

Direct impact of energy price increases on firm profitability and producer prices

Increasing energy prices represent one of the main drivers of the recent increase of HICP inflation to double-digit figures. In this Policy Brief we focus on the first-round effects of increased energy prices on Slovak firms. Our results based on firm level data suggest that increasing energy prices may have a significant direct impact on the profitability of many firms. Without adjusting their prices, the number of firms reporting losses could increase substantially as a result of energy price increases. Moreover, almost all firms with high energy costs would end up with a loss. Therefore, we assume firms transmit increased energy costs to producer prices. The direct effect may reach up to 8% in some sectors to compensate for higher input costs if energy prices double. As energy intensive industries are important suppliers to other domestic industries, we may also expect significant upward second-round effects on producer prices and ultimately increasing consumer prices.

The high energy intensity of Slovakia makes the economy sensitive to energy price shocks. Despite a significant decline in energy dependency over the last 15 years, most of the former new EU member states remain more energy intensive than the rest of the EU (Eurostat, 2022). This is to a large extent driven by the structure of their economies. But it holds even when comparing specific economic sectors. Firm-level data (CompNet, 2021) suggests for example that Slovakia remains in the group of most energy intensive EU countries also within the manufacturing sector. This high energy intensity is underlined, e.g., by Daudin and Faubert (2022), who find that Slovakia has the third highest elasticity of consumer prices to a shock on Russian energy prices (after Lithuania and Bulgaria).

Chart 1 Sequence of price changes the analysis is focusing on



Note: PPI – producer price inflation, CPI – consumer price inflation.

The initial impact of energy price increases on firm profits depends to a large extent on the importance of energy-related costs to firms. The higher the share of energy costs among overall costs for a firm, the higher is the potential impact of energy price increases on its profit. Higher energy prices have a downward impact on profit margins. Firms either find ways to adjust

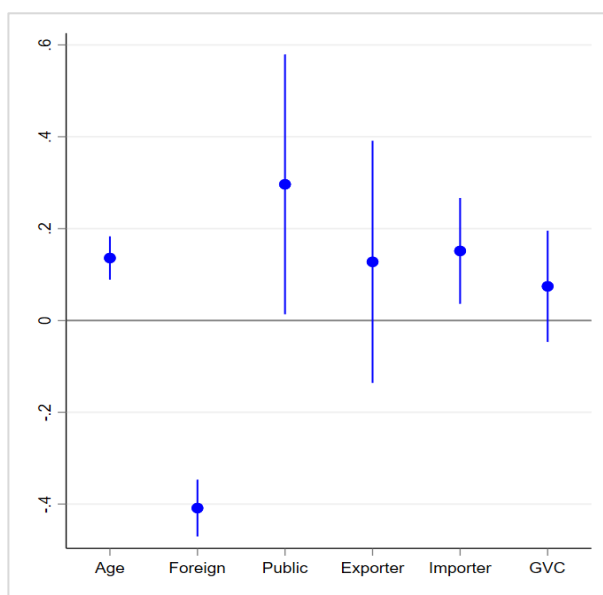
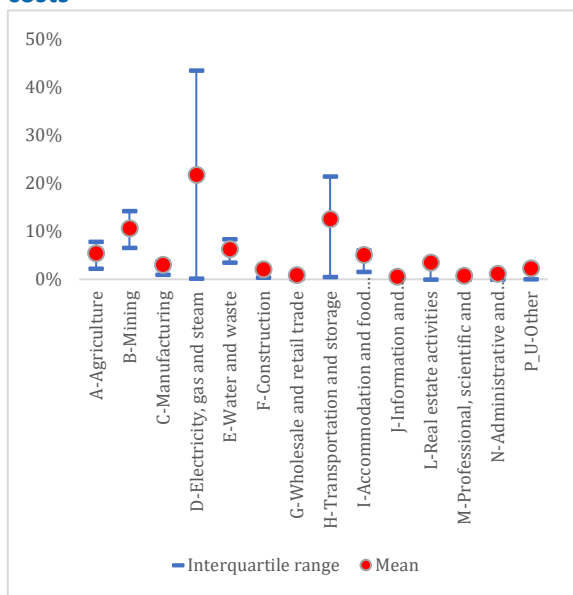
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internally, e.g. by becoming more energy-efficient or by reducing non-energy costs or they transfer a positive energy price shock into their producer prices. In this Policy Brief we are studying the first-round effects of higher oil and gas prices and their pass-through to producer prices using micro-level data on firms with 20 or more employees¹. First, we investigate energy intensity of Slovak firms. Second, we simulate increases in producer prices due to increases in energy prices. Finally, we discuss the sectoral sensitivity to second-round effects ([Chart 1](#)).

