Can Polluter Pays policies in the buildings and transport sectors be progressive?

Country briefing paper: Germany

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1 Executive Summary

Background

The European Commission's Fit for 55 package proposes two significant reforms to energy pricing in the EU:

1) **Energy Taxation Directive (ETD) reform**; and
2) **Extending emissions trading to cover emissions from buildings and road transport (ETS2)**.

These changes are intended to better align the costs of using fossil fuels with the polluter pays principle and help reduce some environmentally harmful subsidies to fossil fuels. The reforms would thus help create a more level playing field for renewable energies and accelerate the transformation to a climate-neutral economy that the EU and its Member States have committed to achieve. While the present study does not quantify the emission reductions of the reform, previous research on carbon pricing and energy taxation has found large emission reduction potentials stemming from the introduction of carbon pricing in Germany.[1]

A concern among stakeholders is how these reforms would impact lower income households. Various policy mechanisms are under consideration to help address potential distributional impacts. Based on a microsimulation model developed by the Basque Centre for Climate Change (BC3)[2] with IEEP[3], we analyse the distributional impacts of ETD reform and ETS2 in Germany.

This report analyses a series of reform scenarios supported by graphical depictions of their distributional effects in Germany.

Key findings

The results show that combined reform of the Energy Taxation Directive and extension of emissions trading to buildings and transport—if combined with well-designed compensatory measures—could have progressive distributional impacts in Germany and benefit poorer German households financially.

The most important conclusions for policymakers and stakeholders are the following:

- **ETD reform has little effect on household costs in Germany.** The proposed new minimum tax rates would only increase the tax rate of coal in Germany.[4] The ETD

[1] Stefan Bach et al. (2019), "Lenkung, Aufkommen, Verteilung: Wirkungen von CO2-Bepreisung und Rückvergütung des Klimapakets", https://www.econstor.eu/handle/10419/205157; Sebastian Gechert et al. (2019), "Wirtschaftliche Instrumente für eine klima- und sozialverträgliche CO2-Bepreisung: Gutachten im Auftrag des Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit," Research Report (IMK Study), https://www.econstor.eu/handle/10419/206808.

[2] See the methodology paper: BC3 (2022), "Modelling the Direct Socioeconomic Impacts of the New Energy Taxation Directive (ETD) and the Extension of the ETS on Transport and Building Sectors" (Leioa: Basque Centre for Climate Change (BC3)), https://api.otea.info/storage/2022/03/08/d87a258a425ad-cad49f3cb35a268fe6ad52935ba.pdf.

[3] See the EU level summary paper: Tim Gore (2022), "Can Polluter Pays Policies Be Progressive?," Research Report (Brussels: Institute for European Environmental Policy), https://ieep.eu/publications/can-polluter-pays-policies-be-progressive.

[4] The present analysis does not model the requirement in Article 5.1 of the ETD proposal that a) Member States apply equal tax rates for fuels used for a particular use if the European Commission has set equal

reform thus results in negligible welfare impacts across all income groups in Germany; the loss in disposable household income is no more than 0.05% on average.

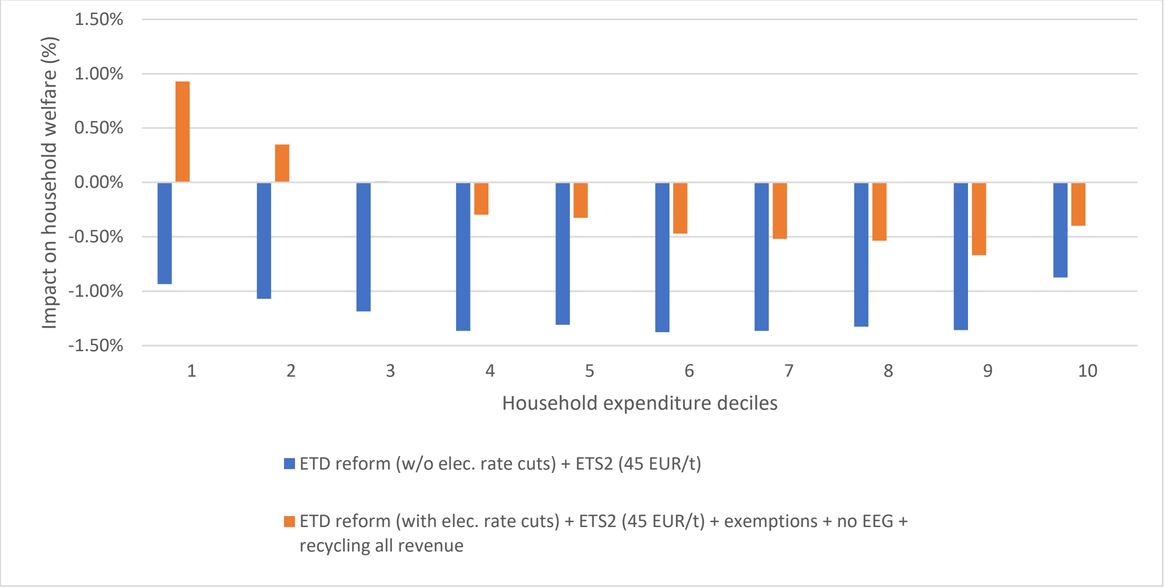
- **Combined reform (ETD and ETS2) without compensatory measures reduces available household incomes in Germany by about 1% to 1.35% depending on income group.** Compared to a situation without a carbon price in place, introducing the ETS2 at a permit price of 45 €/tCO_2 without compensatory measures has higher negative welfare impacts than ETD reform only.[5] The resulting loss in disposable income is about 1% for the lowest three deciles, while the welfare loss is largest (ca. 1.35%) for households in the middle of the income distribution. In nominal terms, the combined reform would cause households to increase energy expenditures by around 150 € (decile 1) to 840 € (decile 10) compared to the situation without a carbon price.
- **A lump-sum revenue recycling via the proposed Social Climate Fund would yield a distribution of approximately 15 € per German household, not enough to fully offset the loss in disposable household income of carbon pricing in Germany.** In order to cushion the distributive effect of introducing the ETS2, the European Commission proposed a mechanism called the Social Climate Fund (SCF). Under the mechanism, Member States would be required to contribute 25% of their ETS2 revenues to the SCF, which then redistributes the money to Member States in order to compensate more vulnerable households. Under the proposed plan, Germany would be a net contributor to the fund, receiving back approximately 30% of what it would pay into the fund.
- **A lump-sum recycling of all ETS2 revenues to all German households would yield a distribution of approximately 170 € per household, generating net welfare benefits for the poorest households in Germany compared to the situation without a carbon price.** Lump-sum redistribution of all the ETS2 revenue creates largely progressive distributional effects, with the combined reform resulting in positive welfare effects for the lowest decile and reducing welfare losses from combined reform (ETD + ETS2) to 1% or below for all other deciles.
- **Reducing electricity taxes and abolishing Germany's renewables levy on electricity (EEG levy) would have progressive effects and speed up electrification.** Two compensatory mechanisms—reducing electricity tax and eliminating the EEG levy—have progressive distributional effects. These compensatory mechanisms could be used in combination to significantly offset reform costs for poorer households while inducing increased electrification across all households.

