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# What the Natural Gas Commission's proposal means for German households: Substantial relief, yet socially unbalanced

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# Imprint

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## Summary

Russia's invasion of Ukraine and the related cessation of Russian energy supplies to Europe are leading to a sharp increase in energy prices in Germany. In its final report presented on 31 October 2022, the German "Expert Commission Natural Gas and Heat", commonly referred to as "Gas Commission", proposed a two-stage system to relieve the burden on private households - consisting of a one-off payment in December 2022 and a subsidised basic quota in the period from March 2023 to April 2024 amounting to 80% of the consumption forecast. Stage 1 of the commission's proposal compensates the average natural gas-consuming household with a one-off payment of €210. The relief in stage 2 amounts to €85 per month at an average natural gas price of 20 cts per kWh. In total, this will compensate 47% of the additional burden in the period from October 2022 to April 2024 - in addition to savings from reducing consumption. The proposal represents a substantial relief for all households. With a high market price of 30 cts per kWh, the relief in step 2 alone cushions more than 60% of the additional costs in all income groups.

However, the distributional effect of the proposals is regressive: even after the relief, low-income households have to pay a significantly higher share of their consumption expenditure to cover the additional cost of natural gas. The high relive relative to consumption for poorer households is afforded by higher absolute payments to rich households. A proposal to tax the payment would smooth out this effect due to progressive tax rates, but does not seem administratively feasible at present. In addition, a cap on the subsidized consumption quota in stage 2 is being discussed. From a social equity perspective, this would prevent excessive payments to high-income households with high natural gas consumption as well as reduce the fiscal cost of the compensation measure – yet, these suggestions are also subject to administrative hurdles: Energy supply companies cannot identify how many households are connected to a single meter, i.e. whether a meter with high consumption is connected to a mansion with a heated outdoor swimming pool or an apartment building consisting of several low-income households. A minimum allotment granted regardless of actual consumption would lead to additional relief mainly to the poorest households at only moderate fiscal costs, but encounters the same technical difficulties to implementation as a cap.

In view of the continuing energy price crisis, further relief measures are also to be expected over the next year. This creates a labyrinth of individual transfers that is difficult for the population to understand. The implementation of which depends in some case on the cooperation of private actors such as energy supply companies. Alternatively, a uniform transfer independent of consumption would create salient relief for private households that would be easier to tax and, thus, differentiable based on social need. Moreover, since a uniform transfer would be independent of natural gas consumption, it would create a particularly strong incentive to reduce consumption. In order to make this form of compensation possible, a flexible system for direct payments should be established as quickly as possible.

# 1 Introduction

The "Expert Commission on Natural Gas and Heat" convened by the German federal government presented its final report on 31 October 2022. In it, the commission proposes measures to relieve all energy consumers affected by the sharp rise in prices for natural gas and district heating. It recommends a two-stage compensation for private households, businesses, trades and services and a separate one-stage procedure for large industrial consumers. In the following, we will first describe the design and mode of operation of the recommended two-stage system with a focus on private households. We then examine to which extend private households will be compensated and discuss the distributional effects of the proposal.

Our analysis is based on data from the German sample survey on income and consumption (EVS), which is conducted every five years - most recently in 2018. It is a static analysis and does not take into account reductions in natural gas consumption triggered by price increases, which households can use to additionally reduce their burden themselves. To account for the current volatility in the natural gas markets, we compare different scenarios with market prices for private households of 20, 25 and 30 cts per kWh. In addition, we consider the effects of the following modifications to the relief measures which could, in principle, allow to account for social equity: Relief payments could be subject to income taxation, alternatively, the subsidised basic quota might be fitted with a minimum allotment on the lower end or a cap on the upper limit.

# 2 The commission's proposal

The measures proposed by the commission to relieve the burden on private households (as well as trade, crafts and services) are caught between different demands in the political discourse: Transfers should be disbursed as quickly as possible, i.e. they should be easy to implement and administer. At the same time, they should be targeted at the most vulnerable households, i.e. they should be primarily income-dependent. Since targeted measures require a certain lead time due to technical restrictions on the part of energy supply companies, the commission has proposed a two-stage system. In stage 1, a one-off transfer is paid to alleviate the burden accruing between October 2022 and February 2023. Subsequently, the "natural gas price brake" in stage 2 is to cover the period until at least April 2024.

## 2.1 Stage 1: One-off payment in December 2022

With the one-off payment in December 2022, the state covers the monthly advance payment for all natural gas users. The amount of the payment is calculated based on the consumption forecast in September 2022. This consumption is multiplied by the consumer's current kWh rate as of December 2022. The transfer is tethered the forecast from September 2022 to prevent abuse by households through strategically increasing the advance payment.

The consumption forecast used to calculate monthly advance payments is typically based on the consumption of the previous billing period. For example, if a household consumed 12,000 kWh in the previous year, the monthly consumption forecast in September 2022 would equal 1,000 kWh. With a kWh rate of 20 cts per kWh in December 2022, this results in a one-off payment of:

1,000 kWh * 20 cts per kWh = €200

According to the commission's proposal, this one-off payment is to be paid out in December 2022, regardless of actual consumption. Hence, if a household saves energy and consumes less than its consumption forecast (in the example above less than 1,000 kWh) the transfer is higher than the household's actual energy cost in December 2022. If, on the other hand, consumption in December 2022 exceeds the forecast, the household has to pay for the excess consumption at the current kWh rate itself. This creates an incentive to consume less natural gas. However, the effect of reduced or increased consumption only becomes salient to the household with a delay in the next annual statement. This is then associated with either a refund or arrears.

## 2.2 Stage 2: Natural gas price brake as of March 2023

Commencing March 2023, the actual "natural gas price brake" takes effect until at least the end of April 2024. The price brake consists of a household-specific basic consumption quota at a guaranteed maximum price of 12 cts per kWh. The basic quota amounts to 80% of the consumption forecast in September 2022. Effectively, this reduces the advance payments beginning in March 2023 by a subsidy in the amount of:

(kWh rate - 12 cts per kWh) * basic quota

If consumption exceeds the basic quota, each kWh in excess will be billed at the household's current kWh rate.

For example, a household with a basic quota of 8,000 kWh, a contract price of 20 cts per kWh and an actual annual consumption of 9,000 kWh incurs the following annual expenses for natural gas:

12 cts per kWh * 8,000 kWh + 20 cts per kWh * 1,000 kWh = €1,160

Without compensation via the price brake, the same consumption would cost 9,000 kWh * 20 cts per kWh = €1,800. This results in a relief of €640 per year. The subsidy does not have to be repaid at the end of the billing period even if the actual consumption is below the basic quota. If the household in the example above only consumes 7,000 kWh, this results in an implicit savings subsidy of:

(20 cts per kWh - 12 cts per kWh) * 1,000 kWh = €80

The household would therefore only pay the subsidised price of 12 cts per kWh for its entire consumption (thus saving €560 compared to the kWh rate of 20 cts per kWh) and additionally receives a refund of €80 with the annual bill. Therefore, the savings incentive is further strengthened.