Exposure to energy price shocks varies across sectors and firms

The average share of energy costs in total firm costs varies between 0.5% and 21% across sectors, with significant differences in the (within-sector) dispersions as well ([Chart 2](#)). The highest share and dispersion are in the sector electricity, gas, steam, and air conditioning supply. When looking at double digit NACE codes, high shares can be identified in land transport and transport via pipelines, as well as in other mining and quarrying. Within manufacturing, the most energy intensive industries are manufacture of basic metals and manufacture of other non-metallic mineral products.

Chart 2 Share of energy costs on overall firm level costs **Chart 3 Effects of other firm characteristics**



Source: Authors' calculations based on firm-level data for the Statistical Office of the Slovak Republic.

Note: Based on firm-level balance sheet data on firms with 20 and more employees. Energy costs represent purchases of energy, fuels and electricity. Coefficients with confidence intervals from OLS regression with the share of energy costs on overall costs at the firm-level as a dependent variable. Sector and size class dummy variables included, but not presented.

Although, most of the firms use energy as an input for production, many firms in the most energy intensive sectors (D and H) are producers/distributors of energy (see [Chart 2](#)). In case of these firms, we may expect a full pass-through of the increased energy costs, with the pace

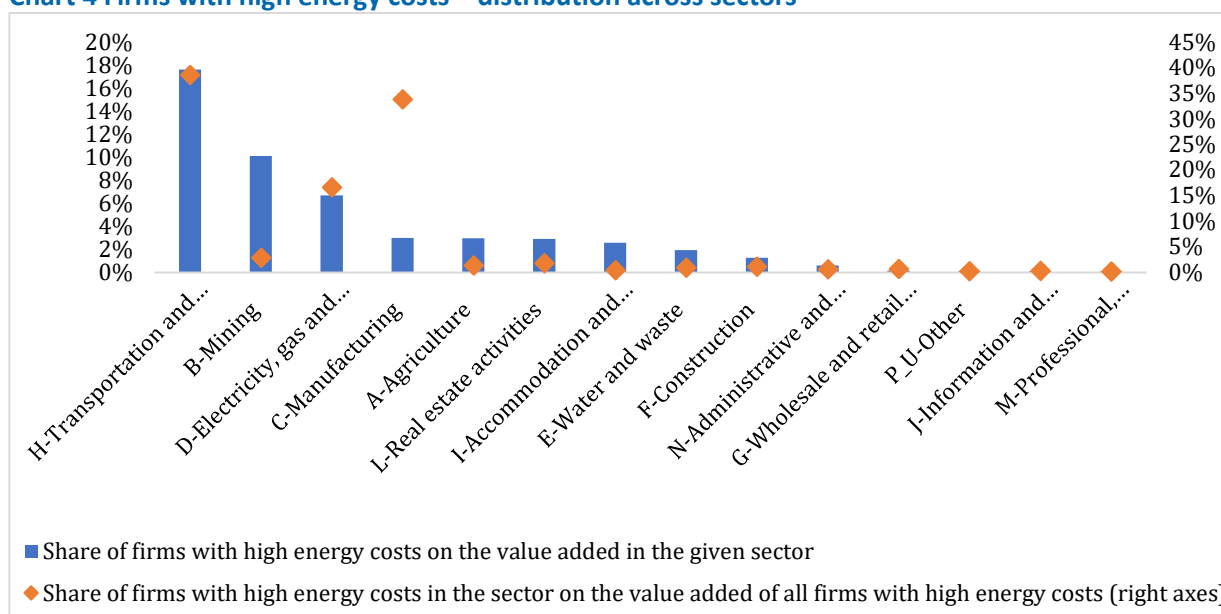
¹ These are the companies for which we have a detailed breakdown of costs. The latest data are available from 2020, i.e. energy cost increases following the Russian invasion to Ukraine are not included. As we do not have detailed information about the interlinkages on firm level, we are focusing on first round effects of energy price increases on producer prices.

