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Research report

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

Assessing the distributional impacts on households of the proposed reform of the Energy Taxation Directive and extension of the Emissions Trading Scheme

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EXECUTIVE SUMMARY

Two politically sensitive reforms

The proposed **Energy Taxation Directive** (ETD) reform and **extension of the Emissions Trading Scheme to buildings and road transport** (ETS2) are two of the most politically sensitive elements of the Fit for 55 package.

On one hand, the proposals would significantly expand the application of the polluter pays principle across the EU, eliminating swathes of fossil fuel subsidies and capping emissions in two laggard sectors in the energy transition. But on the other hand, given that energy costs constitute a higher share of expenditure of lower-income households, who are less able to change consumption behaviour in response to higher prices, many stakeholders are concerned that the proposals risk entrenching inequality.

New evidence of progressive distributional impacts

We provide new evidence from a microsimulation model developed by the Basque Centre for Climate Change (BC3) with IEEP and five other partners in the Think Sustainable Europe (TSE) network to assess the direct, overnight distributional impacts of both measures on households. We show that *if carefully designed* – including well-directed revenue-recycling, and alongside complementary policy measures – the proposals can achieve **clearly progressive impacts**. In short, they could serve as a tool to fight both inequality and the climate crisis.

Scenarios and key findings

Based on the granular insights on household consumption in the EU Household Budget Surveys (HBS) dataset, our modelling provides insights into distributional impacts both **vertically** (by income), **horizontally** (according to a range of socio-economic characteristics), and at three levels: **EU-wide**, **between** and **within Member States** (MSs). In this paper we report key findings related to the ETD reform in isolation and the combined impacts of the ETD reform and ETS2.

The progressive impact of electricity tax reductions in the ETD reform

We show that the ETD reform has limited welfare impacts overall, while proposed exemptions further mitigate risks for households at risk of poverty. In addition:

- The proposed **reduction in electricity tax rates** to become the least-taxed energy carrier is progressive, resulting in welfare gains for the poorest households across the EU-wide distribution and within all MSs that are required to implement it.

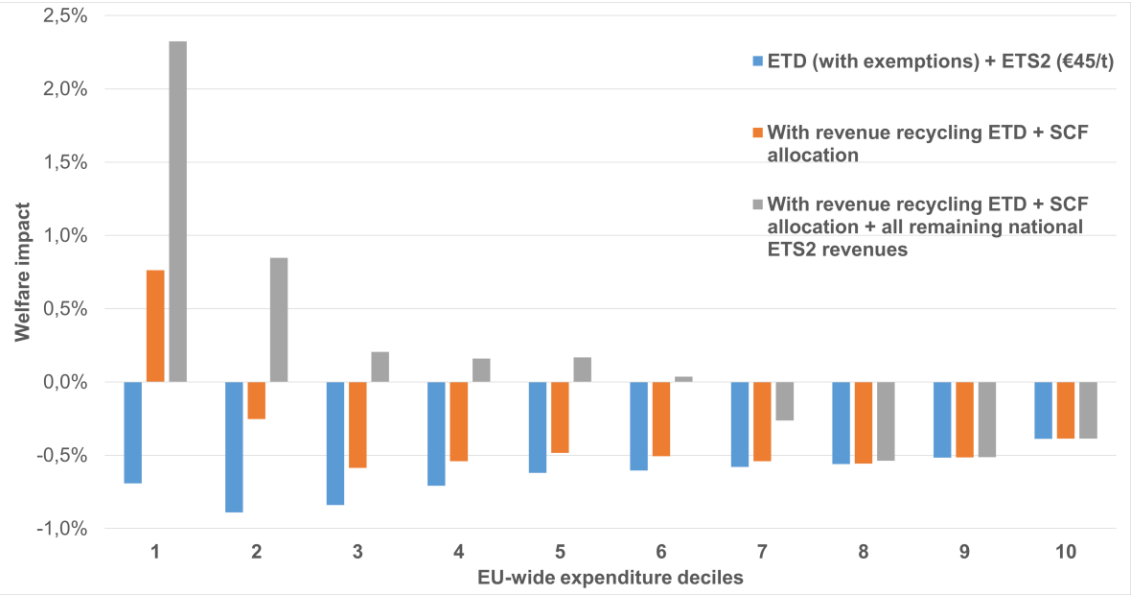
- In countries like **Poland** this effect more than offsets the regressive impact of raising fossil heating and transport fuels.
- The ETD reform also generates significant new revenues in Central and Eastern (CE) MSs in particular, which if recycled appropriately, could achieve net welfare gains for the poorest 50% of households in those MSs.

The combined impact of the ETD reform and ETS2

As shown in Figure ES1, when combined with the ETS2 proposal, we find that:

- The **combined measures** (without revenue-recycling) result in broadly regressive distributional impacts across the **EU-wide** income distribution (with adverse impacts on the poorest 10% slightly lower due to the ETD reform and lower household expenditure on transport fuels) (blue bars);
- Recycling the **new ETD revenues** and the **allocation to each MS from the Social Climate Fund (SCF)** (representing only 25% of total ETS2 revenues) as income support to the poorest 50% in each MS, achieves **net welfare gains** for the poorest 10% worth approximately €100 on average per household, and mitigates but does not eliminate adverse impacts in other lower and middle-income households (orange bars);
- But with additional recycling of **all remaining national ETS2 revenues** to benefit the poorest 50% of households in each MS – which could be through targeted structural investments – the result is clearly progressive (except that the richest 10% of households incur notably lower costs than those in upper-middle-income groups) (grey bars).

Figure ES1: Welfare impact (% household expenditure) EU-wide from ETD reform and ETS2 without and with revenue recycling options



Significant horizontal diversity

Importantly, we find significant horizontal diversity too. We show that:

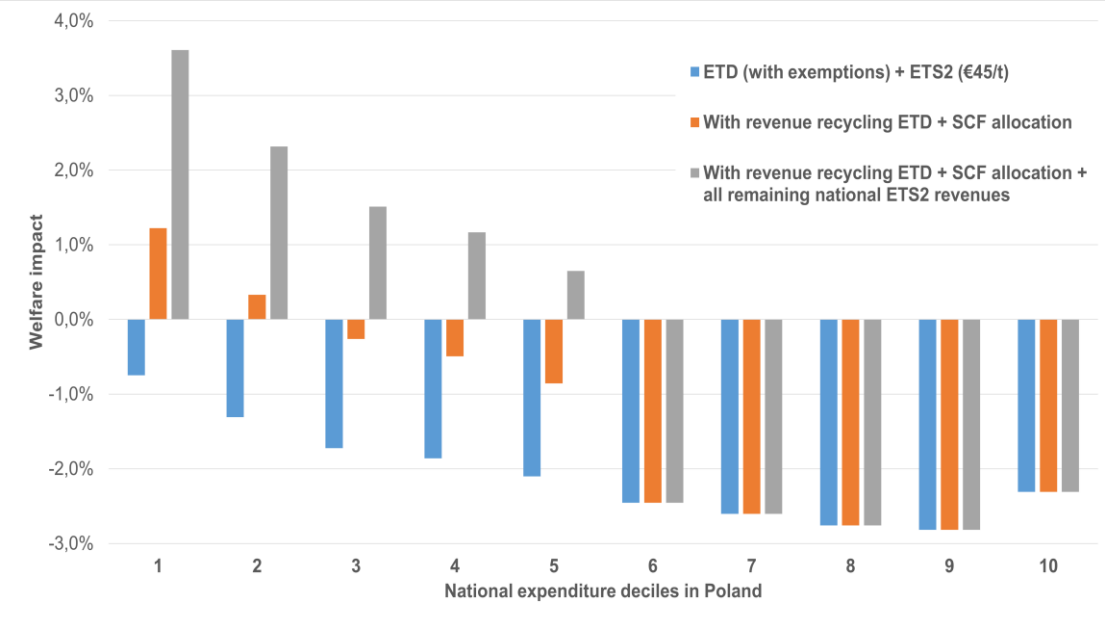
- **Urban** households are far less adversely impacted, and benefit more from revenue-recycling, than **rural** households. For example, rural middle-income households are worse impacted than low-income urban households;
- **Renters** tend to be less adversely impacted and bigger beneficiaries of recycling than **owner-occupiers**; and
- **Women**-headed households, single parent households and households with one older person (groups in which women are disproportionately represented) are among the least affected and biggest beneficiaries of all.

Progressive impacts within CEE MSs

We find that the ETD reform and ETS2 result in clearly progressive impacts within CEE MSs in particular, which are the biggest net beneficiaries of the SCF. Figure ES2 shows results for **Poland**, which are similar to findings across CEE MSs, where:

- The **combined effects** of both policies (even without revenue recycling) are neutral for the poorest 10% of households (blue bars);
- With recycling of **Poland's new ETD revenues** and **SCF allocation** as income support, the poorest 20% see net welfare gains (orange bars);
- And with additional recycling of **Poland's remaining ETS2 revenues**, through targeted structural reforms, the poorest half of the Polish population see clear net welfare gains, with costs shared progressively among the richest half of the Polish population (apart from D10) (grey bars).

Figure ES2: Welfare impact (% household expenditure) in Poland from ETD reform and ETS2 without and with revenue recycling options



Institute for European Environmental Policy (2022)

Impacts in MSs that are net contributors to the SCF

In MSs which are small net recipients from or net contributors to the SCF, we find:

- The poorest 10% of households are affected least, with welfare gains for the poorest 10% apparent in some cases like in **Spain**.
- Revenue-recycling of just the **SCF allocation** in these MSs tends to result in welfare gains for the poorest 10-20% of households, but with the middle-income groups worst affected.
- Additional recycling – in the form of targeted structural investments – of the **remaining ETS2 revenues** in these MSs can largely address impacts on these middle-income households. Complementary measures are however needed to address residual inequities at the top of the distribution.

Conclusions and recommendations

Care is needed in reaching conclusions about the distributional impacts of these measures. There is significant heterogeneity among households that warrants careful granular analysis, which tools like our model can provide. Nonetheless we find that it is *in principle* possible to design these EU-level polluter pays instruments to achieve clear welfare benefits for the poorest households EU-wide and within MSs, and with broadly progressive distributional impacts.

Policy choices in the design of both instruments and the use of their revenues – based on both inter-MS and within-MS redistribution – alongside complementary measures, are critical to **maximising both environmental and equity benefits**. If EU decision-makers are to proceed with the measures, they should *inter alia*:

- Require MSs to reduce electricity tax rates to benefit lower-income households most, and ensure that MSs can make use of energy tax exemptions for households at risk of poverty;
- Encourage MSs to recycle additional revenues from the ETD reform to benefit lower-income households, using the Semester process for oversight;
- Use a price corridor or other measures to provide predictability in ETS2 prices to limit adverse welfare impacts for middle-income households;
- Ensure that inter-MS redistribution of revenues via the SCF is combined with recycling of all remaining revenues within MSs, as both income support and structural investments, to benefit the lowest-income 50% of households in each MS, with clear EU-level governance arrangements;
- Accelerate complementary policy measures to structurally reduce costs for lower-income households in advance of and during the implementation of the instruments, and to address residual equity concerns at the top of the income distribution.

1. INTRODUCTION

The proposed reform of the EU Energy Taxation Directive (ETD)[1] and extension of the EU Emissions Trading Scheme (ETS) to the buildings and road transport sectors (ETS2)[2], along with the linked proposal to establish a Social Climate Fund (SCF),[3] are major elements of the European Commission's (EC's) Fit for 55 legislative package designed to implement the EU's 2030 greenhouse gas emissions reduction target. The proposals are intended to be complementary and would significantly expand the application of the polluter pays principle across the EU.[4]

But increasing polluter pays taxes and charges in the household sector is politically sensitive in many EU MSs. It is widely understood that energy costs make up a higher share of the income and expenditure of lower-income households, who are less able to change their consumption behaviour in response to higher prices, risking widening inequality. As a result, many stakeholders have expressed concerns about the potentially regressive impact of the ETS2 proposal, in particular, in what has become a polarised debate.

This paper provides new evidence from a microsimulation model developed by the Basque Centre for Climate Change (BC3) with IEEP and five other partners in the Think Sustainable Europe (TSE) network to assess the direct, overnight distributional impacts on households of the proposed ETD reform and ETS2, including the SCF. We explore whether the proposed EU-level polluter pays instruments can be designed to achieve progressive distributional impacts, and to identify policy options to ensure they strengthen and do not undermine wider efforts to fight inequality in Europe.[5]

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[1] 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%3A52021PC0563

[2] European Commission (2021) Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC, Decision (EU) 2015/ and Regulation (EU) 2015/757. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0551

[3] European Commission (2021) Proposal for a Regulation of the European Parliament and of the Council establishing a Social Climate Fund. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

[4] In a study for the EC, IEEP *et. al.* estimate that EU polluters on average currently pay for just 44% of the environmental costs associated with their emissions of greenhouse gases and air pollutants. See https://ec.europa.eu/environment/news/environmental-pollution-new-study-finds-polluters-do-not-pay-damage-they-cause-2021-11-12_en

[5] Accompanying papers by TSE partners are available exploring national modelling results in Czechia, France, Germany, Hungary, Poland and Spain, and a BC3 working paper also provides additional detail on the methodological approach. See Annex 4.

The model is static, so does not take account of behavioural changes or the impacts of structural investments through revenue recycling or any other complementary policy measures. Nor does it account for the distribution of non-pecuniary benefits associated with climate action, which tend to be overwhelmingly progressive.[6]

However, it's added value is that it is built on rich microdata from the latest wave of EU harmonised Household Budget Surveys (HBS) that allows for highly granular distributional analysis vertically (by income) and horizontally (according to a range of household socio-economic characteristics), and at three levels: EU-wide, between and within MSs.[7]

The core elements of the assessed policy measures are briefly described below. Thereafter:

- **Section 2** provides more detail on the study's methodological approach and limitations, and describes the modelled scenarios for which findings are presented in this paper;
- **Section 3** sets out the key drivers of distributional impacts in relation to the ETD reform – the structure of household energy consumption and the changes to energy taxation rates in each MS – and describes some of our key findings in this regard;
- **Section 4** sets out an additional key driver of distributional impacts in relation to ETS2 – namely the SCF – and describes key findings in relation to the combined impact of the reformed ETD and ETS2;
- **Section 5** explores wider complementary policy measures to ETD and ETS2 that would be necessary to maximise these policies' environmental and equity benefits;
- **Section 6** concludes and offers some recommendations for policymakers at EU- and MS-level engaged with these legislative files.

[6] See for example: Vona, F. (2021) Managing the distributional effects of environmental and climate policies: The narrow path for a triple dividend. OECD: France https://one.oecd.org/document/ENV/WKP(2021)20/en/pdf

[7] In a later phase of work, we will combine the micro model with a macro model to offer broader insights into the productive side of the economy and additional channels of distributional impact.

The proposed reform of the Energy Taxation Directive (ETD)

The current ETD, unchanged since 2003, sets minimum excise tax rates for energy products and electricity that have no relation to either the energy or carbon content of the fuels, and allows for a range of exemptions and reductions that mean fossil fuels are *de facto* incentivised over renewables. Indeed the majority of EU fossil fuel subsidies are tax expenditures totalling some €35bn annually.[8]

The EC has proposed to remove numerous mandatory and optional exemptions – such as for kerosene aviation fuel or diesel used in company cars, some of the most egregious fossil fuel subsidies that overwhelmingly benefit higher earners and likely men over women[9] – and to set new minimum energy tax rates based on the energy content of fuels and according to a ranking of fuels' "environmental performance".

As such, the minimum tax rate for coal – which is currently lower than for fossil gas – is proposed to increase three-fold to become the highest taxed energy product for heating, followed by fossil gas (the rate for which would initially double from today and then increase over a 10-year transitional period to that for coal). Regarding transport fuels, the rates for diesel – which currently benefits from substantial tax reductions and exemptions – would rise to the same level as petrol, and both would increase slightly higher than the current minimum rate.[10]

Significantly, electricity is proposed to be the least taxed category of all, with the new minimum rate falling 85% from today. This is notable because taxes and charges make up a bigger share of the consumer price of electricity than fossil gas across nearly all MSs, serving as a significant disincentive to the electrification of heating systems and the wider economy. All tax rates are also proposed to be indexed to inflation, for the first time.

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[8] European Court of Auditors (2022) Energy taxation, carbon pricing and energy subsidies. EU: Luxembourg https://www.eca.europa.eu/Lists/ECADocuments/RW22_01/RW_Energy_taxation_EN.pdf

[9] See for example: European Institute for Gender Equality (2012) Review of the Implementation in the EU of area K of the Beijing Platform for Action: Women and the Environment. Gender Equality and Climate Change. https://eige.europa.eu/sites/default/files/documents/Gender-Equality-and-Climate-Change-Report.pdf ; Gossling, S. and Humpe, A. (2020) The global scale, distribution and growth of aviation: Implications for climate change. Global Environmental Change. Vol. 65; Gore, T., Stainforth, T. and Lucic, A. (2021) Sustainable and inclusive transport systems. https://ieep.eu/publications/sustainable-and-inclusive-transport-systems-gender-and-mobility

[10] So-called unsustainable biofuels are proposed to be ranked alongside petrol and diesel, with lower rates for so-called sustainable biofuels, and lower still for so-called advanced biofuels. The distributional implications of biofuels taxation are not included in this study due to lack of data.

MSs are free to tax in excess of the new minima if they choose, so long as the new proposed relative ranking of tax rates is respected. While the proposal removes the vast majority of current national exemptions, derogations and flexibilities, in view of the potentially regressive impacts of raising fossil heating and transport minimum tax rates, MSs may apply tax exemptions for heating fuels for households at risk of poverty (defined as households with 60% or less of the median national income) for a 10-year period. MSs may also apply excise tax rates below the new minima to all other households initially so long as they increase to reach the new minima after 10 years.

The proposed extension of the Emissions Trading Scheme (ETS2)

The reformed ETD is designed to complement the EC's proposal to extend explicit carbon pricing into the buildings and road transport sector through ETS2. The new scheme would operate in parallel to the existing ETS (ETS1), regulating fuel suppliers upstream. It is proposed to become operational in 2025, with an emissions cap and 100% auctioning of emissions allowances introduced from 2026. The cap would decrease annually to achieve emissions reductions of 43% below 2005 levels in 2030 – critical contributions to the EU's 55% below 1990 levels target in sectors which lag significantly behind the reductions required to achieve the EU's carbon neutrality objective.