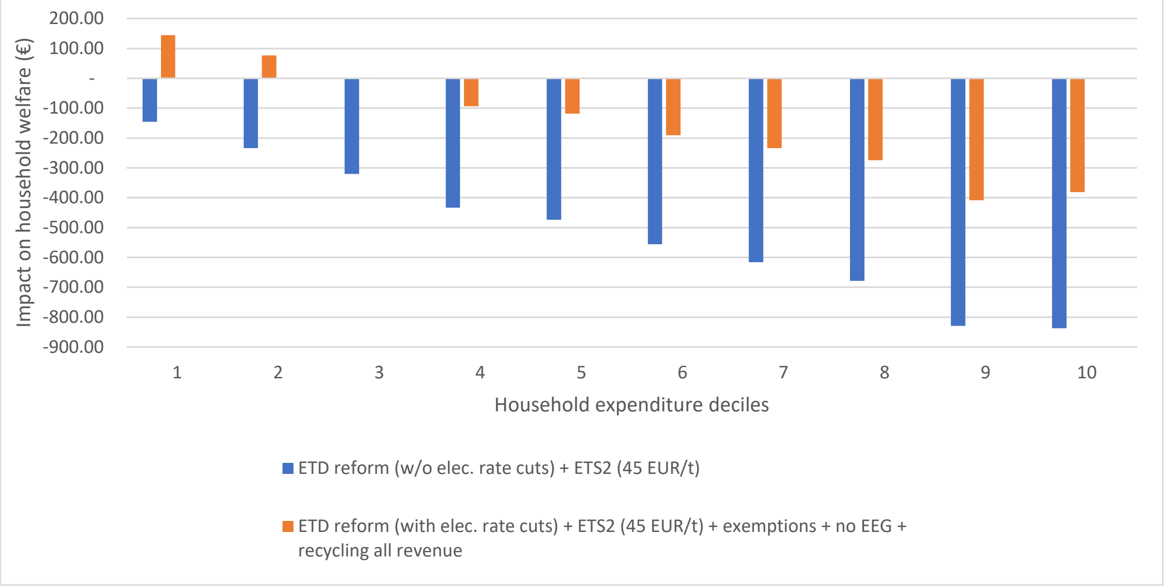
tax rates for those fuels and use; and b) Member States replicate the ranking of minimum levels of taxation in relation to different products for each given use. This would imply further changes to the tax rates of diesel and electricity, though the direction and size of the change is unclear.

[5] The modelling conducted for this analysis was conducted against the baseline of 2020, i.e., before introduction of the German national ETS for heating and transport fuels.

Figure 1 compares the welfare impacts and distributional effects for the two most extreme scenarios examined. The reform scenario with no compensatory measures and no electricity tax changes results in welfare impacts for German households ranging from -1.4% to -0.9%. The scenario is neither clearly regressive nor progressive; the largest welfare effects are observed for the middle to upper deciles. The other reform scenario employs an ambitious set of compensatory measures—electricity tax rate cuts, exemptions for poor households, elimination of the EEG levy and recycling of all ETS2 revenue to all households—generating a strongly progressive effect, with the poorest households clearly benefitting economically compared to present-day policy.

Figure 1. Comparison of two reform scenarios – no compensatory measures versus all compensatory measures (% and €)





2 Introduction

Via the European Green Deal, the European Commission intends to put the EU on the path to climate-neutrality, establish a circular economy, protect biodiversity, and tackle environmental pollution. At the same time, the European Green Deal aims to ensure the competitiveness of European industry and a just transition to a green economy for workers and regions.[6] In July 2021, the European Commission proposed a legislative package, the 'Fit for 55' package that is meant to accomplish these goals.[7]

The Fit for 55 package encompasses a set of policy reforms and new instruments with which the European Commission aims to meet its new 2030 target to reduce greenhouse gas emissions by at least 55% compared to 1990. Carbon pricing is a central pillar of the legislative package. In addition to comprehensive reforms of the existing EU emissions trading scheme (EU ETS), the European Commission wants to extend carbon pricing via two initiatives: the revision of the Energy Taxation Directive (ETD)[8] and the introduction of a separate emissions trading system for heating and transportation (ETS2).[9]

ETD reform

The ETD sets a common framework for energy taxation, primarily through minimum tax rates. It was last revised in 2003. Given the EU's much more ambitious climate protection goals, it is no longer fit for purpose for three reasons:

1. **The current ETD ignores the environment.** The structure of tax rates is not oriented around environmental considerations. Coal, for instance, has a much lower minimum tax rate than gas or advanced biofuels, reflecting neither the carbon content of the fuels, nor other environmental externalities, such as air quality impacts.
2. **The current ETD ignores inflation.** The current ETD is not indexed and does not account for inflation, meaning the real tax rate has decreased over time.
3. **The current ETD incentivises use of fossil fuels.** The current ETD provides numerous exemptions and reductions that function *de facto* as incentives for fossil fuel use. The European Commission's proposal to reform the ETD would address these issues to some extent by introducing minimum tax rates that are based on the energy content and environmental performance of the energy product and by eliminating many of the current Member State specific exemptions and reductions. This would increase prices for fossil fuels relative to low-carbon energy products.

[6] European Commission (2019), "The European Green Deal, COM(2019) 640 Final", https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640.
7 European Commission (2021), "'Fit for 55': Delivering the EU's 2030 Climate Target on the Way to Climate Neutrality COM(2021) 550 Final", July, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0550.
[8] European Commission (2021), "Proposal for a Council Directive Restructuring the Union Framework for the Taxation of Energy Products and Electricity (Recast)", https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52021PC0563.
[9] European Commission (2021), "Proposal for a Directive of the European Parliament and the Council Amending Directive 2003/87/EC Establishing a System for Greenhouse Gas Emission Allowance Trading within the Union, Decision (EU) 2015/1814 Concerning the Establishment and Operation of a Market Stability Reserve for the Union Greenhouse Gas Emission Trading Scheme and Regulation (EU) 2015/757 (COM/2021/563 Final)", https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0551.

ETS2

The introduction of emissions trading for buildings and transport (ETS2) would complement the existing ETS, which covers power and industry. Although the proposed ETS2 is a stand-alone compliance mechanism, separate from the existing ETS, its introduction would result in an economy-wide carbon price for fossil fuels.[10]

Price signals to spur a low-carbon economy

Both measures—the introduction of the ETS2 and the reform of the ETD—would change the relative prices of energy products. Fossil fuels and emission-intensive products would become more expensive, while low-emission products may become relatively cheaper. By putting a price on carbon, the external costs of emissions would be partially internalised. In this way, carbon prices can be a powerful driver of decarbonisation by steering investment decisions from high-carbon to low-carbon activities, by incentivising the switch from high-carbon fuels to lower-carbon and renewable energy sources, and by inducing behavioural changes of consumers to shift to low-carbon forms of heating and transportation.

Compensatory measures to ease the transition

At the same time, restructuring energy taxation can have social consequences. Carbon pricing increases the cost of fossil fuels that are still widely used for heating and transport. In the absence of compensatory measures this tends to have regressive effects.[11] Consequently, carbon pricing must be combined with compensatory measures that cushion the negative impacts on households and reduce their vulnerability to rising energy prices.[12] This is all the more relevant in the context of the current energy price crisis, which is exacerbated by Russia's invasion of Ukraine.

But to design adequate responses and compensatory measures, it is imperative to first understand clearly what the distributive effects of such reforms are, and which groups are affected in which ways; otherwise there is a real risk that well-intentioned compensatory measures end up benefiting constituencies that are the most visible or most vocal, rather than those that are actually most vulnerable and hence need support.

Analysing the distributional impacts

Based on a microsimulation model developed by the Basque Centre for Climate Change (BC3) with Institute for European Environmental Policy (IEEP), this paper analyses the direct, overnight distributional impacts of ETD reform and ETS2 in Germany. We assess different policy options for compensating households to inform policy discussions and identify suitable measures that ensure reform measures are socially sound and support vulnerable households.

[10] Only CO_2 emissions from the land-use sector as well as certain process emissions would remain without a carbon price.

[11] U. Temursho, M. Weitzel, and T. Vandyck (2020), *Distributional Impacts of Reaching Ambitious Near-Term Climate Targets across Households with Heterogeneous Consumption Patterns: A Quantitative Macro Micro Assessment for the Climate Target Plan of the EU Green Deal* (LU: Publications Office of the European Union), https://data.europa.eu/doi/10.2760/89463.

[12] Benjamin Görlach, Katharina Umpfenbach, and Andreas Graf (2021), "A 'Fit for 55' Package Based on Environmental Integrity and Solidarity," Report (Agora Energiewende and Ecologic Institute), https://www.ecologic.eu/17824.