of the transmission depending to a large extent on the type of the contracts with business customers.

While sectoral characteristics play a major role, firm-specific energy intensity differs also substantially with respect to other firm characteristics. After controlling for sector and size class, we observe that the share of energy costs tends to increase with firm age or public ownership (Chart 3). It is pure importers, rather than just exporting or trading (GVC) firms, that exhibit higher energy shares. At the same time, foreign firms have lower energy intensity than domestically owned firms (when controlling for other firm characteristics).²

As there are substantial differences in energy intensity across firms, it is important to assess the impact not only on the non-financial sector as a whole, but also separately on the most energy intensive firms. Narrowing down the assessment on these firms helps in better understanding where to expect the most significant first round impact and to what extent. Finding a correct threshold to define the most energy intensive firms is not straightforward. One possibility is to use the official list of energy intensive firms recognised by the Ministry of Economy³. However, this list consists only of 117 firms that are entitled to receive energy cost compensations. This relatively small number of firms creates about 7% of revenue and 5% of employment or value added.

Chart 4 Firms with high energy costs – distribution across sectors



Source: Authors' calculations based on firm-level data for the Statistical Office of the Slovak Republic.

Note: Firms with high energy costs represent firms with share of energy costs equal or higher than 15% of overall firm-level costs.

² With respect to the possible effect of increased energy costs on sales and prices, one might prefer to investigate the relationship between the share of energy costs on sales, rather than costs. However, our estimates show that there is no major quantitative difference between the two approaches. When we exclude Electricity, gas and steam and Transport and storage industries from the analysis, the effect of public ownership becomes insignificant, the effect of all other characteristics remains practically unchanged.

³ Ministry of Economy of the Slovak Republic recognises such firms each year. One criterion is the consumption of electricity in the preceding year of at least 1 GWh.

<https://www.economy.gov.sk/energetika/kompenzacia-podnikatelom/kompenzacia-podnikatelom-2021-1>

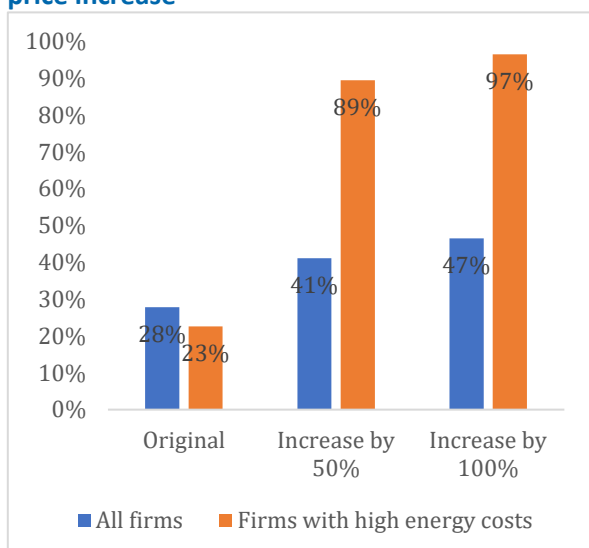
We define firms with high energy costs as firms where energy costs make up at least 15% of their overall costs. While this threshold is arbitrary, it mimics to some extent the average share of energy costs in the most energy intensive sectors. Using this threshold, the number of energy intensive firms increases to 5% of all firms. Increasing this threshold would increase their cumulative share on value added significantly.

