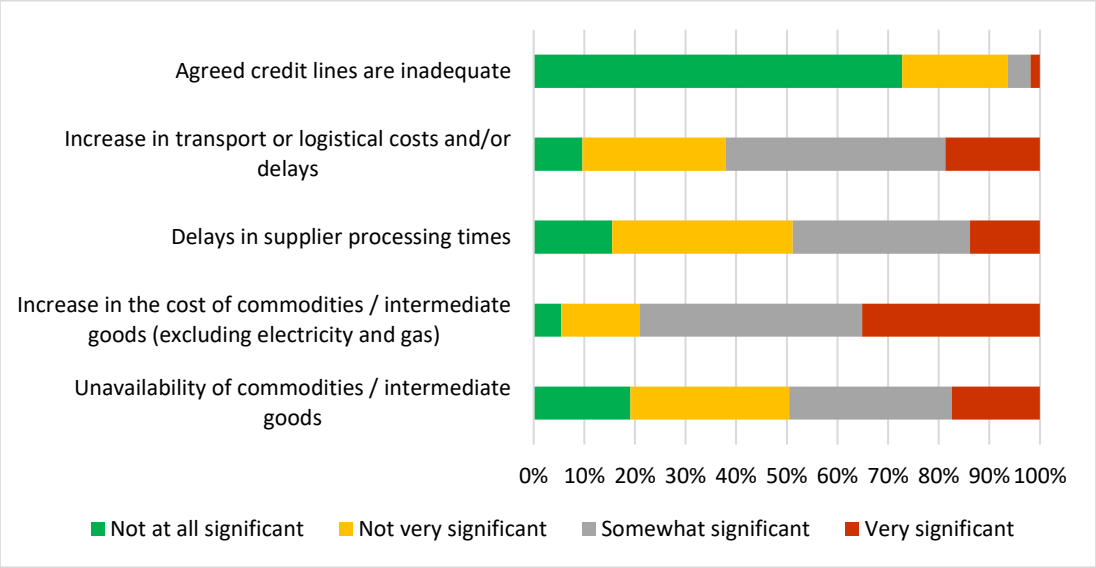


Notes: Surveyed firms report the strategies adopted over *first 9 months of 2022* to cope with the increase in gas and/or electricity prices. They can choose up to two strategies among: (a) reduce the number of hours in which the plants operate and/or the number of operating lines; (b) invest in less energy-intensive machinery; (c) upgrade the plants to operate with alternative energy sources; (d) change electricity provider or renegotiate pre-existing contracts; (e) increase the use of self-produced electricity; (f) reduce profit margins; (g) increase selling prices; (h) none of the above; (i) do not know, do not wish to answer. We discard the observations in (i) from the analysis. Unit of measure: percentage points.

Among the firms that report "*somewhat*" or "*very significant*" difficulties in sourcing inputs, almost half of them declared to have increased their price as a primary strategy, while the share of firms opting for limiting their activity is generally low (about 3%; Figure 10). These findings are qualitatively similar to those for energy costs. Firms seem to cope with both supply shocks mainly by increasing their prices, rather than by cutting production.

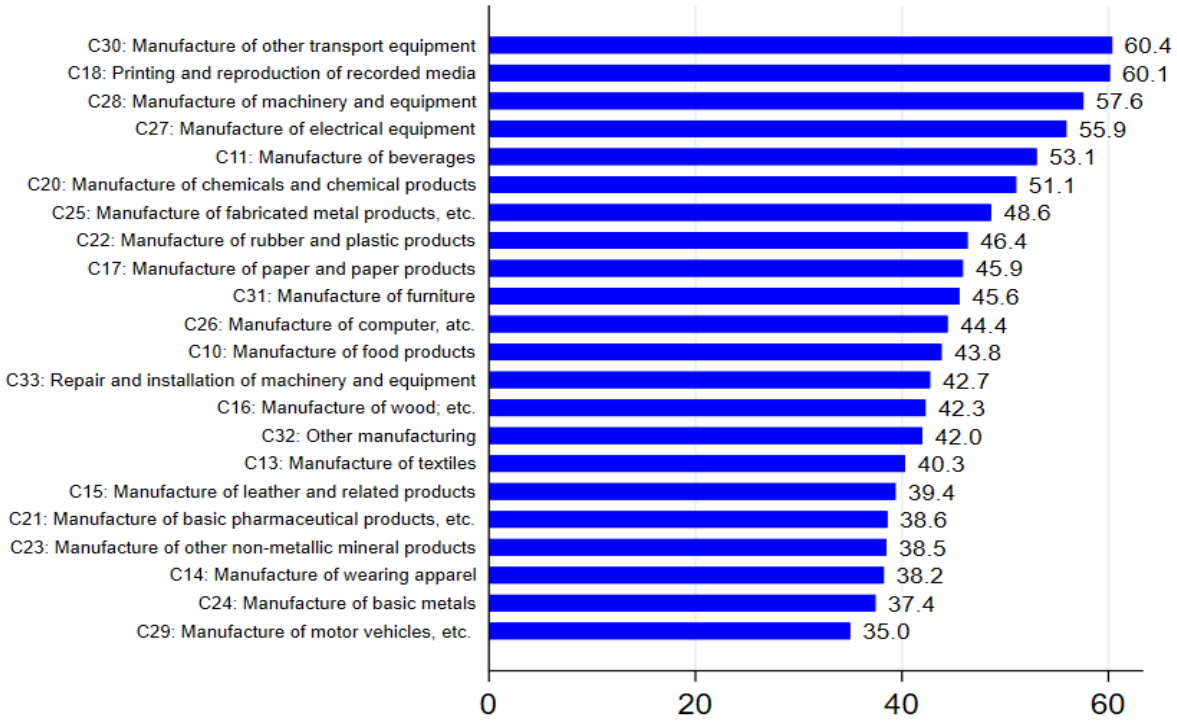
Figure 8. Difficulties in sourcing inputs