The proposed Social Climate Fund (SCF)

Critically, in view of the potentially regressive impacts of ETS2 if the carbon price is passed through to consumers, the EC has also proposed to establish a Social Climate Fund (SCF). This is proposed to redistribute resources equivalent to 25% of the total EU-wide revenues of ETS2 between MSs, via the EU budget, to address adverse social impacts from ETS2. The proposal includes a distribution key to determine the maximum allocation shares to which each MS would be entitled, based on a number of criteria, including the percentage of households at risk of poverty with arrears on utility bills, the population at risk of poverty in rural areas and GNI per capita.

Under the proposal, MSs would submit Social Climate Plans (SCPs) to access the funds, with matching funding provided from national budgets that could be taken, if MSs so choose, from the remaining 75% of national ETS2 revenues. These funds may cover both temporary direct income support for vulnerable households, and structural investments to reduce emissions in the transport and buildings sectors, and as a result reduce costs for vulnerable households and other targeted groups.

2. METHODOLOGY AND SCENARIOS

2.1 General approach

This study reflects findings of a new static micro-simulation model developed by BC3 with IEEP and other partners in the Think Sustainable Europe network, based on household consumption data from the latest wave of HBSs across EU MSs,[11] on energy consumption from the Eurostat Physical Energy Flow Account, and on energy prices and taxes from a range of sources.[12] Full details of the methodology and additional data are available in the accompanying working paper by BC3.[13]

The model simulates price changes for major energy products linked to the introduction of the ETD reform and ETS2 in the MSs, and effectively multiplies these price changes by the expenditure shares for the different energy products of all household types in the HBS dataset to reflect the direct, over-night impacts of the policies on those households, before assuming any behavioural change linked to the new prices (or any other change in emissions resulting from recycling of revenues or other complementary policies, such as the Renovation Wave, Energy Performance of Buildings Directive or the regulation on CO2 standards for cars and light vehicles).[14]

Results are presented in this paper primarily in terms of the welfare impact, reflecting price differences for households as a share of total current household expenditure. A 1% welfare gain thus indicates that the household will experience a net benefit from the policy equivalent to 1% of its current total expenditure, and conversely a 1% welfare loss indicates that the household will face additional costs equivalent to 1% of its current total expenditure.[15]

The HBS microdata allows us to assess highly granular distributional impacts both vertically – according to income – and horizontally – according to a range of other

[11] For some countries such as Malta, Portugal and Slovenia, the 2015 surveys were not available and the 2010 surveys were used instead. The Austrian survey was not available for any of the years so the country is excluded from the study. 2015 prices from the surveys were scaled to reflect 2020 prices.
[12] We have endeavoured to reflect effective tax rates, taking account of the most significant examples of tax exemptions for households in MSs for the most significant energy products.
[13] Epelde, E., Rodriguez-Suniga, A., Garcia-Muros, X. and Gonzalez-Eguino, M. (2022) Modelling the direct socio-economic impacts of the new Energy Taxation Directive (ETD) and the extension of the ETS to transport and building sectors. https://api.otea.info/storage/2022/03/08/d87a258a425adcad49f3cb35a268fe6ad52935ba.pdf
[14] In a later phase of this work, the micro-model will be combined with a macro-model.
[15] Some results shown in terms of Euros, change in energy prices and energy expenditure are available in the BC3 paper, Epelde *et. al. op. cit.*, and additional data are available on request to IEEP.

household characteristics (such as household size, rural vs urban location, age etc). In this paper we present aspects of both vertical and horizontal analysis at three levels:

- Comparing average households in each MS;
- Comparing households EU-wide (as though the EU were a single country); and
- Comparing households within selected MSs.[16]

The vertical analyses presented in this paper use expenditure as a proxy for income. This is considered a better proxy for the permanent income of families as it undergoes a lower fluctuation than income both in the medium and long term.[17] While results differ slightly if presented in terms of income or expenditure, in this paper the two terms are used inter-changeably.

2.2 Scenarios

The full set of scenarios developed to date are reflected in the accompanying BC3 working paper.[18] In this paper we focus on two central scenarios:

- The impact of the **proposed reform of the ETD alone** (including exemptions for households at risk of poverty) – discussed in **Section 4**; and
- The combined impact of the **proposed reform of the ETD** (including exemptions for households at risk of poverty) **and ETS2** (with a carbon price of €45/t) – discussed in **Section 5**.

As discussed in the Introduction, the ETD reform includes the possibility for MSs to fully exempt households at risk of poverty – defined as households with 60% or less of the national median income – from energy excise taxation on heating fuels. In all results presented in this paper we assume that all MSs make use of this optional exemption in relation to any required energy tax rate increases, but we assume that all MSs apply the new minimum rates to all other households.[19]

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[16] Additional within-MS analysis is available in accompanying papers by TSE partners in Czechia, France, Germany, Hungary, Poland and Spain. See Annex 9.

[17] Goodman, A., and Oldfield, Z. (2004). Permanent differences? Income and expenditure inequality in the 1990s and 2000s (Issue R66). IFS Report.

[18] Epelde *et. al. op. cit.*

[19] Scenarios with and without exemptions have been modelled and results are available on request to IEEP. The minimum rate for fossil gas is the rate at the start of the 10-year transitional period.

We use a carbon price of €45/t for ETS2 for our second central scenario, on the basis that this was the price assumed at the start of the ETS2 in the EC impact assessment, and we assume that MSs with existing national carbon taxes would replace them with this measure.[20]

In the main paper we also include results of **three sensitivity analyses** in relation to revenue-recycling. We estimate revenues only in relation to residential energy consumption in buildings and transport,[21] and in all cases we assume revenues are recycled lump-sum to the poorest 50% of households in each MS.[22]

- **First**, in relation to the 'ETD alone' scenario, we include a sensitivity analysis with recycling of just the additional revenues that are generated from energy excise taxes covered by the ETD as a result of the reform.[23]
- **Second,** in relation to the combined ETD and ETS2 scenario, we include a sensitivity analysis with recycling of both the additional revenues generated by the ETD reform and the maximum allocation that each MS is entitled to from the Social SCF on the basis of the EC proposal.

As discussed in the Introduction and further in Section 5, the SCF proposal only redistributes 25% of the expected total EU-wide ETS2 revenues among MSs. This still leaves 75% of national ETS2 revenues in each MS.

- In the **third** principal sensitivity analysis, we show the impact of recycling the additional revenues from the ETD reform, each MS's maximum allocation from the SCF *and* these remaining national ETS2 revenues (ie ensuring that 100% of total EU-wide ETS2 revenues are recycled).

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[20] As such the impact of ETS2 in these countries is modelled as the difference between the existing national carbon tax and this €45/t. For MSs with a national carbon price in excess of this level, we assume they would maintain the higher price. See the BC3 paper, Epelde *et. al. op. cit.* for details.

[21] As a result our estimated revenues discussed in Section 4.1 do not exactly match those from the EC proposal. However, with regard to the SCF allocation, our estimate is very close to that proposed by the EC in the first years of the scheme, and so can be seen as a good representation of the welfare impacts associated with revenue recycling via the SCF. Our estimates of remaining national revenues are slightly lower than the levels that can be expected by MSs when including emissions from commercial operators also. These additional revenues could be assumed to be used to address distributional concerns in the commercial sector, or if also recycled to households would strengthen the welfare impacts described in this paper.

[22] Additional revenue-recycling sensitivities are described in the BC3 paper, Epelde *et. al. op. cit.* including as equal lump sums to all households and to the poorest 70% of households, with results available on request to IEEP.

[23] Note that, as discussed in Section 4, the ETD reform does not generate additional revenues in all MSs. Details of revenues in each scenario are available in the BC3 paper, Epelde *et. al. op. cit.*

While we are showing results with **simple lump-sum recycling**, regarding the last of these sensitivities (recycling all revenues) in particular, the results can be seen as indicative of the distributional impacts of other forms of **structural government investments** targeted to benefit those households.

Investing a major share of the revenues in structural reforms is certainly critical to both the environmental benefits of the ETS2 and to avoid widening social inequalities from lower-income households remaining trapped and dependent on fossil fuel technologies while the energy transition progresses. Indeed, given the relatively low near-term price elasticities of demand in the household sector for heating in particular, the generation and use of carbon pricing revenues is widely understood to be a more significant driver of the environmental benefits of carbon pricing than behavioural changes in response to price.[24] Section 6 includes a brief discussion of some options for targeting structural reforms to benefit different parts of the EU-wide income distribution in this regard.

Finally, in relation to the discussion of the impact of the SCF, we also include in this paper **one additional scenario**, showing the impact of the ETS2 (with a carbon price of €45/t) alone (without the ETD reform). In this scenario, in order to demonstrate the difference that the SCF makes compared to a situation without the SCF, we also include an additional sensitivity analysis with recycling of just 25% of each MS's national ETS2 revenues. This scenario is included in **Section 5.2**.

As discussed in the accompanying BC3 paper, we have also generated results with a range of **additional sensitivities**, including a revenue-neutral version of the ETD reform for some MSs and an ETS2 carbon price of €100/t. Some results with these parameters are provided in the Annexes and discussed in the relevant parts of **Sections 4.2** and **5.2**.

2.3 Limitations

Various limitations to the method are described in the accompanying BC3 paper. These include certain gaps and anomalies in the HBS microdata, and also the limits of a static model in failing to capture behavioural change of households in response to price changes, although price elasticities of demand are generally assumed to be relatively low in the near-term.

[24] See for example: Thomas, S. et al. (2021) Pricing is just the icing: The role of carbon pricing in a comprehensive policy framework to decarbonise the EU buildings sector. Regulatory Assistance Project https://www.raponline.org/wp-content/uploads/2021/06/rap-ETS-alternatives-carbon-pricing-report.pdf

More generally, it is a limitation of the model that it is focused on identifying the socio-economic impacts of the policies, rather than their environmental benefits. That said, in some revenue-recycling scenarios we use lump-sum payments as a simple proxy for the welfare impacts of targeted structural investments, and a further brief discussion of these considerations is included in Section 6. The model also does not reflect the distribution of non-pecuniary benefits of climate action, which we can assume to be skewed in favour of lower-income households.[25]

While we have endeavoured to reflect effective energy tax rates across the MSs, smaller tax reductions or exemptions may be applied to some households in some MSs for some products which are not currently reflected in the model due to information gaps at the time it was developed. We consider this to make very marginal differences to the overall results presented here, and we will continue to refine the model with additional data, in view of the next phase of our work.

It should also be noted that our distributional results for revenue-recycling sensitivities assume those revenues are indeed directed effectively – either as lump-sum payments, or through other forms of government investment – to the poorest 50% of households in each MS. Questions concerning the governance of these revenues at both EU and MS level are critical, but outside the scope of this paper.

Similarly, the wider policy mix, including significant regulatory measures, across the Fit for 55 package – of which the ETD, ETS2 and SCF are just a part – will also substantially shape the distributional impacts of the two policy measures addressed here, depending on how effectively they are implemented in advance of the ETD reform and/or ETS2 being introduced. The importance of locating these pricing tools within a broader framework of fiscal and climate policy reform are discussed briefly in Section 6, but further analysis would be important to better clarify their interactions for the welfare impacts on households.

[25] See for example: Vona *op. cit.*

3. THE DISTRIBUTIONAL IMPACTS OF THE PROPOSED ETD REFORM

3.1 Key driving forces behind the distributional impacts

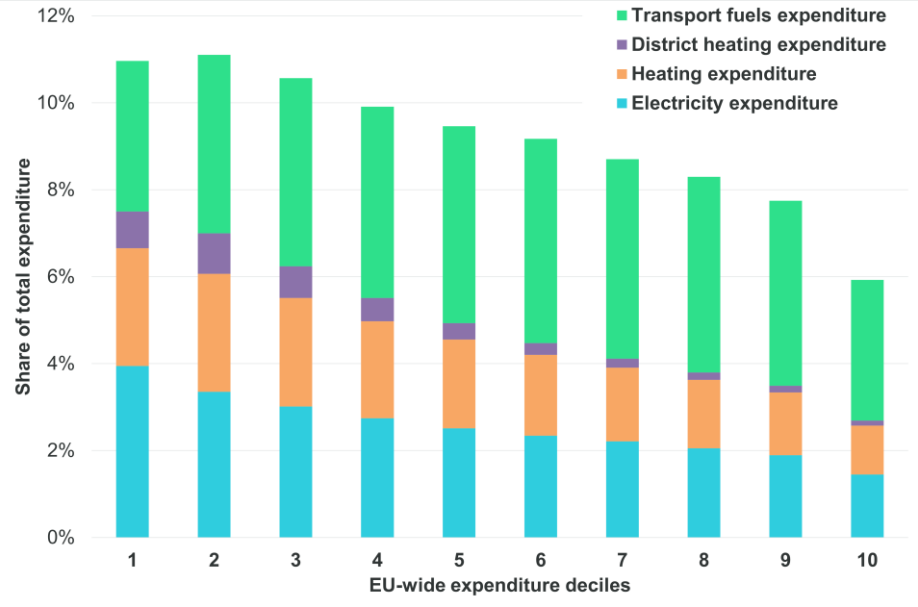
3.1.1 The structure of household energy expenditure

Before turning to the results, it is instructive to consider the key driving forces that shape the distributional impacts of the policy measures. Underlying the results in all scenarios related to both the proposed ETD reform and ETS2 is the structure of household energy consumption, which varies significantly vertically and horizontally, between and within MSs and across the EU-wide distribution.

Energy consumption across the EU-wide income distribution

We can gain a good overall picture of the significant differences in energy consumption among households across the EU by considering first the vertical variation according to the EU-wide income distribution. Figure 1 shows average household expenditure on different energy products as a share of total household expenditure from the lowest-income households in the EU in decile 1 (D1), to the highest-income in decile 10 (D10). This shows clearly that – as is widely understood – energy expenditure as a whole constitutes a significantly larger share of total expenditure of lower-income compared to higher-income households.

Figure 1: Structure of household energy consumption (% total expenditure) across the EU-wide distribution



But it is important to note the differences between energy products. Across the EU-wide distribution, transport fuels constitute the biggest share of expenditure of middle-income households (private car ownership being less common among lower income households). And significantly in the context of the proposed ETD reform, expenditure on electricity makes up the highest share of household expenditure for the lowest-income households – 4% on average for the poorest 10% - higher even than expenditure on heating fuels.

In terms of the EU-wide income distribution, this means that any measures to reduce electricity prices – including the tax reductions in the proposed ETD reform – will have substantially progressive impacts, benefiting the poorest most. By contrast, any measures that increase fossil heating fuel prices – including the tax increases in the proposed ETD reform or the ETS2 – will have regressive impacts, adversely affecting the poorest most. Meanwhile, the impact of such measures on transport fuel prices will mostly affect middle-income households.

Energy consumption between and within MSs

While this is the average picture across the EU-wide distribution, there are important differences in the structure of energy consumption both between and within MSs, and horizontally within these large EU-wide deciles. Average energy expenditure among MSs ranges from around 4% in Malta to nearly 14% in Poland, with significant differences in the shares for different fuels among the MSs (see Annex I).

Within MSs, we find that in lower-income MSs, transport fuel expenditure tends to increase more in proportion with income compared to the EU-wide pattern of transport expenditure, while the EU-wide pattern is more typical of higher-income MSs. Electricity, however, makes up the largest share of expenditure of lower-income households across a clear majority of EU MSs.[26]

Horizontal variation in energy consumption

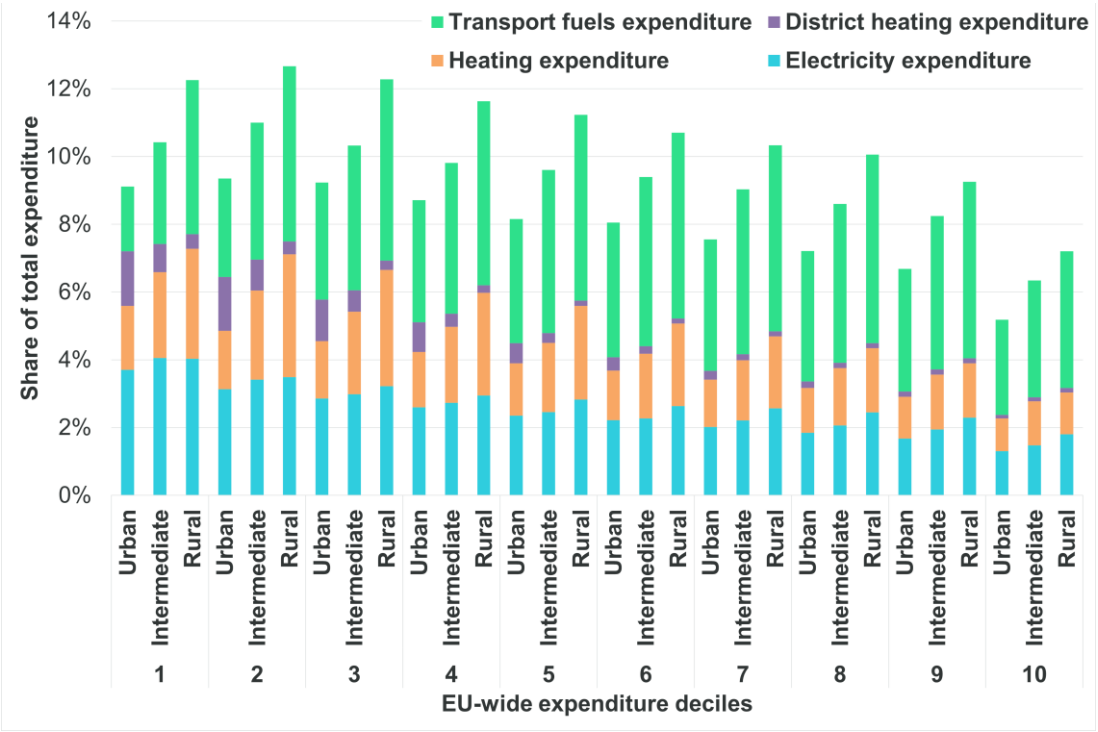
In addition to the vertical variation across the income distribution EU-wide and within MSs, there is also very significant horizontal heterogeneity at all levels. Figure 2 shows that urban households across the EU-wide income distribution have much lower energy expenditure shares than rural households, although this difference diminishes slightly higher-up the income distribution.

In some cases, **household location** is shown to have an even greater impact on energy expenditure than household income. For example, rural households in D5

[26] Electricity constitutes the highest share of expenditure in 18 MSs.

or D6 are shown to spend a greater share of their total expenditure on energy than urban households in D1. Differences in fuel consumption are also notable, with urban households in D1 having the lowest expenditure shares of any group on transport, for example. Across all deciles, it is also notable that rural households have higher expenditure shares for electricity.