As shown in [Chart 4](#), more than one third of these firms operate in transportation and storage and one third in the manufacturing sector. The third most important sector is electricity, gas and steam followed by the sector of mining.

Rising energy costs may lead to a significant increase in producer prices

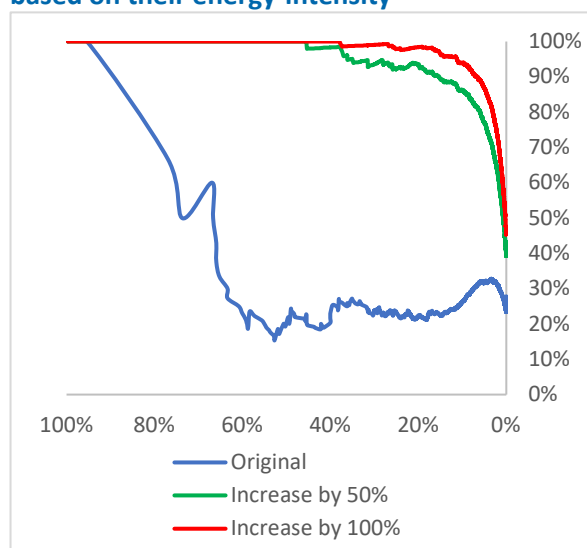
To assess the impact of rising energy costs on the profit of firms, we assume an increase of these costs by 50% or 100%, respectively. These two scenarios reflect the rise in energy prices in 2022 expected at the time of writing this Policy Brief,⁴ but further price pressures cannot be excluded.⁵

Chart 5 Share of loss-making firms based on energy price increase



Source: Authors' calculations based on firm-level data for the Statistical Office of the Slovak Republic.

Chart 6 Cumulative share of loss-making firms based on their energy-intensity



Source: Authors' calculations based on firm-level data for the Statistical Office of the Slovak Republic. Note: x-axis shows energy intensity and y-axis displays cumulative share of loss-making firms.

The assumed increases in energy prices are likely to lead to a substantial increase in the share of firms reporting losses unless firms are able to offset increasing energy costs by reducing other input costs, which is unrealistic, at least in the short run. To quantify the potential impact of increased energy prices on firms without compensatory reductions of other costs, we calculate the share of firms ending up in losses if their energy related costs increase

⁴ See Economic and Monetary Developments 2022 published by NBS (from June 21, 2022):

<https://nbs.sk/en/publications/economic-and-monetary-developments/>

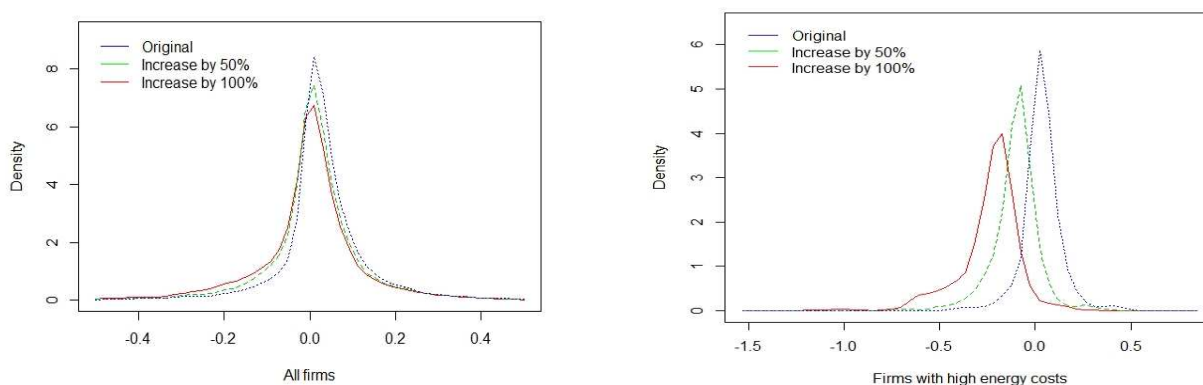
⁵ As already stated, this brief focuses on assessing the first-round impact of energy price shocks. As such, the scenarios include only an increase in energy prices and assumes all the other costs remain unchanged.

by 50% or 100%. Under the first scenario, the share of firms with no profit would increase from 28% to 41%, under the second scenario up to 47%. For firms with high energy costs, the increase in the share of loss-making firms would be more significant, almost 100% after the assumed energy price increase (Chart 5).

