Effects of the energy price crisis on households in Germany
Socio-political challenges and policy options

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Summary

Rapidly rising energy prices pose enormous challenges for households, the economy, and politics in the European Union and Germany. Even if the overall economic costs of rising energy prices turn out to be moderate, households between and within income groups are affected very differently. We qualitatively and quantitatively analyze various options for cushioning the direct burden on households particularly affected by the rise in energy prices. Only the direct and short-term effects of increased energy prices are considered here. The indirect effects, such as higher costs for final and intermediate goods or medium-term adjustment reactions of households, are not considered.

The initial situation shows that the rise in prices for oil on the one hand and natural gas, and electricity on the other are to be assessed differently: Even in the event of a Russian supply freeze, the size and adaptability of the global oil market makes it unlikely that extreme price increases will occur on the world markets. For this reason, the rise in prices for petroleum products needs monitoring for the time being. In the case of gas, electricity, and district heating, substantial price increases for households (several times higher than the previous year’s prices) must be expected very soon, especially if supply contracts and thus also tariff commitments for household customers expire. Social compensation measures should, therefore, primarily target the electricity and heating sectors.

Rising prices are essential in response to a tightening energy supply to quickly stimulate adjustments in both supply and demand. The price response is necessary to exhaust all available short-term options to expand supply and, importantly, to bring demand in line with reduced supply. If private households are kept out of this adjustment process by fixing or capping prices, the adjustment effort has to be fully provided by firms, which would also lead to high economic and social costs (production losses or even plant closures). Moreover, the risk of a market collapse increases if private households do not reduce their gas consumption accordingly in the event of shortages. In such a case, rationing of natural gas (e.g., curtailment during certain time windows) would be the result - which would bring its own political and economic challenges and dislocations, as fair gas allocation is hardly possible, not least due to technical limitations. Market adjustment via the price mechanism, on the other hand, is likely to involve substantial price increases. Therefore, effective social compensation mechanisms are necessary.

In the event of supply shortages or a complete supply freeze as a result of an import or supply embargo, price increases for gas of 70-275% compared with the historical average are plausible, depending on the shortfall volume; for other energy sources, the increase is likely to be less pronounced. Depending on the price scenario, the additional energy expenditure of an average private household could amount to €800-2500/year. For low-income households, the additional costs thus represent 3.5-11% of their consumption expenditure on average. Their real disposable income thus falls much more sharply than that of richer households. In the highest income decile, the average additional burden amounts to only 2-6% of private consumption expenditure, depending on the price scenario. In addition, rapidly rising prices often cause hardship for households with high energy consumption for various reasons, e.g., because they live in poorly insulated apartments or commute long distances.

Within the framework of the existing social systems and the measures in the current tax system that can be implemented immediately, a "basic package" in the form of an immediate action program can provide considerable relief in the first place. This package would include the takeover of the additional energy costs of social welfare recipients, an increase of the flat rate for heating costs of housing allowance and study grant (BAföG) recipients, a reduction in the electricity tax, the abolition of the renewable energy feed-in-tariff (EEG levy), and an increase in the commuting allowance or, even better, its conversion into an income-independent mobility allowance. Direct subsidies for petroleum products and gas should not be introduced. In the event of short-term supply bottlenecks, subsidies do not provide any relief for private households and ultimately end up with the suppliers.

However, such a basic package is not sufficient - a broad compensation mechanism must supplement it. The basic package does not reach all households in the lowest income decile and can mitigate only about two-thirds of the additional burden overall, and only a quarter in the middle-income segments. To guarantee social compensation, the package must be adjusted to include another relief measure that
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A targeted energy allowance can most effectively avoid social hardship among the general population, but especially among low- and middle-income households. Social hardship is defined here as an energy cost increase of more than 5% of a household’s total consumption expenditure. Helicopter money, on the other hand, is less targeted than the targeted energy allowance, so that hardship cases can be supported less precisely. Raising the tax allowance leaves more hardship cases than paying energy allowance or helicopter money, as it only benefits taxpayers. Moreover, it is primarily the middle class that benefits most from this measure; low-income households receive little relief due to no or low tax payments. For both the helicopter money and the targeted energy allowance, a new disbursement channel would have to be created promptly. Preparations for such a broad and effective disbursement mechanism would have to begin immediately so that the state can act quickly in the event of an embargo.

The fiscal costs of the compensatory measures analyzed here would have to be refinanced by (future) taxes, which would primarily burden high-income households. Depending on the energy price scenario, they range from €30 billion (medium price increase) to €77 billion (extreme price increase). Depending on the price increase, the compensation measures cover 75-88% of the total additional burden. Costs could be saved, if the targeted energy allowance or helicopter money were only granted up to a certain income limit.

In addition to social compensation measures, enhanced communication is essential. In the case of electricity and heating, households must be informed promptly about their consumption and the associated costs and made aware of opportunities to save energy and the associated financial gains. This is all the more important as price increases often only take effect with a future change in contract and are not yet immediately visible to households.

A policy aimed at relieving the burden must therefore rest on two pillars from the outset: a) enabling and activating savings potential and b) targeted relief for particularly affected households. This combination is the only way to deal with the current energy price crisis in a socially just and effective manner. Because effective relief can only be achieved with a new transfer system (energy allowance or helicopter money), considerable efforts must be made immediately to design and implement it quickly.
1 Introduction

Sharply rising energy prices pose enormous challenges for households, the economy, and politics in the European Union and Germany. There is high uncertainty about the course of the war that Russia has been waging against Ukraine since February 24. As a result, the impact on European energy markets, industries, and households also remains uncertain. Germany and the EU must also brace themselves against the effects of a possible import embargo on oil, coal, and natural gas or a Russian supply freeze.

In this analysis, we examine the potential impact of rising energy prices on households in Germany and measures to mitigate this impact. Against the backdrop of current price developments on wholesale markets and for consumers, we consider price scenarios for gas, electricity, and oil (transport fuels and heating oil) for the coming twelve months, i.e., April 2022 to March 2023. We calculate the additional costs arising from rising energy prices for households with different incomes. In addition, we discuss options for social policy cushioning of particularly vulnerable groups (i.e., low-income groups particularly affected by energy price increases) based on four basic types of measures (1) compensation within the framework of the existing welfare system, (2) adjustments in the tax system, (3) creation of new transfers, and (4) market intervention and price regulation.

We quantify the distributional and fiscal effects of a basic package (as an immediate program), and three additional choices of measures aimed at providing relief to broad populations: (A) raising the tax allowance, (B) creating a new targeted energy allowance (which partially offsets additional costs due to price increases based on previous year’s consumption), or (C) helicopter money or equal per capita payment to all households.

2 Current and future development of energy prices

Wholesale energy prices have risen very sharply. Figure 1 shows the historical development of wholesale prices for oil, coal, natural gas, and electricity. All prices have risen recently, reaching historic highs in some cases. Table 1 compares the average of March 1-13, 2022 prices to the 2017-2021 average. The price increases for gas (by more than 600%) and electricity (more than 500%) stand out. Compared to the low price level a year ago, the price increases are even stronger.
Figure 1: Trends of purchasing power-adjusted wholesale prices in eurocents through March 13, 2022 for crude oil (Brent), coal (Australia/New Castle), natural gas (Dutch/TTF), and electricity (Phelix baseload spot). Sources: Worldbank PINK Sheet, BMWI (2021), tradingeconomics.com, Bundesbank.