## 2.3 Distributional impact of the proposal

Figure 1 compares the projected total expenditure on natural gas in the period from October 2022 to April 2024 (red bars) with the expenditure after deduction of the commission's proposed compensation payments (orange bars) and the expenditure that would have resulted without the energy price shock (green bars). Average expenditures increase with income in all three scenarios and are about twice as high in the highest decile as in the lowest. In absolute terms, the compensation also increases with income, as

it is (partly) proportional to expenditures. Therefore, the compensation appears socially unbalanced: The higher the income, the higher the transfer received by a household.

Aggregated over the entire period covered by the commission's proposal, October 2022 to April 2024, a private household in the fifth income decile would have to pay approximately €4,700 for natural gas before the transfers. This assumes an average kWh rate of 15 cts per kWh from October to December 2022 and 20 cts per kWh from January 2023 to April 2024 across all new and existing contracts. This amounts to an excess burden of €3,100 in comparison to the scenario without a price increase.[1] The relief measures in stages 1 and 2 lead to a total compensation of about €1,400 for households with middle incomes. Thus, 47% of the additional burden is cushioned by the relief measures alone before accounting for additional monetary savings from a reduction in natural gas consumption.

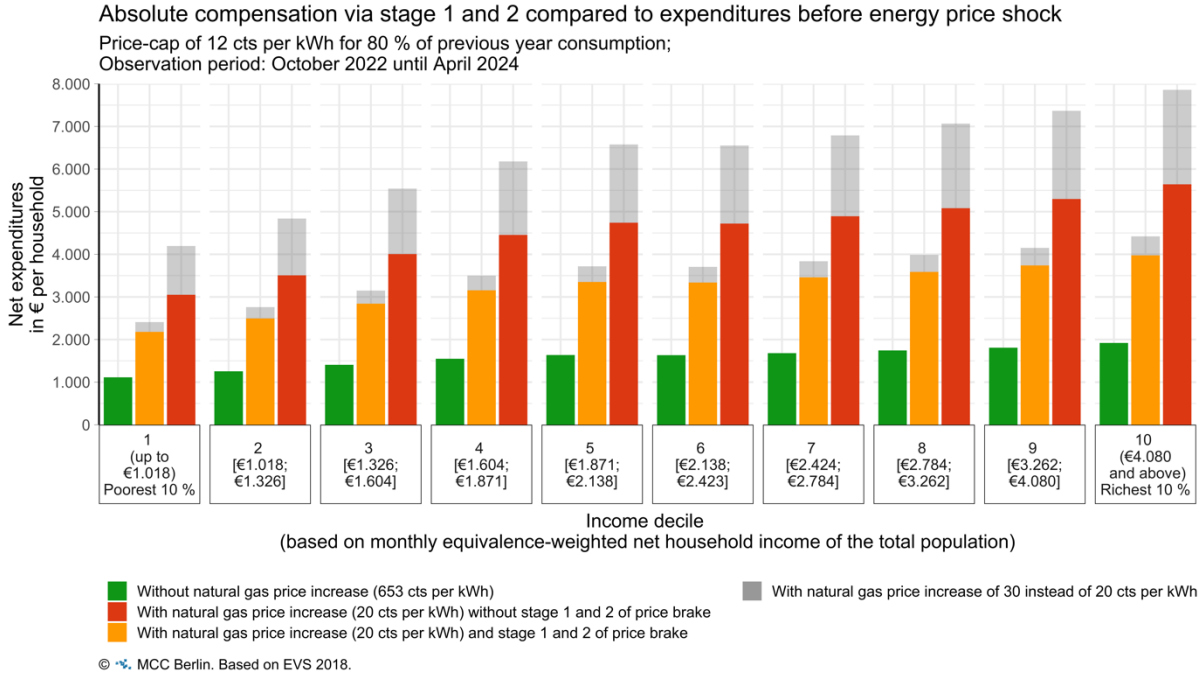


**Figure 1: Average total expenditures on natural gas from October 2022 to February 2024 with and without compensation through measures in stages 1 and 2 compared to expenditures before energy price shock.** Source: Own calculations based on EVS 2018.

In the following, the proposed measures in stage 1 and 2 are analysed separately.

In order to determine the relief effect of the one-off payment in December 2022, we employ the natural gas consumption based on expenditures reported in the German sample survey on income and consumption (EVS) as an approximation for consumption forecast in September 2022. However, the most recent EVS data from 2018 is not suitable to determine current monthly advance payments which are required to measure the relief effect and the fiscal cost of the one-off payment. This is due to the price development between the end of 2018 and October 2022: while some existing customers are still benefiting from very favourable old contracts, the kWh rates in some cases significantly exceed the average level (Mühlenweg et al., 2022). To reflect this, we assign a randomly drawn price between 8 and

[1] In the counterfactual scenario, the expenditures for natural gas in the EVS 2018 are scaled to a period of 14 months, i.e. expenditures are based on 2018 prices. This means that price increases before October 2022 are not taken into account such that the green bar in Figure 1 underestimates the counterfactual expenditures.

31 cts per kWh from a distribution around the mean value of 15 cts per kWh to all households in our sample.[2]