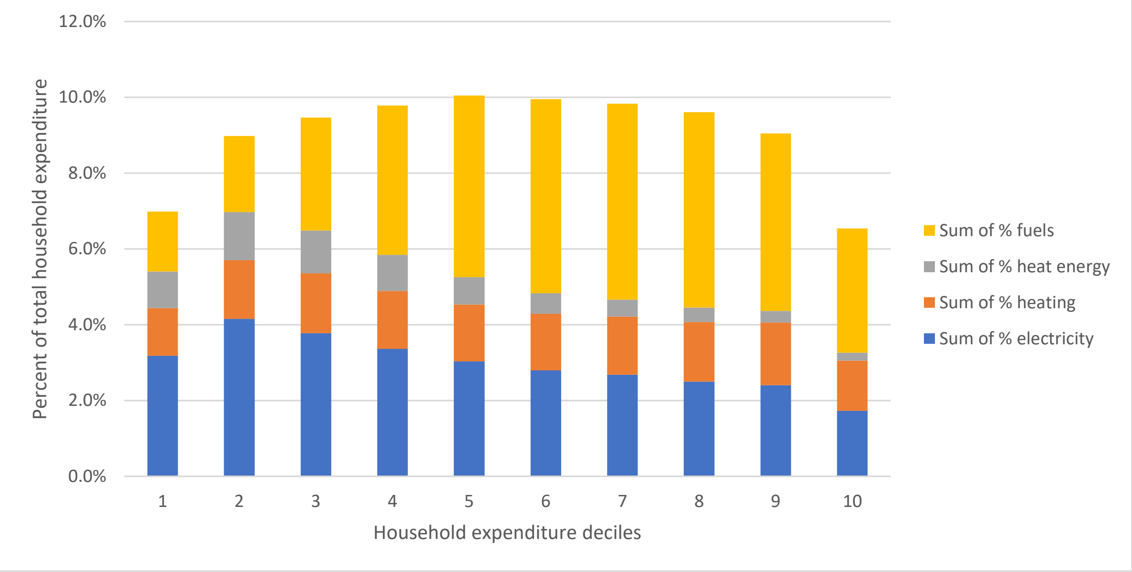
The findings presented in this paper are initial results of a longer research project led by IEEP with partners in the Think Sustainable Europe (TSE) network and will be expanded with macro-modelling later this year.

Understanding household energy expenditure in Germany

The average German household spent about 8.7% of its disposable income on energy products and electricity in 2020. The structure of energy expenditure differs across expenditure deciles. The poorest 10% and richest 10% of households (in terms of disposable income) spend a relatively smaller share of their income on energy products and electricity than households in the middle of the income distribution. Households in the 5th decile spend the largest share of their income on energy products in comparison to other households. It should be noted that energy expenditure in absolute terms increases with income. So, although households in the 1st and 10th deciles spend a similar share of their disposable income on energy, households in the 10th decile will spend a much larger amount in absolute terms, simply because their income is much higher.

The share of income that is spent on electricity decreases with disposable income. In other words, poorer households spend a larger share of their expenditure on electricity than richer households. In contrast, the share of disposable income spent on motor fuels generally increases with household expenditure. So, households with a higher expenditure also spend a larger share of this expenditure on motor fuels. The share of disposable income households spent on heating fuels remains relatively similar across expenditure deciles.

Figure 2. Household energy expenditure in Germany by expenditure deciles



Note: “fuels” refers to motor fuels only; "heat energy" refers to district heating, while "heating" refers to normal heating via natural gas, fuel oil, and coal. Average energy expenditure for all German households in 2020: 8.7% of total household expenditure.

3 Methodology

Results summarised in this paper stem from a microsimulation model developed by the Basque Centre for Climate Change (BC3) with IEEP. The model calculates the direct, overnight distributional impacts of ETD reform and ETS2 on different household types for each EU Member State and for the EU as a whole. The microsimulation is based on household consumption data from Eurostat's 2015 Household Budget Survey (HBS) for all EU Member States. The household surveys map the consumption expenditures of 20,000 different household types in the EU. They thus represent very granular data, which enables modelling the impact on very heterogeneous household types.

Price data from the year 2020 are used as a basis for the modelling and the change in prices under the new tax rates is calculated according to the scenarios. In a further step, the impacts of the price changes for different energy sources are modelled for different household types and their consumption patterns.

The modelling describes how different reform scenarios affect the disposable income of different household types.[13] Results are presented by deciles of income distribution (vertical distribution effect), as well as by socio-demographic characteristics (horizontal distribution effect).

This paper functions as a country-level companion paper to the two flagship papers produced in the project so far, which provide further details on the findings and methodology behind the results (see Figure 3).

[13] The welfare impact on households has been calculated based on total household expenditure, which is a better proxy for the permanent income of families, as it sees lower fluctuations than income over the medium and long term.

Figure 3. EU-level summary and modelling methodology papers

EU-level summary paper:
"Can Polluter Pays policies in the buildings and transport sectors be progressive?"

This paper authored by IEEP provides an EU-level overview of distributional impacts of the proposed ETD reform and introduction of an ETS for the transport and building sectors. Impacts on particular EU Member States are highlighted as are the implication for tax rates on energy in various EU Member States. The paper investigates the driving forces behind the effects, finding that if carefully designed to incorporate compensatory measures, the proposed reforms can achieve clearly progressive impacts in the EU.

The paper also includes a discussion of the methodology, scenarios and limitations, aimed at the general reader.

Link: https://ieep.eu/publications/can-polluter-pays-policies-be-progressive

Methodology paper:
BC3, "Modelling the Direct Socioeconomic Impacts of the New Energy Taxation Directive (ETD) and the Extension of the ETS on Transport and Building Sectors" (Leioa: Basque Centre for Climate Change (BC3), 2022)

This paper authored by BC3 provides an in-depth overview of the microsimulation methodology used to investigate the distributional effects of the proposed ETD reform and introduction of an ETS for the transport and building sectors. It describes the data used, the various scenarios examined and includes a discussion of modelling limitations related to data availability and the microsimulation methodology used.

The paper also includes a country-level analysis of the distributional effects of the ETD reform and ETS2 introduction in Spain.

Link: https://api.otea.info/storage/2022/03/08/d87a258a425adcad49f3cb35a268fe6ad52935ba.pdf

https://api.otea.info/storage/2022/03/09/9fafce9aafb86f60912103be35e1707f83d78861.pdf

Notes on the microsimulation model quoted from BC3 (2022):

"Our microsimulation model . . . does not reflect the reaction of different types of households to expected changes in prices. In this sense, the results on energy bills only reflect the change in relative prices applied to household consumption structures before the reform. A 'behavioural' impact study would require the use of a more sophisticated tool that would capture direct consumer reactions (through price elasticities of demand for energy goods and also induced reactions (through cross-elasticities and also income elasticities, in the event that the reform, as expected, generates higher employment and higher household income). However, these effects are known to be small in the short and medium term, as households do not easily change their energy consumption behaviour."

The main caveats for interpreting the results are the following:

- **Static modelling assumes no behavioural change.** The modelling does not reflect any changes in aggregate energy demand or demand for particular types of energy as a result of price changes. Such behavioural effects are small over the short and medium term, as households do not easily alter their energy consumption patterns in response to price changes.

- **No changes in environmental impacts**. Static modelling does not show the expected environmental benefits of the policies over time. While the present study does not quantify the emission reductions of the reform, previous research on carbon pricing and energy taxation has found large emission reduction potentials stemming from the introduction of carbon pricing in Germany.[14]
- **Modelling is based on 2020 prices.** Germany introduced a national ETS (nETS) for heating and transport in 2021. Hence, the modelling assumes no explicit carbon price while Germany already has one in place now. At present (March 2022), the nETS permit price is 30 €/t, and is scheduled to reach 45 €/t in 2024. Our modelling assumes the introduction of a 45 €/t price, i.e. the price level reached in 2024 by the nETS. However, the welfare impacts of the two scenarios are not the same: in reality there is a gradual phase-in of the carbon price from 30 € at present to 45 € in 2024 while in the modelling there is an overnight phase-in of carbon pricing from 0 € to 45 €.
- **Distributional analyses use averages per decile.** Using decile averages masks substantial differences in effects within decile groups stemming from sociodemographic, behavioural and technological differences. The average effect for a group is thus not representative for all persons in the group (e.g. in a particular decile, there may be a household in an urban area that uses district heating and public transport while another household in that same decile may live in a rural area with long commute distances and live in a poorly insulated house with oil heating. These differences in energy consumption patterns would drive quite different welfare impacts for the same policy reform scenario. The outputs of the microsimulation model enable analyses on several attributes besides income deciles. The annex to this paper contains supplementary analyses that examine how impacts differ by population density and by household type, respectively.

Important note: The "impact on household welfare" referred to in the report graphs refers to the change in household expenditure on energy products/electricity as a share of total expenditure due to the change in tax rates or the introduction of emissions trading. It can also be referred to as "disposable income impact" or "change in disposable income" (where "disposable income" is the income remaining to a household after all taxes and charges).

[14] Bach et al. (2019), “Lenkung, Aufkommen, Verteilung”; Gechert et al. (2019), “Wirtschaftliche Instrumente für eine klima- und sozialverträgliche CO_2-Bepreisung”.