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<th>Crude oil (ct/l)</th>
<th>Coal (ct/kWh)</th>
<th>Natural gas (ct/kWh)</th>
<th>Electricity (ct/kWh)</th>
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<td>Level 1-13 March 2022</td>
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<td>4.3</td>
<td>17.0</td>
<td>29.6</td>
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<td>1.0</td>
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<tr>
<td>Increase March 2022 in %</td>
<td>150</td>
<td>480</td>
<td>1085</td>
<td>618</td>
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</tbody>
</table>

Table 1: Level and increase in wholesale energy prices in eurocents, adjusted for purchasing power in 2021 prices. Sources: see Figure 1.

Consumer prices of petroleum products, adjusted for purchasing power, have not risen extremely historically. Consumer prices for gasoline, diesel, or heating oil are very closely linked to the international oil market, so price rises have a rapid and direct impact on consumer prices. Despite record nominal prices, however, purchasing power-adjusted fuel prices at the beginning of March 2022 have so far only slightly exceeded the high price level of 2012 (see Figure 2). The current price increases are particularly noticeable, however, because they follow an exceptionally low price level in 2020 (caused by the Corona pandemic) at a short distance in time.
The relative increase in consumer prices for households is lower than the increase in wholesale prices due to fixed government levies and taxes as well as distribution costs. Table 2 shows the increases in household energy prices. Here, too, all prices have risen significantly, especially for heating oil and natural gas. The rise in gas and electricity prices is muted compared with wholesale prices: firstly, wholesale prices, along with fixed taxes, levies, and distribution costs, account for only part of total consumer prices; secondly, energy suppliers have concluded long-term supply contracts, and due to the tariff lock-in, gas prices for residential customers adjust only with a time lag. Nevertheless, significant increases for new contracts compared with existing customers are already visible on consumer portals in March 2022.

<table>
<thead>
<tr>
<th></th>
<th>Super (ct/l)</th>
<th>Diesel (ct/l)</th>
<th>Heating oil (ct/l)</th>
<th>Natural gas (ct/kWh)</th>
<th>Electricity (ct/kWh)</th>
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<td>203.7</td>
<td>165.1</td>
<td>12.7*</td>
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<td>Increase March 2022 in %</td>
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<td>55</td>
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<td></td>
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<tr>
<td>Comparison period: 06/2020 - 05/2021</td>
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<td>121.2</td>
<td>53.9</td>
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<td>33.0</td>
</tr>
<tr>
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<td>82.5</td>
<td>111.2</td>
<td>5.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Increase March 2022 in %</td>
<td>42</td>
<td>68</td>
<td>206</td>
<td>80</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2: Level and increase in energy prices in eurocents for private households. *Natural gas/electricity price 2022: Data refers to prices offered for new contracts in March 2022, not to price for existing customers. Sources: BMWI (2021), ADAC, BDEW, www.esyoil.com (heating oil), verivox (natural gas/electricity in March 2022).

Reliable forecasts of future price developments are hardly possible at present. However, plausibility considerations can help to at least estimate the order of magnitude of possible price developments in the
For natural gas, a large import gap is expected in the event of a loss of supplies from Russia - due to a German import embargo or a Russian supply freeze. A significant reduction in supplies of Russian gas would likely lead to drastic price increases over the next twelve months. This is due to the high market share (40% of gas imports in the EU and 55% in Germany) and, in contrast, the limited capacity to substitute with international supplies via liquefied natural gas (LNG) terminals and to distribute the gas within Europe. Aurora (2022) estimates the volume of a complete Russian supply shortfall for this period at 38% of total EU imports (109 billion cubic meters).

Additional imports from Norway, North Africa, and the UK, more EU production in the province of Groningen, and reserves from gas storage facilities could reduce this import gap from 38 to 11% for the next twelve months. Bruegel (2022) estimates the gap of a Russian supply shortfall at 10-15% of total annual demand. This gap would have to be saved. In principle, the substitution of gas by other energy sources (e.g., coal, nuclear, biomass) would be possible in electricity production, as well as a reduction in demand in the building sector (residential, commercial, industrial) and in industrial production. In the milder case that the pipeline crossing Ukraine fails, and Russian gas still flows through the North Stream 1 pipeline, Aurora (2022) expects that the resulting shortfall can be fully compensated by alternative imports and additional production in the EU.

If supply is physically constrained (in the short term) by the limited availability of LNG and by limited transmission capacity, substantial price increases must achieve a corresponding reduction in demand. This also creates scarcity rents for LNG and transmission providers (Figure 3). Short-term scarcity rents provide strong incentives to expand capacity, but this is likely to be effective mainly in the medium term.

Only drastic price increases will bring about the necessary behavioral adjustments that can close the import gap in the short term. First, on the supply side, the high cost of diverting LNG to Europe increases prices significantly. On the demand side, it is difficult to estimate at what prices EU-wide gas demand will fall by 10-15%, but the necessary price increases could be very large in some areas or countries. In an empirical study, Aufhammer & Rubin (2018) estimate the short-term price elasticity of gas demand for U.S. households to be minus 0.2 when prices fluctuate in line with market conditions. Similarly, when prices...
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increase dramatically, as in Ukraine, where gas prices for households increased sevenfold in a few years by 2015, the price elasticity of short-term behavioral changes was found to be minus 0.16 (Alberini et al. 2019).

This means that a drop in consumption of 10-15% requires, as a first approximation, 50–100% higher prices - this corresponds to a tariff increase for household customers of 3.8–7.6 ct/kWh compared to the level in 2017–2021. This price increase also appears necessary to ensure that sufficient supplies of liquefied natural gas are diverted to Europe on the global market (Gros 2022). If the supply shock turns out to be even larger (due to lower substitution possibilities in the short term), correspondingly stronger price increases must be assumed. However, there are also more optimistic estimates that take into account higher substitution possibilities in the industry (Bachmann et al. 2022). These are based on aggregate macroeconomic estimates that forecast better management of supply bottlenecks.

A liquid world market is available for substituting crude oil imports, which should limit price increases. Russia has a global share of oil production of 12% (BP 2021). On the other hand, since it accounts for 4% of consumption (US EIA 2021), an embargo would result in a global shortage of no more than 8%, probably less because some countries would continue to purchase oil from Russia. As other countries are likely to increase output due to rising prices and possibly political agreements, Russian oil should be relatively easy to replace overall - despite individual challenges, such as conversion in refineries geared to Russian oil. At the same time, losses in economic activity caused by the Ukraine war should reduce global oil demand.

Thus, significantly lower price increases can be expected than for gas: Assuming a short-term price elasticity of demand of minus 0.1 (Baumeister and Peersman, 2013, Caldara et al. 2016), a global shortage of 8% would cause price increases of around 80% in the wholesale market. This would correspond to a 25 eurocents per liter (ct/l) increase in crude oil prices compared to 2017–2021 levels, which would likely be reflected in a 30–35 ct/l increase in fuel prices (incl. VAT). At a price elasticity of minus 0.2, the wholesale price increase would be only 40%, or about 13 ct/l compared to pre-crisis levels. We therefore consider increases in petroleum products of 20–40 ct/l (incl. VAT) in our price scenarios, even if current increases are higher due to short-term fluctuations and supply chain conversion.

Electricity prices are likely to remain at a high level in the long term. In electricity production, natural gas, which is expected to be significantly more expensive, can be partly substituted in the coming twelve months by increased use of coal-fired power plants and possibly to a lesser extent nuclear power plants. On the one hand, Germany has domestic CO₂-intensive lignite available for this purpose. On the other hand, even in the event of a halt to Russian hard coal imports (45 % import share in Germany, BMWI 2021), substitution options should be available relatively quickly through deliveries via the liquid world market, so that price increases should be limited.¹ By contrast, the use of gas to cover peak loads will not be completely avoidable; peak load electricity prices will thus continue to be determined by gas prices to a certain extent in the future. Accordingly, higher electricity prices must be expected for the coming twelve months. These will gradually be reflected in price increases for existing customers as well.