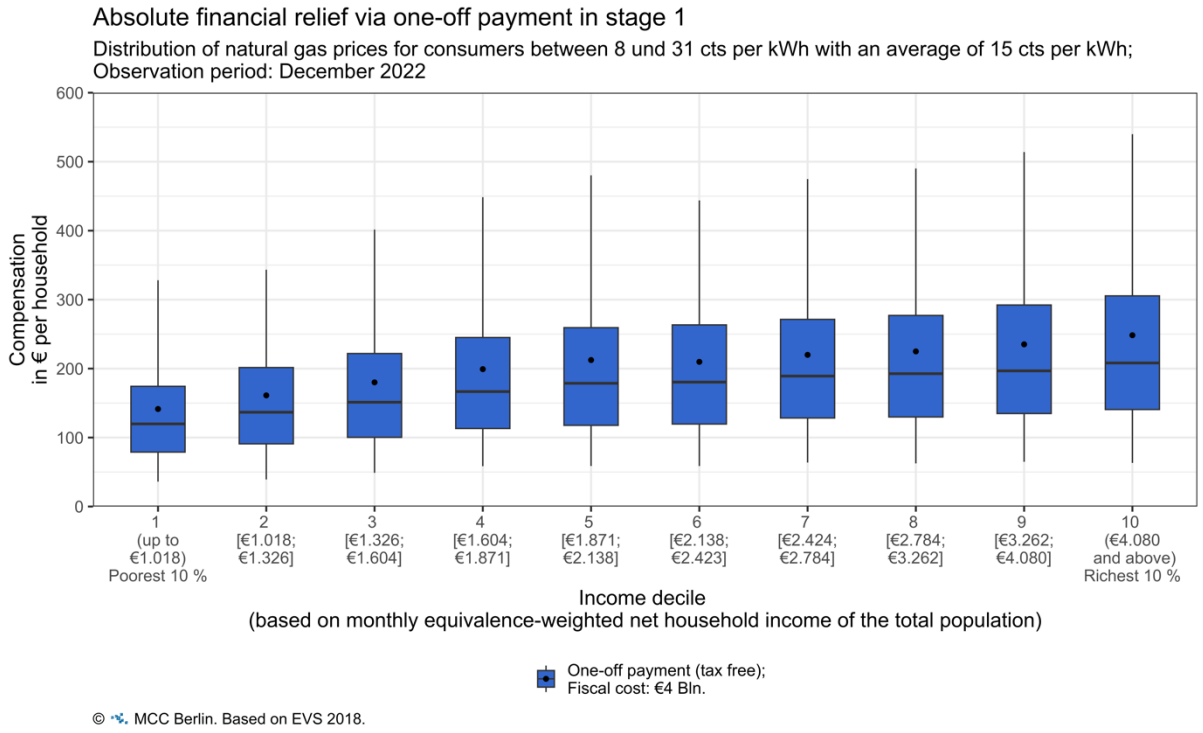


**Figure 2: Financial relief for households through one-off payment in December 2022**

One-off payment to all households heating with natural gas, including recipients of social transfers whose heating costs are covered by the public. Calculation based on 1/12 of the annual consumption determined based on EVS 2018 and on contract prices between 8 and 31 cts per kWh. Source: Own calculations based on EVS 2018.

Figure 2 depicts the relief for households heating with natural gas through the one-off payment across income deciles.[3] A completely tax-free one-off payment leads to an average relief of just under €150 in the lowest decile, which increases to approximately €250 in the highest decile. In addition, the range of payments increases in the upper deciles: among the 10% richest households, 5% would receive a relief of more than €500.

Although the absolute amount of the one-off payment increases with income, the relative relief compared to the burden incurred remains nearly constant across all income deciles. The one-off payment covers about 42% of the additional burden in the poorest decile. In all other deciles, a similarly high relative relief of 37-40% is achieved (see Figure A2 in the Appendix). The one-off payment is independent of consumption: It therefore covers a higher percentage of the burden when households save energy and reduce their natural gas consumption. The effective burden is also reduced by large-scale relief packages

[2] Each household's kWh rate is randomly drawn from a right-skewed normal distribution (cf. Figure A1 in the Appendix). The range is based on the basic supply prices observed in October 2022 (see Mühlenweg et al., 2022).

[3] When calculating the absolute relief, social transfer recipients whose heating costs are covered by the public are also taken into account. In this case, the payment is made to the respective institution (e.g. the employment agency), which ultimately results in a "zero sum" for the tax authorities. In the first step, however, these payments are added to the budget of the relief measure and, thus, are included in our analysis.

passed in spring 2022 ("Entlastungspaket" I and II) as well as a temporary reduction of the VAT (value added tax) on natural gas from 19% to 7%. These additional measures are not considered here.

Unlike in stage 1, we employ average prices to compute the distributional effects in stage 2. This approach is taken to account for the fact that most households will have passed one billing cycle and be subject to a price increase by March 2023. We consider three different price scenarios with average market prices for consumers of 20, 25 and 30 cts per kWh due to the uncertainty regarding price paths. As a reference point: in October 2022, the average price across all contracts was 13 cts per kWh (Mühlenweg et al., 2022), while the average price for new contracts already approached 22 cts per kWh (Handelsblatt, 2022).

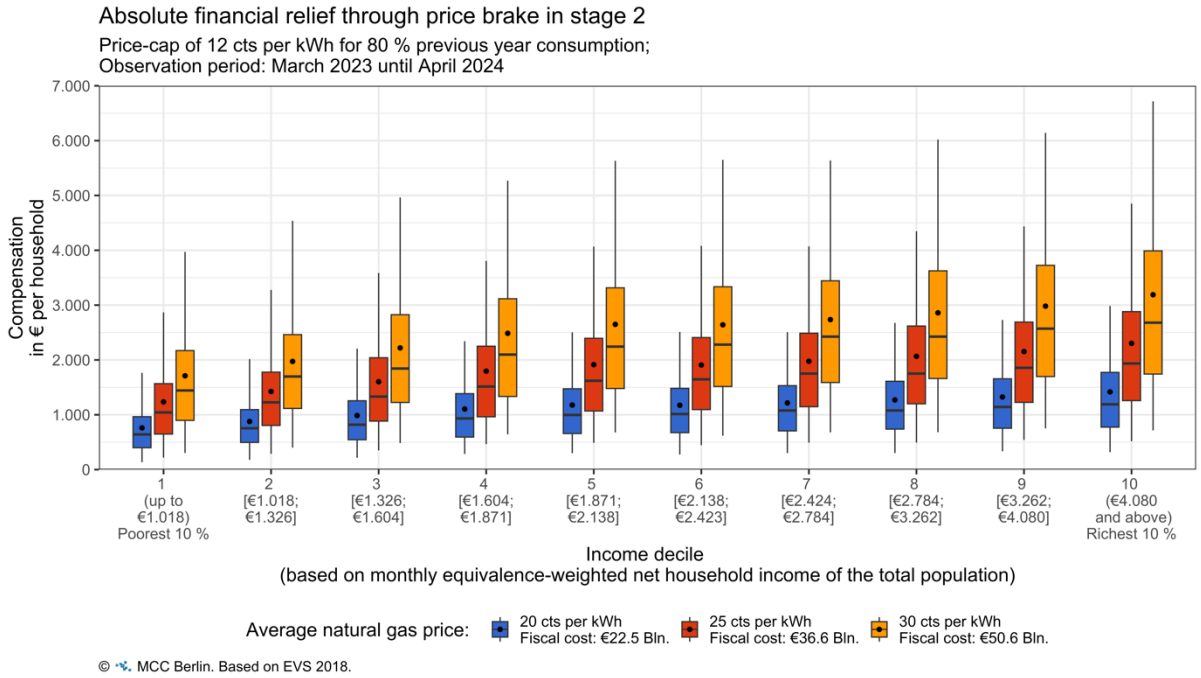


**Figure 3: Relief through subsidised basic quota (price brake) in the period from March 2023 to April 2024**

Relief for all households heating with natural gas, including recipients of social transfers whose heating costs are covered by the public. The basic quota corresponds to 80% of the annual consumption forecast based on the German sample survey on income and consumption (EVS). Source: Own calculations based on EVS 2018.

Figure 3 shows the total compensation for each income decile via the price brake in stage 2 over the period from March 2023 to April 2024.

At a market price of 20 cts per kWh, households in the lowest decile receive an average total relief of about €800 over the period of 14 months (blue bars). The average relief increases to approximately €1,500 in the richest decile, i.e. the absolute relief in stage 2 also increases with income. Relative to the excess cost caused by the energy price shock, however, the relief is the same across deciles as each household's basic quota is based on its individual consumption forecast. The price brake covers 47% of the additional cost.

At a market price of 25 cts per kWh (red bars) and especially at 30 cts per kWh (orange bars), both the additional costs incurred and the absolute relief generated by the price brake increase significantly. As a result, in these scenarios, more than 55% (at 25 cts per kWh) and more than 60% (at 30 cts per kWh) of the excess cost is compensated across all income groups. However, the effective burden and relief also

depend on the ability to mitigate the price shock: If high-income households can more readily reduce their consumption (e.g. by not heating unused rooms or transitioning to alternative heating technologies), the price brake in stage 2 becomes progressive in relative terms, because the compensation then covers a larger percentage of the burden as income rises.