Our selection of the high energy cost threshold at 15% of total costs is largely validated by the cumulative share of loss-making firms based on their energy-intensity. Assuming a 100% increase in energy prices, the share of loss-making firms remains almost flat all the way to the 15% energy intensity and declines steeply afterwards (Chart 6).

The negative impact of energy price increases on firm profits is also visible in the shift of the distribution of profit to the left, mainly in the case of firms with high energy costs (Chart 7).

Chart 7 Distribution of the profit of firms under different energy price scenarios



Source: Authors' calculations based on firm-level data for the Statistical Office of the Slovak Republic.

Note: the chart shows the distribution of the profit as a share of total costs.

In order to assess the impact of the reduction of profits on producer prices, we assume that firms will use producer price increases to compensate for the increase in energy prices.⁶ For the purpose of our exercise, firms are able to increase producer prices, i.e. they are not facing perfect competition in their respective markets. To show the potential of the increased energy price effect, we abstract from the potential reduction of energy use, adjustments of other cost items or the use of financial instruments for hedging in all sectors, not only in the utilities sector.⁷ These measures are also difficult to achieve in the short run.⁸

The first-round increase of prices will reach on average 1.26% under the +50% scenario and 2.52% under the +100% scenario (Chart 8), when we assume a full pass-through of the energy price increase, i.e. firms will fully adjust producer prices to avoid any decrease in profit related to the increase in their energy costs. Under such assumptions the highest price increase

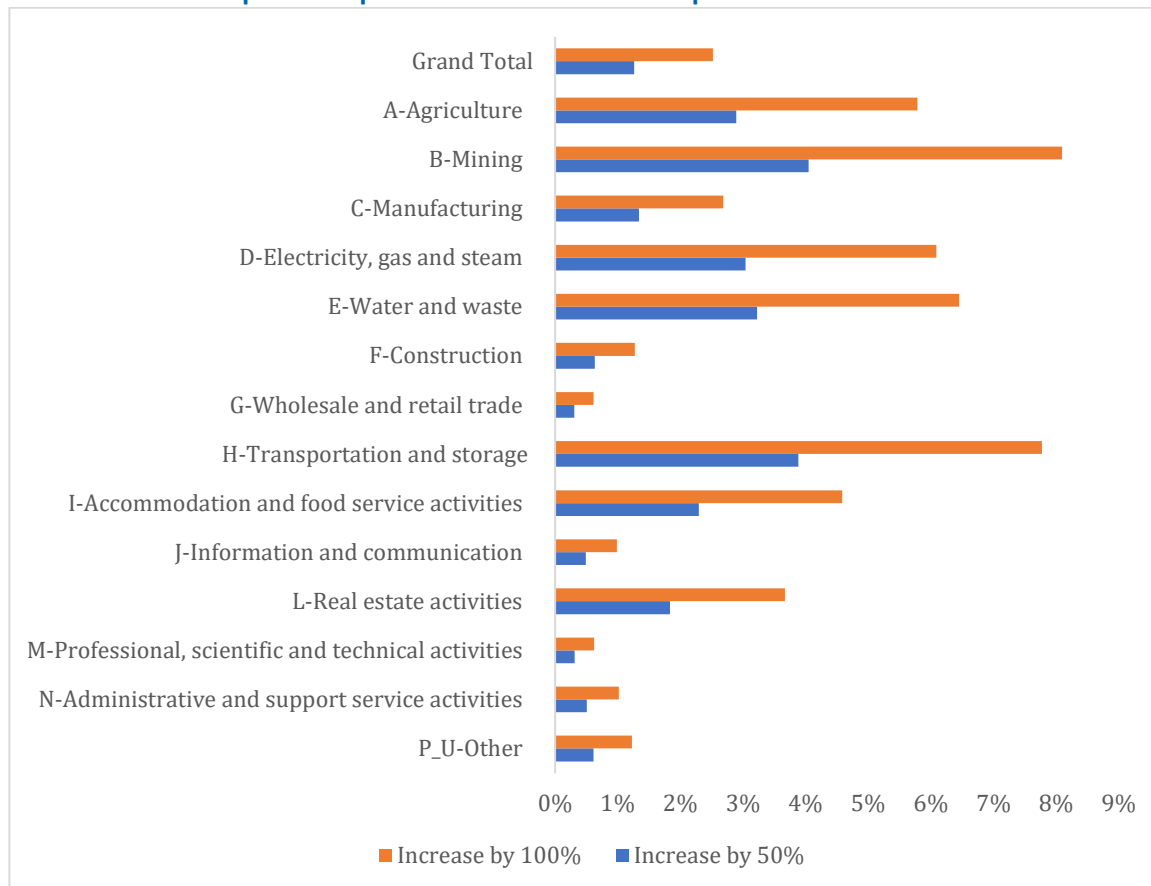
⁶ Although revenue increases do not fully reflect cost increases, and the elasticities differ across energy commodities, Ganapati et al. (2020) suggest that 70 percent of energy price-driven changes in input costs get passed through to consumers in the short to medium run.