District heating. In 2021, around 46% natural gas was used as an energy source for the production of district heating, while the remaining share was accounted for by the use of coal, waste, waste heat and renewable energy sources (BDEW 2022). Therefore, with rising gas prices, significant price increases can also be expected for district heating. Since 73% of district heating is produced as a by-product of electricity generation (co-generation), the cost increases are shared between electricity users and heat users. The increase in the price of district heating is therefore likely to be lower than the direct gas price increases.

Scenarios for price development. Against the background of these considerations and as a starting point for the following assessment of distributional effects, Table 3 shows the assumptions for average energy prices for households in the coming twelve months (all values incl. VAT). These are not to be understood

¹ See also https://www.kohlenimporteure.de/home.html?s=09.
as forecasts, but as scenarios which help to examine possible developments here. This study makes no statements about the likelihood of any of these scenarios occurring. It is solely a matter of exploring possible distributional effects of rising energy prices, particularly in the event of an import embargo or supply freeze of Russian oil and gas.² We assume a full cost pass-through of utilities to all households.

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<tr>
<td>Medium</td>
<td>20 [15 %]</td>
<td>20 [32 %]</td>
<td>5 [69 %]</td>
<td>4 [14 %]</td>
</tr>
<tr>
<td>High</td>
<td>20 [15 %]</td>
<td>20 [32 %]</td>
<td>10 [138 %]</td>
<td>6 [21 %]</td>
</tr>
<tr>
<td>Extreme</td>
<td>40 [30 %]</td>
<td>40 [65 %]</td>
<td>20 [275 %]</td>
<td>10 [35 %]</td>
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</table>

Table 3: Assumptions of this study on purchasing power-adjusted increases (2018 prices) in energy consumer prices comparing the average of the next twelve months (April 2022 to March 2023) with the period 2017-2021.

3 Effects of energy price increases on households

We use the Income and Consumption Survey (EVS) from 2018 and the Microcensus 2016, as well as the microsimulation model of Roolfs et al. (2021) based on them. Here, consumption data on energy use are adjusted and missing data are estimated.³ No adjustment of demand is assumed in the model, but the costs of energy price increases are calculated if consumption remains unchanged. Detailed modeling of demand response in the short run was not considered here; this assumption determines the upper bound of the cost burden. Because of the low short-run demand elasticities, only small reductions in demand around the 10-20% range can be assumed, which mitigates the cost of the price increase. However, this reduction in demand is also offset by a (non-monetary) welfare loss. Moreover, the simulation only considers the immediate impact of the price increase for energy and does not consider any resulting price increases for other products. Overall, therefore, our incidence analysis with unchanged demand is valid as a first approximation of the welfare losses of an increase in energy prices.

In analyzing energy price increases for households, a distinction must be made between vertical and horizontal effects. Vertical effects describe how burdens differ between income groups (e.g. income deciles). For example, when energy prices rise, there is a particularly strong burden on low-income households because they generally spend a high share of their income on energy. In the following, we measure the costs for households relative to their private consumption expenditures because these

² Current increases in gas prices for existing customers also appear to be less pronounced than assumed in our scenarios, because their calculation is likely to be based predominantly on long-term supply contracts. However, significantly higher increases have already been observed for new customers. In the event of an embargo, however, supply contracts with Russian suppliers could become null and void, meaning that existing customers would also be confronted with higher prices.

³ For example, the heating oil demand of households that use oil heating but do not show any expenditure on heating oil in the data is estimated using socioeconomic data. The model has so far been used primarily to calculate the distributional effects of CO₂ pricing and accompanying compensation measures (see http://mcc-berlin.net/CO2preisrechner). In addition, it has been extended to include a simplified income tax model for calculating marginal and average tax rates (see appendix for details).
represent a stable indicator for the long-term (permanent) income of a household. Simplified, this indicator can also be understood as a burden in % of net income available for consumption expenditure. Horizontal effects, on the other hand, describe different costs within an income group. For example, even a middle-income household may be particularly hard hit by the current energy price crisis due to poor housing or building insulation and the use of oil or gas heating, while another household in the same income group - living in a well-insulated dwelling with a heat pump or district heating - is exposed to a significantly lower cost increase.

Without cushioning measures, the burdens of an increase in energy prices conceivable in the current situation could be very high and perceived as unbearable for many households. Figure 4 shows the burden in our three price scenarios for households in Germany (by income deciles). In the medium scenario for energy price increases, the additional burden amounts to an average of €829 per household per year, which corresponds to 2.9% of average consumer spending. In the extremely high price increase scenario, by contrast, the increase amounts to €2527, or 8.9% of average consumer spending.

![Figure 4: Household burden of rising energy prices in euro in absolute (Figure 4A) and relative (Figure 4B) terms, by income decile. The color-filled area of each bar shows the middle 50% of households in an income decile, the long vertical bars show the rest except for statistical outliers (below the 5th and above the 95th percentile), the dot shows the average burden, and the horizontal bar shows the median burden. Detailed illustrations of individual energy sources are shown in the Appendix in Fig. A2. Income deciles are calculated using equivalence-weighted consumption expenditures. Source: Own calculation based on EVS 2018.]

Poorer households - relative to their consumption expenditure - are more affected than richer households. This is because energy expenditure accounts for a larger share of consumption expenditure for low-income households. In the “High” price scenario, households in the first (poorest) decile are burdened with an average of €731 per year, or on average 6% of their private consumption expenditure. The top (richest) decile is burdened significantly more in absolute terms, at €1850 per year, but this burden in relation to total average consumer spending is only about half as high as in the first decile, at 2.8%. Rising energy prices thus increase real income inequality.

The burden is very heterogeneous within income groups. As can be seen from the wide spread (long bars in figure 4), there are poorer households that have a higher absolute burden than richer households.

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4 Because income is subject to short-term cyclical fluctuations and savings rates vary at different stages of life, consumption expenditure is considered a more stable indicator of a household’s long-term standard of living.
and, conversely, richer households that are less affected than poorer ones. Moreover, the "extreme" price scenario shows a burden of more than 15% of consumption expenditure for some households, especially in the lower deciles.

**Rising gas prices primarily drive the overall burden.** This is because the largest price increases are expected here (Figure 5) and a high proportion (around 50%) of households in all income groups own gas heating (Figure 6A). However, rising costs for electricity, heating oil, and district heating also have a regressive effect, i.e., they place a greater burden on poorer households relative to their consumption expenditures. In the case of fuels, the middle class is more affected since poorer households own cars less often or travel shorter distances (see Figure 5 and Figure 6B).

![Figure 5: Contribution of different energy types on the average burden in absolute (Figure 5A) and relative (Figure 5B) terms, by income deciles. Source: Own calculation based on EVS 2018.](image1)

![Figure 6: Predominant energy source of heating (Figure 6A) and share of households with expenditure on transport fuel (Figure B) by income deciles. Source: Own calculation based on EVS 2018.](image2)
4 Policy options

Given the sometimes enormous impact on the disposable income of vulnerable households, social policy support measures are indispensable. The energy price shock was hardly anticipated by policymakers, suppliers, and customers. In this respect, it seems sensible for the federal government to cushion the strongest effects, especially for low-income and particularly affected households. Protection against existential risks is essential for maintaining social peace. Without appropriate measures, a possible import embargo on Russian oil, coal, or even natural gas would hardly be politically tenable. Even without an embargo, Germany would be in a weaker position in negotiations with Russia. The costs of transfer payments would probably ultimately be borne primarily by higher-income households, e.g. in the form of (future) higher tax rates.