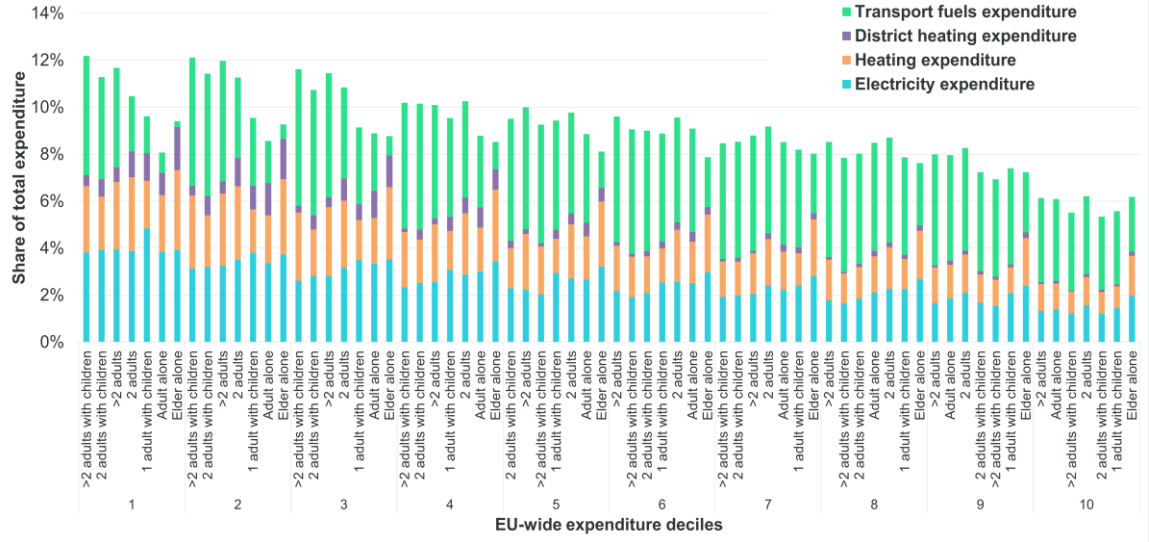
Figure 2: Structure of household energy consumption (% total expenditure) across the EU-wide distribution and according to population density



Energy consumption also varies significantly according to the **size and composition of households**. As shown in Figure 3, households with fewer members tend to have lower energy expenditure shares, albeit the differences are also less pronounced higher-up the income distribution. Single parent households and households with one older person – two groups in which women are disproportionately represented – have the lowest expenditure shares of all household types in each decile.

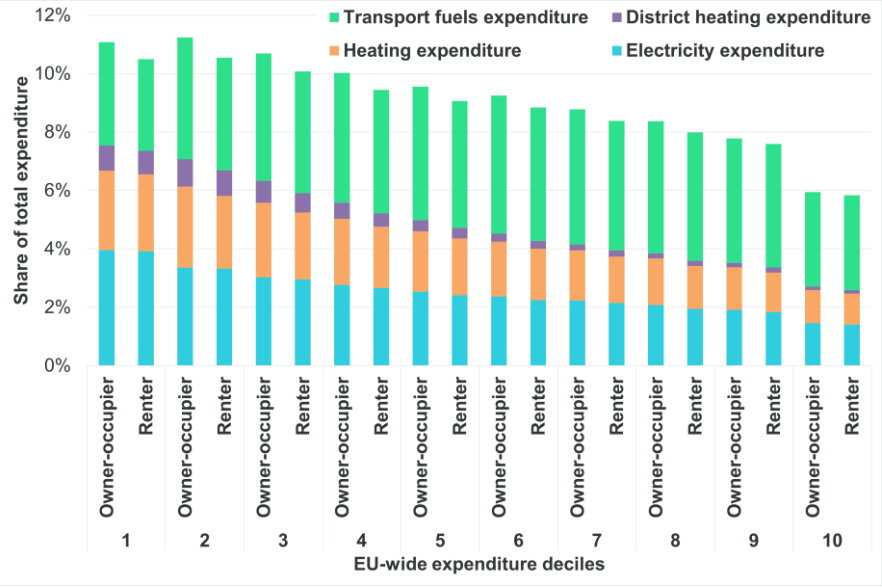
Again, these factors can be a more significant determinant of energy consumption than income: households with one older person in D5 or D6 having lower overall expenditure shares than households with 2 adults and 2 children in D1, for example. Variation in consumption of different energy products is also notable, with single parent households in D1 having some of the lowest expenditure shares on transport fuels, but the highest expenditure shares on electricity and heating, for example.

Figure 3: Structure of household energy consumption (% total expenditure) across the EU-wide distribution and according to household composition



Variation is also notable, though less pronounced, between **renter households and owner-occupiers,**[27] as shown in Figure 4, with the latter having slightly higher energy expenditure shares in all EU-wide deciles apart from D10. Electricity consumption however is constant across these categories, while renter households tend to have lower expenditure shares of heating fuels and transport fuels.

Figure 4: Structure of household energy consumption (% total expenditure) across the EU-wide distribution and according to property ownership



[27] Some care must be taken with interpreting results in relation to the renter and owner-occupier categories because of methodological differences between MSs in determining imputed rents.

3.1.2 Current energy taxation in different EU MSs

The second key driver of the distributional impact of the ETD reform is the current level of effective energy tax rates in each MS (which determines the extent of the price change for each fuel type). Table 1 shows the direction of changes required in effective tax rates for different energy products based on the ETD proposal

Table 1: Direction of changes in effective tax rates for households implied by the ETD proposal

	Electricity	Petrol	Diesel	Gas oil	Natural gas	Coal
Austria (AT)-	↓					
Belgium (BE)+				↑	↑	↑
Bulgaria (BG)+			↑		↑	↑
Cyprus (CY)-	↓					↑
Czechia (CZ)+			↑		↑	↑
Germany (DE)-	↓					↑
Denmark (DK)-	↓					
Estonia (EE)+			↑			
Greece (EL)+					↑	↑
Spain (ES)-	↓		↑			↑
Finland (FI)-	↓					
France (FR)-	↓					
Croatia (HR)+					↑	↑
Hungary (HU)+		↑	↑		↑	↑
Ireland (IE)						
Italy (IT)-	↓					↑
Lithuania (LT)+			↑	↑	↑	↑
Luxembourg (LU)+				↑	↑	↑
Latvia (LV)+					↑	↑
Malta (MT)						↑
Netherlands (NL)						↑
Poland (PL)+	↓		↑		↑	↑
Portugal (PT)+			↑			
Romania (RO)+			↑		↑	↑
Sweden (SE)-	↓					
Slovenia (SI)+			↑			
Slovakia (SK)+			↑	↑	↑	↑

Legend: Up arrow indicates excise tax rates increase; down arrow indicates excise tax rates decrease; + indicates reform generates new government revenues; - indicates reform results in reduced government revenues.

Evidently, the extent to which MSs are required to change their excise tax rates and the resulting impact on government revenues varies by MS:

- Some MSs – like **Ireland** or the **Netherlands** – where fossil heating and transport tax rates are already higher than the proposed new minima, and where electricity is already the least-taxed energy product – are not required to change any tax rates at all, with no consequent impact on government revenues.
- Most MSs – like **Belgium** or **Bulgaria** – are required to increase some tax rates on fossil heating and/or transport fuels, entailing new government revenues.
- Some MSs – like **France** or **Sweden** – are only required to lower their electricity tax rates to become the least taxed energy product, entailing reduced government revenues.
- **Poland** and **Spain**, meanwhile, are required to both increase certain fossil heating and/or transport taxes while also reducing electricity taxes, with revenues increasing and decreasing, respectively, as a result.

It is important to note that excise taxes make up only a relatively small share of the end consumer prices for all energy products. The modelled changes in consumer prices resulting from the required changes to excise tax rates due to the proposed ETD reform are provided in Annex 2, and resultant changes in government revenues are provided in Annex 3. In total 11 MSs see new revenues generated as a result of the reform, worth approximately €1.1bn per year in total, while 16 MSs see revenue losses worth approximately €9bn per year.

The most significant price changes resulting from the ETD reform in relation to fossil heating and transport fuels are in MSs that currently entirely exempt households from taxation in certain energy products – meaning a current effective tax rate of 0. For example, **Bulgaria, Czechia, Croatia, Hungary, Lithuania, Poland, Romania** and **Slovakia** all currently exempt households entirely from excise taxes for fossil gas as a heating fuel.

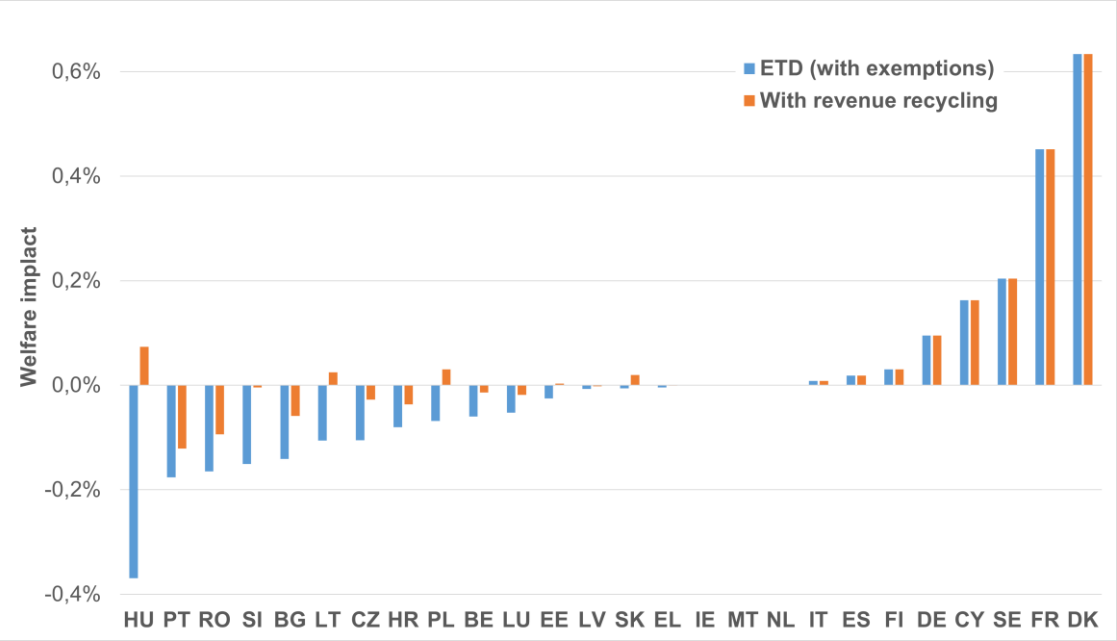
It is also important to note that while the most significant increases in consumer prices concern coal as a heating fuel, this only constitutes a small – and in some cases negligible or zero – share of household energy expenditure across most MSs, with some exceptions like **Poland** or **Czechia**.

3.2 Key findings

Distributional impacts between MSs

Figure 5 shows the welfare impact – as a share of household expenditure – of the proposed ETD reform (including exemptions for households below 60% of median income) on the average household in each MS, and the impact when also considering recycling of any additional revenues generated by the reform lump-sum to the poorest 50% of households in those MSs.

Figure 5: Welfare impact (% total expenditure) on average household in each MS from proposed ETD reform, without and with revenue recycling



The first thing to note is that the scale of the average welfare impacts across all MSs is limited – from around -0.4% at worst in **Hungary**, to around +0.6 at best in **Denmark**. This suggests that the proposed ETD reform is in fact cautious, and unlikely to result in dramatic overnight welfare impacts on average for any MS in either direction.

The most adversely affected MSs in the absence of revenue recycling, on the left-hand side are those, primarily **CEE MSs**, where all households are to a large extent currently exempted from taxation of fossil heating fuels and/or where nominal rates are currently relatively low, and expenditure shares on fossil heating and transport is relatively high. However, **Poland** is notably less affected than some other CEE MSs because Polish households are currently subject to electricity taxation – unlike in **Hungary**, for example – and therefore benefit from the proposed ETD reform's electricity tax reductions.

When revenue recycling is included, then these marginal welfare impacts are further reduced, and in some cases – including in Hungary and Poland – result in marginal welfare benefits for the average household.

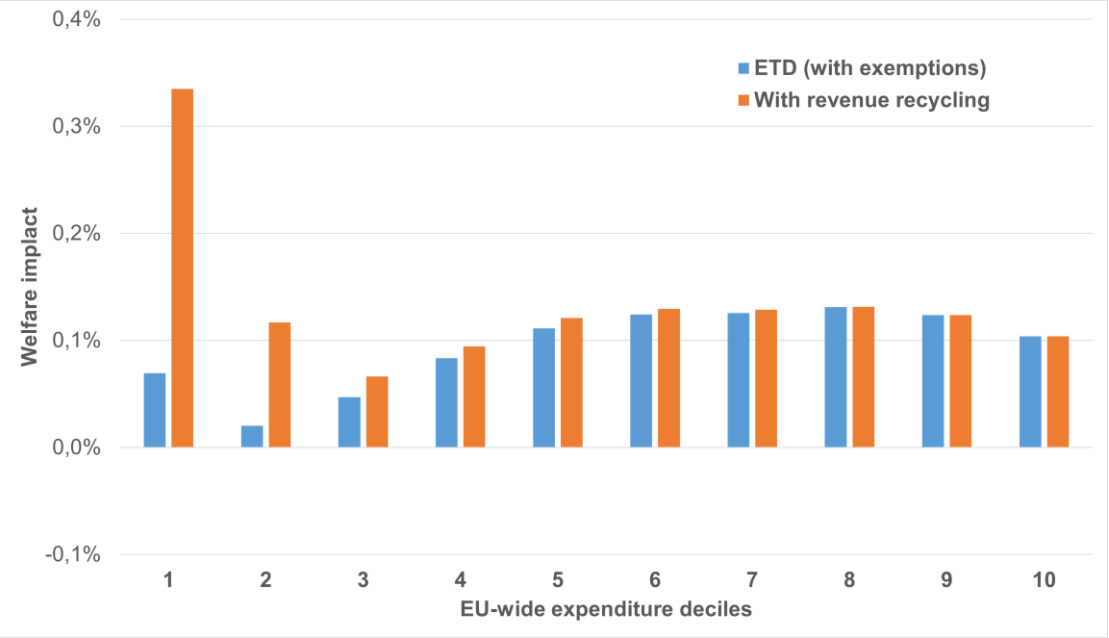
On the right-hand side, MSs like **Denmark, France** and **Sweden** would see average welfare gains from the proposal as a result of reducing electricity taxes substantially, without having to raise fossil heating or transport fuel taxes. As shown above, it should however be noted that such a reform entails revenue losses for such governments, which could in theory be paid for by raising other energy taxes, from elsewhere in the general budget or by increasing government debt (see below for a revenue-neutral version of the reform in these MSs).

Distributional impacts across the EU-wide distribution

Figure 6 shows the resulting welfare impact across the EU-wide income distribution, with small average welfare gains for each decile. This shows that the substantial average welfare gains in MSs on the right-hand side of Figure 5 (which include some of the most populous MSs) more than offset the average welfare losses in MSs on the left-hand side, on average across the EU as a whole.

While D1-3 benefit least from the reform in the absence of revenue recycling – because the largest share of these households are in CEE MSs that on average are worst impacted – the poorest 10% nonetheless benefit most from the recycling of revenues (again because most of the additional revenues available for recycling will be generated in CEE MSs that see the most significant price increases.)

Figure 6: Welfare impact (% total expenditure) EU-wide from proposed ETD reform, without and with revenue recycling

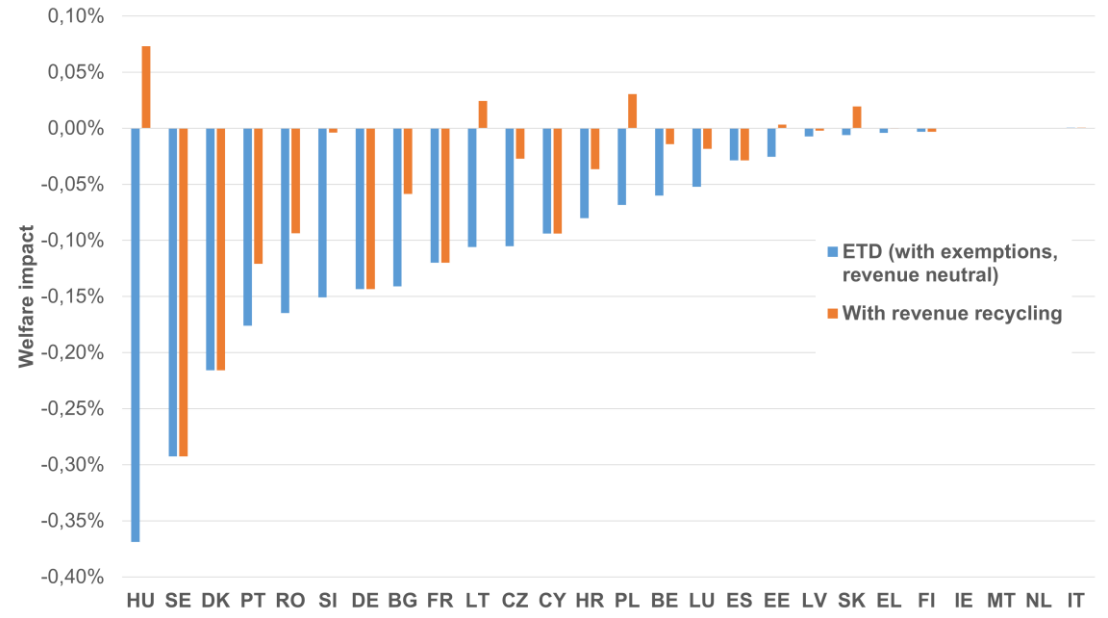


A revenue-neutral ETD reform?

Given that this reform scenario entails significant revenue losses for some governments (albeit revenue gains for many others, see Annex 3), we also considered a revenue-neutral scenario in which MSs with revenue losses from lowering electricity taxes pay for them through increasing fossil energy taxes in proportion to their share of energy consumption.

As shown in Figure 7, these additional costs on fossil heating and transport fuels, in the absence of revenue-recycling, would result in average welfare losses in all MSs, although only of a very marginal nature.