4 Findings and discussion

This section provides a series of analyses, beginning with basic reforms without compensatory measures. The incremental effects of adding compensatory measures are depicted and analysed, supported by graphs showing the impacts on household expenditures by expenditure decile. An annex to this paper provides supplementary analyses, including breakdowns by socio-demographic factors.

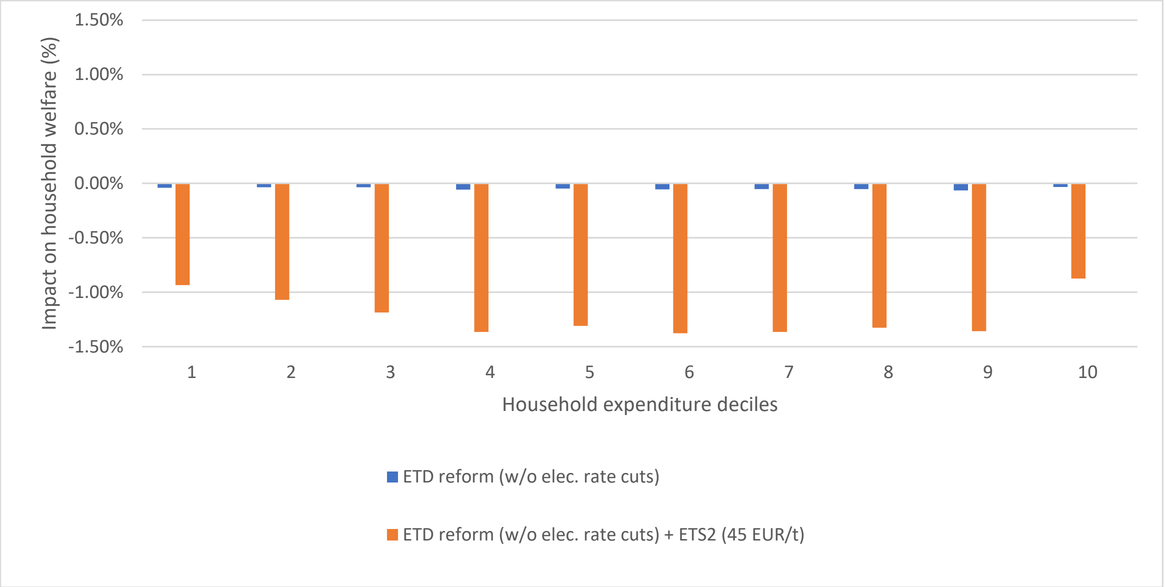
What effect does implementing the ETD reform and the ETS2 have in Germany?

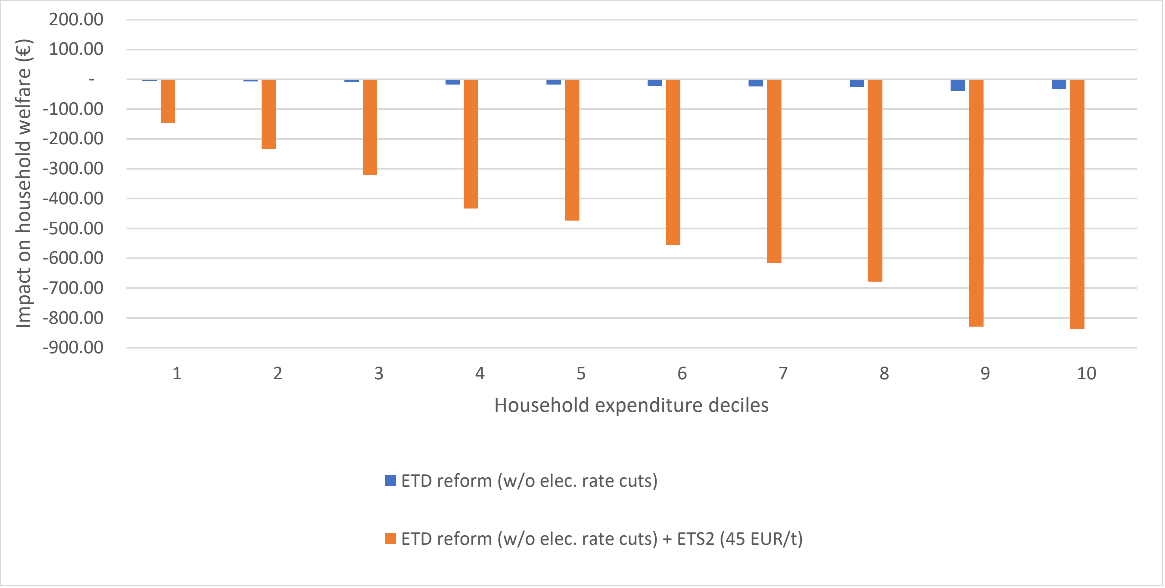
As can be seen in Figure 4, the proposed reform of the Energy Taxation Directive has limited impacts on German households. Since most national energy tax rates in Germany already exceed those mandated in the ETD, the new minimum tax rates would only increase the tax rate of coal in Germany. Since coal use in households is marginal, household expenditure increases in Germany are minimal, averaging less than 0.05% of disposable household income), ranging from around 5 € (decile 1) to 40 € (decile 9) per household annually.[15]

Introducing the ETS2 at a permit price of 45 €/tCO_2 without compensatory measures has stronger impacts on household expenditure than ETD reform only. Overall, the distributive impact is slightly U-shaped. That means households in the middle of the income distribution are affected most. Impacts of the combined reform (ETD and ETS2) result in an increase in household expenditures of about 1% for the lowest three deciles, while these impacts are largest (ca. - 1.35%) for households in the middle of the income distribution (deciles 4-9). The negative impact is the smallest in relative terms for the 10% of households with the highest disposable income (ca. -0.87%). In nominal terms, the combined reform would increase households' energy expenditure by around 150 € (decile 1) to 840 € (decile 10) compared to the situation without a carbon price. These effects are driven mostly by fuel expenditure differences across decile groups (see Figure 2). Households in deciles 4 to 9 spend a larger share of their expenditure on transport fuels, which also means those households are affected relatively more by price increases in these goods. Impacts are lowest for the 10% of households with the highest disposable income (decile 10) due to those households' energy expenditures being a lower percentage of their overall expenditure compared to other households.

[15] Charts in Figure 4 do not include a reduction in electricity tax rates; that reduction is introduced in a subsequent analysis (see Figure 6).

Figure 4. Analysis of ETD reform alone versus ETD reform with ETS2 – impact on household welfare by expenditure deciles (% and €)





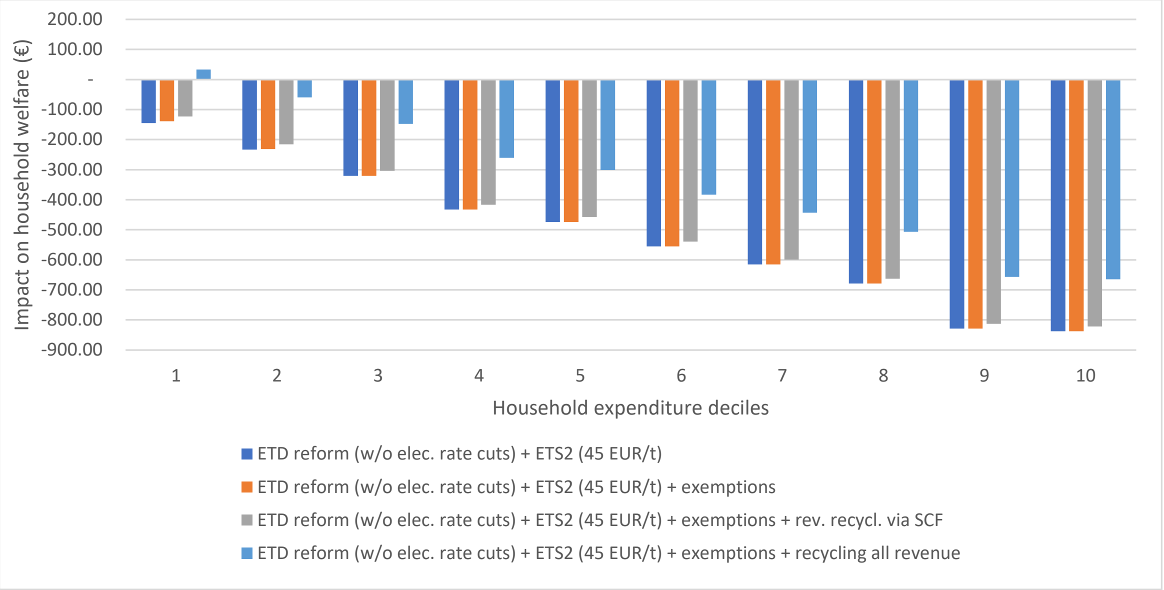
What effects do exemptions for poorer households on heating products have in Germany? What effects does changing the amount of revenue recycling have in Germany?