# 3 Compensation in the mid-term

When analysing the mid-term effects of the proposed transfer scheme, the price brake's subsidised basic quota in stage 2 is particularly relevant as this forms the core of the recommendations and is to be maintained for at least 14 months.


**Figure 4: Monthly expenditures on natural gas with and without relief in stage 2 compared to pre-war levels**

Expenditures without natural gas price increase (green bars) based on the German sample survey on income and consumption (EVS). The grey parts of the bars depict the additional expenditures if the average market price is 30 instead of 20 cts per kWh. Source: Own calculations based on EVS 2018.

Figure 4 compares the monthly expenditures on natural gas according to the German survey sample on income and consumption (EVS, green bars) with the expenditures at an average market price of 20 cts per kWh (red bars) and the expenditures after deducting the second stage (orange bars). The difference between the red and green bars gives the uncompensated additional cost caused by the price increase: in the fifth decile, these amount to about €180 per month. The compensation in stage 2 reduces the monthly excess cost to €95 in the fifth decile.[4] Although this still represents a high financial burden, the price brake cushions a substantial part of the additional cost across all income groups. Reducing consumption further decreases the effective monetary burden.

[4] This comparison does not take into account any of the relief measures passed in Spring 2022. However, with the exception of the temporary VAT reduction, these measures do not have a direct impact the cost of natural gas, but increase overall disposable income.

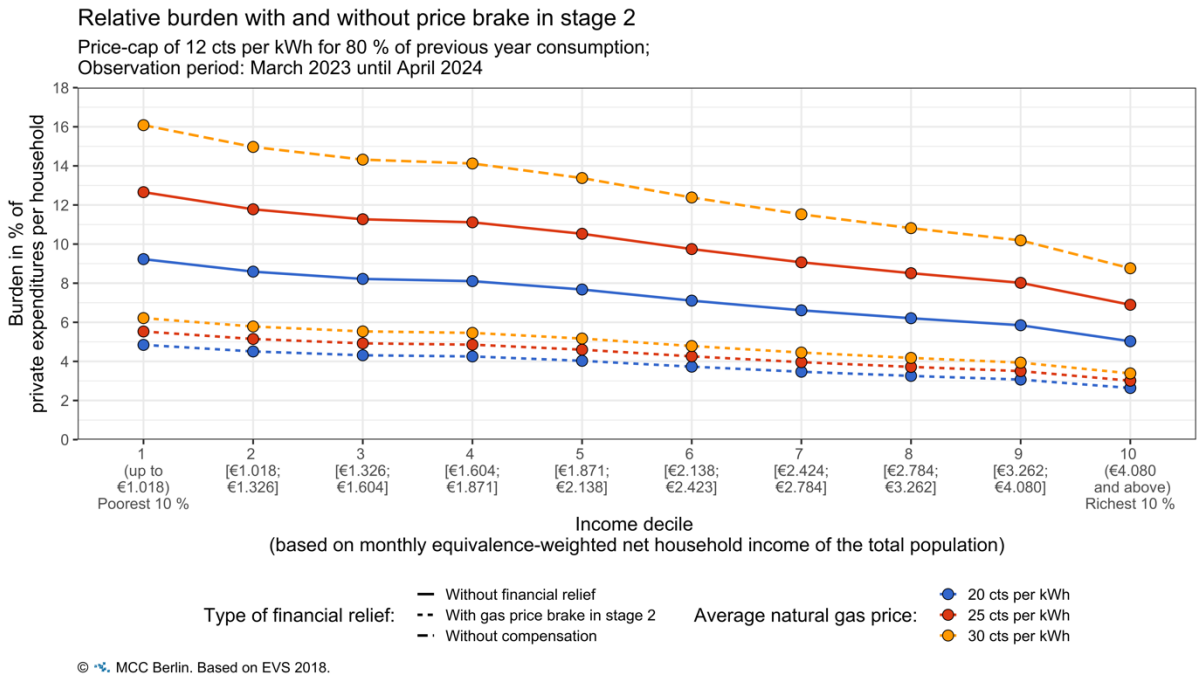


**Figure 5: Excess cost for households heating with natural gas caused by energy price shock before and after compensation through subsidised basic quota in stage 2 relative to consumption expenditures from March 2023 to April 2024**

Average burden per decile without recipients of transfer payments, as their heating costs are covered and thus no direct additional burden arises. The dashed line shows the net burden after relief through the natural gas price brake in stage 2. Source: Own calculations based on EVS 2018.

Figure 5 compares the burden relative to total consumption expenditures before (solid lines) and after (dashed lines) compensation through the price brake in stage 2.[5] Under the pessimistic assumption that a natural gas price of 30 cts per kWh realises, this leads to a substantial burden of 16% of total consumption expenditures in the lowest income decile. However, the price brake can reduce the burden to approximately 6%. In the highest decile, the relative burden of the gas price brake falls from nearly 9% to 3.5% of consumer spending. Thus, the proposed measures have a regressive effect: Low-income households – while still bearing the highest relative burden – experience the largest relief in terms of relative burden.

# 4 Assessment of social equity aspects

The analysis of the distributional effects in the previous sections shows that an undifferentiated design of the measures proposed by the commission would result in a high fiscal cost caused by transfers to high-income households. For this reason, the commission proposes supplementary modifications to the measures, provided they prove feasible: First, both the one-off payment in December and the subsidy in stage 2 should be subject to income taxation for annual incomes of €72,000 and above. Second, upper and lower limits should be set for the basic quota in stage 2.

[5] Figure A3 in the Appendix also depicts the relative burden before and after compensation as a boxplot illustrating that there is also considerable variance in the relative burden within each decile.