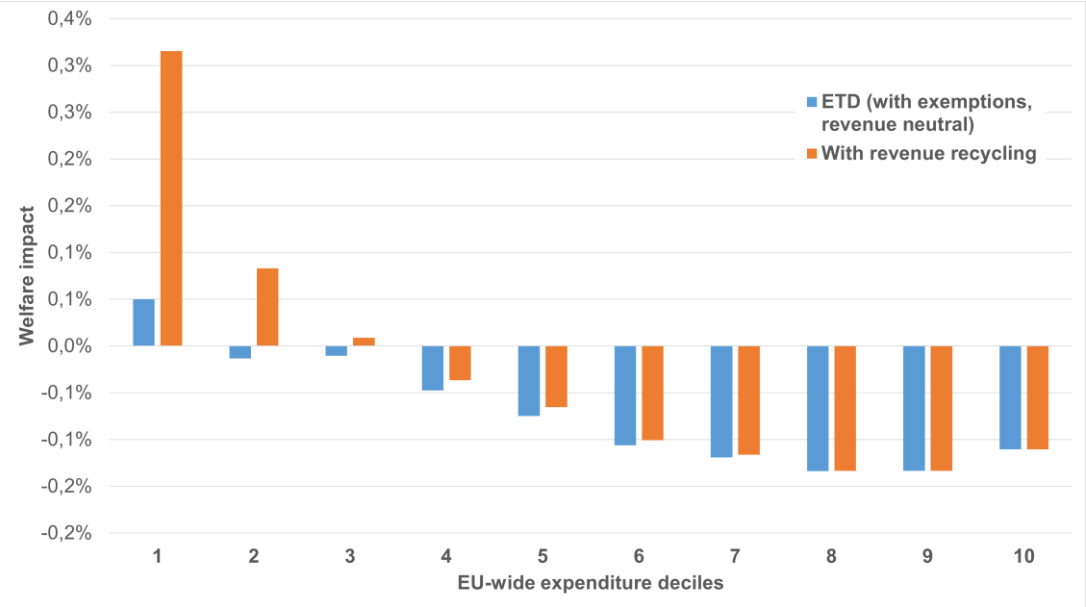
Figure 7: Welfare impact (% total expenditure) on average household in each MS from revenue-neutral version of proposed ETD reform, without and with revenue recycling



In terms of the EU-wide distribution, as shown in Figure 8, households on average in D1 would see the same small benefit as in the previous scenario (since most of these households are in CEE MSs where revenues are positive from the initial reform), with small losses in a broadly progressive direction in the remaining deciles.

When revenue-recycling to the lowest-income 50% in each MS is included, the impact takes a more clearly progressive shape, with the exception of D10 which sees marginally less adverse impacts than D8 or D9 (a pattern which repeats across all scenarios assessed in this study, as discussed in the context of complementary measures to address residual equity concerns at the top of the income distribution in Section 6).

Figure 8: Welfare impact (% total expenditure) EU-wide from revenue-neutral version of proposed ETD reform, without and with revenue recycling



Overall this would suggest that EU-wide the proposed ETD reform can be introduced – even with additional revenues from higher fossil fuel taxes to offset those lost from lower electricity taxes in some MSs – in such a way that the poorest 10% of EU households will see modest welfare gains, even in the absence of revenue recycling.

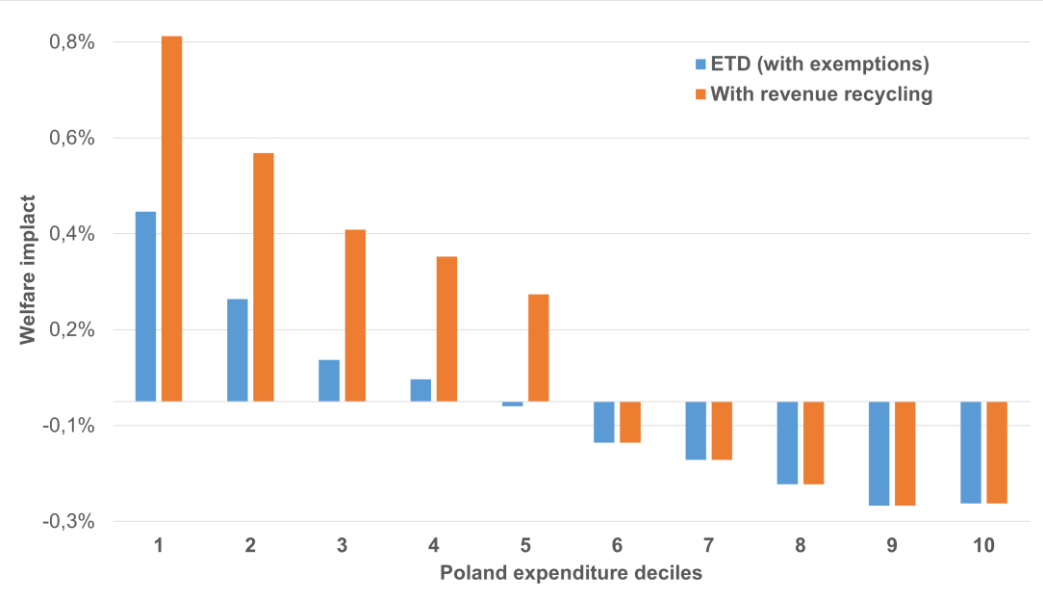
With appropriate revenue-recycling, the ETD could become a tool that not only realigns tax incentives with the fight against climate change, but also achieves a modest level of income redistribution between higher and lower income households EU-wide.

Distributional impacts within MSs

Politically, however, the most important distributional impacts are likely to be those within MSs rather than on average between them or across the EU distribution as a whole.

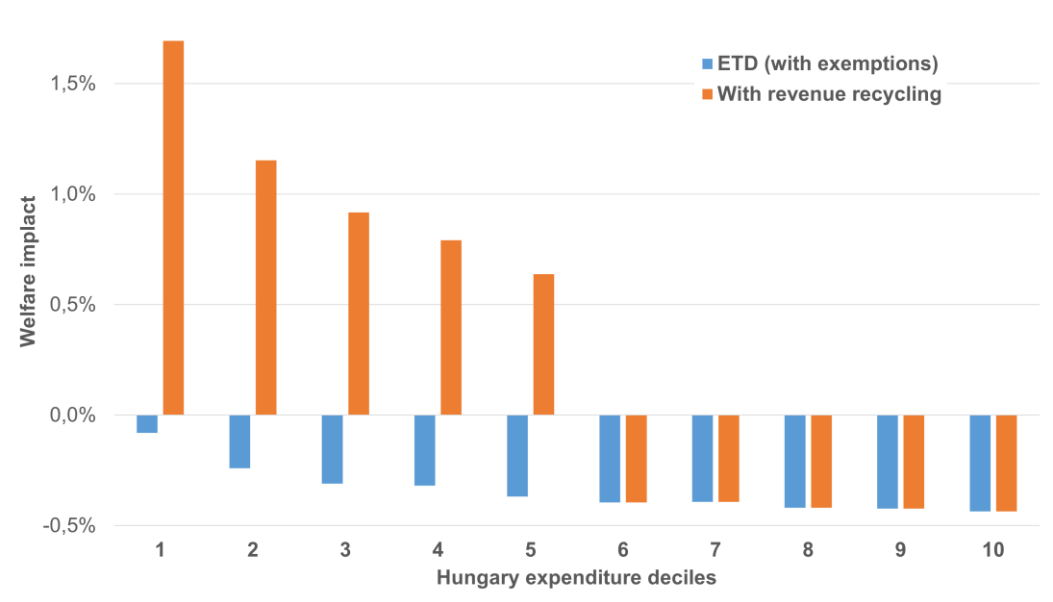
Figure 9 shows the distributional impact of the ETD reform in **Poland.** In Poland's case, it is notable that the progressive impact of lowering electricity tax rates more than off-sets the regressive impact of increasing fossil heating and transport fuels, resulting in average welfare gains for the poorest 40-50% of Polish households, which further increase with recycling of Poland's €290m in new revenues to the poorest 50% of households. Small costs are progressively shared among the richest 50% of households.

Figure 9: Welfare impact (% total expenditure) in Poland from proposed ETD reform, without and with revenue recycling



Across the other **CEE MSs**, where the reform does not entail any reduction in electricity taxes (households already being entirely exempted in MSs like Bulgaria, Hungary and Slovakia, for example), the impact of the initial reform tends to be regressive. However, as demonstrated in the case of **Hungary** shown in Figure 10, when recycling of the additional revenues generated by the reform (€296 in Hungary's case) to the poorest 50% of households is included, the overall distributional impact turns progressive. In Hungary's case, the poorest 50% of households see welfare benefits in the order of +0.5-1.5%, with limited welfare losses of less than -0.5% borne progressively by the richest 50% of households.

Figure 10: Welfare impact (% total expenditure) in Hungary from proposed ETD reform, without and with revenue recycling



Finally, in MSs where the proposed ETD reform entails cuts to electricity taxes without any (significant) increases in fossil heating or transport taxes, the reform has welfare gains across the distribution (albeit with revenue losses for those governments).

As shown in Figure 11 in the case of **Spain**, in such countries where electricity constitutes a significant share of expenditure, these gains are distributed in a clearly progressive way. (Note that in Figure 11, the blue and orange bars are identical, reflecting the fact that Spain does not generate any additional revenues from the reform to recycle.)

Figure 11: Welfare impact (% total expenditure) in Spain from proposed ETD reform, without and with revenue recycling

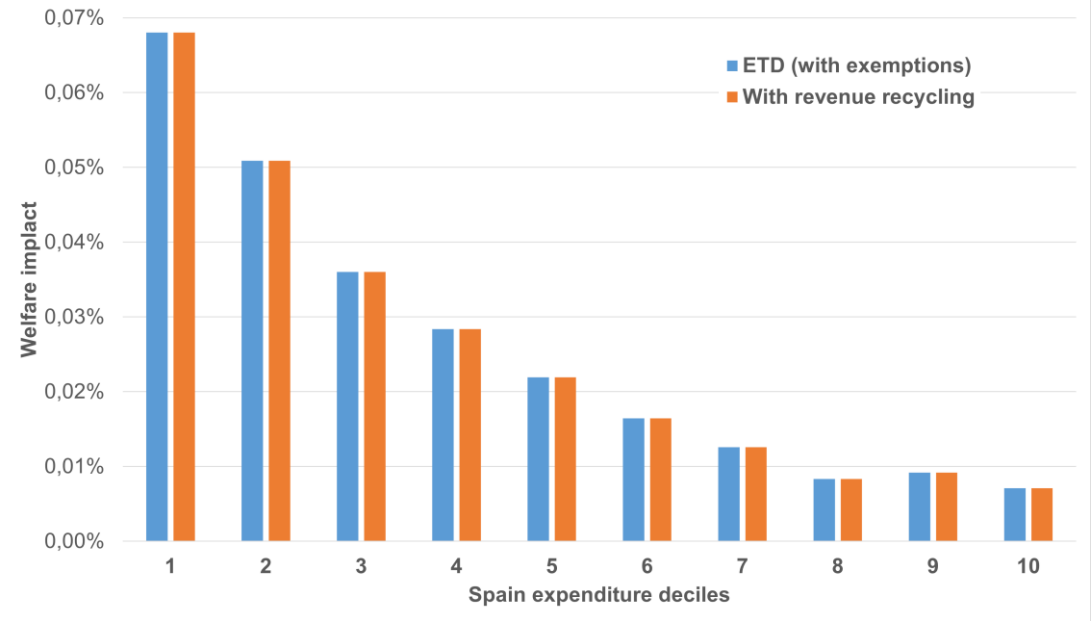
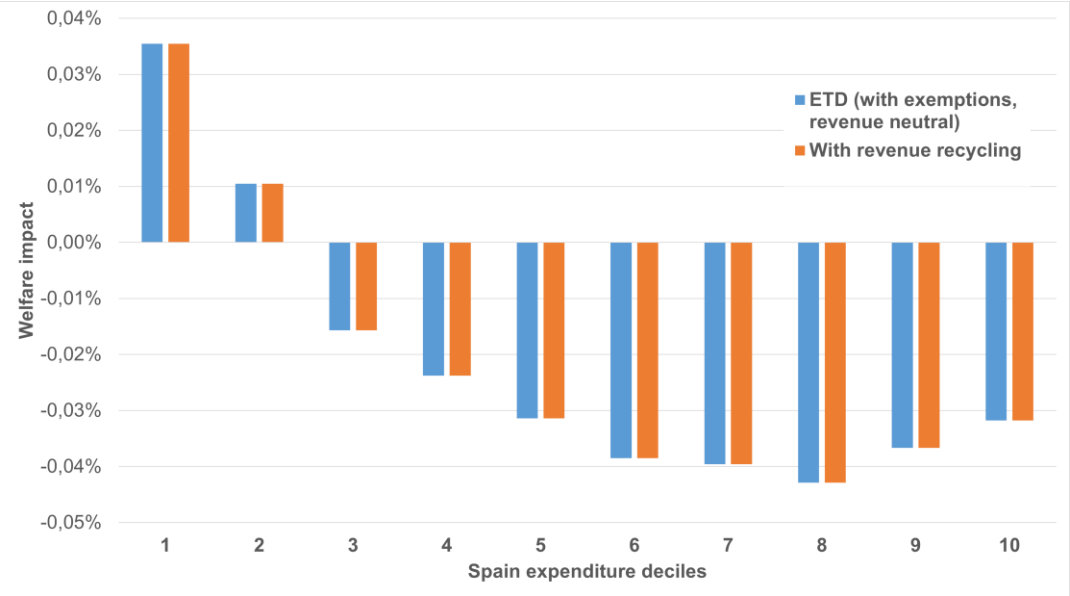


Figure 12 shows our revenue-neutral version of the reform for **Spain** – in which fossil heating and transport taxes are increased to pay for the electricity rate reductions.

It is notable that this revenue-neutral version still produces small welfare gains for the poorest 20% of Spanish households. The very small welfare losses are shared mostly among middle-income households, with D6-8 worst affected. This primarily reflects the increased prices for transport fuels that make up a bigger share of expenditure of these middle-income households.

Figure 12: Welfare impact (% total expenditure) in Spain from revenue-neutral version of proposed ETD reform, without and with revenue recycling



While revenue-neutral ETD reform options certainly seem viable, for the rest of this paper we use the proposed ETD reform as the central ETD scenario so as not to pre-judge governmental choices about how electricity tax rate reductions may be financed (and given that the orders of magnitude of impacts in either direction are, in any case, very small for the MSs concerned).[28]

In general, funding electricity rate reductions from raising progressive forms of taxation – such as by raising top-rate income tax or capital taxes – would ensure even more progressive impacts from the measures.

It is also important to note, as discussed in Section 4.1.1 in relation to the structure of energy consumption, that there will also be significant **horizontal variation** among households in terms of the welfare impacts of the ETD reform explored in this Section. Given the relatively modest scale of the overall impacts, and for the sake of length, these are not further explored here, but are addressed in the context of the combined ETD and ETS2 scenarios in Section 5.

[28] We note that some MSs are exploring reductions to electricity excise taxes or renewable energy levies on electricity bills as a response to the current energy price crisis, with some considering paying for such measures through increases in fossil energy taxation and others through the general budget.

Summary: Can the ETD reform be progressive?

- The **average welfare impacts** of the proposed ETD reform are very limited across all MSs, ranging from around -0.4% at worst to +0.6% at best;
- The proposed reform includes optional **exemptions for households at risk of poverty**, which if adopted by MSs ensures that these households are protected from any adverse welfare impacts for up to 10 years (by which point the energy transition is expected to have advanced significantly);
- Because **electricity** constitutes a larger share of expenditure of lower-income households, the proposed electricity tax rate reductions have substantially progressive impacts across the EU-wide distribution and the distribution within all the MSs that would need to apply them;
- The overall reform is clearly progressive in **Poland** as a result of progressive cuts to electricity tax rates offsetting regressive impacts of raising fossil heating and transport fuels, even in the absence of revenue-recycling; and across all **CEE MSs** the reform is clearly progressive if additional revenues from energy taxes are recycled to the poorest 50% of households;
- In MSs like **Spain** where the reform implies cuts to electricity without any (significant) increases to fossil heating or transport fuels, the poorest households will see the biggest welfare gains, although this will entail significant government revenue losses;
- **Revenue-neutral options** that pay for electricity tax cuts with higher fossil heating and transport taxes have progressive impacts across the EU-wide distribution, as well as within the MSs that would need to apply them. Funding these electricity rate reductions through other forms of progressive taxation would have even more progressive overall impacts.

4. THE DISTRIBUTIONAL IMPACTS OF THE PROPOSED ETD REFORM AND ETS2

4.1 Key driving forces behind the distributional impacts

The structure of household energy consumption and current energy tax rates discussed in Section 3.1 also largely shape the consumer price changes resulting from the introduction of a carbon price via ETS2.[29] Consumer price changes resulting from ETS2 with a carbon price of €45/t are shown in Annex 4.

The most significant price changes for households in most MSs are for fossil gas, which range from 0% in Sweden or Finland (where national carbon taxation already exceeds €45/t) to 37% in Hungary. As discussed above, coal only constitutes a small share of household energy consumption in most MSs, with a few exceptions like Poland, where the price change is 73%.

4.1.1 The inter-Member State distributional impact of the Social Climate Fund

When considering revenue-recycling, a further key driving force of the distributional impact of ETS2 is the inter-MS redistribution of ETS2 revenues via the SCF. Table 2 shows the value of annual national ETS2 revenues in our model,[30] the corresponding contributions to and net allocations from the SCF based on the maximum allocation shares per MS outlined in the SCF proposal,[31] and the remaining annual national ETS2 revenues. Thirteen MSs, in red, are shown to be **net contributors** to the SCF, thirteen MSs, in green, are shown to be **net recipients** from the fund, while Cyprus' allocation matches its contribution.

CEE MSs, whose citizens are disproportionately represented among the lowest-income deciles EU-wide, are the clearest net recipients, with a maximum allocation that is around double their contribution in most cases. Bulgaria and Romania are the clearest net beneficiaries, receiving more than 10 and 6 times their contributions, respectively. Meanwhile higher-income MSs, like Germany, Denmark and Luxembourg – whose citizens are disproportionately represented

[29] There is little variation in underlying fuel prices across MSs for most heating and transport fuels, meaning that the variation in tax rates determines most of the difference in consumer prices.
[30] Based on 2018 residential emissions in buildings and road transport, see footnote 21 for implications. For the SCF allocation, revenues total €7.6bn per year, compared to €7.9bn in the EC proposal for the first 3 years, so should be considered indicative.
[31] Assuming the value of the SCF corresponds to 25% of the actual revenues (as in the European Parliament's draft report), rather than a fixed sum based on projected revenues as in the EC proposal.

among the higher-income deciles EU-wide, tend to be the biggest net contributors.