⁷ This assumption leads to an upper bound estimation of the energy price increase on producer prices.

⁸ The capacity to absorb inflation pressures differs across sectors. On one hand, firms from the most energy intensive industries tend to have lower shares of labour costs and higher profit margins. On the other hand, several labour or material intensive industries record low profit margins and as result do have very limited space to contain future second-round energy price effects, increased material costs and rising wage pressures.

is observed in mining (8.1% under the +100% scenario); transportation and storage (7.8%); water and waste (6.5%) or electricity, gas and steam (6.1%).

Chart 8 Increase in producer prices to avoid decrease of profit



Source: Authors' calculations based on firm-level data for the Statistical Office of the Slovak Republic.

Note: Averages weighted by revenues. Calculations based on all firms reporting energy costs and non-zero revenues.

Energy intensive industries are important suppliers to other domestic industries

Increasing energy costs can also lead to significant second-round producer price effects.

Industries do not operate in isolation. Outputs from energy intensive industries represent important inputs into other industries.⁹ The most energy intensive sectors¹⁰ are mining; electricity, gas and steam; sewerage and waste collection; and land and pipeline transport. Although slightly more than 50% of their output serves foreign markets, a significant share ends up as input to other domestic industries.¹¹

Industries with higher share of input from these sectors are shown on the lower right side of [Chart 9](#). The chart shows that a major share of the first-round energy price shock discussed

