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Policy Paper

DISTRIBUTIONAL IMPACT OF CARBON PRICING IN ROMANIA

National policy paper

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Distributional impact of carbon pricing in Romania

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About EPG:

The Energy Policy Group (EPG) association is an independent think-tank, specialised in energy and climate policies. Founded in 2014, EPG gathers experts who are working together in international research projects. EPG is highly focused on the larger context of European policies and of the global trends, in its endeavour in promoting a constructive dialogue on decarbonisation among the decision makers and the larger audience.

Suggested quotation:

Energy Policy Group (2023), Distributional impact of carbon pricing in Romania

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Executive Summary

Carbon taxes with revenue redistribution represent a promising policy option for reducing emissions and energy poverty at the same time. A carbon tax increases the prices of goods in proportion to their embedded emissions and creates incentives for consumers and producers to shift to lower-carbon alternatives. The revenues collected can be directed at lower-income households both for income support and emissions-reducing interventions, such as energy efficiency, distributed renewable energy, electric heating and transport. At the same time, carbon taxes are politically sensitive. Increasing the price of emission-intensive goods, particularly energy, may reduce economic output in the short run and increase the cost-of-living for households, particularly for the ones affected by poverty. To add to the body of evidence on this relationship, we conduct a simulation of the effects of a generalized carbon tax on all consumption goods with revenue redistribution on GDP growth, employment, household welfare and energy poverty levels. The carbon tax is determined though an economic model at the levels required for a 40% reduction in emissions by 2032 compared to 2021. In absolute terms this means going below 70 Mt CO_2 eq. of GHG emissions, almost a quarter of the 1990 level. The tax ranges between 2.95$/ tonne of CO_2 in 2022 and 15.17$ in 2032, coming on top of the existing carbon price imposed through the EU Emissions Trading Scheme on power producers and heavy industry. The results show minimal negative effects on GDP growth (-0.12%) and employment (-0.02%) in 2032 compared to the baseline. Regarding the impact on households, the tax would generate a welfare loss between 0.8% for the highest income decile and 1.3% for the lowest decile, confirming the potential regressive effects. However, when revenue redistribution is designed as a lump-sum transfer, or price subsidy for lower-income households, the policy becomes progressive, and these households experience a welfare gain. This is also reflected in the energy poverty rates, which become lower with carbon taxes and redistribution than the baseline.

Recommendations

- Carbon taxes and revenue redistribution should be considered as complementary policy options to pursue reductions in emissions and energy poverty at the same time.
- Carbon pricing should not be analysed in isolation. By being exposed to a carbon price, consumers are incentivised to seek lower carbon alternatives that are offered or subsidised through other policies. When considering carbon pricing, the mechanism should be planned and assessed together with other EU and MS level policies, such as energy efficiency, renewable energy expansion, electrification of transport, social benefits and others. This is in line with the current EU approach to energy and climate policy.
- Carbon pricing generates significant revenues, at least in the beginning. That revenue needs to be redistributed back to specific segments of the population, helping them cope with increased prices., the revenues collected can also be used to reduce the households' emissions in the long term, by switching to low carbon alternatives for heating such as heat pumps, insulating their homes or buying electric vehicles.
- The issue of implementation should also be addressed. The targeting required to reduce energy poverty and the impact of carbon pricing on the poorest will be more challenging for countries where existing welfare policies are plagued by large inclusion and exclusion errors such as Romania. Revenues should also be used for improving administrative capacity, particularly in the social policy sector.
- The recently adopted Emissions Trading System (ETS2) for buildings and road transport and the Social Climate Fund (SCF) represent the EU's form of carbon pricing with revenue redistribution. The Social Climate Plans, based on which SCF disbursements will be made, represent an opportunity for Romania address the implementation challenges and to effectively tackle energy poverty while reducing GHG emissions.

Introduction

To deliver on the commitments under the Paris agreement and mitigate the worst effects of climate change, all EU member states need to continue reducing emissions (European Commission, 2021). At EU level, the goal is to reduce emissions by 55% by 2030 compared to 1990. All member states and all sectors need to contribute to this goal. Carbon pricing with income redistribution is widely seen as an effective and fair way of achieving emissions reductions (IMF, 2019). Carbon emissions resulting from the production and consumption of goods generate costs that are borne by society in general and not by their producers or consumers. A carbon price aims to incorporate those costs into the prices of emission-intensive goods and thus make less emissions-intensive goods relatively cheaper. This is expected to encourage people to change their consumption behaviour away from carbon-intensive goods and toward low-carbon alternatives. Carbon pricing is politically sensitive because it may hurt, in the short run, the economy of a country. At micro level, it may negatively affect the welfare of households, who would face higher prices for the goods they currently consume. This is particularly relevant for energy, which is responsible for the highest share of total emissions and therefore would see a price increase proportional to its carbon intensity. At EU level, 34 million citizens are experiencing energy poverty (European Commission, 2021). In Romania, 10.1% of the population are unable to keep their homes adequately warm, 33% spend more than 10% of their income on energy and 34.4% are at risk of poverty or social exclusion (Eurostat, 2022; ORSE, 2022). An economy-wide carbon pricing mechanism risks exacerbating this situation by increasing prices of carbon intensive goods. Moreover, carbon pricing may also be regressive, i.e. hurt low-income households disproportionately, as consumption represents a higher share of their income. To overcome this risk, carbon pricing is often proposed together with revenue redistribution mechanisms. The revenues collected through carbon pricing would be substantial at the beginning and they could fund income support measures and investment in lower-carbon alternatives for the worst affected households. This can achieve both emissions reductions, help alleviate poverty, and accelerate the deployment of low-carbon technologies, all at the same time.

The main types of carbon pricing are Emissions Trading Systems (also called cap-and-trade) and carbon taxes.

Emissions Trading Systems (ETS) establish a declining cap on allowed emissions and impose on polluters to purchase and trade emissions allowances at prices set by supply and demand. The current EU ETS covers the industrial, aviation and power sectors, and has recently been expanded to the maritime sector. The EU is also preparing to implement an ETS for the buildings and road transport sectors (ETS2). Under the ETS2, suppliers of fuels for buildings and road transport will have to purchase emissions allowances, with the total number of allowances available gradually decreasing over time. This would expose households to a carbon price and should thus incentivise them to seek lower carbon alternatives. To mitigate the potential impact on lower-income households, a Social Climate Fund will be set up to finance temporary income support measures,

as well investments for reducing GHG emissions from heating and road transport. Each member state will have to develop a social climate plan (SCP) describing how revenues will be disbursed.

Carbon taxes on the other hand establish a price of carbon and impose it on certain polluting economic activities through the tax system. There are several countries operating carbon taxes, including the Scandinavian countries, Switzerland, and others.