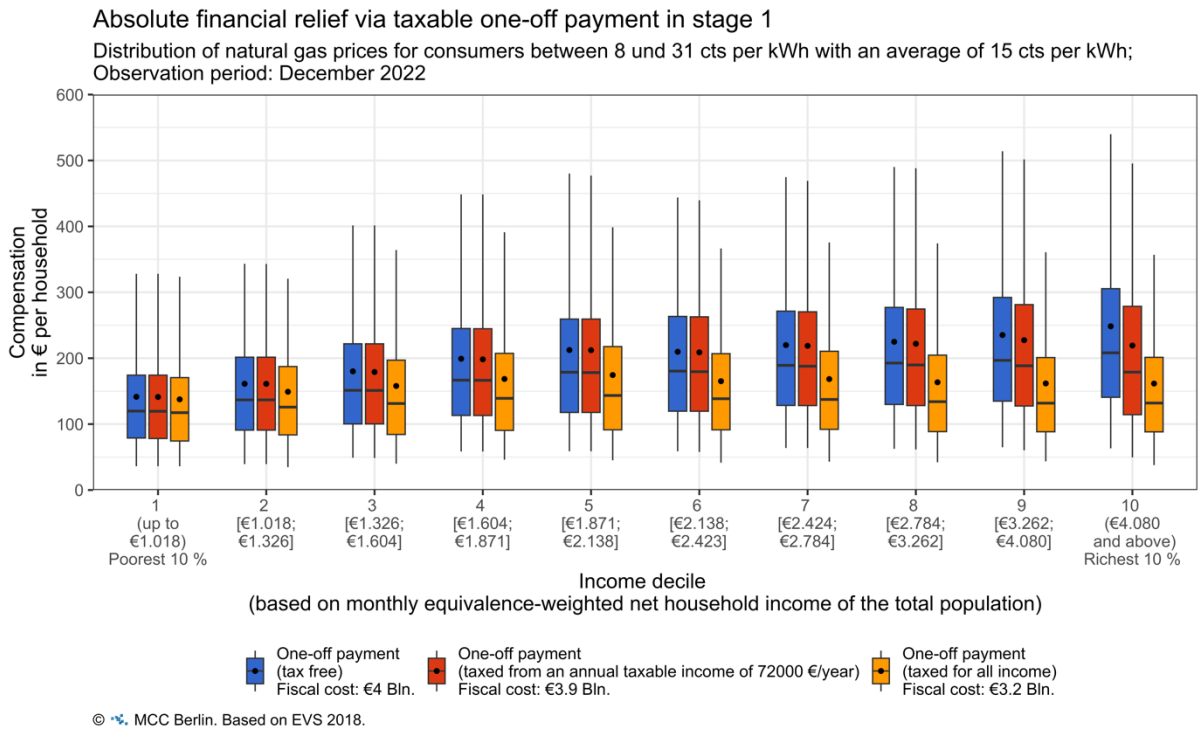


**Figure 6: Effect of taxation on relief through one-off payment in December 2022**

One-off payment to all households heating with natural gas, including recipients of transfer payments, whose heating costs are covered. Calculation based on 1/12 of the annual consumption determined based on the German sample survey on income and consumption (EVS) and kWh rates between 8 and 31 cents. In the taxable scenarios, the one-off payment is subject to the household's marginal income tax rate. Source: Own calculations based on EVS 2018.

Figure 6 examines the effect of taxing the relief measures using the one-off payment in December as an example.[6] If taxable, the one-off payment is subject to each household's marginal income tax rate. If the payment is only taxed at annual taxable incomes of €72,000 and above (€144,000 for married couples, red bars, according to the commission's proposal), the three top deciles receive a lower transfer compared to the completely tax-free payment (blue bars). However, payments to high incomes decrease only moderately with a negligible effect on the total fiscal cost of less than 1%. In contrast, a fully taxable one-off payment without an income exemption threshold (orange bars) would reduce the fiscal cost by 10% and lead to significantly lower payments to high-income households. In return, households with low to medium incomes would also receive noticeably less relief in this case.

Taxation of the one-off payment faces technical difficulties because the payment is conducted by private energy supply companies (either directly or, in the case of households in tenancies with central heating, via the landlords' operating cost statement) by collecting the advance payment in December 2022 from a state account instead of the respective consumers' bank accounts. Therefore, in order to be recorded for tax purposes, a self-disclosure would be required in the income tax declaration.

In order to keep the administrative burden low, the commission recommends a mandatory self-disclosure only for persons who already file a tax declaration. This results in unequal treatment within income deciles (e.g. between self-employed and employees) and, consequently, a smaller fiscal effect than estimated in Figure 6. Against this background, the question arises whether taxing the one-off payment actually serves social justice or would mainly be of symbolic character. A solution that is easier to administer would be to temporarily increase the existing solidarity surcharge as an additional tax on high incomes. Although this

[6] Figure A4 in the Appendix illustrates the effect of taxing the price brake in stage 2.

would also affect high-income households without natural gas heating, they would also benefit from the positive macroeconomic effects of the compensation.

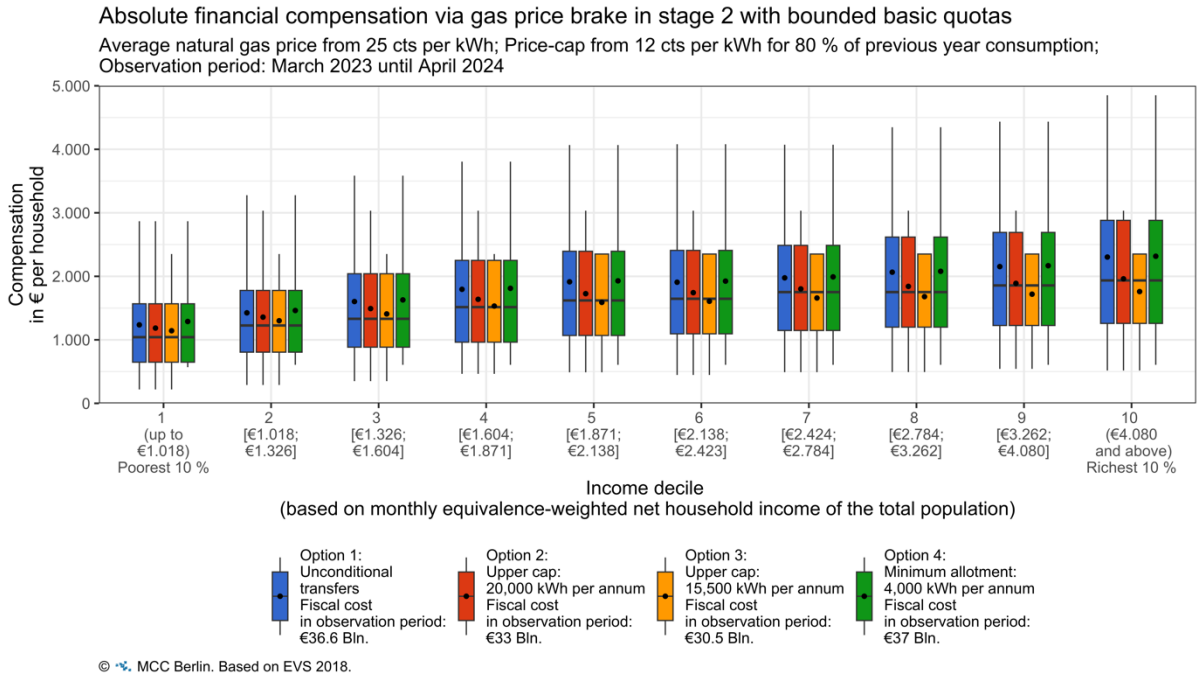


**Figure 7: Effect of caps and floors on relief from subsidised basic quota from 2023 to April 2024**

Relief for all households heating with natural gas, including recipients of social transfers whose heating costs are covered by the public. The basic quota corresponds to 80% of the annual consumption determined based on the German sample survey on income and consumption (EVS). An average consumer price for natural gas of 25 cts per kWh is assumed. Source: Own calculations based on EVS 2018.

In order to avoid high payments to rich households especially in stage 2, the commission also recommends examining "how conditions can be created to implement a household-based minimum allotment and an upper cap for the supported quota" (Expert Commission Natural Gas and Heat, 2022, p. 19). Thus, in addition to the percentage quota (80 % of the projected annual consumption), an absolute limit would also be implemented. This could amount to 15,000 kWh per annum (orange bars) or 20,000 kWh per annum (red bars), as shown in Figure 7. If the upper limit of 20,000 kWh/year is implemented, the relief would be capped for about 25% of the richest households. Households in the second to ninth decile would also be affected by the cap, though, to a much lesser extent.