Table 2: Indicative ETS2 revenues and SCF allocations per year per MS with a €45/t carbon price

	National ETS2 revenues (€m/yr)	Contribution to the SCF (€m/yr)	Allocation from the SCF (€m/yr)	Net allocation from SCF (€m/yr)	Net allocation / contribution	Remaining national ETS2 revenues (€m/yr)	SCF allocation + remaining national ETS2 revenues (€m/yr)
AT	632	158	68	-90	0,4	474	542
BE	1 064	266	195	-71	0,7	798	993
BG	100	25	293	268	11,8	75	368
CY	60	15	15	0	1	45	60
CZ	492	123	183	60	1,5	369	552
DE	8 028	2 007	624	-1 383	0,3	6 021	6 645
DK	340	85	38	-47	0,4	255	293
EE	52	13	22	9	1,7	39	61
EL	460	115	420	306	3,7	345	765
ES	2 688	672	802	130	1,2	2 016	2 818
FI	260	65	41	-24	0,6	195	236
FR	4 596	1 149	853	-296	0,7	3 447	4 300
HR	192	48	148	99	3	144	292
HU	620	155	330	174	2,1	465	795
IE	440	110	78	-32	0,7	330	408
IT	4 376	1 094	823	-271	0,8	3 282	4 105
LT	168	42	78	36	1,9	126	204
LU	72	18	8	-11	0,4	54	62

LV	84	21	54	33	2,6	63	117
MT	20	5	1	-4	0,2	15	16
NL	1 516	379	85	-294	0,2	1 137	1 222
PL	2 636	659	1 341	682	2	1 977	3 318
PT	304	76	143	67	1,9	228	371
RO	428	107	705	598	6,6	321	1 026
SE	368	92	47	-45	0,5	276	323
SI	200	50	42	-8	0,8	150	192
SK	272	68	180	112	2,6	204	384
To-tal	30 468	7 617	7 617	7 617	1	22 851	30 468

4.2 Key findings

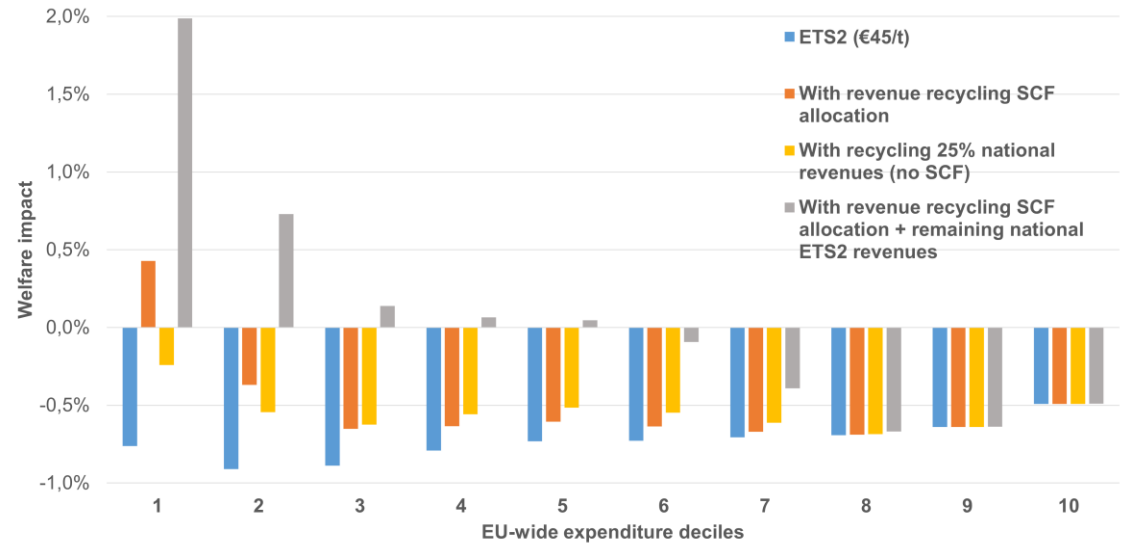
What difference does the SCF make?

In order to illustrate the importance of the SCF for redistributing revenues not only between MSs but between higher- and lower-income households across the EU, we can first compare the EU-wide distributional results in our model for the **ETS2 alone** (ie not including the additional impact of the proposed ETD reform).

Figure 13 shows:

- the EU-wide distributional impact of the ETS2 in the absence of revenue-recycling (blue bars);
- with recycling of just the SCF allocation to each MS to the lowest-income 50% of households within that MS (comprising 25% of total EU-wide ETS2 revenues, redistributed between MSs) (orange bars);
- with recycling of just 25% of national ETS2 revenues within each MS (ie still totalling 25% of total EU-wide ETS2 revenues, but without the SCF's inter-MS redistributive mechanism) (yellow bars); and
- with recycling of both the SCF allocation to each MS and each MS's remaining national ETS2 revenues (grey bars).

Figure 13: Welfare impact (% total expenditure) EU-wide from ETS2 (€45/t) without and with revenue recycling, via SCF and/or nationally



In the **absence of any revenue recycling**, the ETS2 is shown (blue bars) to have negative welfare impacts – and larger in absolute terms than the proposed ETD reform – for all deciles, and with a **broadly regressive** pattern. The poorest 30% of households are impacted worst (although D1 is less impacted than D2 or D3, due to lower transport fuel consumption), and the richest 10% of households least (due to much higher household income than all other deciles).

The **importance of the SCF for the poorest households** is clear by comparing the welfare impacts of recycling 25% of total EU-wide ETS2 revenues with the SCF (orange bars) and without the SCF (yellow bars). The SCF inter-MS redistribution (assuming revenues are recycled to the benefit of the poorest 50% in each MS) results in moderate net positive welfare benefits for the poorest 10% and reduces the adverse impacts significantly for households in D2.

Lower middle-income households from D3-D6, however, tend to be better served by redistributing revenues nationally (reflecting the fact that these households tend to be disproportionately located in MSs that are either small net recipients or net contributors to the SCF). Meanwhile the SCF makes no difference for the richest households from D7-10, with the richest 20% - and, in particular, the richest 10% - seeing the smallest relative welfare impacts of the measure.

This suggests firstly that the SCF inter-MS redistribution is an important mechanism for benefiting the poorest 10% of EU-wide households, in particular, but also that it entails a redistribution from the middle of the EU-wide income distribution to the bottom. The richest, meanwhile, are shown to pay least in relative terms. This is significant given that the 'gilets jaunes' movement consisted of primarily rural, middle-income households and was sparked in part by the

perception that the wider tax reforms of which the French carbon tax increase was a part, were shown to overwhelmingly benefit the very richest parts of French society.[32]

This suggests that **complementary policy measures**, like higher top rate income tax, are needed to address this residual inequity at the **top of the income distribution** (found within most MSs across our scenarios) – consistent with earlier IEEP findings that MSs with greener tax systems tend to have more progressive tax systems.[33] Some options in this regard are presented in Section 6.

It is also clear that the SCF alone is insufficient to fully compensate the adverse impacts on **lower-income households** even in D2, let alone those in lower-middle income groups. However, recycling the **remaining national ETS2 revenues** in addition to the SCF allocation (grey bars) to the benefit of the poorest 50% of households in each MS, ensures adverse impacts are fully compensated for the poorest 50% of EU-wide households, with clear welfare benefits for the poorest 20% - and significantly positive for the poorest 10%. In this scenario, D7 and D8 incur the worst relative welfare impacts.

As shown in Annex 5, we find a similar distributional pattern with recycling the SCF allocation and all remaining national ETS2 revenues in our sensitivity checks with a carbon price of **€100/t**, with substantial welfare benefits for both D1 and D2 and essentially neutral impacts for D3-5.

Assessing the combined impact of the ETD reform and ETS2

While it is useful to look at the distributional impacts of both the proposed ETD reform and ETS2 in isolation, households in the real world will experience the combined impacts of both measures in their day-to-day lives. As discussed in Section 4, it is also important to consider the two measures together because the ETD reform – due to the progressive impact from the reduction of electricity tax rates in many MSs – can serve to offset part of the regressive impact of ETS2 in the absence of revenue-recycling.

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[32] See for example: Piketty, T. (2018) Yellow vests and tax justice. Le Blog de Thomas Piketty. Le Monde.
https://www.lemonde.fr/blog/piketty/2018/12/11/yellow-vests-and-tax-justice/;
Gagnebin, M., Graichen, P. and Lenk, T. (2019) The French CO2 pricing policy: Learning from the Yellow Vests protests. Agora Energiewende : Germany
https://static.agora-energiewende.de/fileadmin/Projekte/2018/CO2-Steuer_FR-DE_Paper/Agora-Energiewende_Paper_CO2_Steuer_EN.pdf

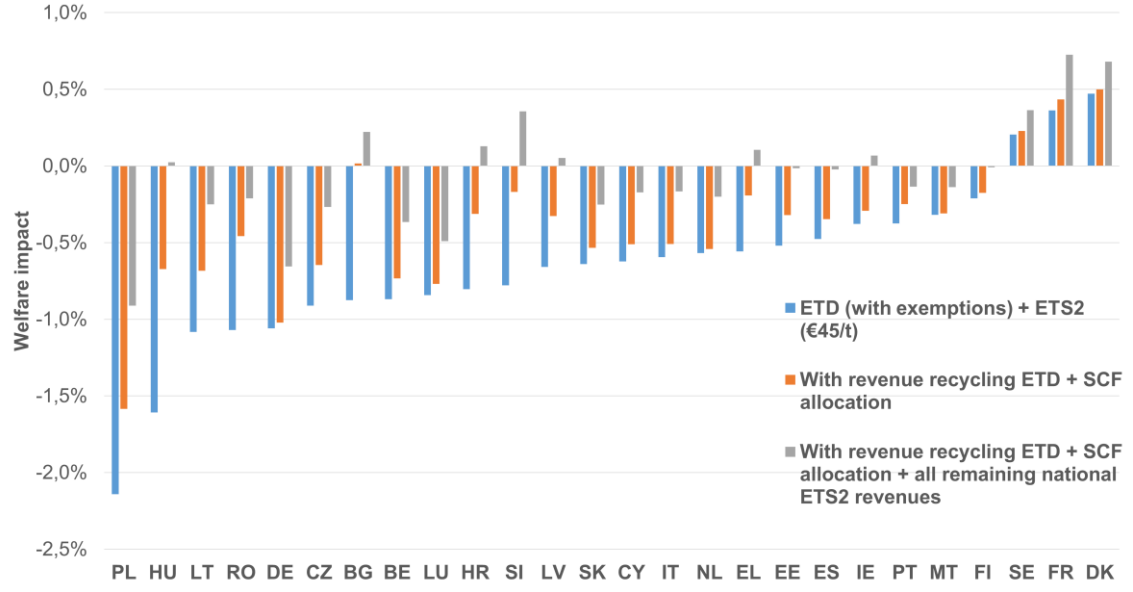
[33] Gore, T., Urios, J. and Karamperi, M. (2022) Green and fair tax in the EU
https://ieep.eu/publications/green-and-fair-taxation-in-the-eu

Distributional impacts between MSs

Figure 14 shows:

- the average welfare impact of both the proposed ETD reform, (with exemptions for households at risk of poverty) and ETS2 (with a carbon price of €45/t) on households across the MSs (blue bars);
- the impact with recycling of new ETD revenues and the SCF allocation lump sum to the poorest 50% in each MS (orange bars); and
- the impact with additional recycling of the remaining national ETS2 revenues as well (grey bars).

Figure 14: Welfare impact (% total expenditure) on average household in each MS from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling



The average welfare impacts are evidently higher than in the ETD alone, dominated by the effect of ETS2. The worst affected MSs on the left-hand side are mostly **CEE MSs** with more carbon-intensive household consumption, lower current energy tax rates and relatively high energy expenditure shares, while average welfare impacts are positive in three MSs (**Sweden, France** and **Denmark**) with existing national carbon taxes close to or above the modelled ETS2 price and which benefit from the electricity tax reductions in the ETD.

Only in **Bulgaria**, which is the biggest net recipient of the SCF, are the recycling of additional ETD and the SCF allocation revenues sufficient to offset the average welfare impact. However, the additional recycling of all remaining national ETS2

revenues results in average welfare gains in 10 MSs and reduces adverse impacts by at least half in all other MSs.

The results of **two further sensitivities**, using the **revenue-neutral** version of the ETD reform and using a **€100/t** ETS2 carbon price are shown in Annexes 6 and 7 respectively, although the shape of the distributional impacts does not vary greatly in either case.

- The impact of the revenue-neutral version of the ETD reform and ETS2 (€45/t) are negative for all MSs, although 8 MSs still see average welfare gains in the event of recycling all available revenues.
- The introduction of a €100/t carbon price approximately doubles the absolute welfare impacts in either direction but does not significantly alter the distributional pattern among MSs, 8 of whom still see welfare gains from recycling of all available revenues.

Distributional impacts across the EU-wide income distribution

Figures 15 and 16 show the corresponding welfare impacts across the **EU-wide** income distribution, as a share of total expenditure and in Euros.

- **Without revenue-recycling**, the combined impacts of the policies are **broadly regressive** albeit D1 is slightly less adversely impacted than D2-4 (due to lower transport fuel consumption and benefiting from exemptions and electricity rate reductions in the ETD reform), with additional costs of approximately €80 per year.
- **With revenue-recycling of just the SCF allocation** to the poorest 50% in each MS as income support, the **poorest 10%** of households EU-wide see **net welfare gains** of around 0.75% (approximately **€100** per year), with the adverse average welfare impact for households in D2 reduced significantly to around -0.25% (a loss of around €40 per year). Middle-income households are worst affected, with losses of around 0.5-0.75% of expenditure (around €125-170). The richest 10% of the distribution incur costs of over €300, but only amounting to only around 0.4% of expenditure.
- When **all available revenues are recycled** to the poorest 50% in each MS, however, then each of the deciles in the poorest 60% of EU households see welfare gains, with significant benefits for the **poorest 10%** in particular – a gain of over 2% of current expenditure (nearly **€300** per year). The worst affected households on average in this scenario are shifted to the upper-middle classes, in D8 and D9.

Figure 15: Welfare impact (% total expenditure) EU-wide from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling

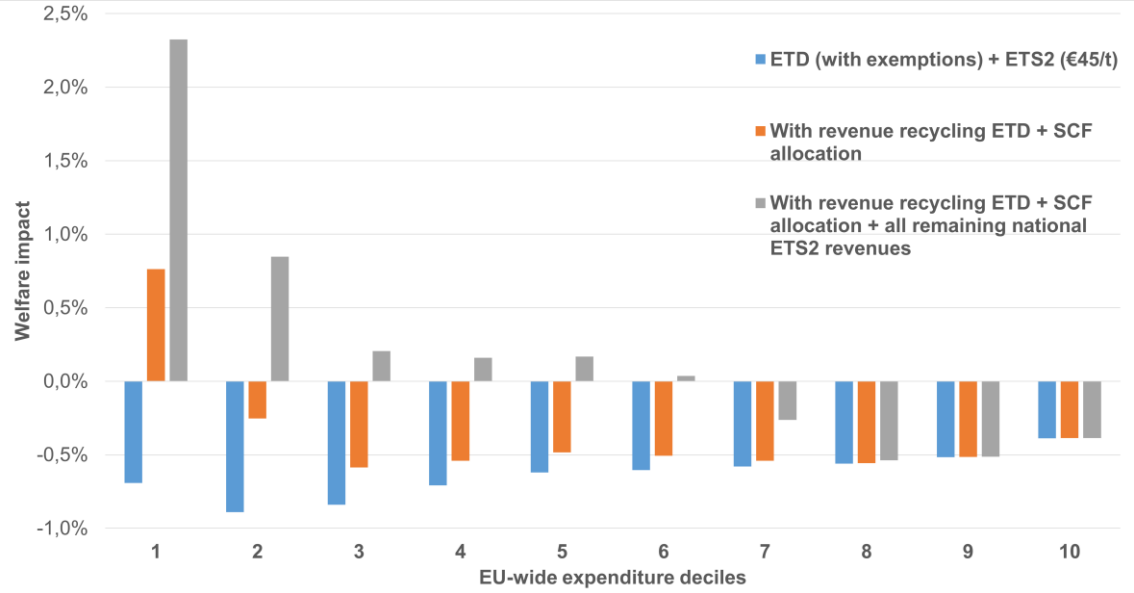
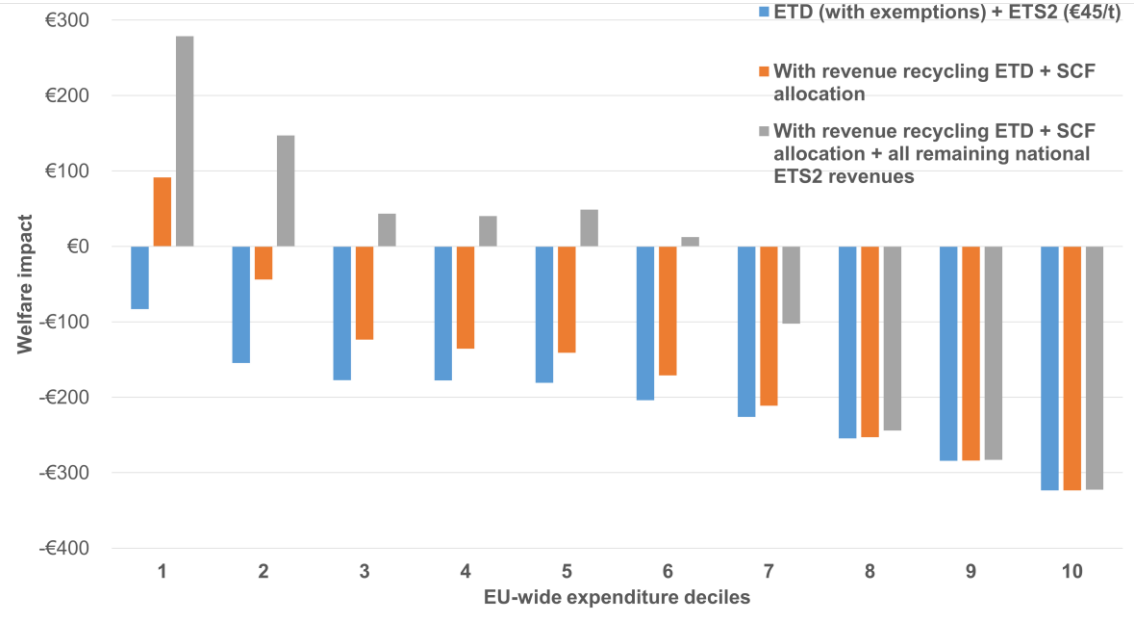