Both types of carbon pricing have been shown to be effective, provided that the carbon price is high enough to create a strong incentive for polluters to seek lower-carbon alternatives (Köppl and Schratzenstaller, 2022). At the same time, carbon taxes tend to be simpler to manage as they can be implemented through existing tax systems.

A carbon tax represents an interesting policy option for Romania to achieve emissions reductions and to generate income that can be directed at helping lower-income households invest in low-carbon alternatives (World Bank, 2022).

To further investigate the economic and social feasibility of carbon pricing in Romania, we simulate a stylised general carbon tax, evaluating its impact on the economy and the welfare of the population. The generalised carbon tax is significantly different from existing carbon pricing at EU level (ETS) and represents a theoretical exercise, evaluating the impact of the most comprehensive solution to the externality: taxing all embedded emissions at the level of the consumer. This tax is applied for the entire economy and comes on top of the already exiting ETS price applicable to power generation, heavy industry, and aviation. The carbon tax is conceptualised as the additional cost of GHG emissions embedded in consumption goods that can deliver the emissions reductions in line with a trajectory for climate neutrality by 2050. We study the impact of such a tax – proportional to the carbon content of all consumption goods – on macroeconomic indicators, on consumer welfare, and expenditure patterns. In addition, we look at several revenue recycling options.

This simulation aims to add to the body of evidence of carbon pricing and inform policy makers on the potential impact of an idealised policy, abstracting away any issues of implementation. In most realistic applications, the carbon pricing scheme would be less comprehensive and the associated impact less pronounced. In addition, we consider that the carbon tax would be passed through entirely to consumers, which in reality, due to competitive pressure, may not be the case.

Overview on emissions and energy consumption

Romania has seen strong economic growth since 2000. Except for the economic crisis of 2007-2009 and the Covid shock, the country's economy recorded continuous and substantial GDP growth, fuelled by consumption, foreign investment into manufacturing and services, EU funds and remittances. The latter increased steeply as emigration accelerated, particularly after EU accession. The period since 2000 has been broadly characterized by an increase in productivity, investment and GDP per capita (Fig. 1), which are decoupled from GHG emissions.

Figure 1. GDP per capita, population and CO_2 emissions in Romania, 2000-2021

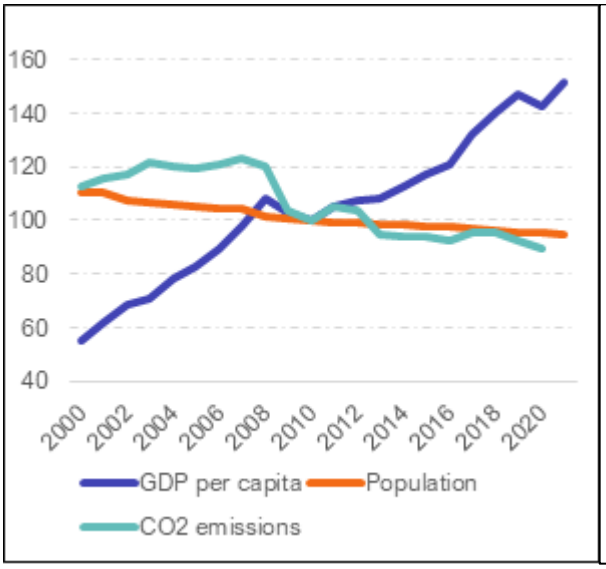
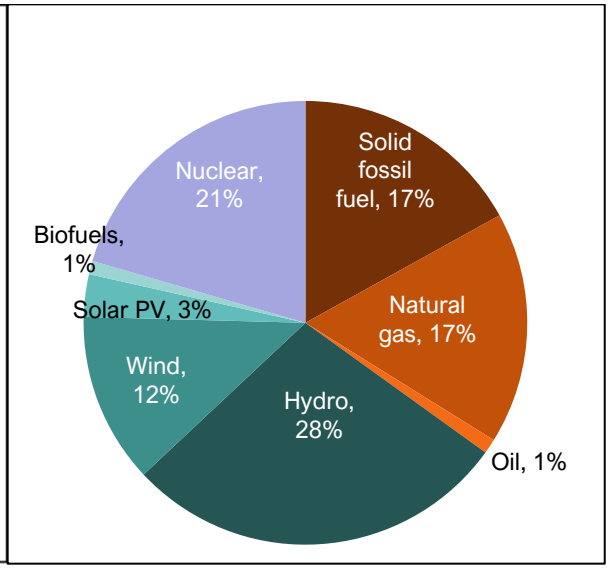
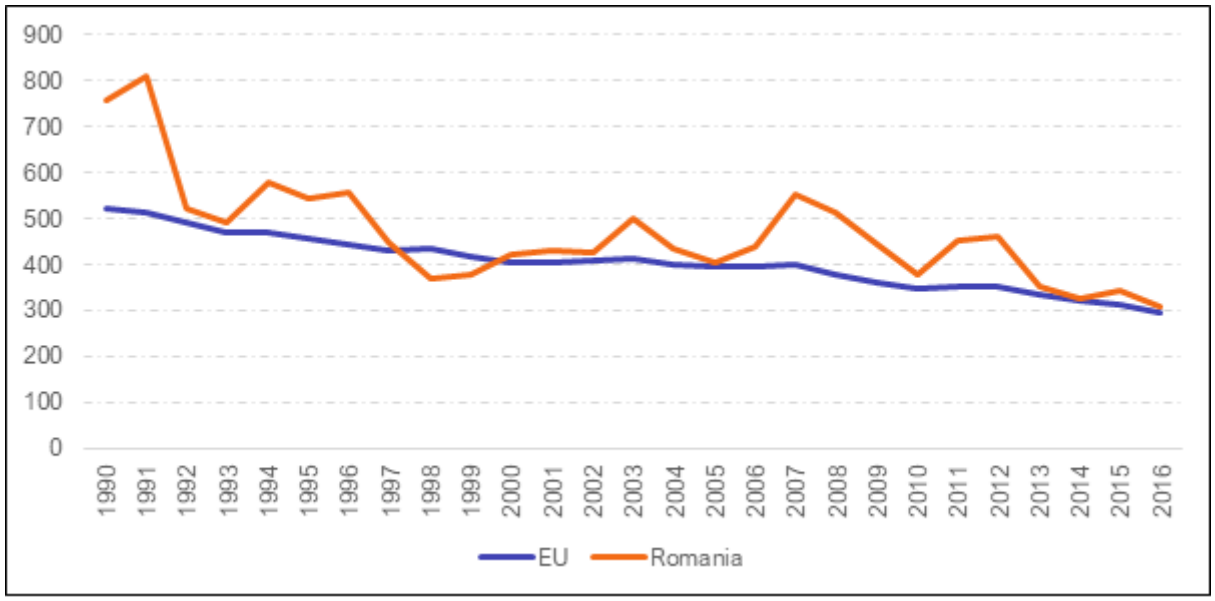


Figure 2: Electricity production by source in 2020



Source: Eurostat.