The European Commission's proposal for revising the ETD includes the possibility for exempting vulnerable households from an increase in taxes on heating fuels. Vulnerable households are defined here as those with a disposable household income below 60% of the median income. Figure 5 shows the effect of introducing exemptions in a scenario where the ETD is revised and the ETS2 introduced. Because the ETD revision would only increase the tax rate on coal, the exemptions also apply only to an increase in the tax rate on coal. Consequently, exemptions do little to offset the welfare loss stemming from the ETS2. The welfare loss for the lowest decile is cut only by about 0.03% (approx. 5 €) on average, while non-existent for the remaining households.

In order to cushion the distributive effect of introducing the ETS2, the European Commission proposed the introduction of a policy mechanism called the Social Climate Fund (SCF). Under the proposed mechanism, Member States must contribute 25% of their ETS2 revenues to the SCF, which then redistributes the money to Member States according to an allocation key that should be used to compensate households. Some Member States will receive more than they paid into the SCF, while others receive less. Germany will be a net contributor to the fund, receiving only an estimated 30% of what it would pay into the fund. However, Germany would also retain the remaining 75% of ETS2 revenues, which could then be used to fund investments in decarbonising buildings and transport, or to compensate households directly.

As can be seen in Figure 5, restricting revenue recycling to just the SCF does little to offset the negative welfare impacts for households across the income distribution. The lump-sum distribution in combination with exemptions for poorer households reduces the welfare loss associated with carbon pricing for households in the first decile by approximately 20% on average, while having a negligible impact for other income groups. In contrast, if, in addition to the SCF, all remaining revenues are redistributed lump sum to all households, this would partly offset the negative effect of the reforms on household disposable income. Lump-sum redistribution of all the revenue creates largely progressive distributional effects, with the combined reform resulting in a 0.21% increase—about 30 €—in disposable income for the lowest decile, compared to the status quo. Though distributing all revenues lump-sum to all households moderates the negative impact on household available income, the remaining 90% of households would still be worse off financially as a consequence of the reform. The relative impact increases progressively with disposable household income up to the 9^{th} decile after which the impact sharply drops. The 10% of households with the highest disposable income would be affected much less than households in the middle of the income distribution (deciles 4 to 9). The disposable income of a household in decile 5 would decline by on average 0.83% (equivalent to approximately 300 €), whereas it would reduce by only about 0.69% (equivalent to approximately 670 €) on average for households in decile 10. Again, this effect can be primarily explained by the fact that the 10% of households with the highest disposable incomes spend a smaller proportion on energy than other households do.

Figure 5. Analysis of exemptions and revenue recycling –impact on household welfare by expenditure deciles (% and €)



What effects does lowering electricity taxes have in Germany? What effects does eliminating Germany's renewables levy on electricity (EEG levy) have? And what are the combined effects of these two changes on German households?

The European Commission's proposal for revising the ETD includes lower tax rates for electricity. While the implication for Germany is not straightforward, the European Commission proposal enables the German government to lower its electricity tax to the proposed minimum. Moreover, the proposal requires Member States to make electricity the least taxed energy source.[16] Lowering electricity taxes can support electrification while offsetting some of the negative welfare impacts of carbon pricing. In Germany, the present electricity tax rate (2.05 € cents/kWh) is substantially above the proposed minimum tax rate (0.054 € cents/kWh). Likewise, the renewables levy on electricity (EEG levy) increases the costs of electricity for German households. The German government recently decided to abolish the EEG levy that funds Germany's feed-in tariff by June 2022. Both measures would substantially lower the electricity bills of households and can therefore contribute to counteracting the negative impacts on household income associated with higher carbon prices.[17]

This can be seen in Figure 6. Reducing electricity costs via cutting the electricity tax rate[18] or the EEG levy, or both, reduces the financial burden resulting from the ETD reform and the introduction of the ETS2. Lowering only electricity taxes reduces the loss in disposable household income to 1.06% on average (equivalent to an average saving per household of approx. 60 € annually) as compared to 1.2% without the cut in electricity taxes. For the poorest ten percent of German households, this reduces the loss in disposable income resulting from carbon pricing by about a quarter. Eliminating the EEG levy has a much larger effect. It would reduce the loss in disposable income for German households to 0.9% on average and would cut the loss in disposable income of the poorest 10% of households by more than half.

Combining a cut in electricity taxes and lowering the EEG levy to zero is even better at offsetting the negative effects of carbon pricing on disposable incomes. This scenario results in the average German household saving approximately 190 € annually compared to a reform without these compensatory measures. On average, the result is a loss in disposable household income of less than 1%.

Generally, measures that reduce electricity prices—e.g., a reduced electricity tax, abolishing the EEG levy, or both—have progressive distributional effects, benefitting poorer households relatively more than richer households. For the poorest 10% of households, the negative impact is substantially reduced, from -0.9% without the cuts in electricity tax and EEG levy to -0.18% with them (a saving of approximately 110 € on average). For a household in the ninth decile, the cuts have a more moderate effect (-1.35% without cuts vs. -0.9% with them). This demonstrates that reducing electricity prices is a socially progressive way to offset the negative impacts of carbon pricing. At the same time, it supports the electrification of energy uses—such as electric vehicles for mobility or heat pumps for space heating—and thereby further reduces exposure of households to rising fossil fuel prices.

