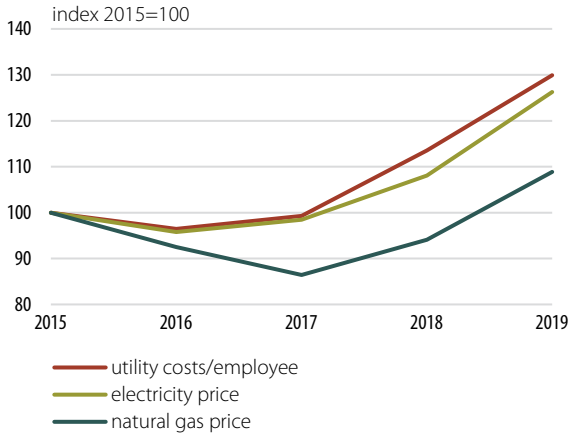
Box 3. The impact of higher utility costs on the number of employees

The substantial rise in commodity and energy prices over the recent period has contributed to disruptions in global supply chains and to the enhanced uncertainty surrounding economic developments after the pandemic. These phenomena have a potential negative effect on jobs and investment decisions, mostly in energy-intensive companies. Consequently, this box aims to estimate the impact of the higher energy/utility costs on the number of employees in non-financial corporations in Romania.

Chart A. Relative developments in utility costs/employee and in electricity and natural gas prices for average industrial/non-household consumers



Note: As far as electricity and natural gas are concerned, prices (VAT and other taxes excluded) for industrial/non-household consumers with an annual consumption between 2,000 MWh and 20,000 MWh (in the case of electricity) and between 100,000 GJ and 1,000,000 GJ (in the case of natural gas) were taken into consideration. As for utility costs/employee, companies with less than four employees were not included.

Source: Eurostat, MF, NBR calculations

The literature generally identifies a negative impact of the rise in energy prices on the number of employees[1]. Nonetheless, the results vary quite considerably across countries and estimation methods. Based on a sample of manufacturing companies in France, Marin and Vona (2021) conclude that the increases in energy prices reduce substantially energy consumption and CO2 emissions, while also slightly lowering employment (i.e. a -0.08 elasticity). Bijnens *et al.* (2021) estimate average elasticities of the number of employees to hikes in electricity prices in a range between -0.02 and -0.06, some sectors being hit harder (elasticity of up to -0.2), whereas in others headcount tends even to rise somewhat over the short term (e.g. in the manufacture of textiles or of wood). Looking at manufacturing as well, Cox *et al.* (2014) find, based on a microeconometric analysis for Germany, that higher electricity prices lead to lower employment due to output contraction. The authors estimate elasticities ranging between -0.06 and -0.69 depending on the skill levels of the labour force. Deschenes (2010) finds, for the US, a negative relation between electricity prices and employment (with elasticities from -0.10 to -0.16).

The estimates in this box are based on annual balance sheet data for the non-financial corporations with majority private capital in the economy in the 2015-2019 period, companies with less than four employees being excluded. Although data for 2020 are currently available, they may have underreporting problems[2], induced, most likely, by the outbreak of the pandemic, which leads to an overestimation of the number of companies having exited the market in the course of the year.

1 Hille and Möbius (2019) find net positive effects of a hike in energy prices on employment. Their explanation is that employment losses in less energy efficient sectors are more than offset by sectors with lower energy consumption. Another way in which higher energy prices may have positive effects on the number of employees refers to some categories of capital goods (energy-intensive machinery) that companies may replace with increased employment (Henriksson *et al.,* 2012), thus reducing energy consumption.

2 Expected to decrease once reports for 2021 are prepared, when revisions of historical data may also occur.

Table A. Average elasticity of the number of employees to increases in utility costs

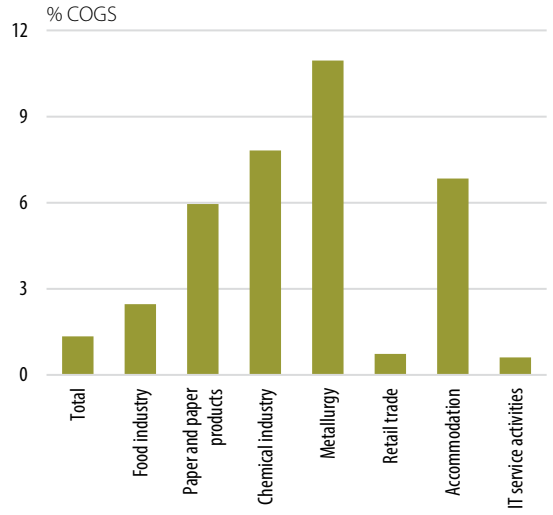
	number of employees	number of employees
utility costs/employee	-0.036***	-0.042***
age		YES
NACE sector x years	YES	YES
firm fixed effects	YES	YES