With an average natural gas price of 25 cts per kWh, the state could save around 10% of the fiscal costs of the transfer with such an approach. However, it is unclear how high the additional administrative effort to implement the cap would be compared to the savings. A stricter cap equal to a maximum of 15,000 kWh per annum – roughly the average consumption of a household heating with natural gas – almost doubles the fiscal savings while also reducing the compensation for more than 25% of middle-income households.

An absolute limit on the basic quota would also have the disadvantage that it is currently not technically feasible to differentiate between particularly large and excessively "wasteful" households. Energy supply companies cannot identify how many households are connected to a single meter, i.e. whether a meter with high consumption is associated to a mansion with a heated outdoor swimming pool or an apartment building consisting of several residential units. The relevance of this is shown in Figure 8, which shows

that annual natural gas consumption correlates strongly with household size across all deciles. The increase in average consumption with income is mainly explained by the higher proportion of households with three or more persons (orange dots) in the middle and upper income groups. Especially in the lower three deciles, a cap would almost exclusively affect large households.

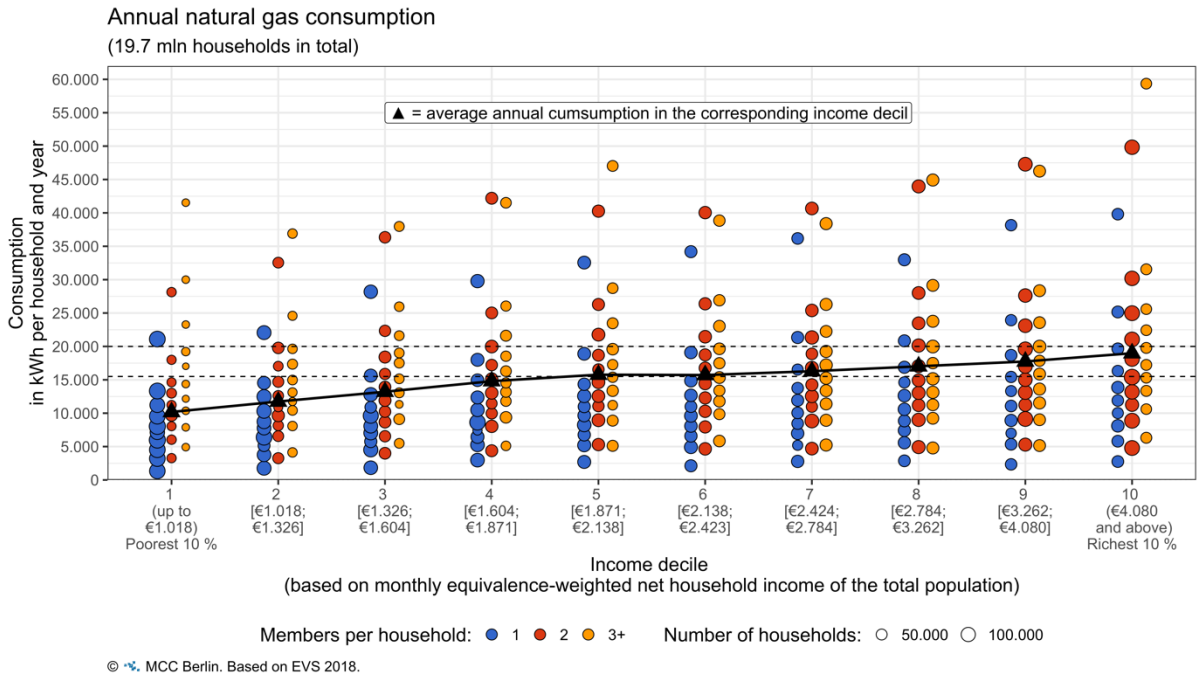


**Figure 8: Annual natural gas consumption in 2018 by income deciles and household size**

Estimated consumption based on average kWh rate in 2018. The size of the dots reflects the number of households per decile with the corresponding annual consumption. Source: Own calculations based on the German sample survey on income and consumption (EVS 2018).

In contrast to the cap, a minimum allotment that is subsidised regardless of a household's individual consumption forecast would not only lead to the relief being made income-dependent, but primarily benefits low-income households (green bars in Figure 7). For example, if all households are entitled to a minimum allotment of at least 4,000 kWh regardless of their projected annual consumption, the relief increases especially for parts of the lowest three deciles. Among households in the lowest decile, approximately 25% would be better off. The additional fiscal cost amounts to about 1% of the total cost of the unconditional transfer (blue bars). However, the same technical difficulties arise with regard to the practical implementation as discussed above in the case of an upper cap.

# 5 Energy saving incentives

In order to prevent a critical natural gas shortage, it is crucial that private households also reduce their consumption compared to the pre-crisis period. Ideally, savings of up to 20% should be achieved (BNetzA, 2022). A suitable design of the compensation measures can harbour considerable potential to provide monetary incentives. On the one hand, these arise through a salient, high market price and, on the other hand, through premiums for savings.

Since the unsubsidized kWh rate has to be paid for every kilowatt hour exceeding the subsidised basic quota, an efficient orientation towards marginal costs initially creates a strong incentive to limit

consumption to a maximum of 80% of the consumption forecast. However, behavioural economics research shows that people often consider average instead of marginal prices in decision making (Ito, 2014). In relation to the natural gas price cap, this means that consumers underestimate the actual price for each additional kilowatt hour consumed above the basic quota. This can reduce the incentive to save, especially if monthly advance payments decrease because the energy supply companies directly offset them against the subsidised quota. Nevertheless, the concept proposed by the commission creates an additional savings incentive as the transfer does not have to be paid back if consumption falls short of the subsidized basic quota. This corresponds to an implicit savings premium.

Overall, however, the incentives set in the commission's proposal are not self-explanatory. Offsetting subsidised basic quota and contract prices in the advance payments is complicated. Moreover, actual consumption is typically billed only once a year, giving consumers very limited insight about their consumption patterns and energy saving efforts. However, the proposed measures can only develop their savings incentives if they are understood by the population. Thus, comprehensive and target group-specific information provision is essential.

Our static analysis is based on consumption quantities estimated using expenditures on natural gas in the German sample survey on income and consumption, EVS 2018, and scaled on the basis of national environmental economic accounts (Roolfs et al., 2021). Thus, savings earned by behavioural changes are not taken into account. Since the price brake is independent of current consumption, this has no influence on the estimated transfer payments. Nonetheless, the net monetary burden caused by the natural gas price crisis depends on whether households are willing and able to reduce consumption. The expenditures on natural gas (Figures 1 and 4) and relative burden (Figure 5) should therefore be understood as an upper estimate: The corresponding values decrease as households reduce their consumption. If the incentives to save are not understood by households (e.g. because of basing consumption decisions on average prices), there is a risk of insufficient demand reduction and the financial burden remains high even if the proposed measures are implemented.