Ideally, compensation payments should be targeted to vulnerable households only. Incentives to save energy should not be reduced in the process. For this reason - and also to ensure incentives to expand supply in the medium term - policymakers should not intervene directly in market pricing. Furthermore, transfer payments should cause only a low administrative burden. Moreover, to avoid the overcompensation of rich households or groups hardly affected by energy price increases, only targeted measures are desirable. However, targeted measures can easily dilute incentives to save energy, e.g., because the recipients would not bear the higher energy costs themselves. Furthermore, targeted measures often require detailed data (e.g., consumption data, household size, and account details), which are often not available for the state and would first have to be made available. This conflict of goals must be taken into account when compiling packages of measures.

We consider four basic mechanisms by which relief for vulnerable groups can be implemented. These are (1) increases in existing social benefits, (2) adjustments in the existing tax system, (3) introduction of new government transfers, and (4) direct government price interventions, combined with the risk of resulting quantity rationing. In this section, we first provide basic qualitative considerations on individual measures. In Section 5, we then use our microsimulation model to estimate the distributional effects of selected options.

4.1 Increase in existing social benefits

Adjustment of energy cost support for recipients of unemployment benefits (ALG II) and social benefits. This is already done automatically and would lead to additional fiscal costs of €1.2 billion, €2.1 billion and €4.1 billion, respectively, under the three price scenarios considered (for calculations, see section 5). Because the costs are already covered, welfare recipients are not exposed to any additional burdens from rising heating costs. However, even in the lowest income group, more than half of the households do not receive social benefits (see Figure 7). Thus, only a limited population group is compensated via this channel.

Adjustment of standard rates for social benefits. Rising electricity and gasoline and diesel prices are also taken into account when determining the amount of the basic benefit, so that an automatic adjustment is generally made. However, the adjustment always takes place on January 1 of each year, based on the price development of the previous year. Due to the current rapid rise in electricity and fuel prices, which are not covered directly by the state, it would therefore make sense to closely monitor price changes and, if necessary, adjust the standard rates during the year.

Flat rate for heating costs for recipients of housing allowance or study grants (BAföG). The increase in the flat rate for heating costs, which was approved in February 2022, provides relief for low-income households that do not receive ALG II. These include recipients of housing allowances and study grants (BAföG) or training allowances (Henger et al. 2022). Since these are lump-sum subsidies based on household size, the incentive to save energy is very high on the one hand, but on the other hand, this does not allow any further differentiation according to the actual burden. This means that the horizontal inequality in the burden on low-income households can only be reduced to a limited extent: For some
households with gas heating, an apartment with low energy efficiency, and correspondingly high energy demand, the subsidy does not cover the costs. A general increase in the subsidy would, in turn, overcompensate other households. This basic problem exists for many of the measures discussed below.

**Conclusion:** Only a limited proportion of the low-income population is targeted by increasing existing social benefits. A dynamic adjustment of social benefits can effectively help households in the lowest two income deciles. However, because recipients of social benefits are fully reimbursed for energy costs, there is no incentive for this group to save energy. Such an incentive could be strengthened by introducing additional financial rewards for reducing consumption (e.g., based on a comparison with the previous year). Overall, only a small proportion of the low-income and vulnerable population can be reached through the welfare system: About 7% of the population receives unemployment benefits (ALG-II) and social benefits (Statista 2022), about 1.7% of households are recipients of housing allowances or study grants (BAföG) and thus eligible for the newly introduced flat rate for heating costs (Henger et al. 2022).

![Figure 7: Proportion of households receiving social benefits, by income decile. Households in which different members receive different social benefits are included twice here. Source: Own illustration based on EVS 2018.](image)

**4.2 Adjustments in the existing tax system**

**Increasing the commuting allowance:** Increasing the commuting allowance would help to cushion the impact of higher fuel prices for employees. To fully compensate an average household (marginal tax rate of 25%), the lump-sum commuter allowance would have to be raised by 11 ct per kilometer of commuting distance, for every 20 ct/l price increase. However, households with higher incomes would be overcompensated. The increase is always either excessive for richer households or insufficient for poorer households. The instrument is therefore hardly suitable as an instrument for targeted compensation. Moreover, the commuting allowance only provides relief retroactively with the tax return in the following year (hence creating consumer credit lines might make sense, see below). Moreover, households with

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5 At a consumption of 7l/100km, a price increase of 20ct/l raises the travel costs by 1.4 ct/km and thus the commuting costs by 2.8 ct per kilometer of simple commuting distance. This is exactly compensated by 11 ct more commuter allowance at 25% marginal tax rate - but at the top tax rate of 42% the compensation is 4.6 ct/km.
short commutes and low other work-related expenses do not receive any relief if the sum of expenses is below certain limits ("Werbungskostenpauschale").

**Replace the commuting allowance with a mobility allowance.** An alternative to the commuting allowance is the mobility allowance. In this scheme, commuting costs would be deducted or reimbursed as a lump sum from tax liability (instead of taxable income). In the above example, a 20 ct/l increase in fuel prices would be reimbursed at 2.8 ct/km to achieve full compensation. Because the mobility allowance applies regardless of the choice of transport mode, incentives to use alternative mobility models (public transport, bicycle) would be strengthened. Such a paradigm shift toward a mobility allowance would have to be passed by the Bundestag and then implemented quickly to take effect promptly; potential effects on the labor market would also have to be taken into account. As with the commuting allowance, the actual relief effect only starts with the tax return in the following year. According to Bach et al. (2019), a revenue-neutral conversion of the current commuting allowance of 30 ct/km to a mobility allowance would result in a mobility allowance of 13.5 ct/km. This value might then be further adjusted in proportion to fuel price increases.

**Reduction of electricity tax and renewable energy feed-in-tariff (EEG levy).** The electricity tax could be lowered from the current 2.05 ct/kWh to the EU-legal minimum rate of 0.1 ct/kWh. The abolition of the EEG (renewable energy feed-in tariff) levy of 3.7 ct/kWh is already planned for July 1. This will have a progressive effect, as low-income households in particular have relatively high electricity expenditures (Kalkuhl et al. 2021a). It also facilitates electrification of the transport sector (electric vehicles) and the building sector (heat pumps), thus helping to increasingly replace fossil fuels with renewable electricity (Kalkuhl et al. 2021b). While the reduction of the EEG surcharge and electricity tax makes sense in terms of social and climate policy, their relief effect is limited to a maximum of 6.7 ct/kWh incl. VAT.

**Increase of the tax allowance.** The increase in the tax allowance could be implemented quite easily and quickly and would provide broad relief for (income) taxpayers (Bachmann et al. 2022). However, the relief would be most pronounced in the middle class, because low-income earners would benefit only to a very limited extent due to already low marginal tax rates. Moreover, households that do not pay taxes or have incomes below the tax-free threshold would not benefit.

**Lowering the value added tax.** By lowering the VAT rate, broad and relatively even relief can be achieved across all income groups. It is relatively easy to implement administratively. However, the reduction also provides relief for many households, especially high-income households, which would not need it because of their high income or low energy costs.

**Subsidizing fossil energy use.** In tight markets with short-term inelastic supply (e.g., natural gas in the EU in the event of an import freeze vis-à-vis Russia), subsidies do not have a price-reducing effect because the market-clearing price after a subsidy is equal to the price without subsidy (see Infobox 1). Thus, subsidies primarily increase scarcity rents in the "bottlenecks" of gas supply. In the case of a shortfall in Russian supplies, this would primarily be the transmission system operators, whose capacity is limiting; in the case of limited supplies, it would ultimately be all gas suppliers, including Russia (Hirth 2022).