(*per cent*)



Notes: Surveyed firms are asked to what extent *in the first 9 months of 2022* the following factors have contributed to any difficulties in sourcing commodities and/or intermediate goods (excluding electricity and gas): (a) unavailability of commodities / intermediate goods; (b) increase in the cost of commodities / intermediate goods (excluding electricity and gas); (c) delays in supplier processing times; (d) increase in transport or logistical costs and/or delays; (e) Agreed credit lines are inadequate. For each category, firms could select: (i) not at all significant; (ii) not very significant; (iii) somewhat significant; (iv) very significant; (v) do not know, do not wish to answer. We discard the observations in (v) from the analysis. Unit of measure: percentage points.

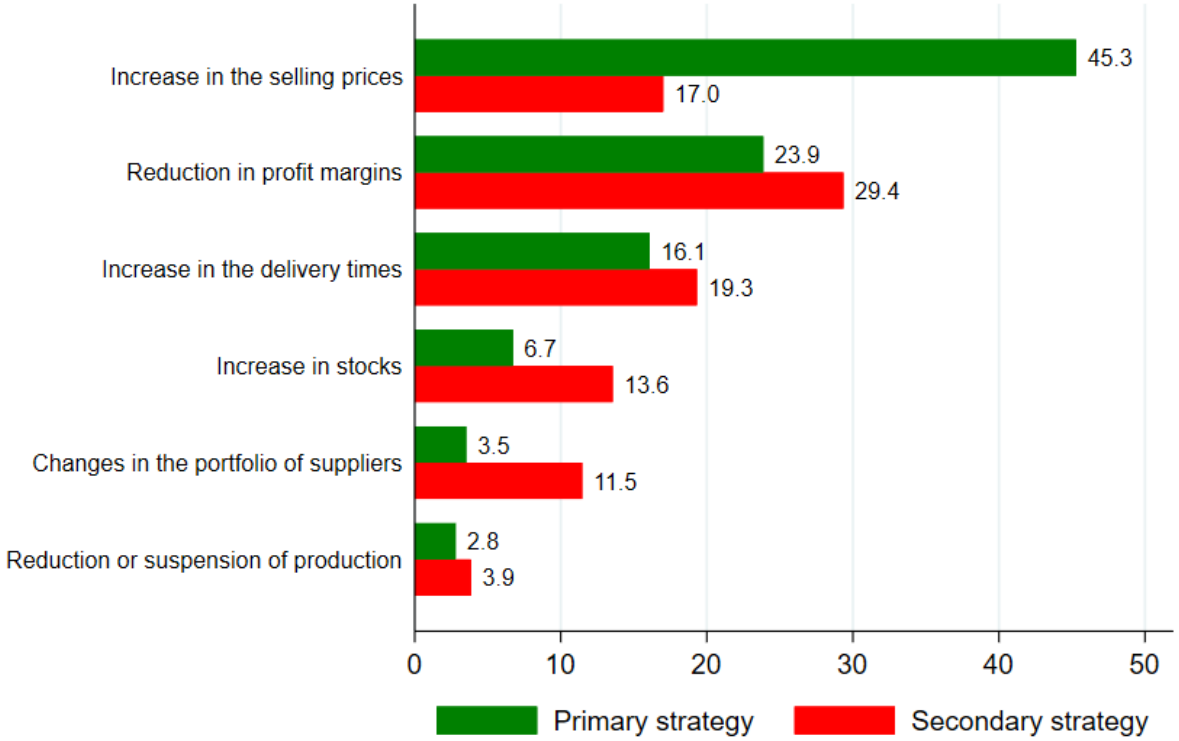
Figure 9. Difficulty in sourcing inputs, by sector