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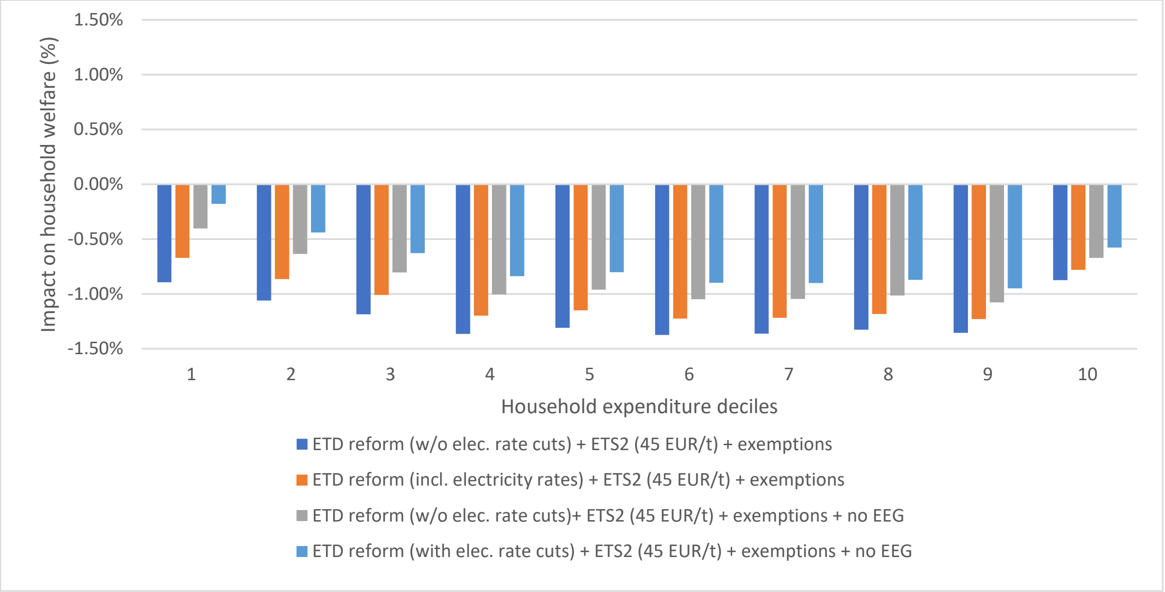
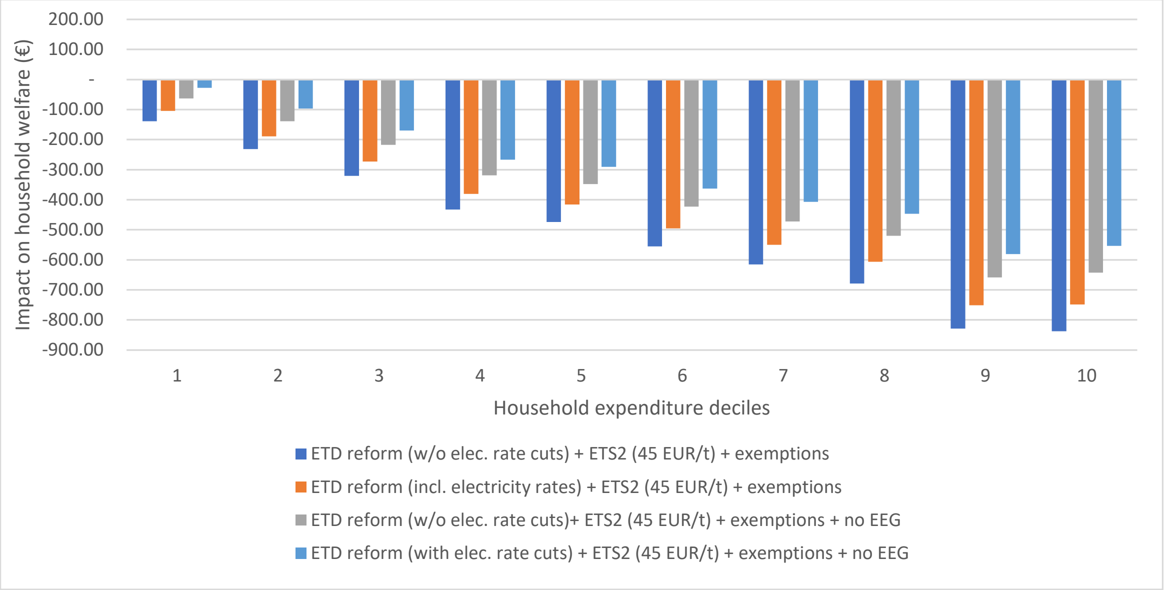
[16] In the explanatory memorandum of its proposal for revising the ETD, the European Commission states: „electricity should always be among the least taxed energy sources in view of fostering its use, notably in the transport sector, and should be ranked together with other motor fuels and heating fuels." European Commission (2021), "Proposal for a Council Directive Restructuring the Union Framework for the Taxation of Energy Products and Electricity (Recast)". This logic is reflected in Article 5(1) of the European Commission's proposal.

[17] We assume that electricity suppliers fully pass on the reduction in Germany's EEG levy to consumers.

[18] The present modelling assumes that the German government will not lower the electricity rate to the proposed minimum but to the tax rate of the currently lowest taxed energy product, namely heating coal. The new tax rate would be 0.12 € cents/kWh.

Figure 6. Analysis of lowering electricity tax rates and eliminating EEG – impact on household welfare by expenditure deciles (% and €)





What effects does changing the amount of revenue recycling have in Germany?

The German government could combine the different compensatory measures: 1) lowering electricity prices through tax cuts; 2) eliminating the EEG levy; and 3) redistributing the revenue of the ETS2 through lump-sum payments. Combining these measures can help offset the welfare losses associated with carbon pricing substantially, although the extent depends on the amount of revenue that is redistributed. Revenue recycling generally results in progressive distributional effects.

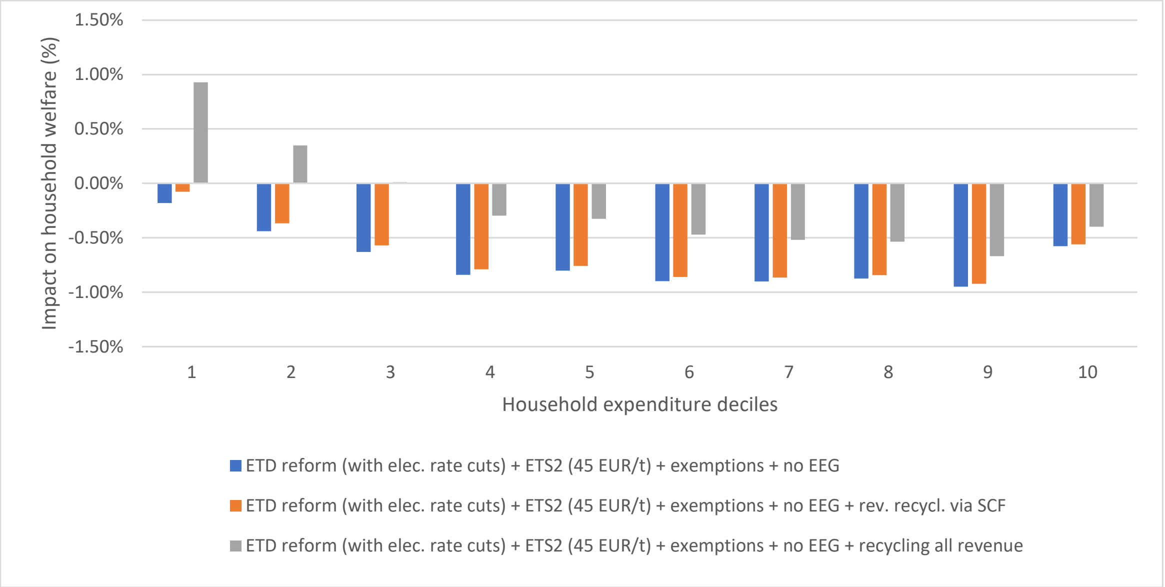
The amount of revenue that is redistributed is important for determining the overall distributive outcome. As can be seen in Figure 7, recycling revenues via the Social Climate Fund yields only a small difference for all households, with the average negative impact on disposable household income reduced from -0.75% to -0.71% (equivalent to approximately 15 € per household). For the lowest decile, this is enough to almost neutralise the negative impact of the reforms completely. However, for most households a substantial net loss persists, despite all the compensatory measures.

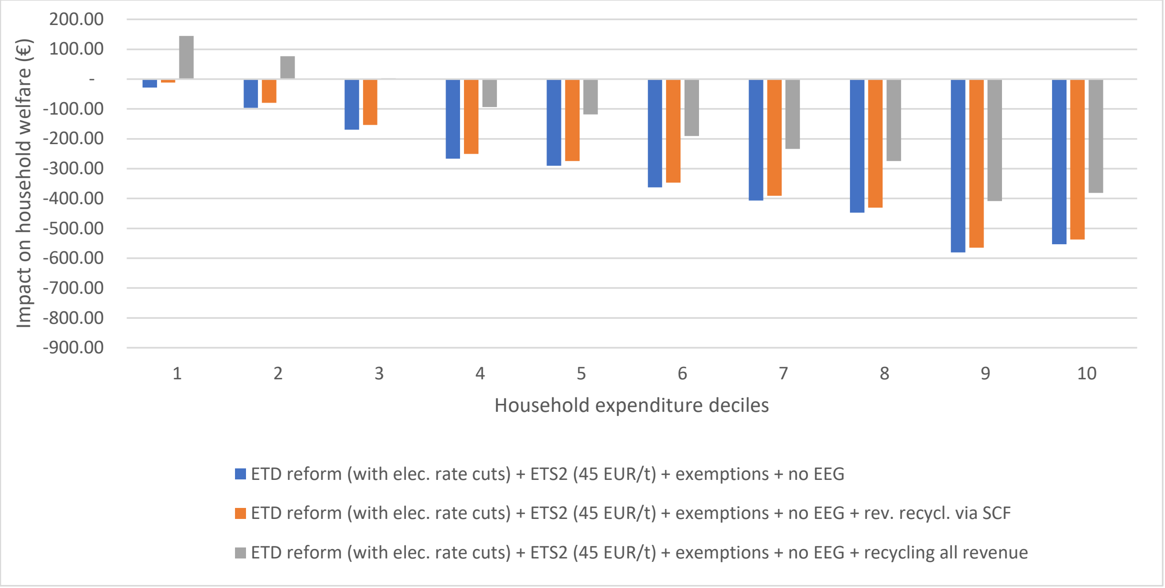
This changes when the remaining ETS2 revenues are used in addition to the SCF (see Figure 7). Using all revenues can help offset the negative effects on available household incomes. For households in the lowest three deciles, recycling all revenues means available household income increases or stays the same, whereas the negative impact is reduced by more than half for households in the fifth decile. In sum, using the full set of compensatory measures and all revenues results in a progressive distributional effect, benefitting poorer households relatively more.