Figure 16: Welfare impact (€2020) EU-wide from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling

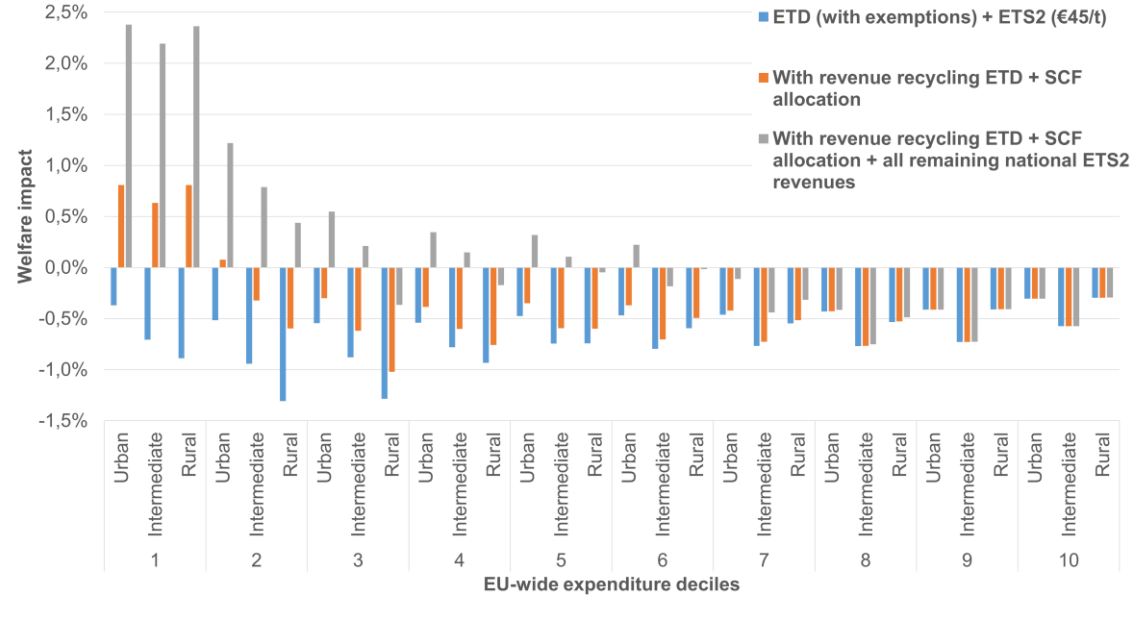


Significant horizontal heterogeneity

As discussed in relation to the structure of energy consumption in Section 4.1.1, it is important to note the substantial horizontal differences within these very large EU-wide income deciles. The following graphs illustrate some of the key inter-sectional parameters which shape the welfare impact on households.

Figure 17 shows the welfare impact differences between **rural, intermediate (or peri-urban) and urban households** in each EU-wide income decile. In each decile, urban households are the least impacted by the policies in the absence of revenue-recycling. Rural households are worst impacted in the poorest two quintiles, from D1-D4, whereas among the richest 60% of the EU-wide population, from D5-D10, it is intermediate or peri-urban households that are clearly the worst impacted.

Figure 17: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling, EU-wide and according to population density

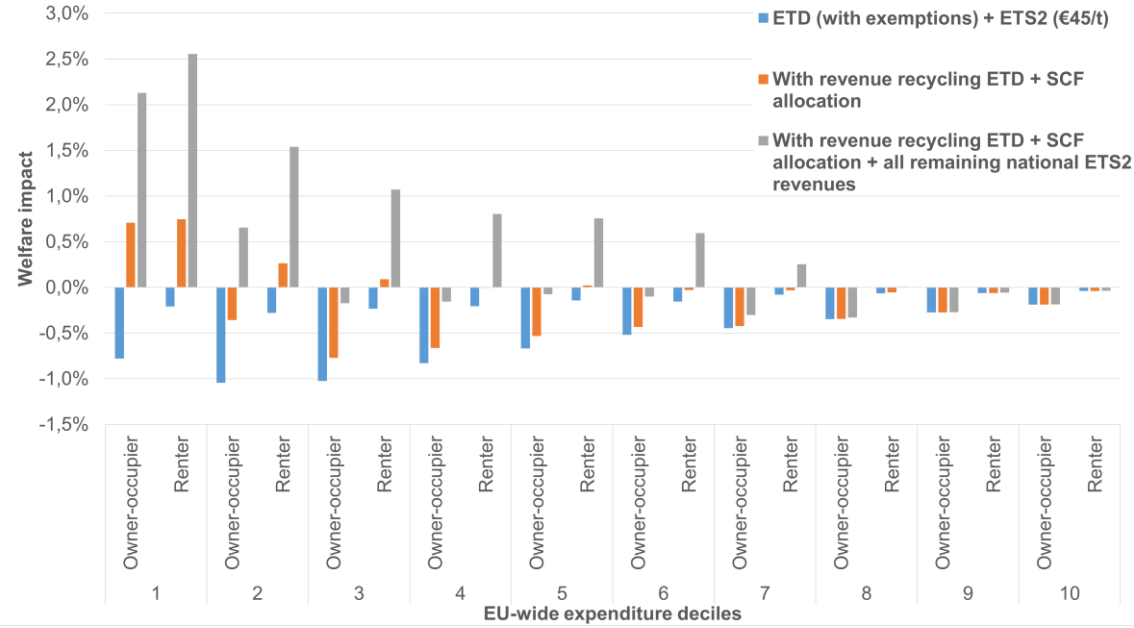


It is notable that rural households in D1, despite being worst impacted by the policies, are among the biggest beneficiaries of revenue recycling, with slightly higher welfare gains than the less affected intermediate households. That said, rural households from D2-D4 see far smaller welfare gains from revenue-recycling than those in D1, with adverse impacts for rural households in D3 not fully compensated on average even when all available revenues are recycled. Urban households throughout the poorest 60% of the EU-wide population benefit most from revenue-recycling.

Figure 18 shows the horizontal differences in each EU-wide income decile between **renters and owner-occupiers**.[34] Given that renters are widely understood to face additional barriers to investment in energy efficiency renovations or changing heating systems, and are therefore generally considered to be among the most vulnerable households to carbon pricing policies, it is notable that they are substantially less adversely impacted by the policies in the absence of revenue-recycling than owner-occupiers, across all EU-wide income groups.

What is more, renter households see far more substantial gains from revenue-recycling from D2-D7. While owner-occupiers in D1 will also see significant welfare gains from revenue-recycling, this is still lower than that for renters in D1.

Figure 18: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling, EU-wide and according to property ownership



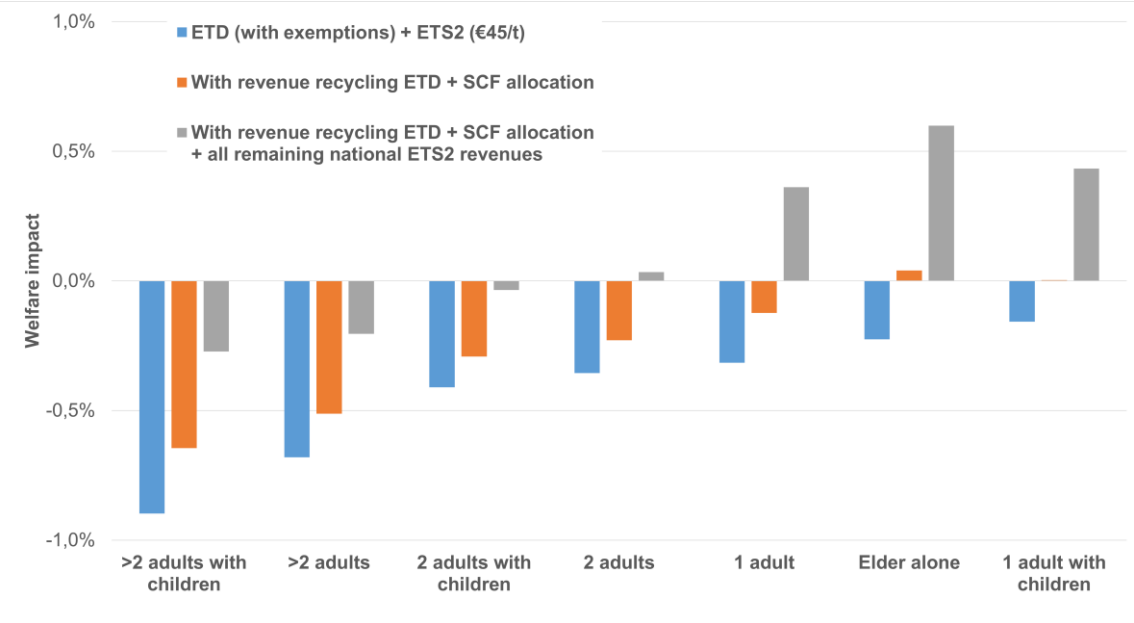
Finally, Figure 19 shows the differential impacts across the EU-wide population according to the **size and composition of households**. Households with more people are more impacted by the policies and tend not to be fully compensated by revenue-recycling. But it is notable that single elder households and single parent households are among the least impacted by the policies and see the biggest welfare gains with revenue-recycling. For these households in D1-D5 (not

[34] As noted above, some caution is needed with interpreting this category because differing methodologies are used in the HBS of different countries to calculate "imputed rents" from which the owner-occupier households are identified.

shown here), these two household types see welfare gains between 1-2% on average with recycling of all available revenues to the poorest 50% of households.

This is potentially significant because **women** are disproportionately represented within these household categories, and we find similar results for women-headed households, suggesting that to some extent women may be less adversely impacted by these polluter pays measures and bigger beneficiaries of revenue recycling than men.

Figure 19: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling, EU-wide according to household composition



Distributional impacts within MSs

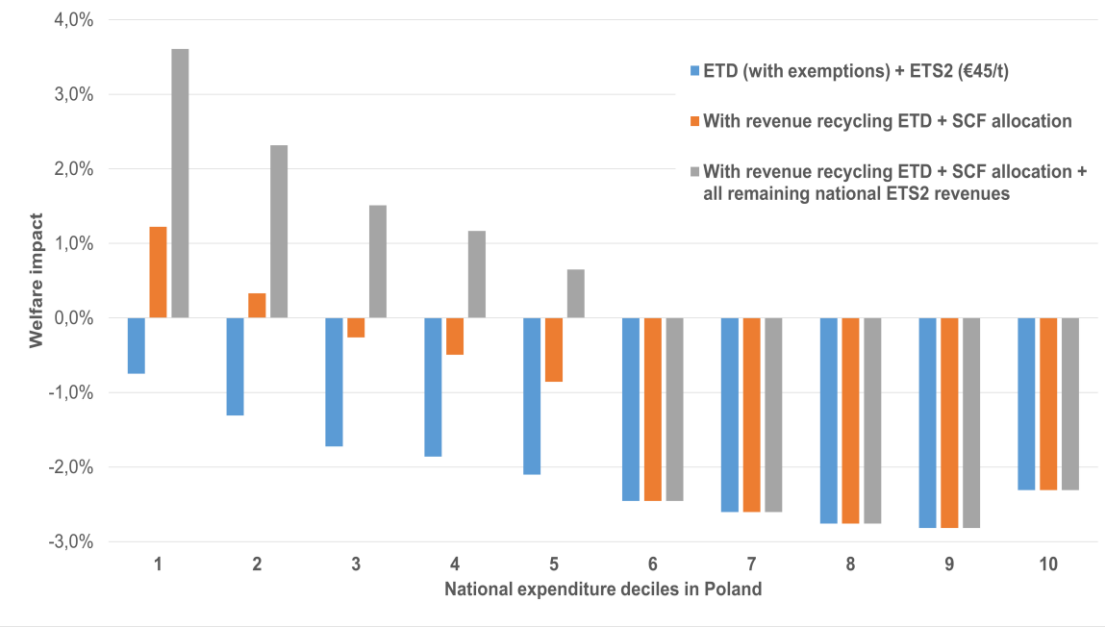
As discussed in relation to the ETD in Section 4.2, it is the distribution within MSs that is likely to be most important politically. In this section only vertical distributional impacts are assessed for the sake of brevity, although it is important to note that horizontal differences are just as apparent at MS-level as EU-wide and should be considered in any effort to design appropriate policies.[35]

[35] Often these MS-level horizontal differences mirror those identified EU-wide, but not always. For example, in some lower-income MSs like Bulgaria, rural households tend to be less impacted by the assessed policies than urban households. See also the accompanying MS-level papers, see Annex 9.

Figure 20 shows the vertical distributional impact of the combined policy measures in **Poland**. It is notable that:

- Without revenue-recycling, the combined measures have least impact on the poorest 10% of Polish households, of around 0.7% of expenditure. Here we see the benefits for lower-income households in Poland from the ETD reform, discussed in Section 4.1.1, offsetting part of the regressive impact of ETS2.36 Adverse welfare impacts then increase in proportion to income, with the exception of the richest 10% which are slightly less affected than the upper-middle income households in Poland.
- With revenue-recycling of just Poland's allocation from the SCF, the poorest 20% of households see net welfare gains – of over €150 per year for D1 and over €60 per year for D2 – with small to moderate negative impacts for the next three income deciles.
- This still leaves just under €2bn per year in remaining national ETS2 revenues in Poland available for investments. If these were also spent in order to benefit the poorest 50% of Polish households, the results are clearly progressive and would represent substantial welfare gains to the poorest Polish households. Net gains for D1 would rise to around €450 per year, for example.

Figure 20: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling in Poland

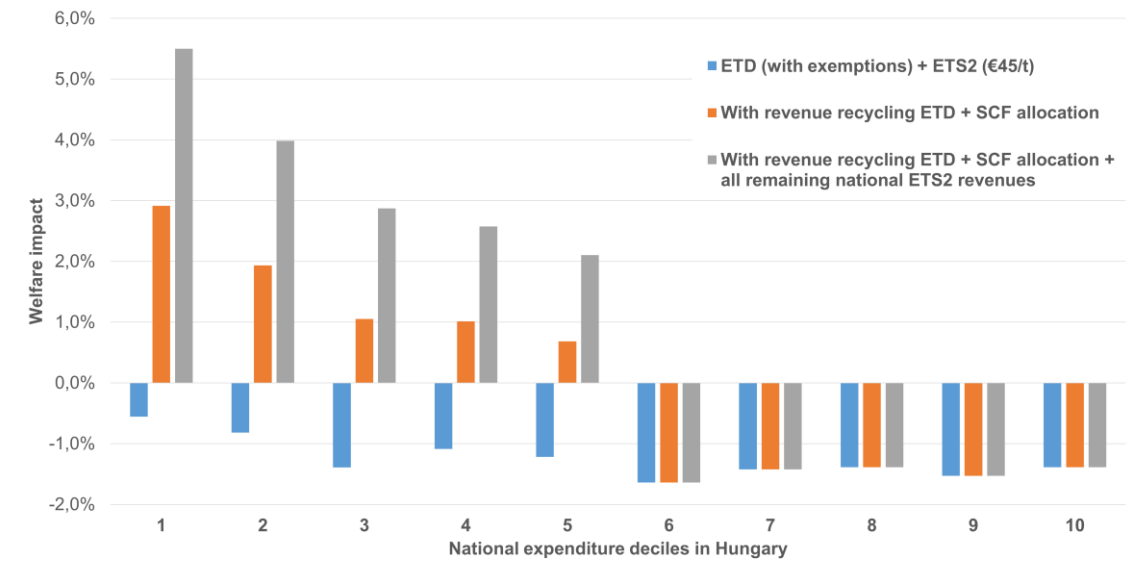


[36] Without ETD, the ETS2 results in adverse welfare impacts for D1 in Poland of -1.1%, for example.

We find similar results across the CEE MSs. Figure 21 shows similar results for **Hungary,** with the lowest adverse welfare impacts from the policies in the absence of revenue-recycling for the poorest 10%, of around 0.5% expenditure, and very substantial welfare gains for the poorest 20-50% of Hungarian households with redistributing only the SCF allocation.

This would still leave nearly €500m per year for the Hungarian government to invest in additional measures. If these were invested in such a way as to benefit the poorest 50% of households also, then again the measures would be clearly progressive with substantial welfare gains for the poorest half of the population – amounting to over 5% of expenditure, or over €450 per year, for the poorest 10% for example.

Figure 21: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling in Hungary

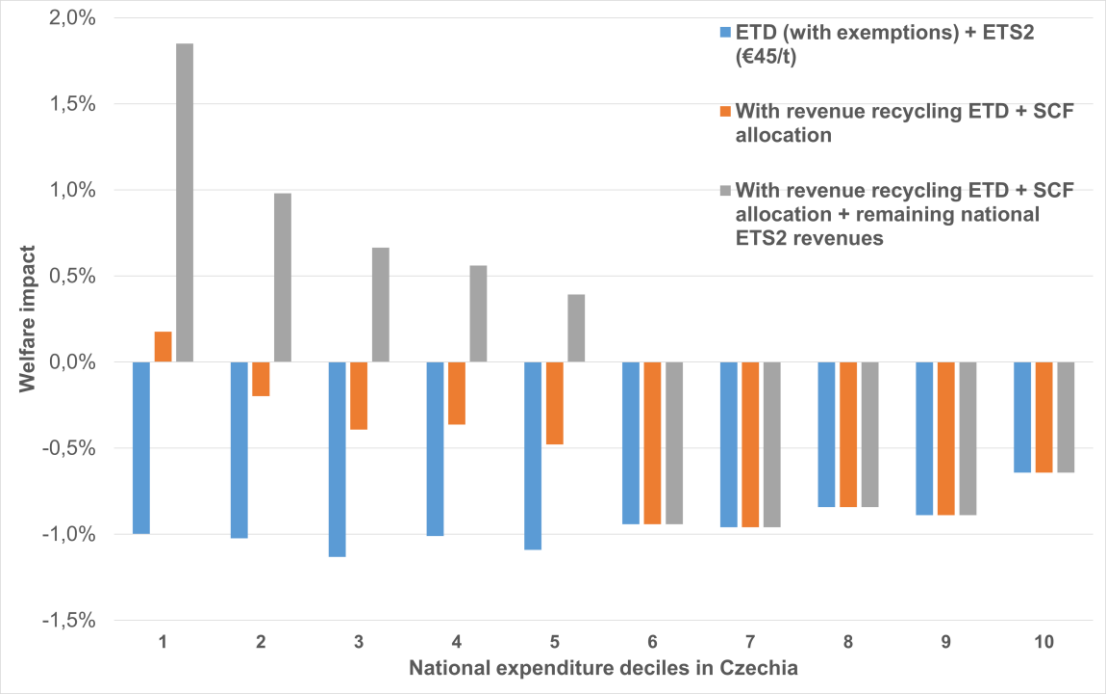


The picture is slightly different in the case of **Czechia,** as shown in Figure 22, which sees a smaller net allocation from the SCF compared to other CEE MSs and where higher fossil fuel price increases are not offset by electricity tax cuts as in the case of Poland.