Figure 3. CO_2 intensity of electricity generation (g CO_2/kWh)



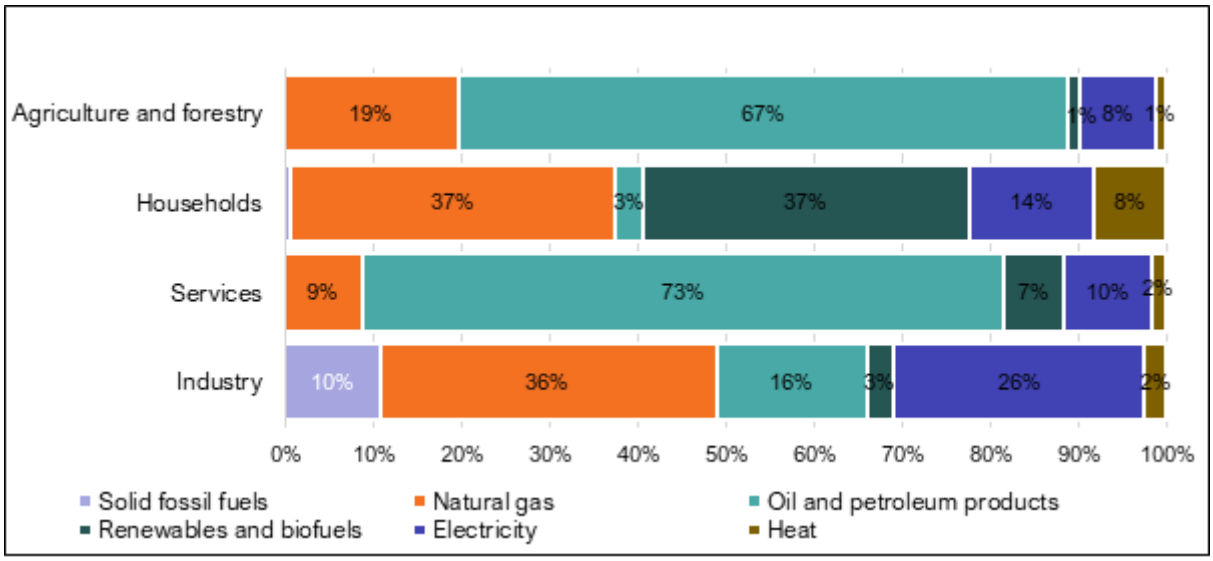
Source: European environment agency

At the same time, the emission intensity of the economy went down, mostly driven by the shift from the pre-1989 heavy industry dominance to a more service-based economy. In 1990 emissions from fuel combustion and industrial processes were at 148 MT and 32 MT respectively. In 2020 the levels dropped significantly to 64 MT in energy and 13 MT in industry.

Romania operates a relatively balanced electricity generation mix (Fig. 2). Solid fossil fuels and natural gas amount to a total of 34%, nuclear for 21%, while renewable generation represents almost half of the electricity generation (hydro 28%, wind 12%, and solar 3%). The current mix generates significantly less CO_2 compared to thirty years ago (Fig 3). In 1990 and 1991 producing one kWh of electricity released 0.8 kg of CO_2, while in 2016 the level dropped to 0.3 kg, similar to the EU average.

Looking at energy use by economic sector (Fig 4), oil and petroleum products are heavily relied upon in services (almost 3/4 of final consumption) and in agriculture (2/3). A balanced mix can be observed in the industry sector, while the household sector gets most of its energy needs from biofuels (mostly woody biomass), electricity and heat.

Figure 4. Final energy consumption in 2021



Source: Eurostat.

Households account for a third of the final energy consumption in the country, higher in percentage terms than in 1990, but lower in absolute terms - from 122 TWh in 1990 to 93 TWh in 2020. Services accounted for 53 TWh in 1990 or 11% of the final energy consumption while in 2020 the figure was 96 TWh or 36% of the total final energy consumption (Fig. 5). In the services sections, transport accounts for 75 TWh, or 78% of energy used in services.

Figure 5. Final energy consumption by sector, 2020

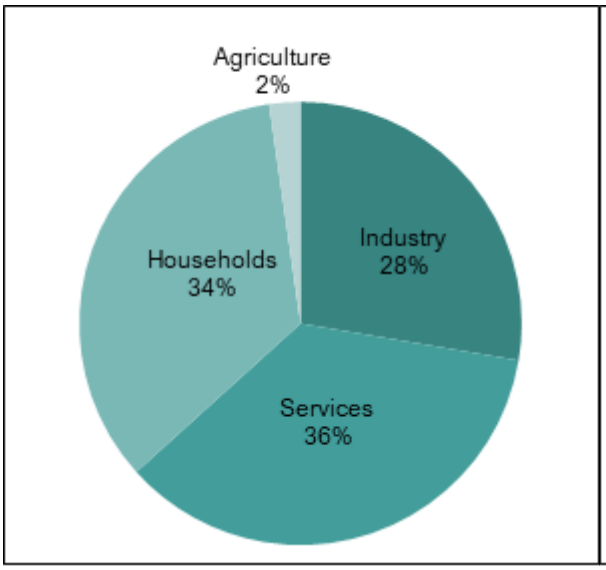
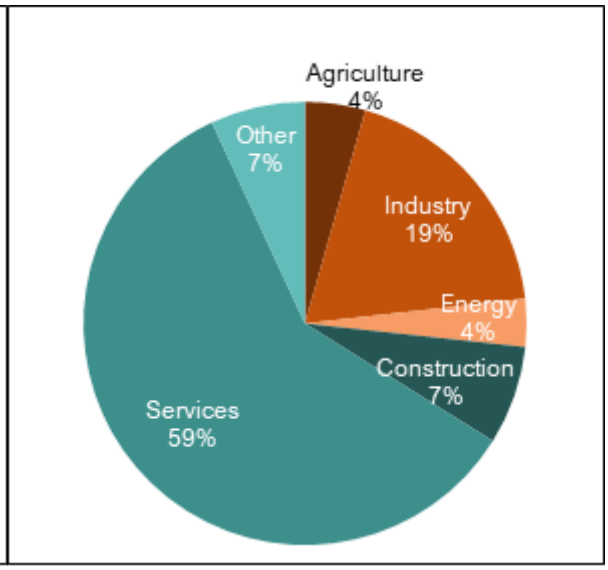


Figure 6. Value added by sector, 2020



Source: Eurostat

In recent years, services represent a considerable driver of added value and employment (Fig. 6). This sector produces 59% of the total added value and employs half of the total workforce. Agriculture employs more than 20% of the workforce. Industry, energy and construction have lower contributions in terms of value-added (19%, 4%, 7% respectively) and employment (18%, 3%, 9% respectively).

