

# IMPACT OF RISING ENERGY PRICES ON HOUSEHOLD INCOME AND ENERGY CONSUMPTION: ANALYSIS OF EFFICIENT RELIEF MEASURES FOR THE CASE OF GERMANY

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## Overview

Energy prices have risen significantly in recent months. Most recently, the war in Ukraine caused a further increase in the already very high energy prices. Private households are directly affected by the energy price increases. Whereas households in Germany spent an average of around 7.0% of their income on energy (including car fuel) before the Corona crisis, this figure has now risen to 9.4%. Although the rise in energy prices significantly reduces the purchasing power of all private consumers, individual households are likely to be affected to different degrees.

In our study, we examine the expected income and consumption effects for private households as a result of the price increases for the respective energy carriers electricity, natural gas, heating oil, gasoline, and diesel. We examine these effects separately by income group and assess the overall impact on income distribution in Germany. Further, we analyze a variety of regulatory relief measures in terms of their efficiency in mitigating the financial stress on those households most affected while at the same time maintaining saving effects in energy consumption.

## Methods

For our analyses, we use economic models and simulations based on the representative microdata of the currently most recent data sample of the income and consumption sample (ICS) of the Federal Statistical Office in Germany (FDZ, 2018). The ICS covers about 0.2% of all households in Germany (about 60,000 households). The reaction of households to energy price increases is modeled using short-term consumer price elasticities of energy demand and simulated based on the ICS microdata (Bach et al., 2019).

We analyze three types of household relief measures that can help to reduce the financial burden on households due to the increasing energy prices: (1) Targeted government payments to households that are particularly affected, (2) flat-rate government payments that are paid out equally to all households, (3) price discounts (e.g. through tax reduction) that reduce the retail price per unit consumed.

## Results

Across all income classes, households are experiencing a significant increase in the financial burden caused by higher energy prices (cf. Figure 1).

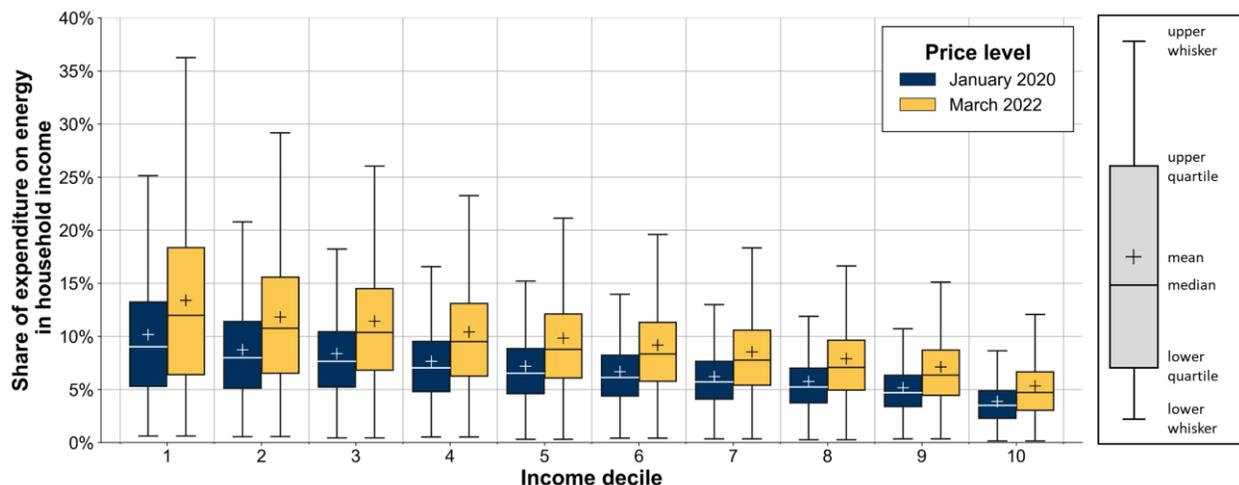


Figure 1: Share of income spent by private households on energy (household and heating electricity, natural gas, heating oil, gasoline, and diesel), broken down by income decile (income decile 1: low incomes; income decile 10: high incomes).