This progressive effect can be accentuated if the revenue recycling becomes more targeted to vulnerable households. For example, restricting the lump-sum distributions to the lower half of the income distribution would yield results that are more progressive with substantially higher net gains for the lowest deciles.[19]

[19] See Gore, Tim (2022), “Can Polluter Pays policies in the buildings and transport sectors be progressive?,” Research Report (Brussels: Institute for European Environmental Policy), https://ieep.eu/publications/can-polluter-pays-policies-be-progressive

Figure 7. Analysis of introducing revenue recycling, lowering electricity tax rates, and eliminating EEG – impact on household welfare by expenditure deciles (% and €)





5 Conclusions

The two proposed reforms examined in this paper—reform of the Energy Taxation Directive (ETD) and an introduction of an emission trading scheme for buildings and transportation (ETS2)—have distributive effects within Germany and across the EU. Yet how these distributive effects play out crucially depends on the use of revenues: if revenues entirely flow to the public budget (i.e. no recycling), the net effect is neither clearly progressive nor clearly regressive—German households across all deciles are affected in similar proportion, with the highest relative burden falling on households in the middle deciles. The more of the revenue is recycled back to households, the more progressive the effect becomes, in that poorer households benefit proportionately more.

These proposals are important reforms that would anchor the polluter pays principle in the EU's energy taxation framework and help correct the environmentally inefficient system of taxation that has existed for the past decades. A reliable price signal will be important for driving decarbonisation, accelerating the EU's transition away from fossil fuels.

However, in the context of skyrocketing energy prices, there is increasing hesitancy among policymakers concerned about the potential social consequences of the reforms. Although the present study has some limitations as noted in the methodology section, the results described above show that reforms can be designed in a way that is socially progressive.

Several conclusions can be drawn for the German context:

- **Reducing electricity costs is progressive and speeds electrification.** Reducing households' electricity costs through eliminating Germany's renewables levy on electricity (EEG levy) or cutting the electricity tax has progressive distributional effects and can help to offset some of the welfare losses associated with the introduction of carbon pricing via the ETD and ETS2. In addition, eliminating the EEG levy and cutting the electricity tax also supports the electrification of energy uses—such as electric vehicles for mobility or heat pumps for space heating—and thereby further reduces exposure of households to rising fossil fuel prices. The German government in its cabinet decision of March 2022, decided to eliminate the EEG levy by June 2022. It should also reduce the electricity tax to amplify the progressive effect.
- **Ambitious levels of revenue recycling are necessary to significantly offset welfare impacts.** Revenue recycling is a progressive and straightforward way to compensate households and cushion the negative welfare effects of the reform. However, limiting revenue recycling to just the Social Climate Fund is not enough to offset the effects of the reforms on disposable household income, especially for middle-income households. The German government should use all of the revenues to compensate or support households.
- **Reducing vulnerability and supporting fossil fuel phaseout:** Recycling revenue in the form of lump-sum payments is one form of supporting households that is relatively easy to administer and easy to model. Yet in practice, it is equally important to provide targeted support to vulnerable households, in order to reduce their exposure to higher energy prices. This includes support for energy efficiency investments, heat pumps, insulating homes, public transport infrastructure and other investments that help households reduce their consumption of fossil fuels.
- **The German government should support implementation of the Social Climate Fund.** Though Germany would have more funds to compensate households if it would not contribute to the Social Climate Fund, the SCF addresses regressive distributional effects at the EU level. Even after contributing to the SCF, there remain ample revenues available to compensate households or to finance investments domestically. The German government should therefore support the establishment of the SCF, as it is an important mechanism for EU solidarity that will help harness support for carbon pricing across EU Member States.
- **In the short term, Germany should frontload the implementation of its national compensation system, the *Klimageld*, and cut the electricity tax.** As part of the coalition agreement, the German government envisaged the introduction of a new compensation mechanisms, through which revenues from the newly introduced national Emissions Trading System would be recycled to all households. Faced with rapidly escalating energy prices in the wake of the Russian invasion of Ukraine, this measure needs to be accelerated—along with cutting the remaining electricity tax. Both measures would function very similarly to the measures analysed here and would benefit poorer households—as opposed to increasing income tax rebates for commuters or lowering VAT on transport fuels, which tend to have a regressive effect.

Annex: Supplementary analyses

What effects does increasing the carbon price have in Germany?

The ETS2 is an emissions trading scheme, which means the price is not fixed by the state as is the case with a carbon tax but determined by the relative scarcity of permits. Over time and with a decreasing supply of permits, the carbon price will likely rise. Increasing carbon prices also result in larger losses in disposable income, as can be seen in Figure 8. The distributional effect remains similar to the lower carbon price, but the relative and absolute effects are amplified. The distributional effect is U-shaped, affecting middle-income households the most in relative terms. The amount of revenues that can be recycled increases in proportion to the carbon price. Recycling all these revenues can offset the welfare losses for the lowest decile; the net effect is an increase in disposable income. For all other expenditure deciles, the compensatory measures are no longer able to offset the welfare losses of the higher carbon price and substantial losses in disposable income persist for households in the middle of the income distribution (>1.5% of disposable income).

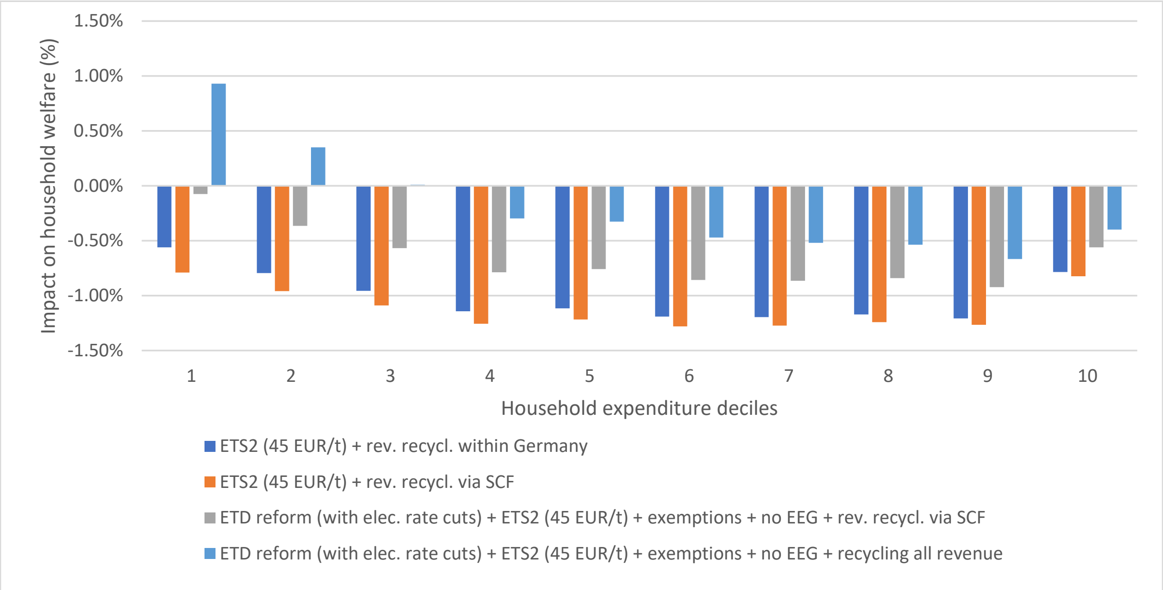
Figure 8. Analysis of the effects of a higher carbon price (100 €/tCO_2) with and without compensatory measures – impact on household welfare by expenditure deciles (%)

What are the distributional effects in Germany with and without the SCF? What is the distributional picture after introducing the full set of compensatory measures?