In the case of oil products, supply is much more elastic due to access to the world market, and subsidizing fossil fuels correspondingly reduces the necessary incentives for saving. Moreover, subsidies for fossil energy sources are not very targeted, since all consumers benefit from them. In addition, subsidies have secondary price effects for other (especially poorer) countries, such as in Eastern Europe, because they do not reduce energy demand in Germany and make energy correspondingly more expensive for other market participants. In an overbidding competition, prices can thus be driven up unnecessarily. Subsidies

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6 The mobility premium was introduced on a very limited scale as part of the recently adopted relief package related to CO2 pricing for long-distance commuters whose income is below the entry tax rate. In the proposal discussed here, it would be extended to all households.
should therefore be avoided: They lead to price increases and play profits into the hands of the suppliers, which only lead to a capacity expansion and thus to a price reduction in the long term.

**Infobox 1: Effect of subsidies and taxes on scarcity rents in supply constraints.**

**Subsidies and taxes in the event of supply bottlenecks**

Figure 8a shows the mechanism of a consumer price subsidy in the presence of inelastic supply. The subsidy shifts demand upward, depending on the price elasticity - but due to inelastic supply (caused by capacity bottlenecks in the gas market due to limited LNG infrastructure or limited transit capacity), it is still not possible to expand supply from $q^1$ to $q'$. The market-clearing supply price, therefore, increases to $p_s$. Subtracting the subsidy, the original consumer price is again $p_1$. The consumer price thus remains unchanged, the subsidy remains completely with the supplier, so that the scarcity rent increases compared to Figure 3.

**Figure 8a: Effect of energy price subsidies under inelastic supply.**
The opposite is true for a consumption tax (see Figure 8b). It can skim the scarcity rent that arises from supply shortages without leading to higher prices for consumers: Taxing \( \tau \) shifts the demand curve downward. At the original price level \( p_1 \), however, less gas \( q' \) would be demanded than suppliers would be willing to supply because the price is above suppliers' marginal costs. Suppliers must therefore offer the market-clearing price \( p \). In doing so, the original supply quantity adjusts to \( q_1 \). Consumers now pay the original price again along with the excise tax (so they do not profit initially, but purchase the same quantity). Suppliers, however, pay the full tax burden. With the tax revenues, consumers could now be compensated through transfers. If the tax is set too high, this can distort the market-clearing quantity so that the capacity limit is no longer exploited.

In practice, however, it is difficult to correctly identify the exact amount of scarcity rents and taxing them appropriately. This is especially true if they occur only for a short period of time and/or regionally.

Scarcity rents set strong supply-side incentives to expand capacity in the medium term: For example, in the case of limited LNG import capacity, floating LNG ports might be deployed until the end of this year (Stratmann 2022). For longer periods, new LNG ports can be built and pipeline infrastructure expanded. Therefore, the expected price level plays an important role for the expansion of capacity. Even if an embargo initially reduces capacity from \( q^0 \) to \( q^0_0 \), expected high future prices increase the incentive to invest in new capacity and thus expand it to the level of \( q^1 \) (see Figure 9). In contrast, if prices were capped at \( p^0 \), the long-term expansion of capacity would not occur.

**Figure 8b: Effect of quantity taxes in the presence of inelastic supply.**

**Figure 9: Adjustment of supply and transmission capacity in the medium and long term.**

**Reduction of the value added tax on natural gas, heating oil, or transport fuels.** These measures are conceptually equivalent to a subsidy (see above) and are to be evaluated accordingly.

**Conclusion: The tax system can be used to compensate taxpayers. However, the compensation is either not sufficient or carries the risk of further price increases.** Lowering the electricity tax and abolishing the EEG levy make sense in order to promote the envisaged electrification, irrespective of the current energy market developments; however, this can only provide limited relief. Subsidizing heating and fuel for private households leads to further price increases for other consumer groups and countries.
The most effective way to compensate for persistently high gasoline and diesel prices is to convert the commuter allowance into a mobility premium and adjust it to the price of gasoline. However, the existing tax system offers hardly any possibilities to compensate for rising prices of natural gas or district heating. New compensation mechanisms are needed for this.

4.3 New government transfer mechanisms

High energy prices provide a strong incentive to expand supply and reduce demand in the event of acute shortages. Compensation for severely affected, especially low-income households, should therefore not be based on actual consumption. This would be a subsidy of the corresponding consumption and, on the contrary, would create incentives to expand consumption. In contrast, consumption-independent lump-sum payments or payments that depend only on the previous year’s consumption can achieve effective compensation and at the same time ensure the incentive to save: Lower energy consumption then leaves correspondingly more money for other expenditures.

Targeted energy allowance for gas, district heating, and heating oil. This would create a new transfer benefit for households, the amount of which would be independent of actual consumption, but still closely correlated with consumption (see Infobox 2 on design issues). An energy allowance that depends on household size was introduced in Ukraine (of all places) when the price of gas more than doubled within a few months due to the Russian invasion of Crimea in 2014 (Alberini et al. 2019). In the short term, an energy subsidy can be paid as a targeted cushioning measure, depending on energy consumption in the same period of the previous year. However, this can result in a strategic incentive not to reduce consumption too much in order to receive higher payments in the future. If this measure were to be granted over several years, it would therefore be necessary to switch to lump-sum payments (e.g., depending on the size of the household, similar to the energy cost allowance for housing benefit recipients).

**Infobox 2: Design and implementation of transfers based on past consumption to cushion rising energy costs**

Targeted energy allowance: transfers based on past consumption data.

The design and implementation of energy cost transfers can be done as follows. First, a certain amount of energy (normative base amount) must be defined, which will be covered by the transfer at the current price level. This can be, for example, 75% of the typical gas or electricity consumption of a household with a comparable number of persons. The fewer determinants are included in the normative base quantity and the simpler they are to collect and check, the simpler their implementation. In the above case, it is only necessary to check whether a household uses a certain energy source (can be done via gas meter no. or electricity meter no.) and how many people live in the household (registration certificate). Alternatively, 75% of the energy consumption from the previous year’s statement could be used as the base quantity (proof by previous year’s statement if available; otherwise, use of flat-rate average values). The basis for calculating the transfer is then the product of the normative base quantity and the underlying price increase.

If the transfer is measured on the basis of the previous year’s consumption, the result is a uniform relief that is very closely correlated with the actual burden (for newly established households without previous year’s consumption, flat-rate values would have to be used). However, this approach is difficult for households with oil heating because annual consumption values are difficult to prove independently. Here, a flat rate based on household size would be appropriate.

In the case of gas and electricity contracts, there is a considerable lag in tariffs due to the market structure: New customers are currently exposed to very high immediate price increases, while existing customers pay significantly lower tariffs. In the event of an embargo or supply disruption, many
suppliers are likely to adjust existing tariffs of their customers due to force majeure. Therefore, the payment of transfers should only apply to new contracts or contract adjustments as of a certain cut-off date. In addition, the amount of the transfers should be regularly adjusted to the price level.

The transfers could be paid out via an authority (e.g., job center, family fund "Familienkasse") or directly via the energy suppliers, who would be compensated for this by the government. However, the latter would not be possible in the case of households with oil heating (for which a separate payment channel via an authority would then have to be set up). In the case of payment via the energy supplier, the payment would likely be offset directly against energy costs, which would reduce the incentive effect due to the low visibility of variable energy costs. In this case, an explicit separation of transfer disbursement and energy costs (also in the form of separate account transfers) would be useful, as would accompanying information about the financial benefits of saving energy. Also, in the case of tenancies in which heating cost bills are prepared by property managers with a long delay, there would have to be a prompt adjustment or explanation of tariff increases in order to provide incentives for saving at an early stage.