In Czechia's case, only the poorest 10% of households see a positive welfare impact from recycling of Czechia's SCF allocation revenues, with limited adverse impacts of less than -0.5% in D2-5, or around €25-90 per year. This would still leave approximately €350m in national ETS2 revenues available to the Czech government for investments. As with the other CEE MSs, if these were invested in such a way as to benefit the poorest half of the Czech population, the result is a

very clearly progressive distributional impact, with net benefits for the poorest 50% of households of around €75-175 per year.

Figure 22: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling in Czechia



At the other end of the SCF spectrum, it is instructive to consider the situation in higher-income MSs which are either **small net recipients** or **net contributors** to the SCF. One such group of MSs are those – like **Denmark, France** or **Sweden** – that have existing national carbon taxes at or above the €45/t ETS2 price assumed here in the building and transport sectors, and that should reduce electricity taxation but are not required to increase fossil heating or transport fuel taxes under the ETD reform. For these MSs, even though they are net contributors to the SCF, the welfare impacts are distinctly positive across the distribution.

As discussed in the context of the ETD reform in Section 4.2, lowering electricity tax rates in this way does, however, entail government revenue losses from energy taxation that would have to be paid for through raising fossil energy taxes, from elsewhere in the general budget or from government debt.

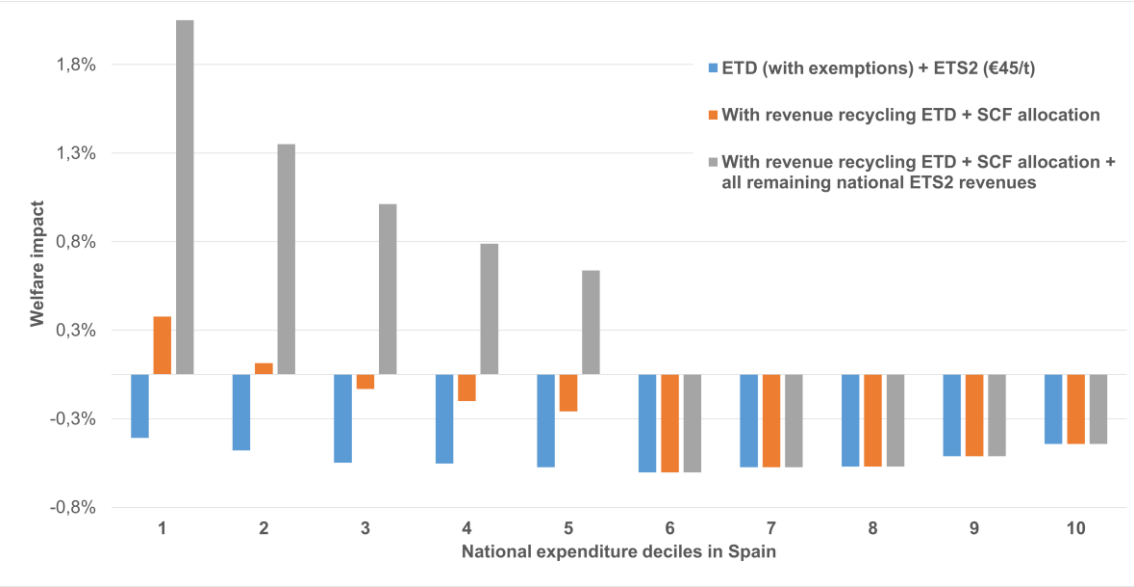
But as shown in Annex 8 in the case of **France**, even a revenue-neutral version of the ETD reform (with increased taxes on fossil heating and transport to offset revenue losses from lower electricity taxation), combined with the ETS2, has small net welfare gains for the poorest 20% even in the absence of revenue recycling. With recycling just France's SCF allocation, the adverse impacts on the poorest

30-40% can be offset entirely (if allocated to the poorest 50% of French households). When all remaining national ETS2 revenues are also recycled, the impact is again highly progressive for the poorest half of the French population.

For the **other higher-income MSs** that are small net recipients or net contributors to the SCF, the picture is similar to that of France with a revenue-neutral version of the ETD reform combined with the ETS2, showing a U-shaped distributional impact absent revenue recycling.

Figure 23 shows the results for **Spain**, with moderate adverse impacts for the poorest 20% of households absent revenue-recycling, which can be addressed through recycling just Spain's SCF allocation. However Spain's SCF allocation alone is not sufficient to offset adverse welfare impacts outside the poorest quintile, with upper middle income households from D6-D8 the worst impacted.

Figure 23: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling in Spain



This shows clearly the importance for higher income countries such as Spain, that do not benefit from the SCF in the same way as the CEE MSs, to recycle all remaining revenues – approximately €2bn per year in Spain's case – to the benefit of the poorest 50%. Doing so can effectively neutralise adverse impacts for the lower-middle-income groups (up to D5), while ensuring a significant net welfare gain – equivalent to around €250 per year – for the poorest 10% of Spanish households. It should be noted again that households in D10 remain among the least impacted. Additional complementary measures would be needed to further

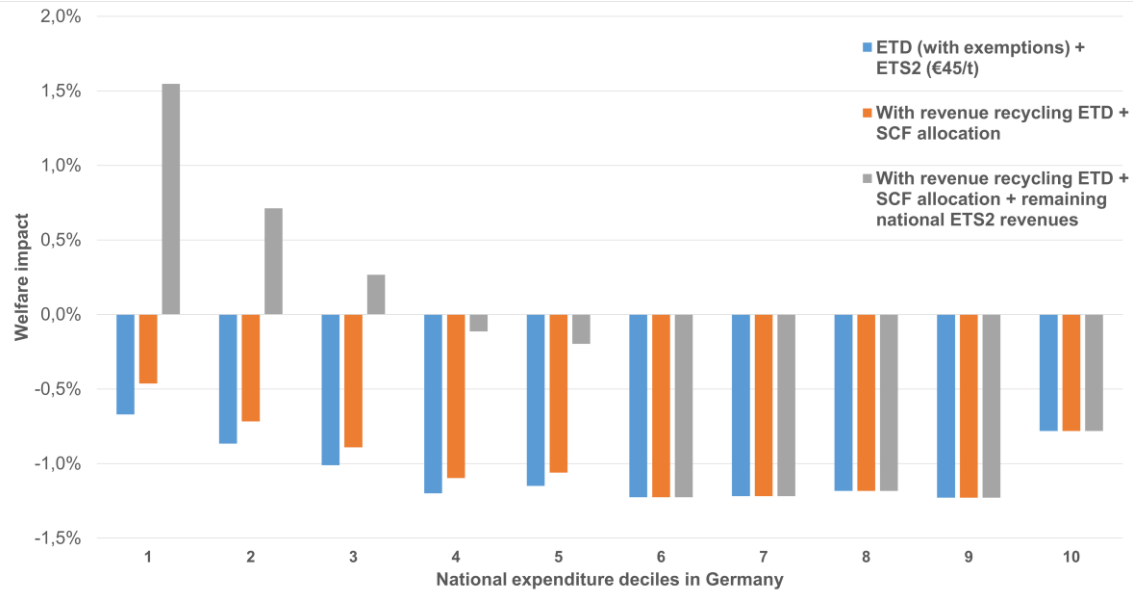
address such equity considerations at the top of the distribution – as discussed in Section 6.

A similar picture is found, for example, in countries like **Belgium, Germany, Italy** and the **Netherlands**. Figure 24 shows the results for **Germany**, the biggest net contributor to the SCF. Adverse impacts for the poorest 10% are the lowest of all income deciles, and can be reduced through recycling of Germany's SCF allocation. But more substantive adverse impacts occur throughout the rest of the distribution, in a broadly U-shaped distribution affecting worst the middle-income households.

It is nonetheless notable that even in Germany's case – despite making a net contribution of over €1.3bn per year to the SCF – with progressive recycling of all remaining national ETS2 revenues, the poorest 30% of German households will see net welfare gains, with substantial gains for the poorest 10% in particular (equivalent to around 1.5% of expenditure, or around €250 per year) while costs for households in D4 and D5 are largely compensated.

Upper-middle income households are however worst affected, and again households at the top of the distribution in D10 incur the least adverse welfare impacts, suggesting the need for a wider scope of complementary policies to be introduced to address these residual top-end inequities.

Figure 24: Welfare impact (% total expenditure) from ETD reform (with exemptions for vulnerable households) + ETS2 (€45/t), without and with revenue recycling in Germany



Summary: Can the proposed ETD reform combined with ETS2 be progressive?

- The **ETS2**, with a carbon price of €45/t, drives more significant welfare impacts than the more cautious ETD reform, with regressive impacts EU-wide and within MSs in the absence of revenue-recycling;
- The **SCF** results in a substantial redistribution of ETS2 revenues between MSs that, if recycled to benefit the poorest 50% in each MS, results in clear welfare gains for the poorest 10% of households EU-wide and is also better for households in the second EU-wide income decile than a scenario without the SCF (while middle-income households benefit more from purely national revenue recycling);
- It is important to consider the combined impact of the **ETD reform and ETS2**, however, because the progressive impact of reducing electricity excise tax rates in some MSs (including Poland) in the ETD reform can help to offset at least part of the regressive impacts – in the absence of revenue-recycling – of ETS2;
- Overall, the combined impact of the **ETD reform and ETS2** results in welfare gains for the poorest 10% of households EU-wide with recycling of just the additional ETD revenues and 25% of total ETS2 revenues via the SCF (distributed to the poorest 50% in each MS); while investing the remaining national ETS2 revenues in structural reforms to the benefit of the poorest 50% in each MS as well produces a clearly progressive distributional impact across the EU-wide income distribution;
- In MSs which are clear **net recipients from the SCF**, notably in most of the **CEE MSs**, recycling just the allocation from the SCF (in addition to any additional ETD revenues) to the poorest 50% in each MS, results in a clearly progressive distributional impact with significant welfare benefits for the poorest 10-50% of households;
- This still leaves significant remaining national ETS2 revenues in CEE MSs, which if also invested in structural reforms to the benefit of the poorest households in those MSs results in even greater welfare benefits;
- In MSs which are small net recipients from or **net contributors to the SCF**, the poorest 10% of households tend to see very limited or

negligible adverse impacts from the policies, which can be compensated through recycling of just those MS's SCF allocation;

- However, in such MSs, the most adverse welfare impacts occur in the **middle-income groups** and cannot be addressed through the recycling of the SCF allocation alone. If all remaining national ETS2 revenues are appropriately invested in structural reforms that target those groups, however, most of these impacts can be addressed;
- **Horizontal differences** are substantial within these broad MS and EU-wide income groups, however, and should be taken into account in policy design; larger, rural households in particular tend to be more adversely impacted, while single parent and single elder households – in which women are disproportionately represented – tend to be least adversely impacted and benefit most from revenue recycling;
- In nearly all cases the **richest 10%** incur the most limited welfare impacts, suggesting additional measures are needed to address residual inequities at the top of the income distribution.

5. HOW CAN REVENUE INVESTMENTS AND COMPLEMENTARY POLICY MEASURES MAXIMISE EQUITY AND ENVIRONMENTAL BENEFITS?

The EC maintains that extending the application of the polluter pays principle in the buildings and transport sectors, through a better alignment of energy taxation with climate objectives and a clear carbon price signal, is important (as part of a wider policy mix) in order to send the right price signals and provide the right incentives for sustainable behaviour.[37]

But assuming that near-term price elasticity of demand for household heating and transport fuels is relatively low, then the most significant near-term environmental benefits of these measures will likely arise as a result of the establishment of an emissions cap via ETS2 and through the use of the revenues from these polluter pays instruments for structural investments.

There is no question that a dramatic increase in public and private investments is required to accelerate the equitable decarbonisation of these sectors. By one estimate, annual additional public investment needs through to 2030 amount to around €90bn for the buildings sector and around €30bn for the transport sector.[38] Evidently the ETD reform and ETS2 alone will not be sufficient to meet these needs, while also supporting the incomes of low-income and vulnerable households. But with total revenues likely to reach in excess of €40bn per year, they could nonetheless make a substantial contribution.

In order to maximise both the equity and environmental benefits of these revenues, recycling should be balanced across both direct income support measures for low-income and vulnerable households and structural investments, which should also be targeted explicitly to achieve progressive distributional impacts.

Further complementary measures can also support technological change for lower-income and vulnerable households and help to address residual inequity concerns at the top of the income distribution. Table 3 sets out some indicative options in this regard, identifying policy design, revenue recycling and

[37] European Commission (2019) Communication from the Commission to the European Parliament, the European Council, the Council, the EESC and the COR: The European Green Deal. EC: Belgium https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF

[38] WWF EPO (2022) Financing the Social Climate Fund: Model for a transformative fund.

complementary policy options that may be employed to address concerns at different points of the EU-wide income distribution.

Table 3: Indicative options for designing ETD reform and ETS2, use of their revenues and complementary measures to maximise equity and environmental benefits

EU-wide deciles	1	2	3	4	5	6	7	8	9	10
Policy options to address concerns in different parts of the income distribution										
ETD	Exemptions for households at risk of poverty Electricity tax rate cuts		Transitional period for all other households to reach new minimum heating tax rates					End exemptions for aviation fuel End reductions for diesel in company cars		
ETS2				ETS price corridor or other price control measures[39]						
SCF	100% of actual ETS2 revenues to be recycled for Social Climate Plans, and directed to the poorest 50% of MS households Flexibility, not strict limits, to define groups to benefit from direct income support[40] Front-loaded recycling well-before carbon price is implemented									
Revenue recycling options to address concerns in different parts of the income distribution										
Direct income support	Carbon dividends or energy/public transport vouchers		Labour tax cuts for lower-earners							

[39] In our results, lower income households continue to see net welfare gains with high carbon prices (€100/t) with appropriate recycling to the poorest 50% of households, but net welfare gains turn to small losses for middle income households at high carbon prices.

[40] Given significant horizontal diversity, MSs need flexibility to identify the most affected households.

Structural investments	Public transport expansion (Geothermal) district /heating expansion Investments in deep energy efficiency retrofits and switching to renewable heating	Expansion of electric vehicle charging infrastructure Electric car subsidies or financing schemes Electric heat pump / renewable heating subsidies or financing schemes Building renovation subsidies or financing schemes				
Complementary policies to address concerns at different points in the income distribution						
Wider tax reforms	Removal of RE levies from electricity bills VAT cuts for circular economy products	Labour tax cuts for lower-earners			Higher top-rate income and wealth taxes Frequent flier levies or SUV sales taxes	
Regulatory standards	Energy Efficiency Obligation Schemes under EED to address low-income households				Removal of OEM-specific mass adjustment under CO2 from Cars Regulation (that incentivises heavier cars like SUVs)	
	Rent controls and bans on 'renovictions' under EPBD, and technical assistance targeted at energy poor households					
Social policy	Adequate minimum wages					
	Strengthened social dialogue and investments in re-skilling/re-training					

6. CONCLUSIONS

Reaching conclusions about the distributional impacts of the assessed proposals is not straight-forward. There is significant heterogeneity among households that warrants careful granular analysis, which tools like our model can provide (even noting its methodological limitations).

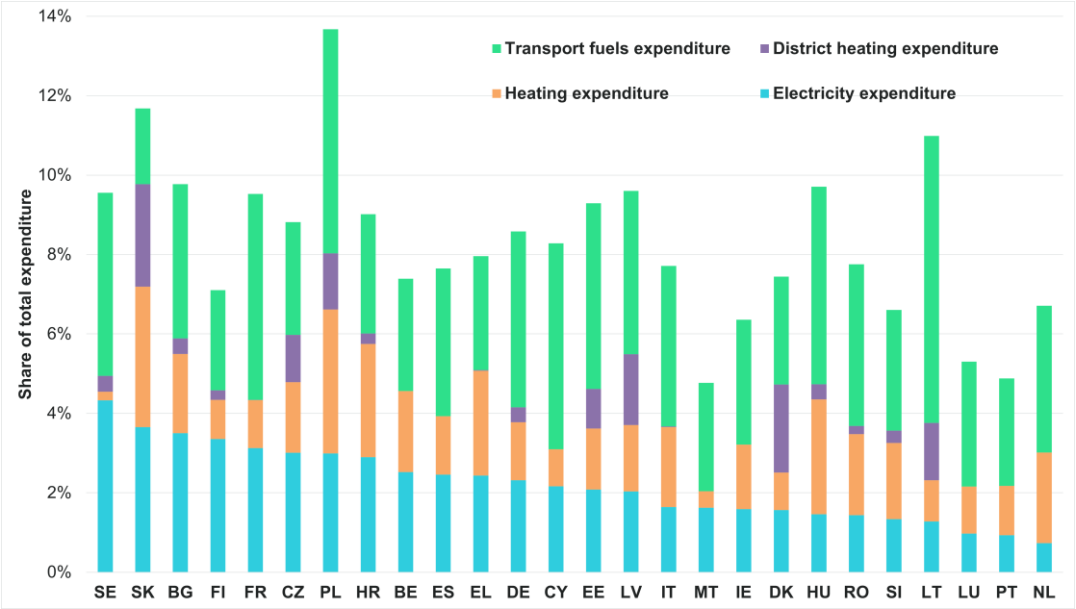
Nonetheless we find that it is *in principle* possible to design these EU-level polluter pays instruments so as to achieve clear welfare benefits for the poorest households EU-wide and within MSs, and with broadly progressive distributional impacts. In short, these EU polluter pays instruments can help fight inequality as well as climate change.