However, low-income households are affected most relative to their income. Since January 2020, they spend on average an additional 3.2 percent of their income to pay their energy bills, compared with an additional 1.3 percent for high-income households. The results of our simulations show a slight increase in the Gini coefficient and thus in income inequality as a result of increased energy prices. According to our research results, around 600,000 additional households in Germany slip below the at-risk-of-poverty threshold as a result of the significant rise in energy prices alone.

A breakdown of the additional costs shows that for lower-income households higher natural gas prices are the main reason for the overall increase in energy expenditure. In contrast, the increase in gasoline and diesel prices tends to be more significant for higher incomes. The additional expenditure of private households per year increases in the analyzed period by 492 €/a for households in the first (lowest) income decile and by 1,419 €/a for households in the tenth (highest) income decile. Between the households in these two extreme income deciles, there is thus a factor of 2.9 for additional energy expenditures while there is a factor of 8.2 between their average disposable incomes.

In the first (lowest) income decile, additional expenditures for natural gas dominate total additional energy expenditures with a share of 42%. This share decreases with increasing household income to finally 31% in the tenth (highest) income decile. The share of additional expenditures for gasoline and diesel in total additional energy expenditures is distributed in the opposite way between the income deciles. Whereas in the first (lowest) income decile 24% is attributable to energy for car fuel, this share increases with disposable household income. In the tenth (highest) income decile, this share is 43%.

In terms of their distributional impact, we see price discounts and tax relief as the most inefficient measures if the goal is to relieve those households that are particularly affected by energy price increases. While price discounts and tax relief provide relief to all households, they increase social inequality, as they have a greater impact on households that consume more energy (which, according to our analysis, is the case for higher-income households). In addition, price discounts are most likely cushioning energy savings as lower prices will stimulate consumption. Accordingly, even flat-rate government payments are preferable to price discounts and tax reliefs. Flat-rate government payments, when related to household income, have a stronger effect the lower the income. The most efficient measures with regard to the use of funds for relieving the burden on households at risk of poverty are targeted government payments. However, it is important that these are paid out as soon as possible, as energy suppliers have already drastically adjusted their prices.

## Conclusions

The rise in energy prices is placing a considerable burden on private households. However, the results of our studies show that households are affected to different extents depending on the energy source and income situation. Furthermore, our results show that higher energy prices are already leading to a measurable reduction in private energy consumption.

The discussion on suitable energy policy measures should take into account the distributional impact and the effects on energy demand. In particular, price and tax reductions should take into account the fact that they lead to a certain increase in energy consumption and thus also in import dependency. Furthermore, our results indicate that relief on petroleum products such as gasoline or diesel would tend to relieve high-income households. Lower-income households would be more likely to benefit from a reduction in expenditures on natural gas.

## References

- Bach, S., Isaak, N., Kemfert, C., Kunert, U., Schill, W.-P., Schmalz, S., Wagner, N., & Zaklan, A. (2019). CO<sub>2</sub> pricing in the heat and transport sector: Discussion of effects and alternative relief options (CO<sub>2</sub>-Bepreisung im Warme- und Verkehrssektor: Diskussion von Wirkungen und alternativen Entlastungsoptionen). DIW Berlin: Politikberatung kompakt.
- Destatis. (2019). Mileage and fuel consumption of private households with passenger cars (Fahrleistungen und Kraftstoffverbrauch der privaten Haushalte mit Personenkraftwagen). Statistisches Bundesamt. <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Umwelt/Materialfluesse-Energiefluesse/Tabellen/fahrleistungen-haushalte.html>
- FDZ. (2018). Income and Consumption Sample 2018—Basic File 3 (AAGSHB), SUF, Version 1 (Einkommens- und Verbrauchsstichprobe 2018—Grundfile 3 (AAGSHB), SUF, Version 1) [Data set]. Forschungsdatenzentren Der Statistischen amter Des Bundes Und Der Lander. <https://doi.org/10.21242/63211.2018.00.04.3.1.1>
- OECD. (2013). Framework for integrated analysis (S. 171–192). OECD Publishing. <https://doi.org/10.1787/9789264194830-en>