Means-tested transfers would be relatively easy to implement via energy suppliers but would also relieve the burden on higher-income households. An income test, on the other hand, is costly and prone to litigation. Alternatives could be to grant transfers only if taxable income does not exceed a certain level in a given year, or to phase out the transfer amount in line with taxable income. In this case, the test could initially be omitted in order to minimize the administrative burden: All those who apply for or do not object to the transfer would receive it initially - but with the obligation to provide their tax ID and file a tax return in the following year. In the tax return, the payment would be checked and offset if necessary.

Ultimately, it should be clarified whether there is an "opt-in" or "opt-out" for transfer payments. Opting-in means creating an offer that households can accept. This would have the advantage that high-income households in particular would sometimes not even take up this offer (which saves costs). However, this could also lead to vulnerable households not accepting this offer for a variety of reasons. With an opt-out, all households would automatically benefit from the transfer, but could (or would have to) waive it ex post.

**Climate dividend.** The climate dividend agreed in the coalition agreement, i.e., the payment of a uniform per capita transfer from the revenues of CO₂ pricing to make it fairer, could be brought forward and, if necessary, topped up with federal funds. The disbursement would require the establishment of a registry to ensure that all recipients are properly accounted for. Disbursement could be paid directly to citizens or indirectly through offsetting health insurance contributions (Stede et al. 2020), salaries or social benefits, and pensions (Färber and Wieland 2022). Implementation would probably take 6-9 months, perhaps faster given the imminent and high-profile nature of the current situation. A climate dividend also compensates richer households for the costs of CO₂ pricing. But because they pay more than average for CO₂ pricing, the bottom line is a redistribution from high-income to low-income populations (Kalkuhl et al. 2021a). If a central agency pays the premium, it is also possible to match it with other data (e.g., whether a gas connection is available; income in the previous year, etc.). In the long term, this system could be used for targeted compensation depending on the specific burden on the household, thus leading to a transition to a targeted energy allowance.

**Helicopter money.** Helicopter money refers to a uniform per capita payment to all citizens (once or several times, paid by the government) and is otherwise conceptually similar to the climate dividend. However, it would be implemented in the current situation independently of CO₂ pricing (and corresponding revenues). In principle, a higher amount of helicopter money could be paid to lower-income households, but this requires an income test (which is costly and prone to dispute). A pragmatic alternative could be
to provide for payment only to adults with taxable income below a certain threshold, but to make the
check (with possible repayment) only when filing the tax return in the following year (see income check
for energy transfers in Infobox 2). A differentiation between adults and minors could also be made. The
disbursement of helicopter money encounters similar difficulties as the disbursement of the climate or
energy allowance: Because no established mechanism exists yet, it still has to be created legally and
administratively.

**Consumer credits.** Since extreme price increases, especially for natural gas, are likely to remain temporary
(1–2 years), consumer credits with long-term (and possibly initially suspended) repayments could also help
to reduce heavy short-term burdens. The standard “Schufa” check (for credit-worthiness) could be
suspected, and the loans could be secured with a government guarantee instead. However, such
consumer loans do not solve the fundamental problem that rising energy prices place a heavy burden on
poorer households and vulnerable households in particular - they merely spread the costs over a longer
period. Therefore, this instrument can only be a supplement to other measures. However, it can be useful
as an accompanying measure, since even carefully designed packages of measures always fail to address
(a few) households adequately, and some relief measures - such as the commuter allowance - are only
implemented retroactively.

**Conclusion: New transfers could have a targeted and broad impact.** The creation of a new transfer to
cover energy costs, which would be granted based on past but independent of current consumption, could
provide targeted relief to low- and middle-income households. In a sense, this transfer would provide a
“basic allowance” to cover a certain amount of energy. A climate dividend and the conceptually similar
helicopter money provide broad channels for relief to vulnerable households. Such relief can also be linked
to income. However, targeting is compromised because the specific burdens of households are only taken
into account to a limited extent.

### 4.4 Direct government price intervention (price controls, block tariffs, and rationing).

**Government intervention in market pricing increases the risk of government rationing and thus the risk of considerable social and economic dislocation.** If very high energy prices, as is plausible in the EU
over the next 12 months, especially for natural gas, cause the federal government to impose direct
dampening price controls, then supply and demand fall apart and market clearing fails to occur (figure
10). With a government-set price, there is also less incentive for suppliers (e.g., of LNG imports) to supply
the quantities demanded. There would also be too little investment in expanding import and distribution
capacity, so capacity constraints would remain over the long term (see figure 9 in Box 3). Conversely, at
this price, households and businesses are less likely to be incentivized to reduce their demand to match
the available supply quantity. If the price cap (with possible financial compensation from the government)
is applied only to residential customers, then this is at the expense of gas supply to the industry sector. In
the case of a slight shortage, the industry sector would then curb consumption and cross-subsidize the
lower gas prices of households through higher gas prices. If a severe shortage were to occur, the entire
market could collapse because there would be a gap between supply and demand. Households would then
be in competition with industry and with each other. In this case, the state must introduce rationing to
prioritize consumption.7

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7 Prioritization of household customers over industry is already provided for in the BMWK’s “Emergency Gas Plan for
the Federal Republic of Germany,” see https://www.bmwi.de/Redaktion/DE/Artikel/Energie/gas-krisenvorsorge-
management.html.
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Figure 10: Government price control at level $p^s$ causes supply and demand to diverge. Price reduction leads to demand $q^d$ exceeding supply $q^s$. In this case, direct rationing must be used to determine how the resulting gap is divided among consumers.

Government rationing of natural gas consumption in Germany requires explicit and detailed prioritization of the allocation and disconnection of natural gas in industry and households. The political challenges and conflict potential of a volume allocation of natural gas are potentially enormous. For example, the allocation between industry and households would have to be decided, and targeted industrial plants would then have to be (temporarily) shut down in each case. These regulatory interventions are likely to be accompanied by costly compensation. In general, targeted shutdowns at the points with the lowest marginal costs would considerably reduce the welfare costs of rationing (see De Nooij et al. 2009 for the Dutch electricity market).

But there are considerable technical limitations in the case of natural gas: Due to the structure of natural gas networks, rationing for households appears possible only by temporarily shutting down entire areas. This leads to evasive reactions such as strong heating of boilers during the connection phase, which could thus increase gas demand inefficiently. Corresponding effects have been observed with fuel rationing in the U.S. (Deacon and Sonstelie, 1989). Rationing for critical infrastructure (hospitals, etc.) also appears practically challenging. The welfare losses, for example, for particularly affected households (cold-sensitive pensioners, young children, the sick, shift workers, etc.) and rationing for industry are likely to be significant and higher than control via market price. Of course, this is only true if targeted compensation of vulnerable groups is possible and implemented.

In contrast to a price increase, price capping and rationing do not siphon off the high willingness-to-pay of some market participants; instead, it “expires” (Frech and Lee, 1987). Thus, in the management of water supply shortages, a welfare loss has often been found to result from rationing relative to price increases. This is estimated to be about half of the average annual household drinking water expenditure in Australia (Grafton and Ward 2008), and similar effects are estimated by De Los Angeles García Valiñas (2006) for Seville and by Woo (1994) for Hong Kong.

