Assessing the distributional consequences of the transition in the EU

European Union—European Commission

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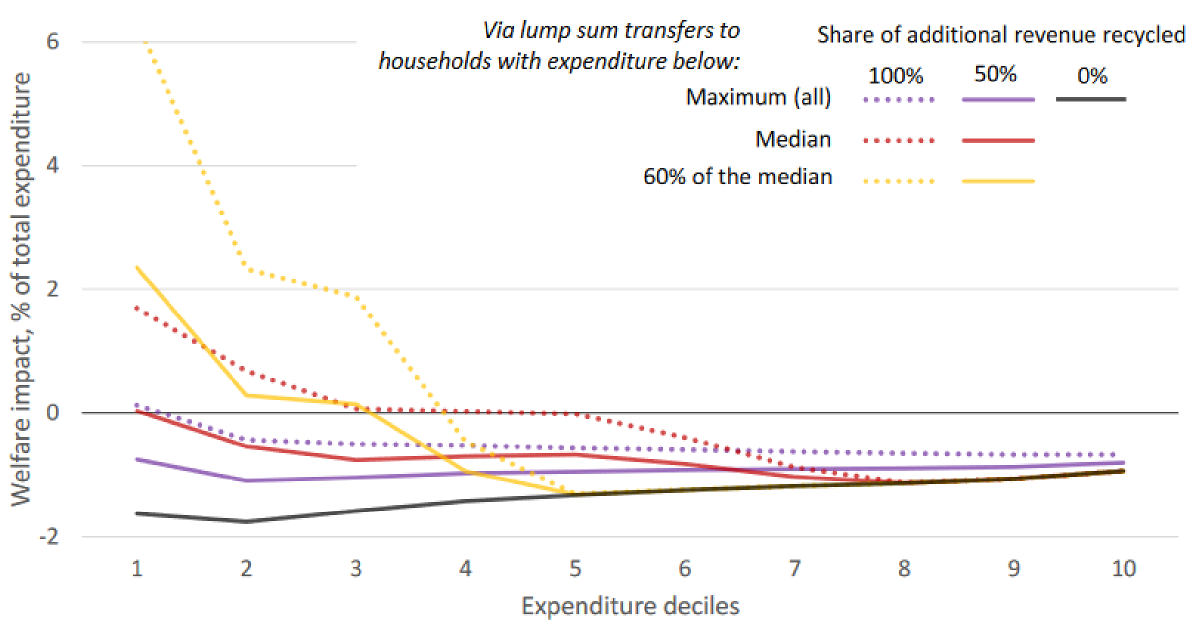
High-standard evidence-based policymaking is key for Ministries of Finance. Impact assessments contribute to harmonizing methods and informing who will be affected by the policy initiative and how. To complement the macroeconomic assessment of climate change mitigation policies, the European Commission's Joint Research Centre (JRC) recently expanded its modeling toolbox to cover the analysis of distributional consequences. This allows the identification of groups of the population particularly affected by a given policy proposal and how adverse effects can be mitigated, e.g., through redistribution of revenues from carbon pricing.

The JRC's computable general equilibrium (CGE) model JRC-GEM-E3 takes inputs from the PRIMES energy model to capture specificities of the transition in key sectors of the transformation; however, there is only one representative household in the model.[1] In order to assess how changes in prices affect different households and to evaluate distributional consequences, the CGE model output is combined with detailed household microdata from the European Household Budget Survey (HBS). Price changes from the CGE model account for direct and indirect effects of emission pricing as well as other costs, e.g., to comply with stricter standards for buildings or vehicles. Applying these price changes to the expenditure data of about 200,000 European households thus provides much richer detail on the effects of climate policies on individual groups of the population (Weitzel et al., 2023).

Figure 1. Distributional impact of reaching the EU's 55% net emissions reduction target, including an extension of the EU Emissions Trading System to buildings and road transportation



Note: Impacts are shown across household deciles with different carbon revenue recycling schemes.
Source: European Commission (2021), based on JRC-GEM-E3 analysis

The modeling of the consequences of the "Fit for 55" package in 2030 indicates that the cost of energy (and related equipment) increases relative to the baseline as carbon pricing is expanded, and complying with more stringent standards requires additional investments in energy equipment (European Commission, 2020). Energy costs are obtained from dedicated energy system models coupled with JRC-GEM-E3. As poorer households on average spend a higher share of their income on energy, an increase in energy costs leads to regressive effects. This regressive impact can be reversed

1 The JRC's GEM-E3 (General Equilibrium Model for Economy-Energy-Environment) model is a multi-regional, multi-sectoral, recursive dynamic computable general equilibrium model. The PRIMES (Price-induced market equilibrium system) model is an energy model that combines microeconomic foundations of the behavioral modeling with an engineering and energy-system approach. For more details, see https://climate.ec.europa.eu/eu-action/climate-strategies-targets/economic-analysis/modelling-tools-eu-analysis_en

by using additional revenue from expanded carbon pricing. A lump sum transfer leads to progressive effects, and using even a fraction of the revenue in a more targeted fashion (e.g., only providing transfers to households at risk of poverty) can make the poorest households benefit from the policy (Figure 1). This provides support for measures complementary to carbon pricing, and in the case of the "Fit for 55" package led to the design of a Social Climate Fund to facilitate a just transition without leaving behind those that are (or are at risk of becoming) energy poor.

Preserving the full detail of the HBS data makes it possible to assess impacts on different segments of the population beyond income groups. Within a given income decile, there is often considerable variation in the impacts due to the heterogeneity of the individual households' situations, including location, dwelling conditions, car ownership, etc. (Vandyck et al., 2022). It is also possible to assess how energy poverty indicators change under different policy design schemes, e.g., determining households that spend a high share of their expenditure on energy and simultaneously have a low income (Vandyck et al., 2023). The modeling framework allows the impact of a broad range of policy packages that affect the cost of energy to be evaluated.

Maintaining the modeling toolbox requires a critical mass of modelers to keep the models up to date, develop new features, and carry out analyses. This toolbox also allows other distributional effects, arising from shifts in employment out of brown sectors into sectors that benefit from the energy transition, to be investigated. Despite the number of sectors covered in the models, there may be limits to granularity, and hence sometimes discrepancies between what the models can depict in terms of scale and what is required by policymakers.

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