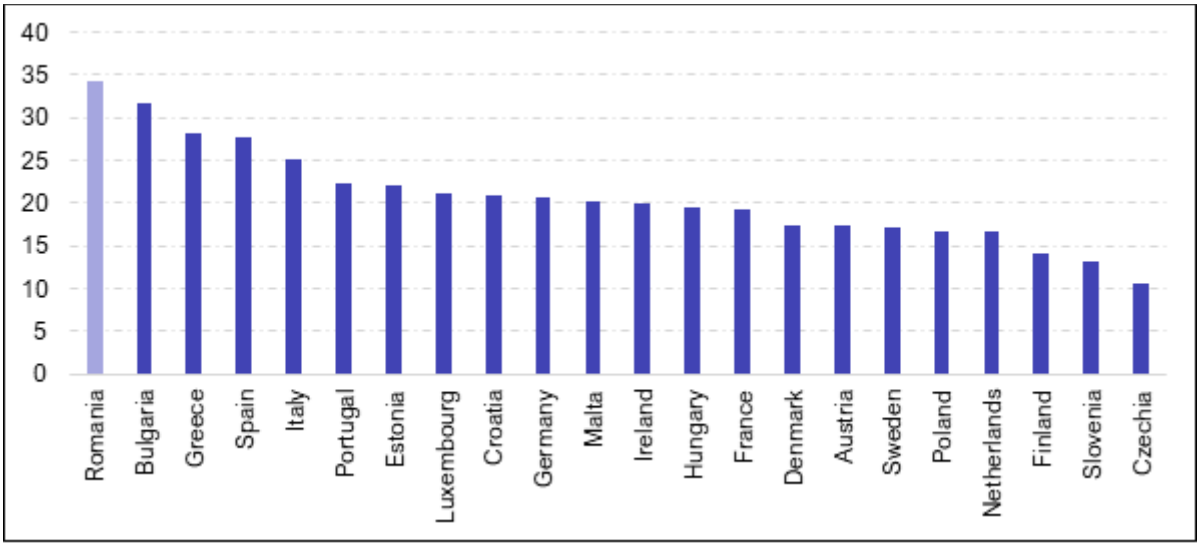
At the same time, compared to the EU average, Romania continues to have a strong industrial base, with the gross value added from industry accounting for a higher share of the GDP than the EU average. Industry, including constructions and manufacturing, contribute around 28% to gross value added yearly and employ around 30% of the labour force.

Energy poverty in Romania

Among EU members, Romania is one of the countries most affected by poverty and energy poverty. While currently lacking a common EU definition, energy poverty tends to be approximated by looking at several indicators that capture its various dimensions (EPAH, 2022b). The most relevant are the risk of poverty, the inability to keep homes warm, arrears to utility bills, abnormally high or low energy spend.

Romania is the country with the highest share of people at risk of poverty or social exclusion in the EU (Fig. 7). The extent to which this translates into energy poverty is not known with precision, but it is safe to assume that this factor is a driver for most other forms of poverty, including energy.

Figure 7. People at risk of poverty or social exclusion, 2020.

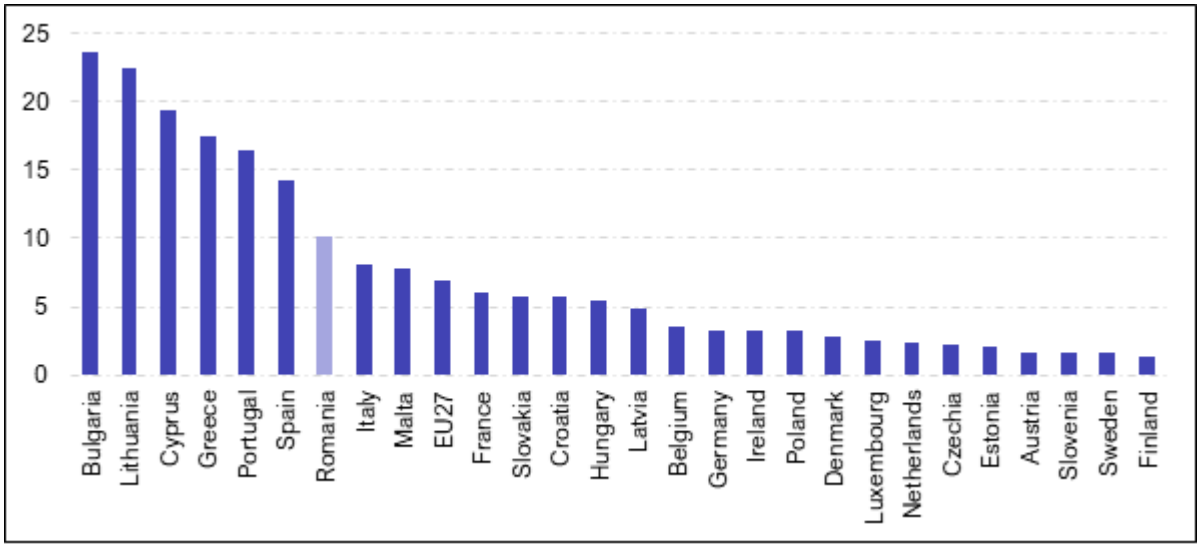


Source: Eurostat

With regard to the energy poverty indicators, Romania tends to perform slightly better. The country ranks above the EU average in terms of the percentage of the population that cannot keep

their home adequately warm, doing better than higher-income countries like Spain. This may be explained by structural factors such as the reliance on district heating and firewood in Romania, which, until recently at least, enabled many households to heat their homes at relatively low costs.