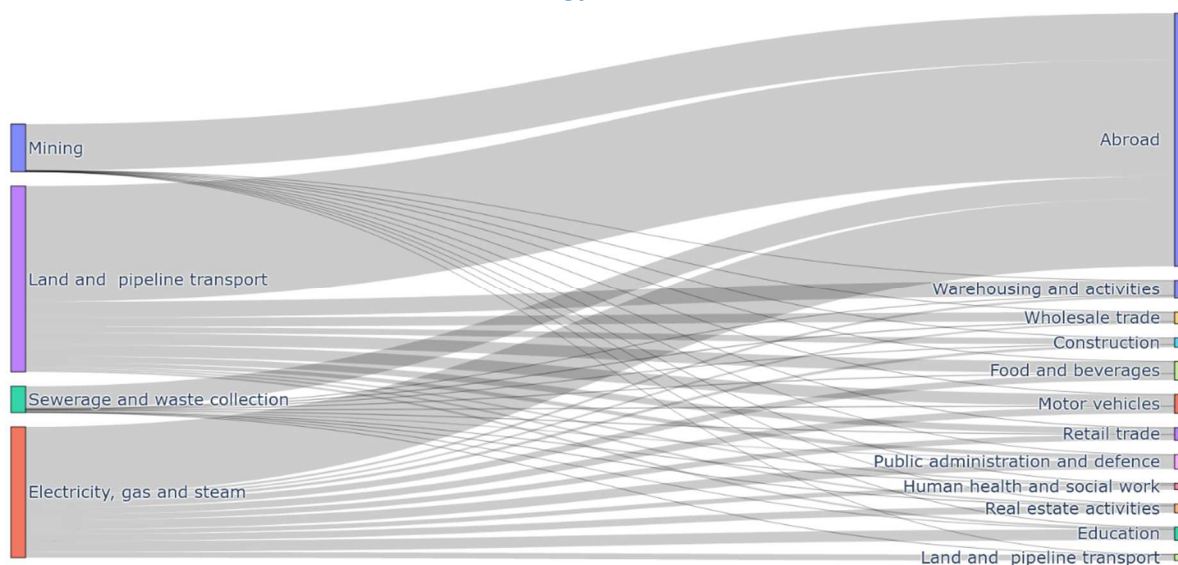
⁹ Direct flows to households are not available. On the other hand, energy prices for households and small enterprises are regulated and set by the Regulatory Office for Network industries and therefore they are out of scope of this analysis.

¹⁰ Based on TiVA database using double digit NACE codes.

¹¹ We are thankful to Juraj Zeman (NBS) for providing us information on sectoral interconnectedness based on the most recent data from TiVA database and to Miroslava Ivančová for her technical assistance.

above is likely to be relatively quickly transmitted to domestic manufacturing or service industries.

Chart 9 Value added flows from domestic energy intensive industries to other domestic industries



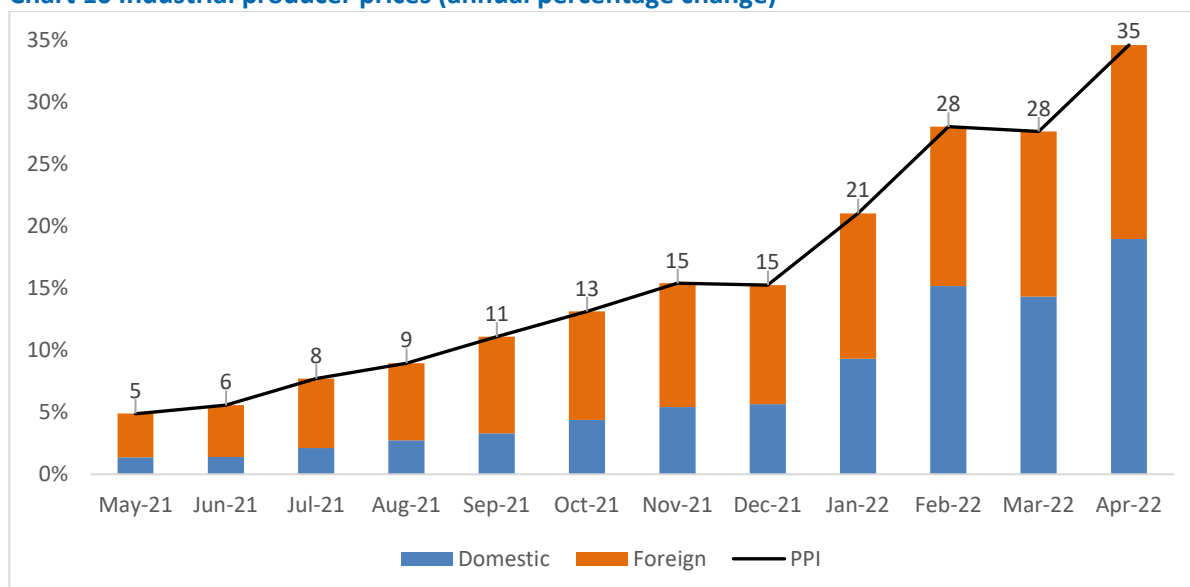
Source: Authors' calculations based on TiVA database.