# 6 Conclusion

The relief measures for private households proposed by the German "Expert Commission Natural Gas and Heat" are capable of absorbing a substantial share of the additional burden caused by rising natural gas prices. However, the relief has a progressive effect, as households with high incomes receive much higher payments in absolute terms.

A more socially balanced (i.e. income-dependent) design of the relief would, in principle, be possible through taxation of the compensation payments or through upper and lower caps for the subsidised basic quota. However, both options are difficult to implement because the relief is not administered directly by the state, but indirectly via energy supply companies. Additionally, due to the required lead time in order to implement necessary changes to the billing systems, no payment is possible before December 2022.

Furthermore, there is a danger that the savings incentives associated with the compensation mechanism will be weakened by the high complexity of the system and delay between fixed advance payments and reporting of actual consumption quantities which is particularly relevant for tenants. In particular, the government's plan - which deviates from the commission's recommendations - to make the one-off payment in December dependent on actual annual consumption rather than on forecast consumption (Tagesschau, 2022) would further undermine the incentives to save.

A faster, taxable and incentive-compatible relief would be possible through consumption-independent payments similar to the lump-sum energy price transfer ("Energiepreispauschale") which was paid to all German employees in September 2022 and to pensioners in December 2022. This type of transfer could be adapted to, e.g. a monthly lump-sum of taxable €80 per employed person and tax-free €40 for non-employed persons as an effective relief measure (Kalkuhl et al., 2022). Current transfer frameworks do not provide sufficient information to specifically target payments exclusively to households heating with natural gas. However, in view of the ongoing energy price crisis and expectable future need for political intervention over the coming year, it could make sense to continue thinking in this direction. In the mid-term, it appears necessary to set up a direct transfer channel capable of targeted transfers. This would also prove expedient beyond the current energy price crisis in light of climate policy targets and the German federal government's declared objective to refund revenues from carbon pricing to households.

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# Appendix

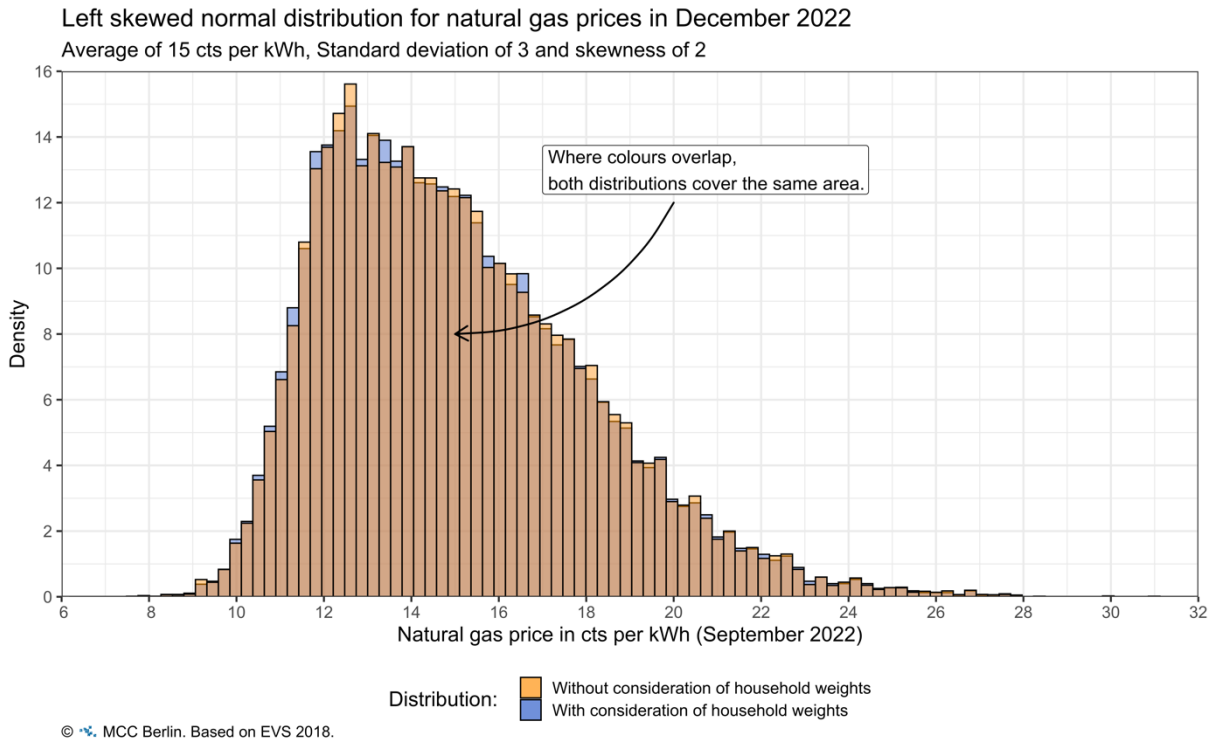


**Figure A1: Random distribution of natural gas prices for the computation of the one-off payment in December 2022**

Distribution parameters: Average = 15 cts per kWh, standard deviation = 3 , skewness = 2. Source: Own calculations based on the German sample survey on income and consumption (EVS 2018).

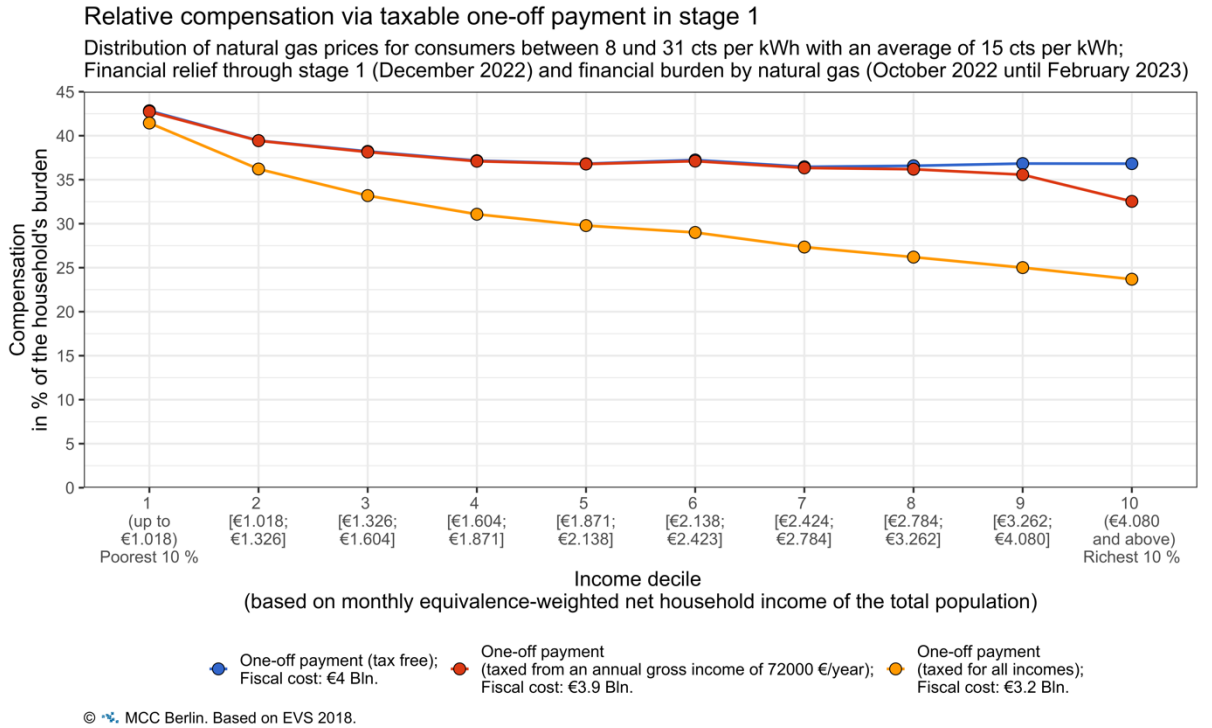


**Figure A2: Compensation trough one-off payment in December 2022 relative to the burden caused by the energy price shock form October 2022 to February 2023.** Source: Own calculations based on the German sample survey on income and consumption (EVS 2018).