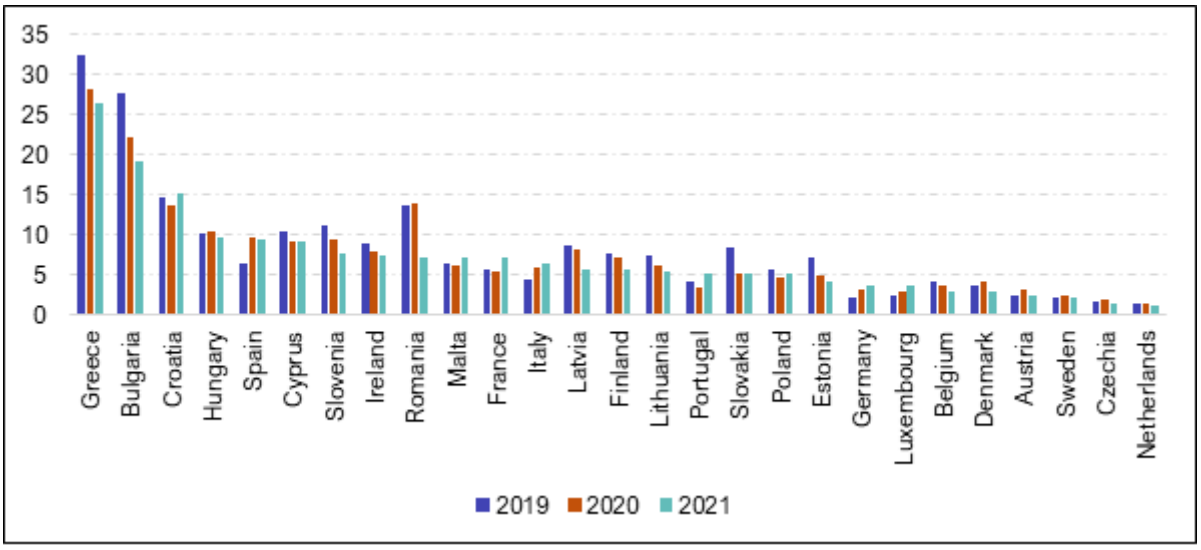
Figure 8. Households that cannot keep home adequately warm, 2021.



Source: Eurostat

Another indicator of energy poverty based on survey data is the percentage of households that have had arrears to utility bills over the past 12 months. In 2021, more than 7% of households in Romania experienced difficulties in paying their utility bills on time because of financial constraints. In the previous two years, the rate was double.

Figure 9. Arrears on utility bills, 2019-2021

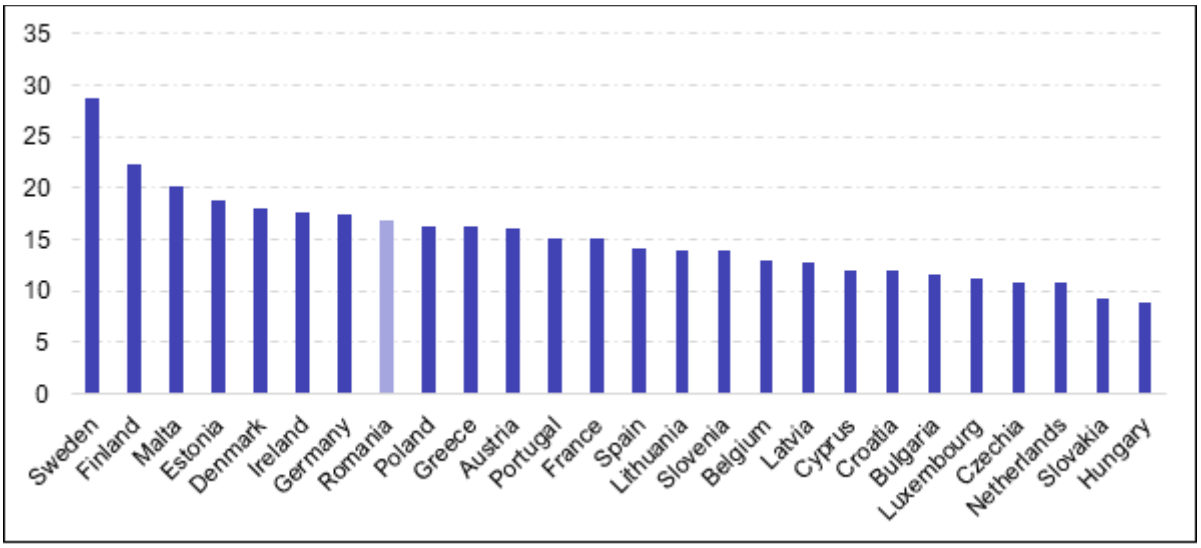


Source: Eurostat.

A distinctive set of indicators that attempt to capture certain dimensions of energy poverty are the ones based on abnormally shares of expenditure or abnormally low absolute expenditure.

Households that spend significantly higher shares of their income on energy compared to the national median may be experiencing energy poverty, due to low incomes, inefficient housing, or both. In Romania, 17% of households had a share of expenditure on energy more than twice as high as the median of the country in 2015 (the 2M indicator).

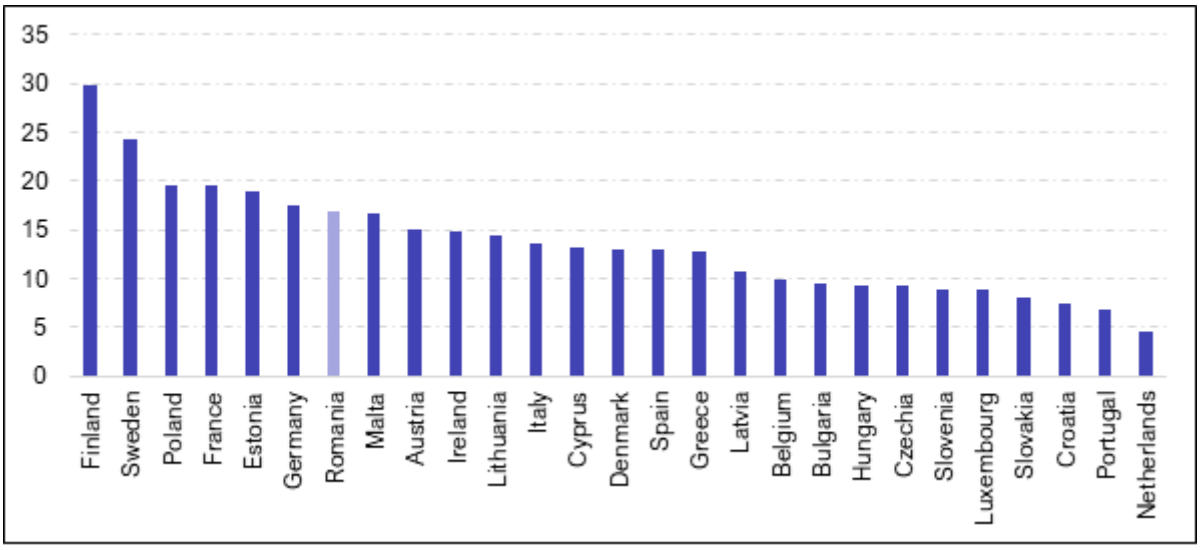
Figure 10. High share of energy expenditure (2M).