There are different revenue recycling mechanisms. The European Commission proposes revenue recycling via the SCF, as explained above. This would leave Germany with fewer revenues to give back to households domestically than if it would keep all its revenues.[20] The left-two bars in Figure 9 compare the introduction of the ETS2 including revenue recycling under two scenarios: 1) with Germany keeping its entire SCF contribution (25% of domestic ETS2 revenue) and redistributing that lump-sum to all households; and 2) according to the SCF. In nominal terms, the German government would have about 35 € more to distribute per household if it keeps all of its national contribution than would be the case if revenues are recycled via the SCF. At the same time, the SCF benefits poorer Member States and thus helps to offset regressive distributional effects at the EU level.[21]

Moreover, the German government would keep 75% of its ETS2 revenue under the SCF that it can use for compensatory measures. It could use these funds for investments, or it could recycle all the revenue lump-sum back to households. The right two bars in Figure 9 compare the distributive effects of the German government introducing the full suite of compensatory measures, once with lump-sum revenue recycling according to the SCF (and without using remaining revenues) and once with the SCF as well as all the remaining revenues. Combining the SCF with other compensatory measures offsets the negative welfare effects for the lowest deciles substantially, while still leaving a sizable sum for investments in climate neutrality (an estimated 6 bn €/yr.)[22]. Recycling all the revenue has even stronger progressive effects: the welfare effect of the reform becomes positive for the lowest two deciles, while being neutral for decile 3. Using the full suite of compensatory measures and recycling all revenues back to households will reduce the negative welfare effects of carbon pricing to less than -0.36% of disposable income on average.

Figure 9. Analysis of revenue recycling alternatives with and without compensatory measures – impact on household welfare by expenditure deciles (%)



[20] Under the SCF, Germany will receive only about 31% of its SCF contribution back for redistribution to German households, while it would have 100% to recycle if it would keep all its national contribution to itself. Gore, Tim (2022), "Can Polluter Pays policies in the buildings and transport sectors be progressive?".

[21] Gore (2022).

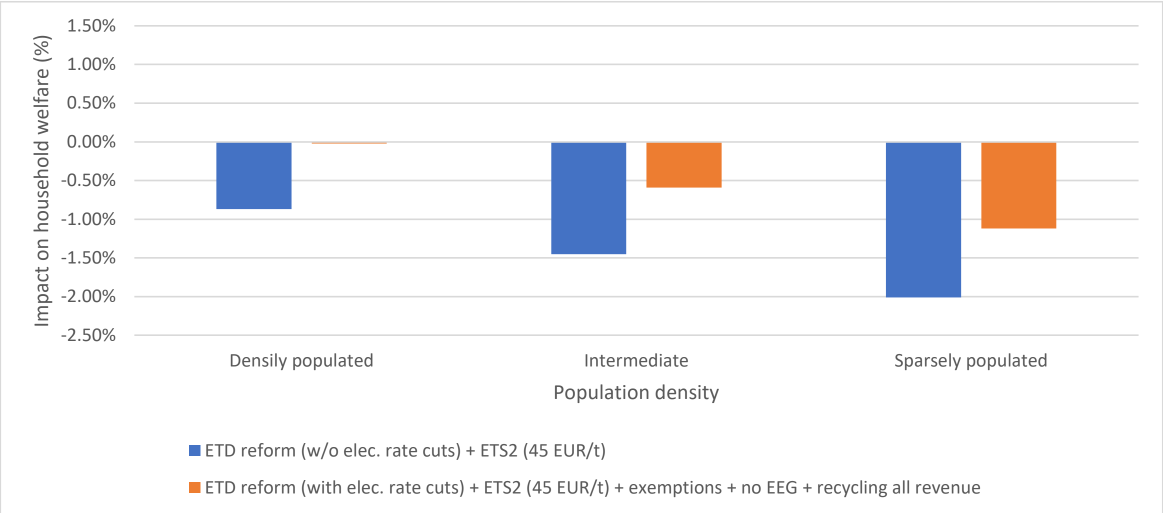
[22] Gore (2022), p. 21.

How does the impact of carbon pricing on household expenditure vary by population density?

The introduction of the ETS2 and the implementation of the proposed ETD affects households in rural areas more than households in urban areas. Figure 10 shows the welfare impact on households according to the population density of the households' place of residence in two different scenarios. The average impact for households in sparsely populated areas is more than twice that for households in urban areas (-2% vs. -0.87%) in a scenario where no compensatory measures are put in place. In nominal terms, disposable income will decline by approximately 570 € more annually for households in rural areas than for households living in densely populated areas. This difference can be primarily explained in terms of fuel expenditure. Households in rural areas tend to drive more and thus spend more of their disposable income on transport fuels. Consequently, they are affected more by increases in fossil fuel prices due to carbon pricing than households in urban areas, where commutes tend to be shorter and better public transport infrastructure is available.

Introducing the full suite of compensatory measures[23] to offset the negative welfare effects of carbon pricing on households moderates some of the negative welfare effects. For households in urban areas, the negative effect on expenditure is completely offset. The overall effect is consequently neutral for an average household in urban areas. For households in rural areas, on the other hand, the negative impact of carbon pricing cannot be fully offset, but almost reduced by half (-2% vs. -1.1%).

Figure 10. Analysis of combined reform (ETD + ETS2) with and without compensatory measures – impact on household welfare by population density (%)

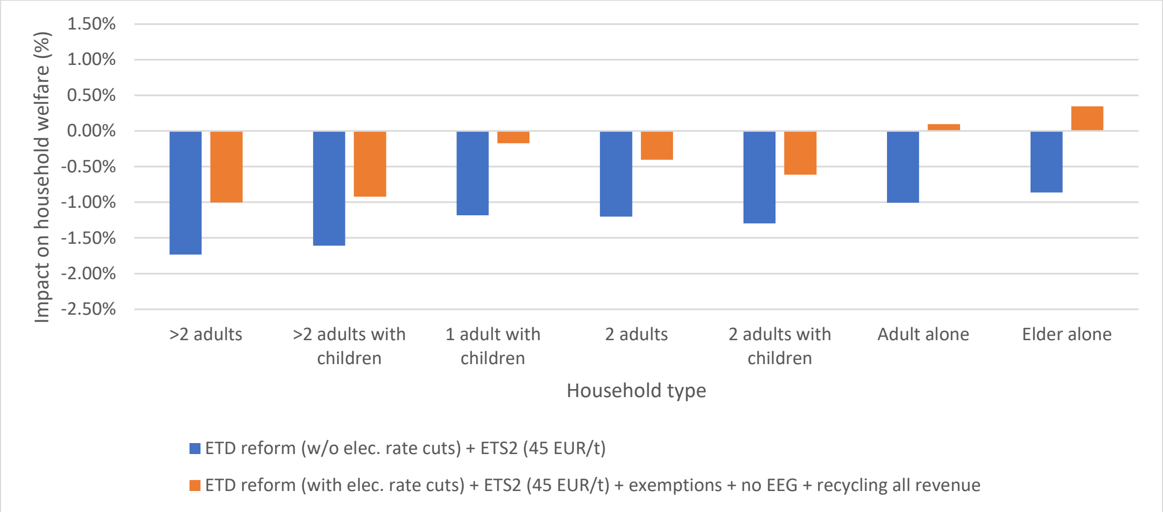


[23] Including a reduction of electricity taxes, lowering the EEG levy to zero, exempting poor households from increases in taxes on heating fuels, and recycling all revenue back lump-sum to households (SCF + remaining national revenues).

How does the impact of carbon pricing on household expenditure vary by household type?

The welfare impact of introducing carbon pricing is not the same for all household types. Figure 11 shows the welfare impact on different household types in two different scenarios: without compensatory measures and with the full set of compensatory measures[24]. A few household types stand out. Single parent households are affected substantially by the reform, experiencing a 1.18% fall in their disposable income. However, they can also be compensated very effectively. Introducing comprehensive compensatory measures almost completely offsets the loss in disposable income by a full percentage point. Similarly, single elder households, which are sometimes depicted as acutely affected by energy price increases are affected the least (a loss in disposable income of 0.86% on average). Moreover, compensatory measures can more than offset the impact of carbon pricing on these households, rendering the net welfare effects of the policy change positive. A family with two adults and children is moderately affected by the reform. Without compensatory measures this household type will experience an average loss in disposable income of 1.3% annually (about 800 € in nominal terms). However, compensatory measure can cut this welfare loss by more than half.

Figure 11. Analysis of combined reform (ETD + ETS2) with and without compensatory measures — impact on household welfare by household type (%)



[24] The full set of compensatory measures examined are as follows: a reduction of electricity taxes, lowering the EEG levy to zero, exempting poor households from increases in taxes on heating fuels, and recycling all revenue back lump-sum to households (SCF + remaining national revenues).

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