Policy choices in the design of both instruments and especially in the use of their revenues – based on both inter-MS and within-MS redistribution – alongside complementary measures, are critical to **maximising both environmental and equity benefits**. If EU decision-makers are to proceed with these measures, they should *inter alia:*

- **Regarding the ETD reform:**
  - Require MSs to reduce electricity tax rates to benefit lower-income households most;
  - Ensure that MSs can make use of energy tax exemptions for households at risk of poverty;
  - End tax exemptions or reductions for aviation and diesel company cars that likely benefit most higher income households and men;
  - Encourage MSs to recycle additional revenues from the ETD reform to benefit lower-income households, using the European Semester process for oversight;
- **Regarding the ETS2 and SCF:**
  - Establish a carbon price corridor or other measures to provide predictability in ETS2 prices to limit adverse welfare impacts for middle-income households;
  - Ensure that inter-MS redistribution of revenues via the SCF is combined with recycling of all remaining revenues within MSs, as both income support and structural investments, to benefit the lowest-income 50% of households in each MS, with effective EU-level governance arrangements;
- **Accelerate complementary policy measures** to structurally reduce costs for lower-income households in advance of and during the implementation of the instruments and to address residual equity concerns at the top of the income distribution.

7. ANNEXES

7.1 Annex 1: Average household energy expenditure in EU MSs, arranged in order of electricity share of expenditure



7.2 Annex 2: Consumer price changes related to the proposed ETD reform

	Petrol (%)	Diesel (%)	Gas oil (%)	Electricity (%)	Natural gas (%)	Coal (%)
Austria	0.0	0.0	0.0	-5.1	0.0	0.0
Belgium	0.0	0.0	3.8	0.0	2.9	11.6
Bulgaria	0.0	8.8	0.0	0.0	7.0	13.2
Cyprus	0.0	0.0	0.0	-8.2	0.0	13.2
Czechia	0.0	1.1	0.0	0.0	4.7	14.6
Germany	0.0	0.0	0.0	-5.8	0.0	33.9
Denmark	0.0	0.0	0.0	-39.9	0.0	0.0
Estonia	0.0	2.7	0.0	0.0	0.0	0.0
Spain	0.0	2.0	0.0	-3.6	0.0	5.2
Finland	0.0	0.0	0.0	-0.9	0.0	0.0
France	0.0	0.0	0.0	-14.3	0.0	0.0
Greece	0.0	0.0	0.0	0.0	2.3	13.4
Croatia	0.0	0.0	0.0	0.0	7.0	13.3
Hungary	3.9	11.8	0.0	0.0	8.8	14.5
Ireland	0.0	0.0	0.0	0.0	0.0	0.0
Italy	0.0	0.0	0.0	-0.5	0.0	9.2
Lithuania	0.0	3.0	3.3	0.0	8.1	13.4
Luxembourg	0.0	0.0	6.2	0.0	3.0	21.6
Latvia	0.0	0.0	0.0	0.0	2.1	2.8

Malta	0.0	0.0	0.0	0.0	0.0	13.4
Netherlands	0.0	0.0	0.0	0.0	0.0	9.0
Poland	0.0	10.0	0.0	-11.8	6.3	12.5
Portugal	0.0	6.3	0.0	0.0	0.0	0.0
Romania	0.0	7.2	0.0	0.0	8.0	12.9
Sweden	0.0	0.0	0.0	-4.9	0.0	0.0
Slovenia	0.0	1.1	0.0	0.0	0.0	0.0
Slovakia	0.0	3.3	4.0	0.0	5.6	13.2

7.3 Annex 3: Changes in government revenues related to the proposed ETD reform

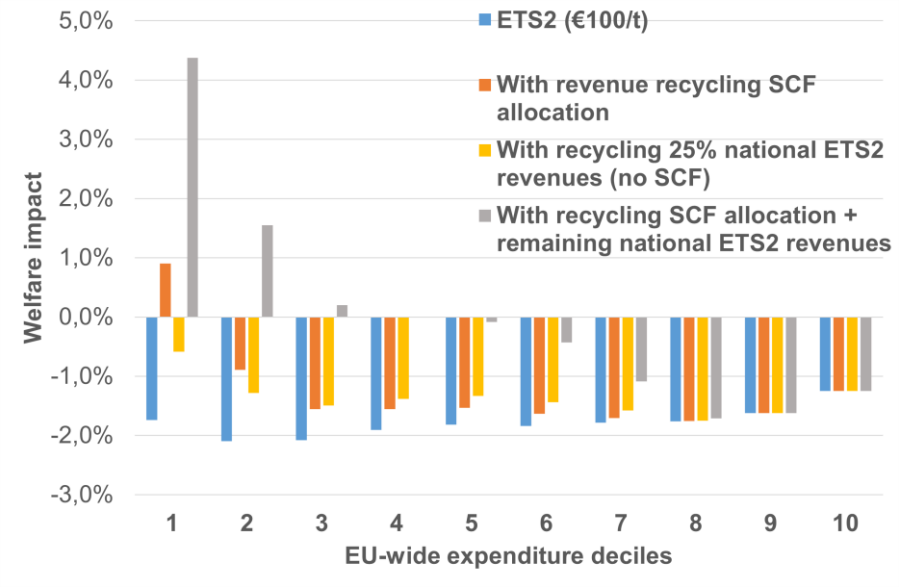
The table below shows government revenues in the central ETD scenario reported in this paper and the version which is revenue neutral in MSs that would otherwise see revenue losses. In both cases all MSs are assumed to apply exemptions to any energy tax increases to households at risk of poverty.

	ETD (with exemptions) *€m*	ETD revenue-neutral (with exemptions) *€m*
Austria	-195	0
Belgium	99	99
Bulgaria	30	30
Cyprus	-27	0
Czechia	76	76
Germany	-2,260	0
Denmark	-1,105	0
Estonia	4	4
Spain	-325	0
Finland	-38	0
France	-4,482	0
Greece	4	4
Croatia	14	14
Hungary	296	296
Ireland	0	0
Italy	-68	0
Lithuania	38	38
Luxembourg	7	7
Latvia	1	1
Malta	0	0
Netherlands	0	0
Poland	290	290
Portugal	110	110
Romania	93	93
Sweden	-529	0
Slovenia	13	13
Slovakia	57	57
TOTAL	**-7,897**	**1,131**

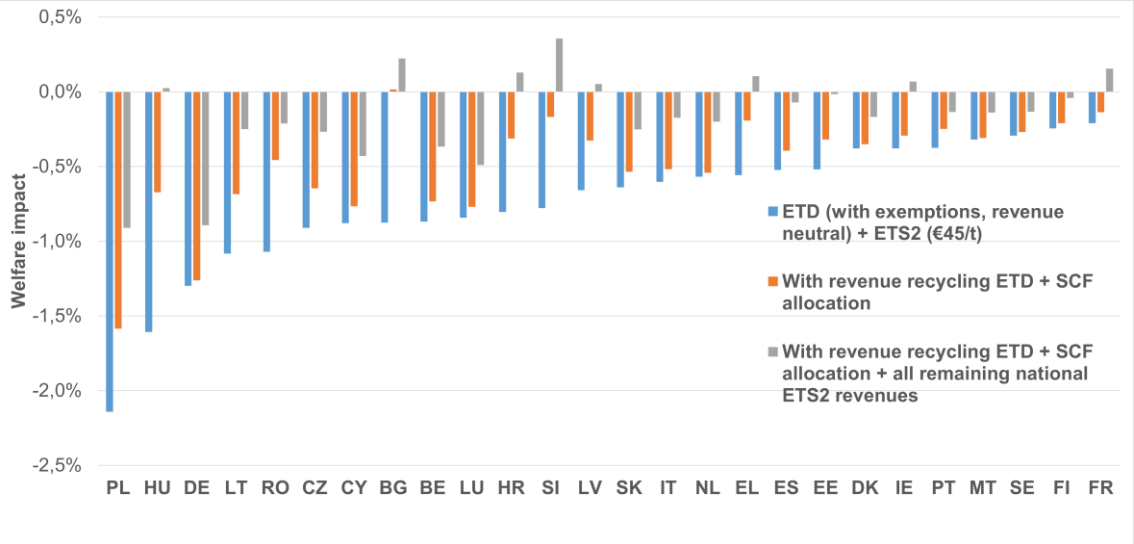
7.4 Annex 4: Consumer price changes related to introduction of ETS2 (€45/t)

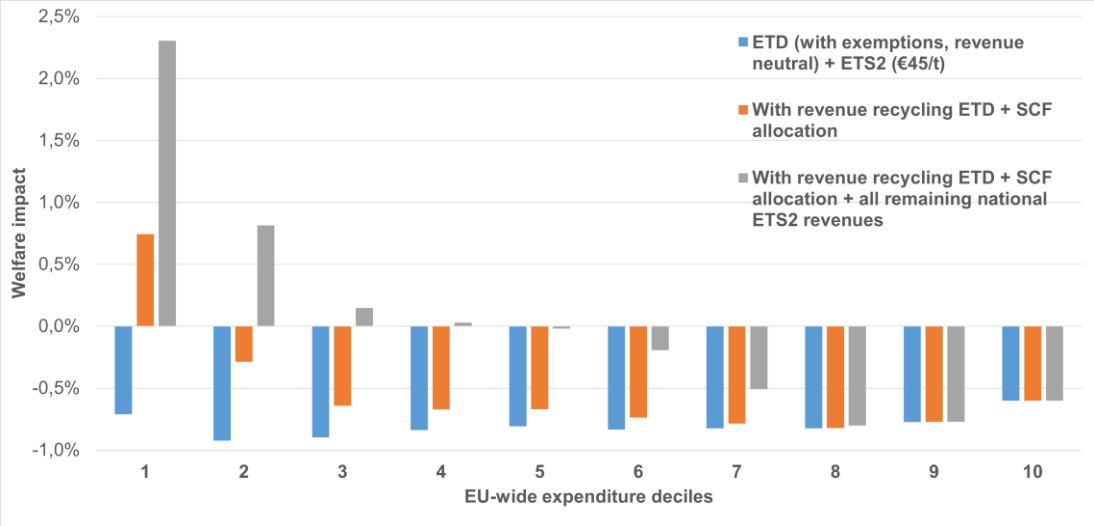
	Petrol (%)	Diesel (%)	Gas oil (%)	Electricity (%)	Natural gas (%)	Coal (%)
Austria	11.4	14.1	24.2	0.0	16.7	62.6
Belgium	9.8	11.5	32.1	0.0	21.9	86.7
Bulgaria	13.3	16.0	18.3	0.0	29.2	82.1
Cyprus	11.4	13.1	21.5	0.0	0.0	82.7
Czechia	11.7	14.0	26.7	0.0	19.7	91.1
Germany	9.5	13.2	28.1	0.0	17.6	220.5
Denmark	4.2	6.0	6.2	0.0	7.1	23.7
Estonia	9.9	13.5	20.5	0.0	25.5	72.1
Spain	10.6	13.9	26.2	0.0	14.3	75.6
Finland	9.1	12.2	0.0	0.0	0.0	31.9
France	0.2	0.2	0.4	0.0	0.3	44.7
Greece	8.9	12.8	16.7	0.0	19.8	79.6
Croatia	10.7	13.3	30.7	0.0	29.6	78.8
Hungary	12.8	14.8	14.8	0.0	36.9	78.4
Ireland	4.4	5.6	12.2	0.0	6.6	52.9
Italy	8.8	11.4	13.1	0.0	13.9	77.8
Lithuania	11.4	14.9	33.8	0.0	33.9	81.5
Luxembourg	11.2	14.8	32.6	0.0	25.0	92.8
Latvia	10.9	14.2	25.2	0.0	36.6	73.9
Malta	8.9	11.7	14.5	0.0	0.0	83.6
Netherlands	8.0	12.0	15.1	0.0	11.0	78.3
Poland	12.7	15.0	24.2	0.0	26.6	72.6
Portugal	4.3	5.7	6.8	0.0	6.7	59.6
Romania	12.9	15.2	18.4	0.0	33.6	82.5
Sweden	0.0	0.0	0.0	0.0	0.0	23.1
Slovenia	8.3	9.9	12.7	0.0	13.6	55.5
Slovakia	10.5	13.9	14.9	0.0	23.3	82.0

7.5 Annex 5: ETS (€100/t) sensitivity

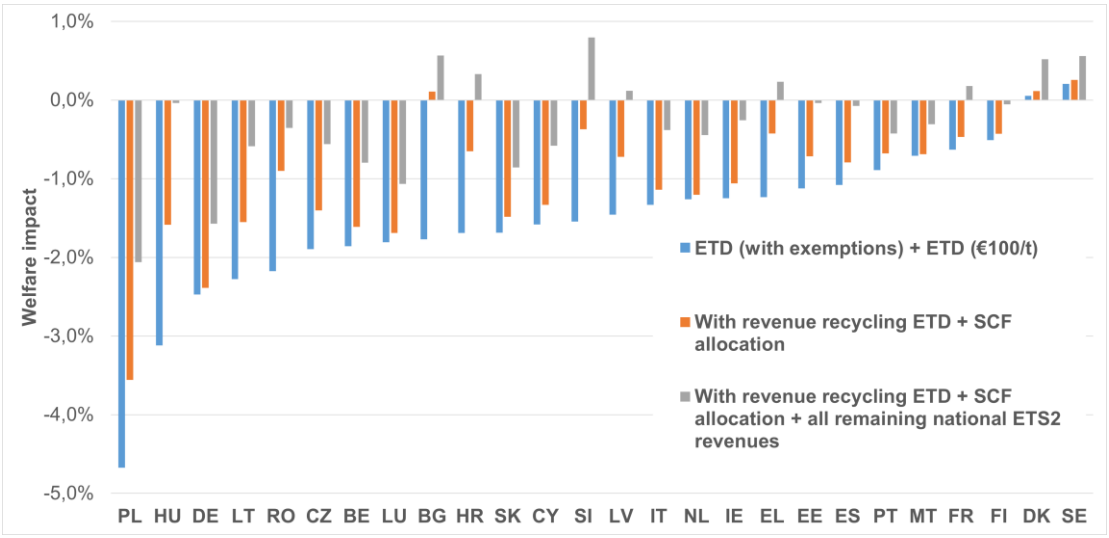


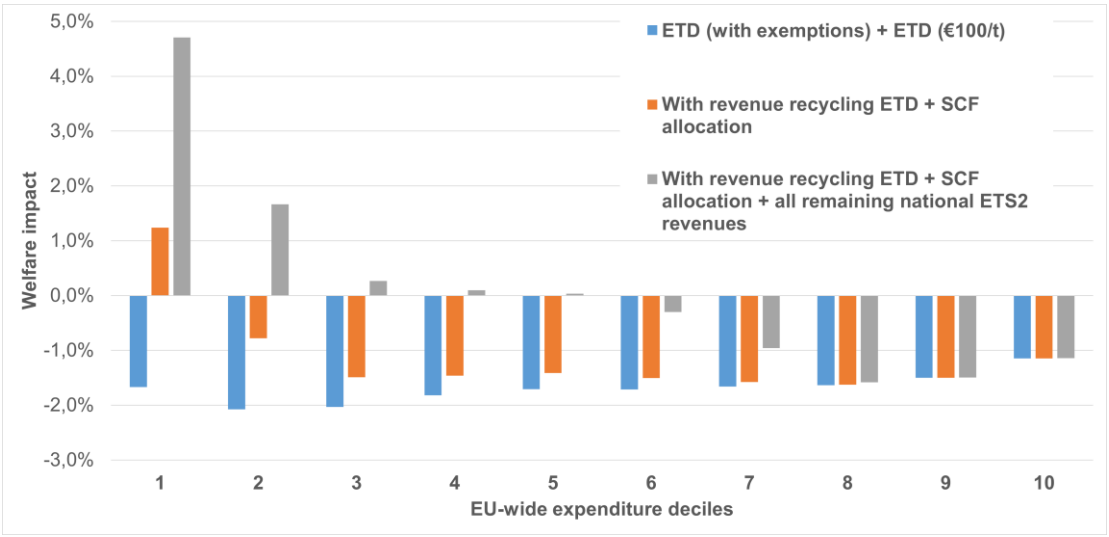
7.6 Annex 6: Revenue-neutral ETD (with exemptions) + ETS2 (€45/t) sensitivity



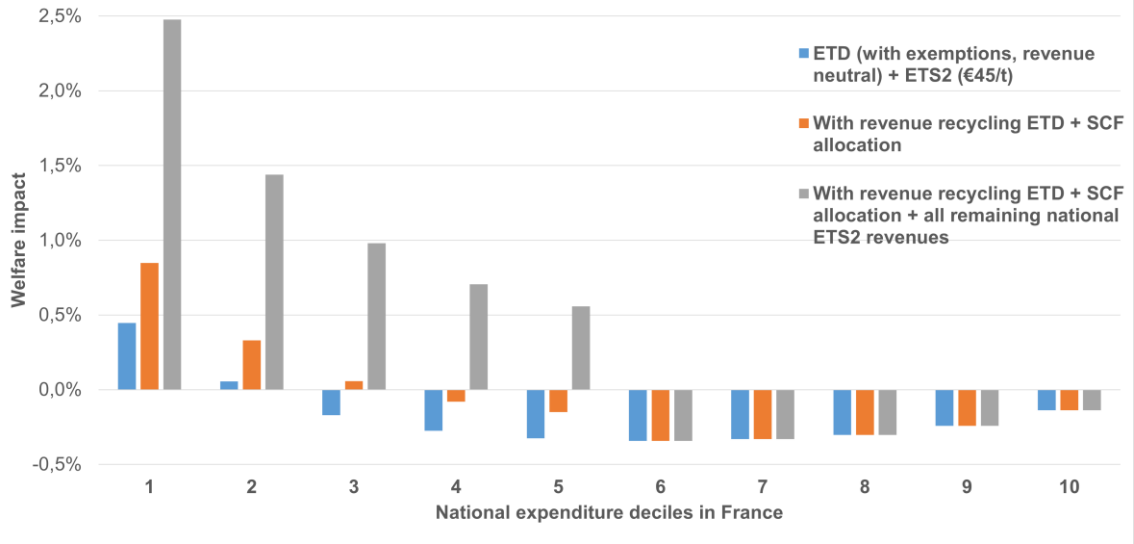


7.7 Annex 7: ETD (with exemptions) + ETS2 (€100/t) sensitivity





7.8 Annex 8: Revenue-neutral ETD (with exemptions) + ETS2 (€45/t) in France sensitivity



7.9 Annex 9: Accompanying national-level analyses by six other Think Sustainable Europe members

In Czechia, see: https://www.amo.cz/en/

In France, see: https://www.iddri.org/en

In Germany, see: https://www.ecologic.eu/

In Hungary, see: https://energiaklub.hu/en

In Poland, see: https://wise-europa.eu/en/

In Spain, see: https://www.bc3research.org/

www.ieep.eu