Block tariffs with increasing prices depending on natural gas consumption enable relief for households with low consumption and secure basic needs with a price cap. In order to achieve a more socially acceptable market-clearing via the gas price, a block tariff system can be introduced. For this purpose, gas consumption is divided into consumption blocks with increasing prices per block. Thus, in the
lowest block, a basic consumption can be guaranteed by a state-regulated maximum price, and, for example, in the highest block, it can be traded at the market price, which creates an incentive for savings at a given level (see also the proposal by Dullien & Weber 2022). Different tariff systems can be chosen for households and industry. However, difficulties arise in practical implementation, since consumption is largely determined by household size. A large low-income household could therefore slip into a higher-priced tariff block than a high-income single-person household. Consumption blocks would therefore need to be set and applied on a per capita basis. In addition, households that had not previously exhausted the consumption volume in their respective block could be incentivized to increase consumption (Gabor, 1955).

Empirical evidence on the effectiveness of block tariffs is limited, as they are mainly applied in emerging and developing countries. Nevertheless, granting a low-cost base volume can increase welfare, but at the cost of lower market efficiency (Gadenne, 2020). In China, block tariffs are already used extensively to regulate residential gas consumption and achieve both the goal of social acceptability and consumption reduction (Gong et al. 2016). This can be attributed, at least in part, to a much higher price elasticity of gas demand (Zeng et al. 2018). In the case of acute supply shortages due to a gas embargo and rapidly changing gas prices, there is also the problem that an erroneously overestimated base consumption (or underestimated base tariff) jeopardizes market clearing and thus ultimately leads to a rationing regime. Block tariffs are thus less suitable in a situation where it is necessary to react to rapidly rising supply bottlenecks.

5 Quantitative assessment of relief options

5.1 Options considered: basic package and additional relief options

In the following, we calculate the fiscal costs and the distributional impact of four packages of measures. We first consider a basic package that could be implemented immediately by scaling up existing social and tax policy measures:

- **Adjustment in the energy cost support for recipients of social assistance** (already done automatically),
- **Adjustment of the newly introduced flat rate for heating costs** (“pauschalierter Heizkostenzuschuss”) of housing allowance and study grant (BAföG) recipients, which covers an average of 50% of heating costs (because further measures in the basic package have a relieving effect and could otherwise result in overcompensation),
- **Adjustment of the commuting allowance** in proportion to the increase in fuel prices (in the future: conversion to a mobility allowance) and
- **Reduction in electricity prices** (reduction of electricity tax and abolition of renewable energy feed-in-tariff (EEG levy)).

The basic package could be implemented immediately. It involves only the adjustment of existing subsidy, tax, or levy rates. According to the above considerations, all the measures considered can provide targeted relief in the event of rising energy prices - with the exception of the lump-sum commuting allowance, the relief of which mainly affects higher-income households. Raising the commuting allowance is explicitly not a recommendation, but a possible immediate government measure that is considered here. A deferred conversion of the lump-sum commuting allowance to a mobility allowance would further increase the relief effect for vulnerable and socially weak households and should therefore be considered.

In addition to this basic package, we consider three other relief options. They are designed to have identical total fiscal costs:
(A) **Raise the tax allowance** by €1400, €2600 or €5300 (depending on the price scenario). The increase is chosen so that the total cost to the state budget is equal to the other two measures (B and C). This option can be implemented very quickly and relieves workers immediately as a result of the reduced payroll tax deduction. However, it has a very limited impact on low-income households with low marginal tax rates (as discussed above) and does not provide relief to households that do not pay taxes or have incomes below the exemption threshold.

(B) **Targeted energy allowance.** Here, a transfer would cover 75% of the increased costs for households with gas heating and district heating (in accordance with consumption according to the previous year’s billing, but regardless of current consumption). For households with oil heating, a lump-sum transfer would be granted that would also cover 75% of the additional costs, depending on the size of the household; the gradation of the transfer would be based on the gradation in the newly introduced flat-rate heating allowance for housing benefit recipients. The design and implementation of a targeted energy allowance is likely to take several months.

(C) **Helicopter money:** transfer payments to all households not receiving social assistance of €220, €394 or €774 per person (depending on the energy price scenario). Children and adolescents under 18 receive 50% of the adult amount because minors usually do not run their own households and parental household energy costs do not increase proportionally with household size. The amount of the per capita transfer is chosen so that the fiscal cost is equal to that of the other two measures (A and B). The design and implementation of the transfer is also expected to take several months. The helicopter money could also be paid out over several months instead of one time. The calculation assumes that welfare recipients do not receive helicopter money because their energy costs are already covered by the state, or that the payment would be offset against basic benefits.

We do not consider income limits here for reasons of comparability with relief measure (A) for energy allowance and helicopter money. However, the introduction of an income limit could significantly reduce the costs for the state budget, e.g., by about 30% when excluding households in the top three income deciles.

5.2 **Effects of the basic package**

The basic package as an immediate measure provides significant relief for many households and in particular for many with the lowest incomes. In this context, the commuting allowance provides relief primarily for households in the middle- and upper-income groups. Low-income households benefit mainly from the already existing takeover of energy costs, from a further increase in the flat rate for heating costs, and from a reduction in electricity prices (see Figure 11 for the “High” price scenario). In the lowest decile, these measures can compensate on average for almost two-thirds of the burden of price increases, and the average burden falls from 6% to 2% of consumer spending in the lowest-income group. In the “Extreme” price scenario, the relief is lower, and households in the two lowest deciles are still significantly burdened there, with about 5-7% of their consumption expenditures on average (see figure A.3 in the appendix). The basic package thus appears insufficient, especially in the case of high or extremely high price increases, as would be expected in the event of an import freeze. It should therefore be supplemented by further measures.
5.3 Effects of combining the basic package with broad relief options

Combining the basic package with one of the broader relief options can significantly reduce the burdens. A targeted energy allowance is the most effective option for reducing hardship. The introduction of helicopter money (measure C) is the most progressive, meaning that low-income households benefit the most (see Figure 12A). However, even with the helicopter money, there is a significant share of households with heavy burdens in all income groups (see Figure 12B). This is because helicopter money is paid regardless of energy needs, except for the very rough graduation for children and youth under 18. The introduction of a targeted energy allowance (measure B), the amount of which is based on the previous year’s consumption, provides relief primarily to low-income households and can be very effective in avoiding hardship cases. These are households for which energy price increases amount to more than 5% of their consumption expenditure.

By contrast, the increase in the tax allowance (measure A) provides greater financial relief for middle- and higher-income households (see Figure 12A). There are significantly more households with particularly heavy burdens with this measure (see Figure 12B). This is because, on the one hand, only taxpayers benefit from the measure and, on the other hand, the relief effect hardly correlates with the level of energy costs.

In the "Extreme" price scenario, the average burden is still around 2% of consumer spending, despite extensive measures. In this case, a greater reduction could be achieved, for instance, by further scaling the relief measures (A–C), albeit at increased fiscal costs.

The fiscal costs of the packages depend on the extent of the assumed price increases. In the case of a medium price increase, the fiscal costs amount to €30 billion, in the high price scenario to €43 billion, and in the case of extreme price increases, the relief measures would require a scope of €77 billion. This burden applies to an assumed twelve-month price increase. As the supply situation is expected to improve in the medium term, the high and extreme price scenarios should only be relevant for a short period (one year). In addition, the accelerated transformation should reduce the exposure to an increase in the gas price rise, as gas consumption among households will increasingly decline due to increased use of heat pumps, improved building insulation or renewable energies. Nevertheless, further relief programs may also be
necessary to a lesser extent in the medium term because the transformation and diversification of the energy sector will be associated with higher energy prices for the foreseeable future.