Notes: Surveyed firms are asked to what extent *in the first 9 months of 2022* the following factors have contributed to any difficulties in sourcing commodities and/or intermediate goods (excluding electricity and gas): (a) unavailability of commodities / intermediate goods; (b) increase in the cost of commodities / intermediate goods (excluding electricity and gas); (c) delays in supplier processing times; (d) increase in transport or logistical costs and/or delays; (e) Agreed credit lines are inadequate. For each category, firms could select: (i) not at all significant; (ii) not very significant; (iii)

somewhat significant; (iv) very significant; (v) do not know, do not wish to answer. We discard the observations in (v) from the analysis. For each sector we show the average firm shares reporting "somewhat significant" and "very significant" impact of sourcing difficulties across categories (a)-(e). Unit of measure: percentage points.

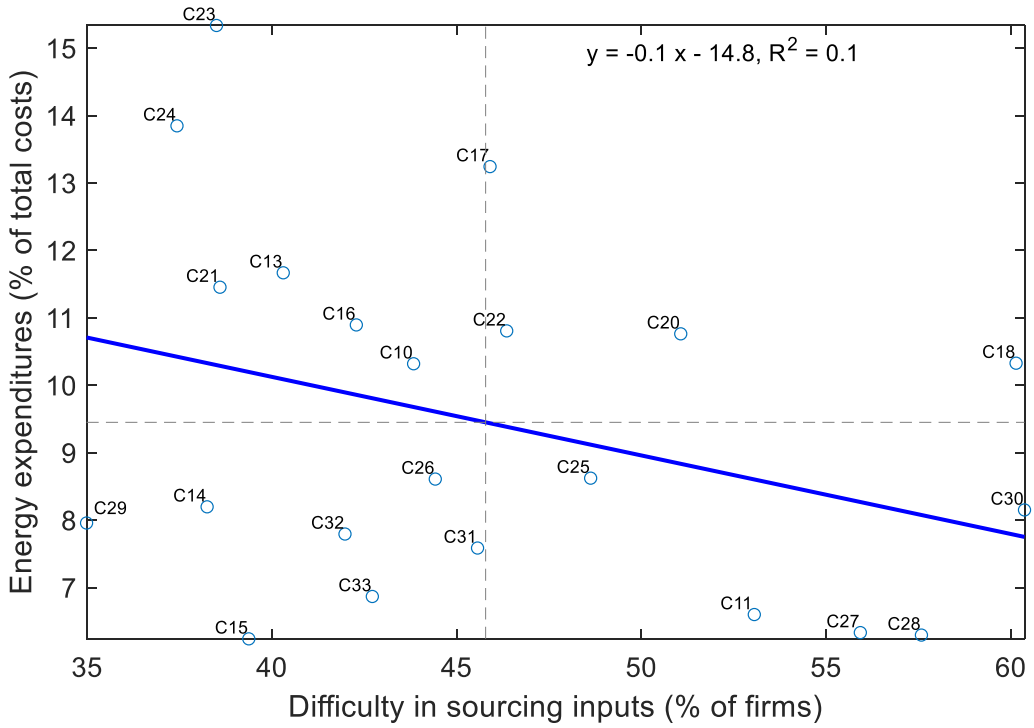
Figure 10. Firms' strategy to cope with sourcing difficulties



Notes: Surveyed firms report the strategies adopted *in the first 9 months of 2022* to cope with sourcing difficulties. They can choose a primary and a secondary strategy among: (a) increase in the selling prices of your firm's goods/services; (b) reduction in profit margins; (c) increase in the delivery times of your firm's goods/services; (d) reduction or suspension of production; (e) changes in the portfolio of suppliers from which your firm sources commodities/intermediate goods; (f) increase in stocks; (g) other; (h) do not know, do not wish to answer. We discard the observations in (h) from the analysis. Unit of measure: percentage points.