Source: EPAH

Some households experiencing energy poverty may be identified by looking at low absolute expenditure, which may be insufficient to cover the basic energy needs of a typical household. In Romania, 17% of households had a total expenditure on energy that is below half the national median in 2015 (the M/2 indicator). Many households in rural areas have low levels of consumption of electricity and are not connected to the natural gas grid. They use woody biomass for heating, which they often procure informally. The extent to which this amounts to energy poverty is difficult to establish but these households are very likely being captured under the M/2 indicator.

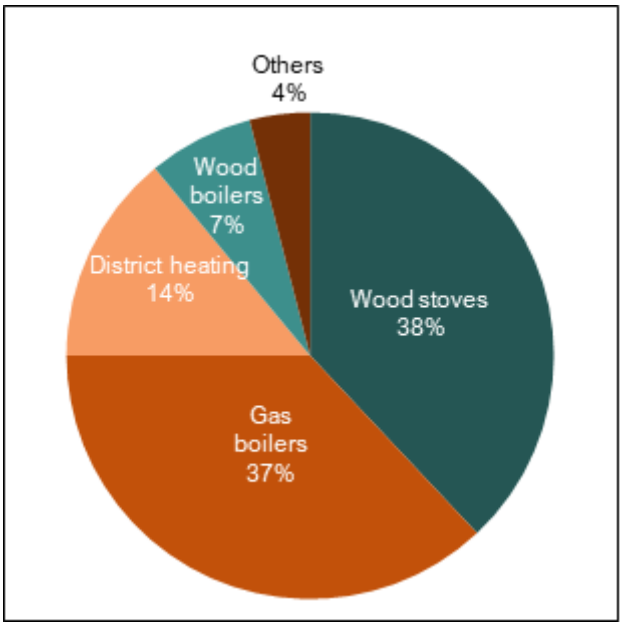
Figure 11. Low absolute energy expenditure (M/2), 2015.



Source: EPAH

There appears to also be a connection between the type of fuel used for heating and poverty. According to Household Budget Survey data for 2019, from the National Institute of Statistics, 2.8 million households use mainly wood-burning stoves for space heating. This technology has a very low efficiency, with a great amount of heat exiting through the chimney.

Figure 12. Main space heating technology used in Romanian households in 2019.



Source: National Institute of Statistics: Household Budget Survey data for 2019

Wood-burning stoves can be replaced by wood burning boilers which can operate on the same fuel but require a significantly higher upfront investment. This is the main reason for which less than 0.5 million homes use wood-burning boilers. According to HBS data in 2019, in the first income decile, namely 10% of all households with the lowest income per capita, more than 80% use wood-burning stoves as the main space heating source. The percentage is ten times lower in the highest-income decile. Out of the 1.28 million households (17% of total) made of wattle and daub in Romania, 89% (1.14 million households) use wood-burning stoves. Therefore, wood-burning stoves are usually found in low-income households with often precarious living conditions.

In urban areas the predominant heating technology are gas boilers (58% of urban households), followed by district heating (24%), wood stoves (11%), and others (7%). Rural areas are using primarily wood-burning stoves (68%), gas boilers (14%), wood burning boilers (11%) and others (7%).

In order to further understand how the expenditure on various sources of energy varies between different income levels, we have split Romanian households according to their total consumption expenditures into 10 groups (deciles) and examined the spending patterns on energy sources.

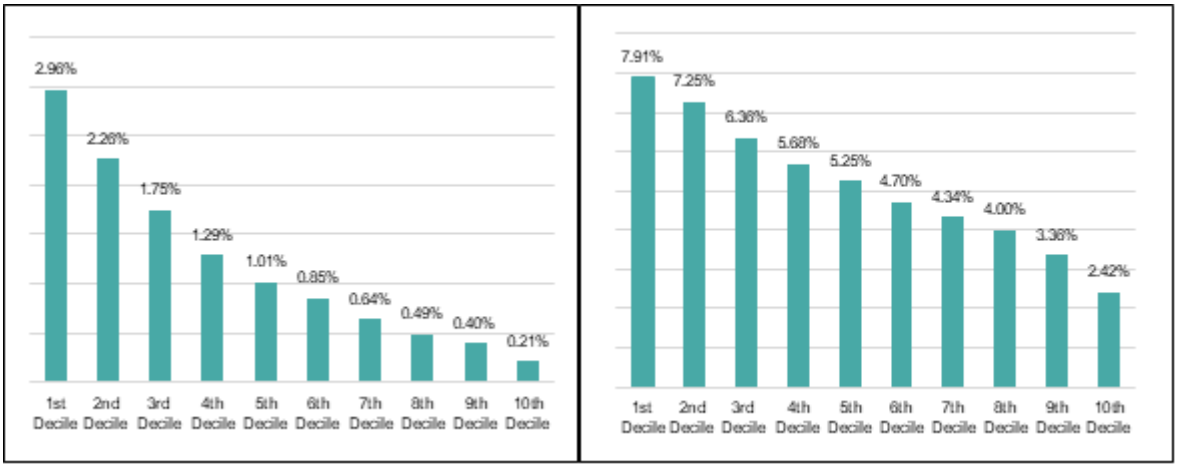
Results based on HBS data for the year 2019[1] suggests that lower income households have overall different spending patterns that higher income households. For example, when looking at how much Romanian households have spent on electricity, the first decile, allocated 7.9% of their total consumption expenditures on electricity, while higher income households spent a significantly lower share (2.4% in the 10th percentile). Nonetheless, while the share spent on electricity might

be larger for lower income households, the amounts are lower in absolute terms (on average a household from the 1st decile spends 87 RON on electricity, while a household from the 10th decile will spend 107 RON).

Another energy source used by lower income households would be LPG for home cooking and heating. As we can observe in the charts below, the first decile spends 2.96% of their total consumption expenditures on LPG, while wealthier households spend around 0.2%.