Figure 12: Relief effect of the various supplementary measures (A-C) in addition to the basic package for the "Medium," "High" and "Extreme" price scenarios, by income decile. In each case, the figures on the left show the average burden, while the figures on the right-hand side show the share of households with a heavy burden, defined as at least 5% of consumption expenditure. Source: Own calculation based on EVS 2018.

| Total burden on private households and fiscal costs of relief options (€ billion/year) |
### Table 4: Total burden on private households and fiscal costs of the analyzed measures according to the three scenarios for energy price increases ("Medium," "High," "Extreme"; for the assumptions of the scenarios, see Table 3). Source: Own calculation based on EVS 2018.

<table>
<thead>
<tr>
<th>Cost of basic package</th>
<th>&quot;Medium&quot; price scenario</th>
<th>&quot;High&quot; price scenario</th>
<th>&quot;Extreme&quot; price scenario</th>
</tr>
</thead>
<tbody>
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<td>Heating cost takeover of welfare recipients</td>
<td>1.2</td>
<td>2.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Adapting flat rate for heating cost of housing allowance and study grant (BAföG) recipients (covers about half of the cost increase for these households)</td>
<td>(2x planned rate) 0.5 (4x planned rate) 1.0</td>
<td>(8x planned rate) 2.0</td>
<td></td>
</tr>
<tr>
<td>Reduction of electricity tax to 0.1 ct/kWh (incl. VAT)</td>
<td>3.1 (households only)</td>
<td></td>
<td>(together with relief for the economy: 8.0)</td>
</tr>
<tr>
<td>Abolition of renewable energy feed-in-tariff (EEG levy) (incl. VAT)</td>
<td>5.7 (households only)</td>
<td></td>
<td>(together with relief for the economy: 15.5)</td>
</tr>
<tr>
<td>Increase in commuting allowance by 11 ct/km per 20 ct/l increase in transport fuel prices</td>
<td>3.8</td>
<td>3.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Basic package: Total cost</td>
<td>14.3</td>
<td>15.7</td>
<td>22.7</td>
</tr>
<tr>
<td>Basic package: Coverage of additional burden on average of all private households (data in %).</td>
<td>42</td>
<td>29</td>
<td>22</td>
</tr>
<tr>
<td>Cost of additional relief options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) Increasing income tax allowance</td>
<td>(around €1400) 15.1</td>
<td>(around €2600) 27.7</td>
<td>(around €5300) 54.3</td>
</tr>
<tr>
<td>(B) Targeted energy allowance for heating costs (75% of additional costs).</td>
<td>15.3</td>
<td>27.4</td>
<td>54</td>
</tr>
<tr>
<td>(C) Helicopter money (per capita payment, minors with half of the specified amount each).</td>
<td>(€220)</td>
<td>(€394)</td>
<td>(€774)</td>
</tr>
<tr>
<td>Basic package plus one of the three relief options: Total cost</td>
<td>29.6</td>
<td>43.1</td>
<td>76.7</td>
</tr>
<tr>
<td>Basic package plus relief option: coverage of the additional burden on all private households (data in %).</td>
<td>88</td>
<td>81</td>
<td>75</td>
</tr>
</tbody>
</table>

6 Concluding remarks

We are experiencing an energy price crisis of historic proportions that could dwarf the oil price crises of the 1970s. This threatens social peace and Germany’s room for manoeuvre in security policy. Because government price controls undermine incentives to expand supply and reduce demand, they lead
to further price increases: they are tantamount to trying to put out the fire with oil. The price-setting mechanism must therefore not be abandoned, as it creates the conditions for supply to be expanded and demand to be curtailed in the event of an embargo. However, ensuing social distortions must be prevented by a carefully designed and clearly communicated social policy relief program. With an eye on higher-income groups of the population that would bear a significant part of the burden, the advantages of such a sociopolitical show of strength should also be clearly communicated: with a view to dealing with Russian aggression, Germany’s corresponding ability to act in terms of security policy, avoiding rationing (and its potential for conflict), and ensuring lasting social stability.

**Supply shortages of natural gas pose significant challenges to the pricing system and social cohesion.** If demand for natural gas cannot be met due to supply shortages and physical scarcity, there are two possible consequences: (1) prices rise rapidly and dramatically so that strong financial incentives reduce demand sufficiently, or (2) rationing occurs due to price caps or (overly rigid) tariffs for residential customers. The more flexible prices respond to supply shortages, the better rationing can be avoided - but the more important social compensation becomes for vulnerable households.

**In order to cope with supply bottlenecks, there is also a need for increased awareness of savings measures and frequent monitoring of own consumption and the associated costs (salience).** The incentive effect of price increases can be severely weakened due to delayed service charge settlements for tenancies and long tariff lock-ins. This can lead to the omission of necessary savings measures. Policymakers must therefore also empower households at an early stage to exploit savings potential.

**In the short term, increasing existing social policy transfers can help the lowest-income households in particular, but this requires a broader complement.** A targeted lump sum energy allowance is particularly effective in preventing hardship. It could reach the most affected households with energy cost increases of more than 5% of consumption expenditure in a targeted way, and at the same time preserve incentives to save energy. However, new administrative structures need to be created for this - and also for alternative options such as helicopter money. Given the scale of the current crisis, this task should be tackled with determination, pragmatism and great speed.

**Beyond the acute supply situation in 2022/23, significant social compensation for rising energy prices is also necessary for the medium term (2-10 years).** In addition to the effort to substitute Russian energy imports with (more expensive) alternatives, this also arises from the additional burdens of the climate targets that are already planned and CO2 pricing as well as other climate policy instruments to achieve them (Edenhofer et al. 2019, Kalkuhl et al. 2021a). The considerations presented here can therefore also be embedded in the longer-term goal of transforming the energy system towards net-zero greenhouse gas emissions socially just. Against this background, creating a new transfer system to mitigate high energy costs is also likely to have strong relevance for climate policy.
Literature


Statista (2022) Hartz IV: Anzahl der Leistungsempfänger von Arbeitslosengeld II und Sozialgeld im Jahresschlechtzeit von 2012 bis 2022. Available at:


Appendix

Modeling increase tax allowance

We calculate the taxable income per household from the specified EVS tax payments per household. The taxable income is then used to calculate the marginal tax rate and average tax rate per household from the tax formula for 2022. In the calculation, it was assumed that couples are assessed jointly for income tax.

Figure A1: Marginal and average tax rate currently and with an increase of the tax-free allowance by €2600. Source: Own representation.

Figure A1 shows the marginal and average tax rates for the 2022 income tax and for an income tax model with an increased tax allowance. For this purpose, the tax allowance was increased by €2,600 from €9,984 to €12,584 as an example, and the limits in the first and second groups were also increased. From a taxable income of €58,597 per year, the top tax rate of 42% continues to apply.
Distributional effects of energy price hikes

Figure A.2: Household burden of rising energy prices in absolute (left-hand side) and relative (right-hand side) terms, by income deciles. Shown are the additional costs incurred by households under the price increase scenarios described in Table 3. The burden is shown only for households that consume a particular type of energy in each case (non-consumers are not included in each case). In each case, the color-filled area of the bars shows the middle 50% of households in an income decile, the long vertical bars show the rest except for statistical outliers (below the 5th and above the 95th percentile), the dot shows the average burden, and the horizontal bar shows the mean burden (median). Income deciles are calculated using equivalence-weighted consumption expenditures. Source: Own calculations based on EVS 2018.
Figure A.3: Relief effects of the basic package for the three price scenarios "Medium," "High" and "Extreme," by income decile. On the left in each case, the average burden per household; on the right in each case, the share of households with a heavy burden, defined as at least 5% of consumption expenditure. Source: Own calculations based on EVS 2018.
EFFECTS OF THE ENERGY PRICE CRISIS ON HOUSEHOLDS IN GERMANY