We finally investigate whether there exists any correlation between being exposed to the energy shock – proxied by the share of electricity and gas expenditures over total costs in 2022 - and having difficulties in sourcing inputs, i.e. the data reported in Figures 6 and 9, respectively. Figure 11 shows a scatter plot by sector of the share of firms reporting bottlenecks against the share of energy costs. The correlation is negative between these two variables, though not statistically significant. Therefore, according to the survey data, the sectors most affected by higher energy prices tend not to be reporting severe supply shortages. Indeed, the four sectors most impaired by supply snags (C30, C18, C28 and C27) display a degree of energy intensity, according to the classification by Alpino et al. (2022), ten-fold lower than that of energy-intensive industries.

Figure 11. Difficulty in sourcing inputs (% of firms) and energy expenditures (% of total costs)



Notes: The figure shows the relationship between the share of firms reporting difficulty in sourcing inputs and the share of electricity and gas expenditures over total costs by sector. The regression slope is equal to -0.1 and it is not statistically significant according to conventional levels.

5. Conclusions

Energy price rises and supply chain bottlenecks affected manufacturing activity in Italy since 2021. In particular, the dramatic increase in energy prices raises the question on whether industries within the manufacturing sector are affected in a heterogeneous way depending on their energy intensity.

While producer prices exhibit different dynamics between energy-intensive and non-energy-intensive industries since the beginning of 2021, this occurs for industrial production only since the spring of 2022. According to the latest release of the Bank of Italy Business Outlook Survey of Industrial and Service Firms, the majority of firms affected by higher energy costs or supply bottlenecks has increased their prices while a lower share has reduced or discontinued production. Interestingly, these two factors are not correlated, i.e. the sectors most affected by higher energy prices tend not to report severe supply shortages.

Developments in industrial production and producer prices reveal that there are two dimensions of heterogeneity: (1) between energy-intensive and non-energy-intensive industries; (2) between prices and quantities. Studying and monitoring this double layer of heterogeneity is crucial to understand the channels through which this record energy shock unravels across the aggregate economy, bridging micro and macro evidence. A structural analysis to identify demand- and supply-side shocks may also help refining the analysis and enhancing the robustness of the results.

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Appendix

Table A.1. Classification of sectors in the industrial production index (IP) and in the producer price index (PPI) and relative weights (in percentage)

Code	Description	Weight in IP (%)	Weight in PPI (%)
	Energy-intensive		
C17	Manufacture of paper and paper products	**2.1**	**1.9**
C20	Manufacture of chemicals and chemical products	**4.1**	**3.2**
C23	Manufacture of other non-metallic mineral products	**3.5**	**2.1**
C24	Manufacture of basic metals	**3.3**	**5.3**
	Non energy-intensive		
C10	Manufacture of food products	**8.3**	**10.0**
C11	Manufacture of beverages	**1.6**	**1.4**
C12	Manufacture of tobacco products	**0.1**	**0.0**
C13	Manufacture of textiles	**2.1**	**1.2**
C14	Manufacture of wearing apparel	**3.0**	**1.7**
C15	Manufacture of leather and related products	**2.9**	**1.8**
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	**1.4**	**1.3**
C18	Printing and reproduction of recorded media	**1.4**	**0.9**
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	**3.5**	**1.1**
C22	Manufacture of rubber and plastic products	**4.6**	**3.1**
C25	Manufacture of fabricated metal products, except machinery and equipment	**11.1**	**6.8**
C26	Manufacture of computer, electronic and optical products	**2.8**	**1.2**
C27	Manufacture of electrical equipment	**3.9**	**2.3**
C28	Manufacture of machinery and equipment n.e.c.	**13.6**	**5.6**
C29	Manufacture of motor vehicles, trailers and semi-trailers	**4.4**	**3.7**
C30	Manufacture of other transport equipment	**2.8**	**1.4**
C31	Manufacture of furniture	**2.3**	**1.4**
C32	Other manufacturing	**2.3**	**1.0**
C33	Repair and installation of machinery and equipment	**3.0**	**1.8**
	Energy-producing		
B	Mining and quarring	**1.1**	**0.8**
C19	Manufacture of coke and refined petroleum products	**0.9**	**6.8**
D35	Electricity, gas, steam and air conditioning supply	**10.1**	**31.3**
E36	Water collection, treatment and supply	**X**	**0.9**

Note: Note that year 2021 is set as the weighting reference period for IP, while year 2022 is chosen for PPI.