Figure 13. Percent of all consumption expenditures spent on LPG for home

Figure 14. Percent of all consumption expenditures spent on

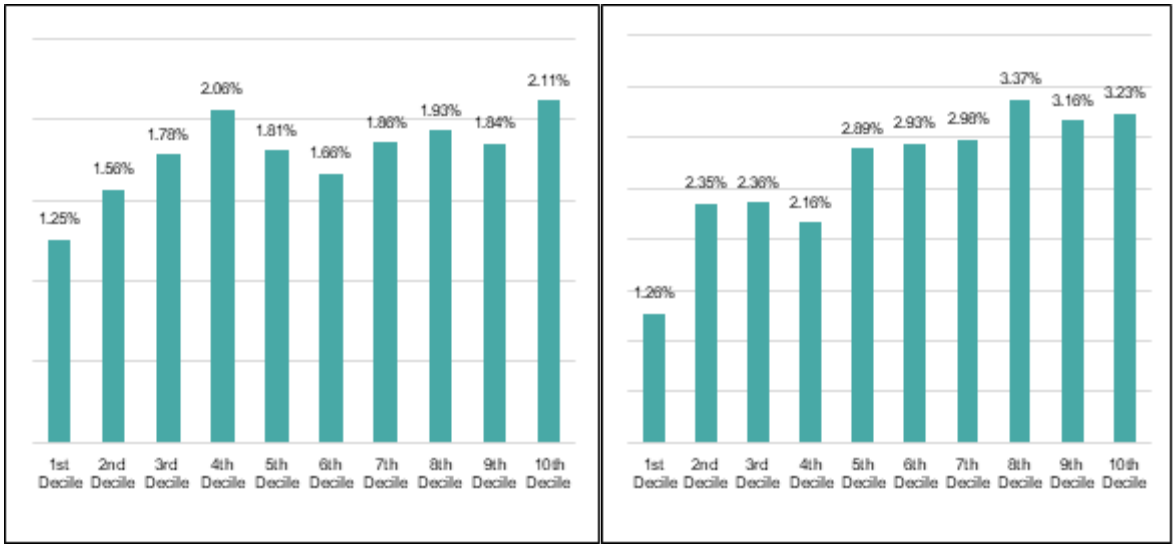


Source: National Institute of Statistics: Household Budget Survey data for 2019

On the other hand, households which belong to the 10th decile spend more on gasoline (3.23% of their expenditures compared to 1.26% the 1st decile spends), and diesel, since they are more likely to own a car or other vehicles.

Figure 15. Percent of all consumption expenditures spent on Diesel

Figure 16. Percent of all consumption expenditures spent on Gasoline

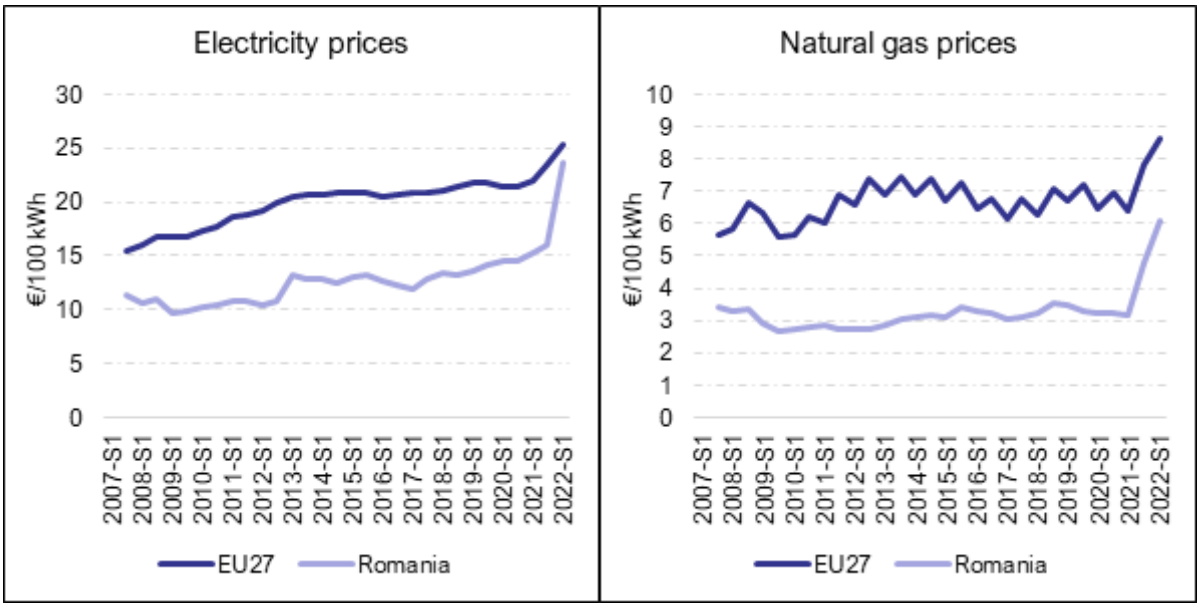


Source: National Institute of Statistics: Household Budget Survey data for 2019

Overall, in Romania, the drivers of energy poverty for households are typical for a middle-income country. Being at risk-of-poverty, living in households with low labour intensity, being exposed to severe material deprivations (cannot afford to pay rent / loans / bills, adequately heat the house, manage unpredicted expenses with current income) are all dimensions of energy poverty. An estimation from 2017 found that 5.6% of households have informal access to electricity, 32% of households fall into poverty after paying for energy bills, and that 218.698 households (out of a total of about 7.5 million) were benefiting from heating aid during winter (CSD, 2017).

Energy prices are also relevant in the context of poverty. Romania has gone through several cycles of liberalization and regulation, depending on the evolution of prices. Energy markets – power, natural gas and transport fuel tend to be strongly correlated with the rest of the EU, while being constantly lower than EU averages.

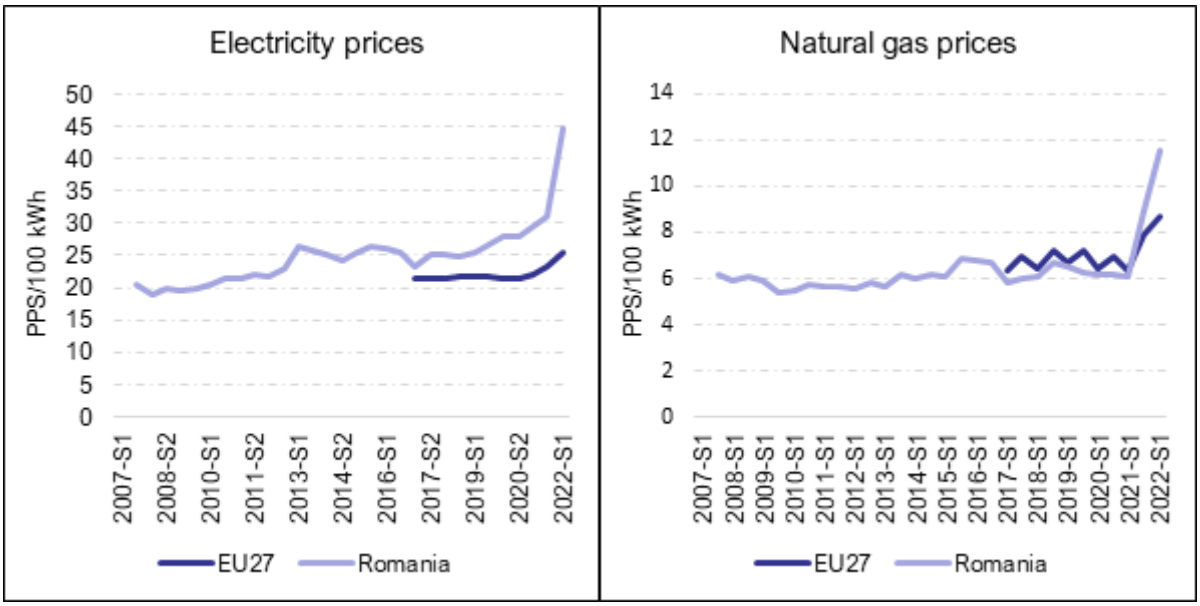
Figure 17. Electricity and gas prices for households in euro/100 kWh.