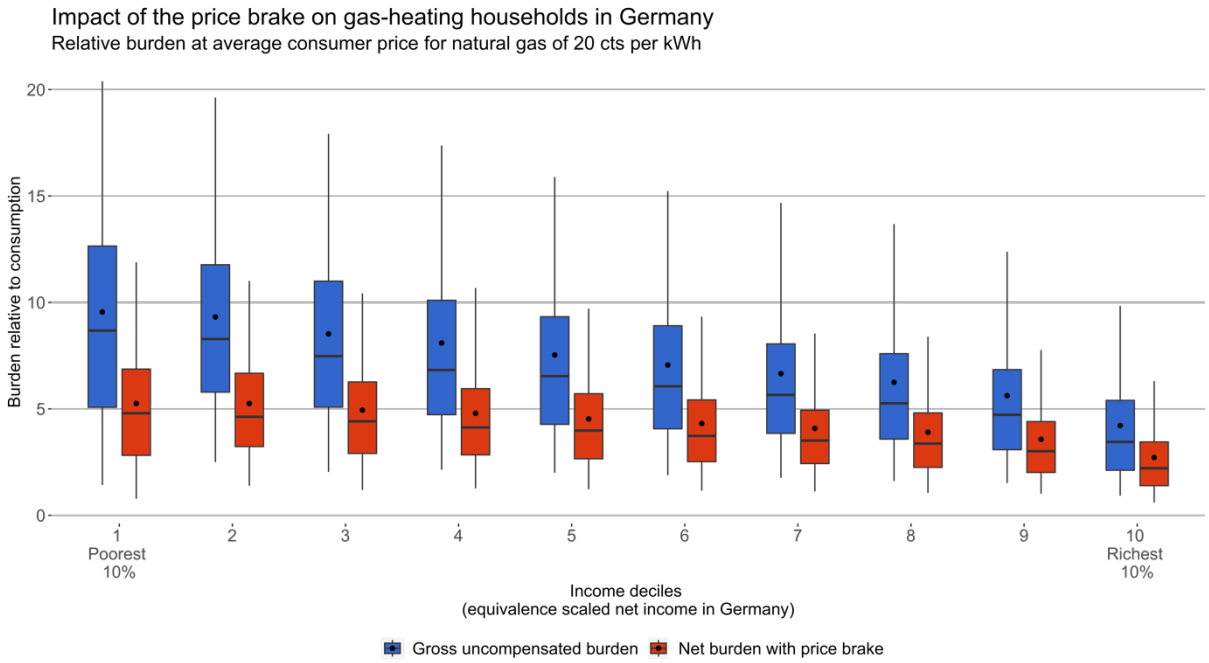


**Figure A4: Excess cost for households heating with natural gas caused by energy price shock before and after compensation through subsidised basic quota in stage 2 relative to consumption expenditures at a natural gas price of 20 cts per kWh.** The black horizontal lines and dots depict the median and mean of each decile, respectively. Blue and red bars cover 50% of the population in each decile, while black vertical lines include an additional 20% of the respective populations. Source: Own calculations based on the German sample survey on income and consumption (EVS 2018).

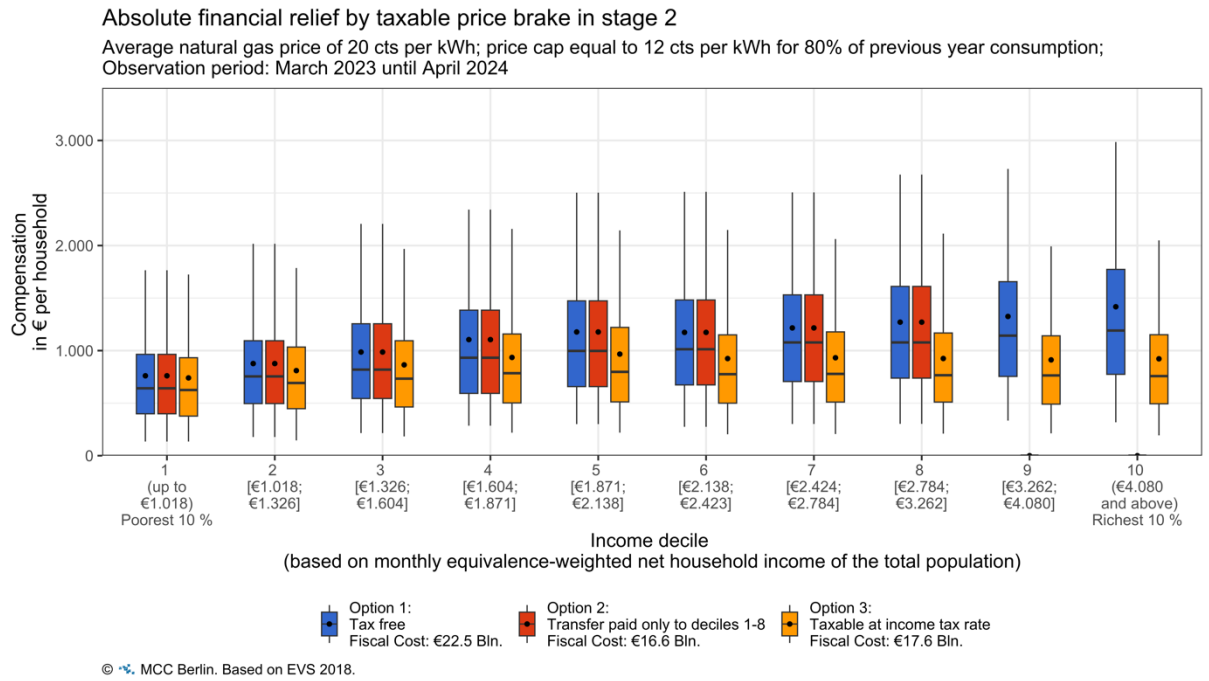


**Figure A4: Effect of taxation on relief through price brake from March 2023 to April 2024**

Compensation via price brake to all households heating with natural gas, including recipients of transfer payments, whose heating costs are covered. In the taxable scenarios, the price brake is subject to the household's marginal income tax rate. Source: Own calculations based on EVS 2018.