Table A.2. Industrial production index, seasonally adjusted, for energy-intensive industries by sectors (index 2015 = 100)

	2019Q4 (pre-Covid)	2021Q4 (pre-war)	2022Q1	2022Q2	2022Q3	% change with respect to	
						Pre-Covid (2019Q4)	Pre-war in Ukraine (2021Q4)
C17: paper products	97.0	101.6	101.1	103.4	98.6	1.6	-3.0
C20: chemicals	104.1	106.5	106.8	104.3	97.0	-6.8	-8.9
C23: non-metallic minerals	101.4	112.5	105.8	110.8	107.8	6.3	-4.2
C24: basic metals	98.9	107.1	102.8	102.4	94.3	-4.6	-11.9

Table A.3. Industrial production index, seasonally adjusted, for non-energy-intensive industries by sectors (index 2015 = 100)

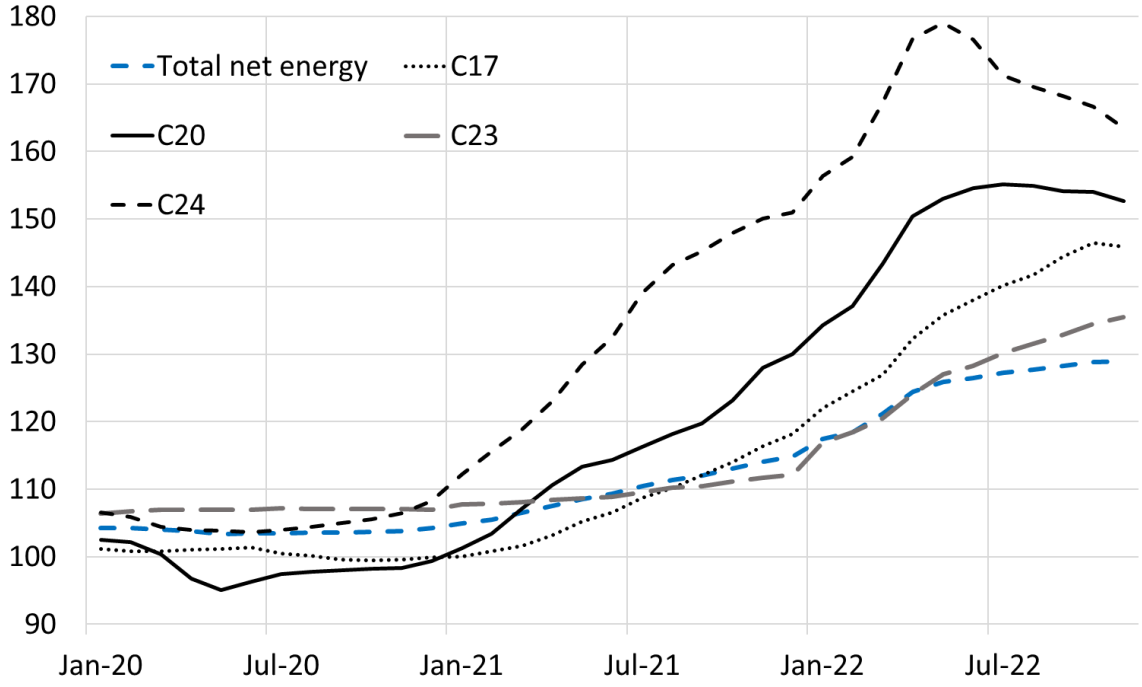
	2019Q4 (pre-Covid)	2021Q4 (pre-war)	2022Q1	2022Q2	2022Q3	% change with respect to	
						Pre-Covid (2019Q4)	Pre-war in Ukraine (2021Q4)
C10: food	108.4	110.9	109.3	113.1	112.3	3.6	1.3
C11: beverages	117.4	127.9	129.4	124.8	135.3	15.3	5.8
C13: textiles	85.0	85.3	85.7	86.7	83.6	-1.6	-2.0
C14: wearing apparel	86.1	55.8	56.5	59.9	60.0	-30.3	7.6
C15: leather	101.8	90.3	93.9	100.1	97.2	-4.6	7.6
C16: wood	95.3	109.8	108.1	111.3	112.5	18.0	2.4
C18: printing	83.1	78.4	71.4	72.7	61.7	-25.8	-21.3
C21: Pharmaceutics	115.0	117.1	113.0	119.4	124.8	8.5	6.6
C22: Rubber & plastic	96.4	105.4	100.9	100.3	99.5	3.2	-5.7
C25: metal products	100.8	104.7	103.2	103.9	101.8	1.0	-2.7
C26: Computer	108.5	109.4	114.3	118.5	119.1	9.8	8.8
C27: electrical equipment	104.5	112.0	112.1	114.9	113.5	8.7	1.4
C28: machinery n.e.c.	109.9	112.0	111.2	113.2	115.5	5.1	3.1
C29: motor vehicles, trailers	87.5	82.9	86.7	83.2	87.0	-0.6	4.9
C30: other transport equipm	122.6	114.0	115.3	117.5	120.8	-1.5	6.0
C31: furniture	105.5	109.1	113.9	118.7	111.5	5.7	2.2
C32: other manufacturing	117.0	129.9	125.6	128.8	131.6	12.5	1.3
C33: repair and installation	129.5	126.1	125.6	123.8	125.4	-3.1	-0.5

Table A.4. Share of firms opting for different reaction strategies to cope with the increase in gas and/or electricity prices.