* p<0.05, ** p<0.01, *** p<0.001

Note: OLS estimates, errors robust to heteroscedasticity. The dependent variable is the number of employees of a company, the main regressor being utility costs/employee (both written in logarithmic form). Apart from firm and time fixed effects (year), the NACE sector in which the company operates (and its interaction with each year) and firm age were used as control variables. For details on the importance of firm age in explaining the dynamics and level of the number of employees, see the box entitled "Evidence on job creation and destruction in Romania" in the November 2018 *Inflation Report*. Companies with less than four employees were not included.

Source: Eurostat, MF, NBR calculations and estimates

Chart B. Share of utility costs in cost of goods sold (COGS), 2019



Source: MF, NBR calculations

In order to better capture the rise in utility costs, while eliminating, as much as possible, the volume effect of consumption (adjustments inherent to the introduction of new technologies), the sample under review includes a relatively brief period of time (five years), calculating utility costs relative to the number of employees of the firm[3]. Thus, as shown in Chart A, in the period under review, the growth rate of utility costs/employee of sample firms is similar to that of energy prices, particularly electricity prices. The dependent variable of the estimation is the number of employees and the main explanatory variable is utility costs/employee (both in logarithmic form)[4].

The estimates show the elasticity of the number of employees to an increase in utility costs to be approximately -0.04, i.e. a rise of 10 percent in the utility costs of companies over one year implies a 0.4 percent decline in the number of employees (Table A). Relative to the literature, this elasticity stands at the lower bound of the range of estimates, thus indicating a lower impact of energy/utility costs on the number of employees of firms in Romania[5]. Hence, given the sample of employees included in the estimates (around 3.1 million persons), a 10 percent increase in utility costs for non-financial corporations would lead, *ceteris paribus*, to the number of employees falling by approximately 12 thousand as compared with the situation in which these cost rises would not take place[6].

Last but not least, it should be highlighted that the actual impact of (recent and short-/medium-term) hikes in energy prices on the number of employees on aggregate hinges however on a number of factors that the estimates in this box cannot take

3 In order to scale utility costs to firm size.

4 Utilities include, apart from electricity and natural gas, water and waste disposal. Thus, unlike other papers in the literature, this box does not strictly analyse the elasticity of the number of employees to the change in the energy price. Nevertheless, as shown also in Chart A, the path of utility costs/employee for sample firms is very similar to that of electricity and natural gas prices for average industrial/non-household consumers.

5 The structural rigidities of the labour market and the capacity of some large companies to negotiate advantageous energy prices are possible explanations for the lower values, in absolute terms, of this elasticity. In addition, the papers in the literature used for comparison mostly include in their estimates companies operating in manufacturing, a relatively energy-intensive sector.

6 Assuming utility costs doubled, the impact, in the absence of other compensatory measures, would be an around 120 thousand drop in the number of employees.

into account: the institutional framework of the energy market (which influences also the contracts for energy supply to companies), the government's support measures for firms for a less sharp transition to the new prices[7], the capacity of the other sectors/companies to absorb (part of) the laid off workers and technological change, which may enable energy saving, the temporary/permanent nature of the rise in utility costs. Moreover, the period employed in the estimation might differ with respect to the pass-through of changes in energy costs from the recent and future periods (amid firms' adaptation to the new energy price regime and attempt to promote and introduce new technologies). In addition, it should be noted that utility price hikes will exert a heterogeneous sectoral effect. Chart B shows the share of utility costs in cost of goods sold (COGS) of companies operating in several economic sectors in 2019. It can be observed that metallurgy, the chemical industry and the manufacture of paper and paper products, as well as accommodation (which was significantly affected by the pandemic as well) have a (very) high share of utility costs in cost of goods sold in comparison with both the economy as a whole and sectors such as retail trade or IT service activities[8].

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7 The estimated model is static and does not take into account adjustment costs.

8 For a wider discussion of the energy intensity of economic sectors, see the box entitled "The rise in energy prices: its impact on inflation rate and economic activity" in the November 2021 *Inflation Report*.