Note: Flows from the selected most energy intensive industries (Electricity, gas, steam and air conditioning supply; Land transport and transport via pipelines; Mining and quarrying; Sewerage, Waste collection, treatment and disposal activities; materials recovery, Remediation activities and other waste management services;) to industries representing recipients with highest shares. Direct flows to households are not available.

Overall increase in producer prices reaches much higher level

The direct impact of energy price increases on domestic firms is only part of the overall price pressure, largely supplemented by other factors. Supply chain disruptions that drove up commodity and input prices in 2021, continued to fuel producer prices in 2022.

Chart 10 Industrial producer prices (annual percentage change)



Source: Authors' calculations based on data from the Statistical office of the Slovak Republic.

The additional shock associated with the Russian invasion to Ukraine (in February 2022), that increased uncertainty in the availability of basic commodities and materials, pushed wholesale prices of gas, electricity and other commodities to extremely high values in historical terms (Chart 10). As a result, originally dominant contribution of producer prices for foreign markets to overall producer price index in Slovakia was outperformed by the industrial producer price component for domestic markets.

This suggests that the direct impact of energy price increases derived from the balance sheet information explains only part of the overall developments in producer prices. Actual and perceived future material (and labour) costs pressures probably played the decisive role, here.

The very high trade openness of the Slovak economy is therefore one of the underlying factors why energy price shocks to domestic production prices have only a limited impact on overall domestic consumer prices. Based on WIOD data, majority of value added originates abroad.¹² At the same, even energy consumer industries with the highest relative inflows of value added from domestic energy producer or distributor industries source between 35% and 62% from abroad.¹³

Further consumer price increases related to the energy prices and material inputs are hard to be grasped. Literature frequently finds unidirectional causality between producer and consumer prices. Similarly, it is difficult to find consistent estimates of the pass-through from commodity price changes to producer prices. Following a recent contribution by Jiménez-Rodríguez and Morales-Zumaquero (2022), we may assume a partial pass-through from commodity prices to producer prices and also to consumer prices (for advanced countries). For energy prices, the authors find that a 1% shock has 0.03% contemporaneous impact on producer prices, and it increases to about 0.1% in mid-run (i.e., after 1 year) in advanced countries.¹⁴

Conclusion

The Slovak economy is a relatively energy intensive economy compared to other EU economies. It is therefore important to understand the possible impact of increasing energy prices. In this brief, we shed light on the first-round effects of increasing energy prices on the economy using firm level data, more precisely by investigating the impact on profit margins. We also analyse the impact on firms with high energy costs, defined as firms reporting the share of energy costs on total costs equal or more than 15%. We analyse two scenarios, the first assuming an increase of energy prices by 50%, the second assuming an increase by 100%.

Our results suggest that increasing energy prices can have a significant impact on the profitability of firms. Without any offsetting measures, the number of firms reporting losses can increase substantially as a result of energy price increases, even close to 100% in case of firms

¹² It is 63% if we exclude domestic within-sector flows (32%, when domestic within-sector flows are included).

¹³ By energy consumer industries we mean Warehousing and activities, Water transport, Manufacturing of paper and products, Air transport, Mining and Manufacturing of basic metals or other non-metallic products. By domestic energy producer or distributor industries we mean Electricity, gas and steam industry and Land and pipeline transport.

¹⁴ For consumer prices, the contemporaneous impact is 0.01% and increases to 0.04% in 12 months.

with high energy costs. Therefore, we assume a rise in producer prices. First-round effects are likely to be very heterogenous, but in some sectors they can reach up to 8% in order to compensate the higher costs associated with the assumed doubling of energy prices. In addition, given that energy intensive industries are important suppliers to other domestic industries, these first-round effects can lead to significant second-round effects as well. However, the energy price channel can explain only part of the current overall price developments.

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