First 9 months of 2022	Following 6 months (i.e. October 2022 - March 2023).						
from\to	Reduce the number of hours in which the plants operate and/or the number of operating lines	Increase the use of self-produced electricity	Invest in less energy-intensive machinery	Upgrade the plants to operate with alternative energy sources	Change electricity provider or renegotiate pre-existing contracts	Reduce profit margins	Increase selling prices
Reduce the number of hours in which the plants operate and/or the number of operating lines	-	1.4	1.1	1.5	0.6	0.9	2.1
Increase the use of self-produced electricity	0.4	-	0.5	0.9	0.6	1.0	2.4
Invest in less energy-intensive machinery	0.6	2.1	-	1.5	1.4	0.8	2.6
Upgrade the plants to operate with alternative energy sources	0.5	1.3	0.5	-	0.5	0.4	1.4
Change electricity provider or renegotiate pre-existing contracts	1.3	3.2	1.4	2.4	-	2.0	4.3
Reduce profit margins	1.7	4.5	1.7	2.8	1.4	-	6.7
Increase selling prices	2.8	4.7	2.4	3.3	1.9	3.0	-

Note: This table shows the unweighted share of firms that report to have changed their response strategies to high energy prices between the *first 9 months of 2022* and the *following 6 months*. For each period, they can choose up to two strategies. For example, 2.8% is the share of firms that report: (i) to have increased their prices in the first 9 months; (ii) and not to have opted for the same strategy in the following 6 months, but instead have reduced production.

Figure A.1: Euro Area producer price indexes, January 2020-November 2022
(PPI indexes, 2015 = 100)



Note: Indexes of Producer prices in industry for the domestic market, euro area (fixed composition); 2015=100.
Source: Eurostat

Figure A.2: Indexes of industrial production for energy- and non-energy-intensive sectors in the Euro Area, January 2020-November 2022 (index, 2015=100), Eurostat

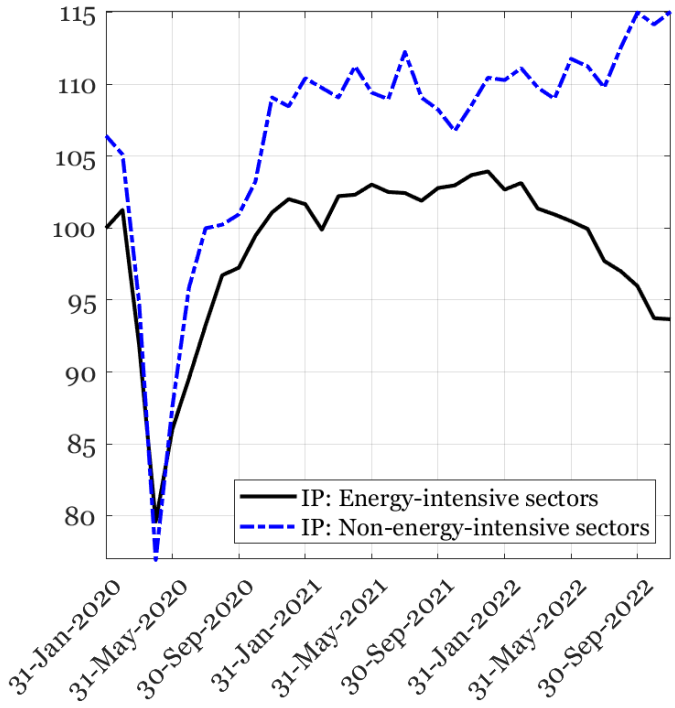
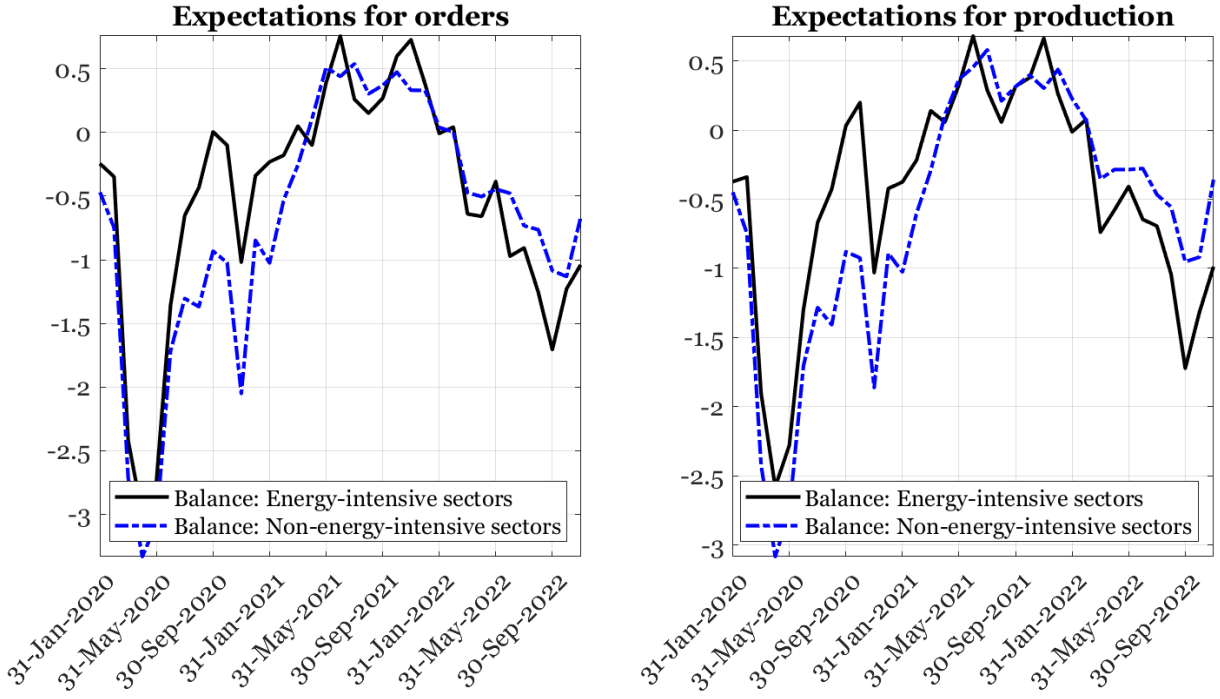


Figure A.3. Balances of orders and production expectations, January 2020-November 2022
(seasonally adjusted and standardized)



Note: The long-run variance and mean used to standardized the variables are computed from January 1986, when the series started. The balances of the business survey variables consist of the differences between the share of firms reporting positive and negative answers.

Figure A.4. Balances of orders and production assessments, January 2020-November 2022
(seasonally adjusted and standardized), Istat.

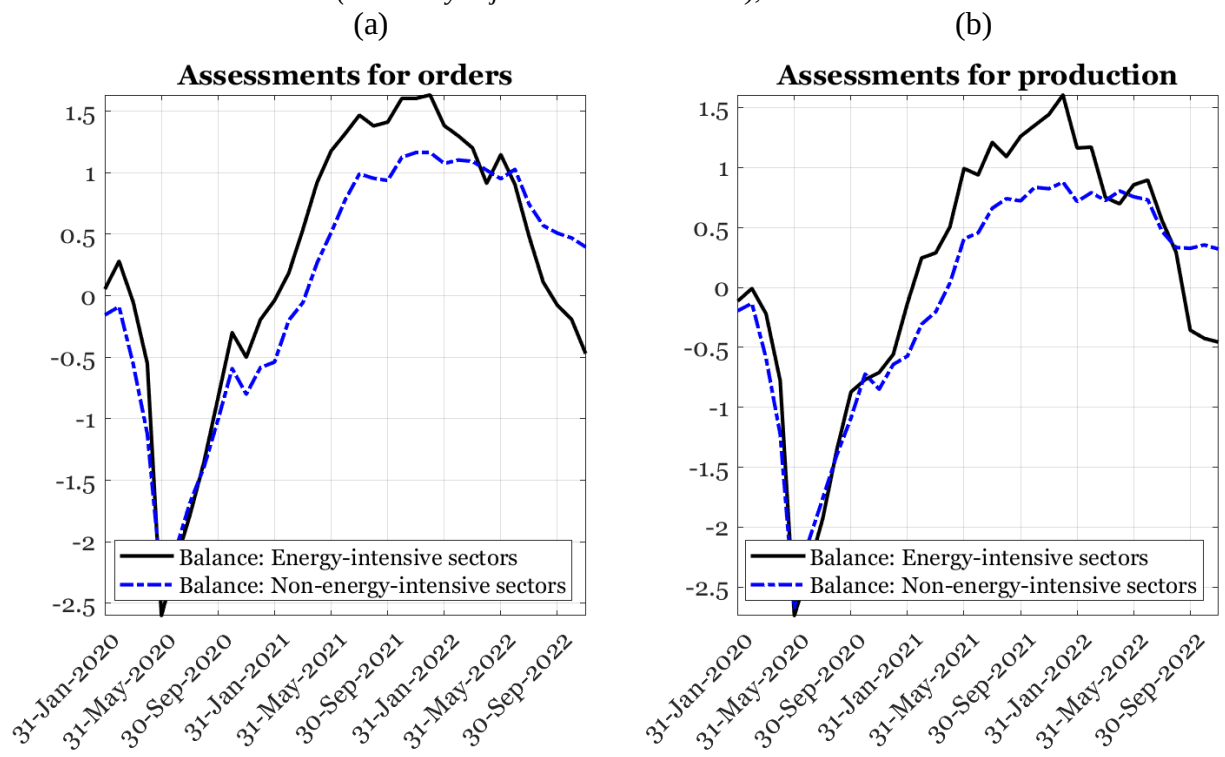
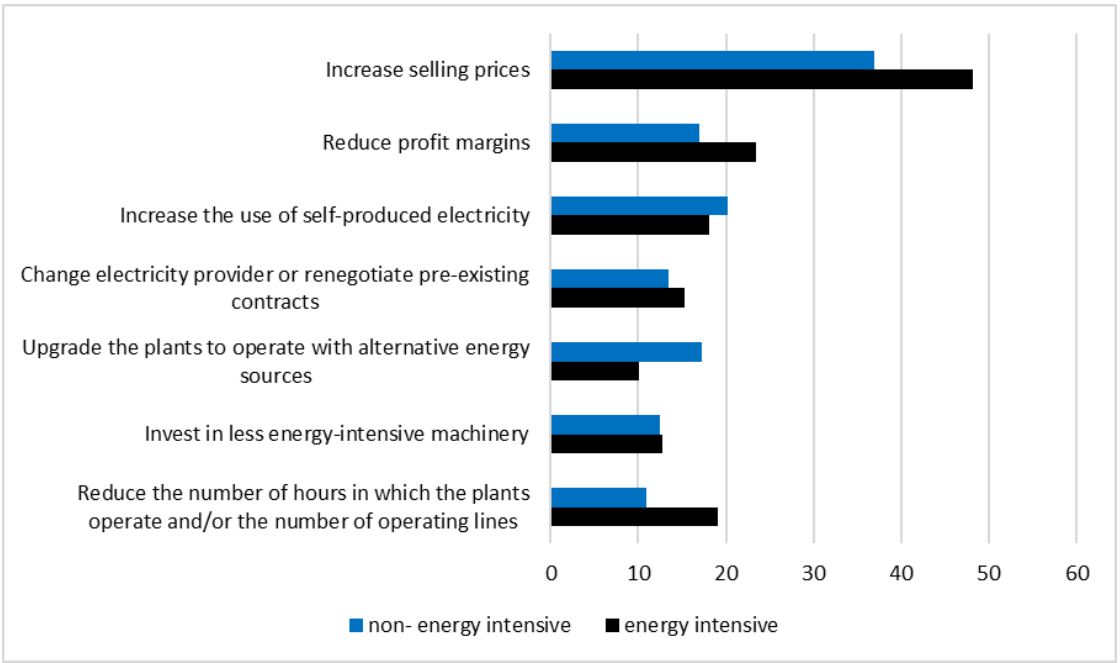


Figure A.5: Firms' strategy over the *following 6 months* to cope with the increase in gas and/or electricity prices by energy intensity.



Notes: Surveyed firms report the strategies adopted over the *following 6 months* to cope with the increase in gas and/or electricity prices. They can choose up to two strategies among: (a) reduce the number of hours in which the plants operate and/or the number of operating lines; (b) invest in less energy-intensive machinery; (c) upgrade the plants to operate with alternative energy sources; (d) change electricity provider or renegotiate pre-existing contracts; (e) increase the use of self-produced electricity; (f) reduce profit margins; (g) increase selling prices; (h) none of the above; (i) do not know, do not wish to answer. We discard the observations in (i) from the analysis. Unit of measure: percentage points.