Source: Eurostat

Romanian households pay higher prices for electricity than the EU average when looking at their purchasing power. The same goes for natural gas, where, despite having some of the lowest prices in the EU, the burden on households tends to be high. In the first semester of 2022, in PPS terms Romania had the highest prices for electricity in the EU, while for gas it ranked 5th (Eurostat, 2023).

Figure 18. Electricity and gas prices for households in PPS/100 kWh.



Source: Eurostat

Carbon taxes would purposely increase prices of emissions-intensive goods, energy being the most relevant. Given the energy poverty situation in Romania, an evaluation of the possible impact of such tax is warranted. However, the revenue redistribution options for income-support as well as the investments into low-carbon alternatives, like renewable energy, electric mobility and heat pumps, need to be included in such assessments to capture the full policy impact.

Policies supporting energy-poor households

The lifting of Covid restrictions, the economic recovery that followed and the war in Ukraine pushed power prices to record levels in Romania. In August 2022, a new record on the day-ahead market was set at almost 600 EUR/MWh. Throughout the period, the Romanian Government shielded most categories of consumers from these prices, by fixing the retail price and paying suppliers the difference between the market wholesale price and the administrative retail price. This difference ballooned over the course of 2022 and the Government delayed payments to suppliers and instated windfall profit taxes on the generation side (EPG, 2022). While this solution contributed to limiting the rise in the inflation rate, this started to be seen as unsustainable (IMF, 2022). New caps and partially regulated wholesale prices were introduced from January 1st, 2023, but the principle has not changed significantly, with most households benefitting from heavily subsidized prices. While not targeted to households experiencing energy poverty, the measure did keep prices at their pre-pandemic level and represented the main intervention that prevented the rise in energy poverty rates.

In Romania, dedicated policies to reduce energy poverty have been relatively ineffective (ORSE, 2022). Until recently, vulnerable consumers were mentioned in the Energy Law (Law 123/2012) and in the regulations of the National Energy Regulator. However, those references were vague and rarely applied. The most concrete targeted measure, historically, has been the heating aid, delivered through local authorities. However, the measure has been ineffective, based on outdated thresholds for eligibility and lengthy bureaucratic procedures. The aid has not been indexed for a long period of time, which means the amount became less and less relevant, as both wages and prices increased, making the measure largely ineffective (CSD, 2017).

In September 2021, a new law was adopted establishing social protection measures for vulnerable energy consumers. Under the new Law, vulnerable consumers are defined as individuals or families who, due to illness, age, insufficient income or isolation from energy sources, would benefit from social protection measures and additional services ensuring their minimum energy needs. An estimated 500,000 households receive up to RON 500 (EUR 100) per month to pay bills during the cold season (between November 1st and March 31st). Non-financial measures include facilities for accessing and connecting to available energy sources necessary to ensure minimum energy needs, such as a ban on disconnection from energy supply sources for certain categories of vulnerable consumers, and transparent and accessible advice and information on energy sources and associated costs.

In 2023, the Government also launched an energy voucher scheme, using EU funds, that targets certain categories of the population that may be at risk of energy poverty. The eligible beneficiaries will be pensioners with incomes below a certain threshold, families with children in difficulty and the beneficiaries of other social policy interventions. The amount would be around 280 euros per household per year.

Currently, the revenues from EU ETS are used by the Environment Fund Administration in several programmes, none specifically aimed at reducing energy poverty. The programmes with the largest pool of beneficiaries among Romanian households are the *National program for the replacement of used electrical and electronic equipment with more energy-efficient ones* and *the Program to stimulate the renewal of the national car park*. Through the latter, 1 billion RON (218.16 mil. EUR) were spent in 2022 to subsidise the scrapping of 107.000 old vehicles and the acquisition of 53.000 new ones, out of which 10,462 were electric vehicles.

Overall, we can say that Romania is significantly affected by energy poverty and has had relatively ineffective policies to mitigate it. Given the country's relatively low administrative capacity, targeted measures have been less effective. This was compensated for with repeated and expensive interventions of price regulation for the entire population, with questionable sustainability over time.

Findings

Brief overview of methodology

To add to the body of evidence on the suitability of a carbon tax for emissions reductions and mitigation of energy poverty, we conduct a simulation.

The carbon pricing mechanism chosen for the modelling exercise is a stylized direct carbon tax, applied to all the major components of the national economy, proportional to the average carbon content of each of the sectors.

We have the following approach to model the carbon tax. First, we set a CO_2 emissions reduction goal of 40% until 2032, compared to 2021, in line with achieving carbon neutrality by 2050. Second, we adjust the carbon tax (expressed in $ per tonne of CO_2 emissions) to reduce the emissions by 40%. The carbon tax value depends on the general macroeconomic situation of the country as well as the carbon intensity and energy mix.

The carbon content of each sector is derived from existing literature, which usually relies on environmentally-extended input-output models. We model an incremental tax whose annual levels are decided to smooth the emission reduction, with a cumulative reduction rate of 40% by the end of 2032, compared to the baseline year 2021. The carbon content calculated for Romania is

presented in Table 1 below. The resulting carbon tax is modelled as linear increase from 2.95$ / tonne CO_2 in 2022 to 15.17$ / tonne CO_2 in 2033. This modelled tax comes on top of existing direct and indirect carbon taxes applied in Romania (ETS, excise duties).

Table 1. Carbon content by categories of goods in Romania

	Food	Others	Electricity	Transport fuels	Transport services	Energy	Total emissions
$kgCO_2$/ household	964	1.344	1.166	2.777	571	2.529	9.394

Source: own computations using the MEMO model

To simulate the effects of the tax on the overall economy, we apply a macroeconomic multi-sector dynamic stochastic general equilibrium (DSGE) model called MEMO (MacroEconomic Mitigations Options). We use this model to simulate the changes in employment, wages, and prices of goods at a sector level in response to the introduction of a carbon tax. The results of the MEMO model are expressed as per cent deviations from the no-intervention scenario.

We also conduct a microsimulation using the main results of the MEMO model as inputs for a demand-system estimation which enables us to assess the distributional and welfare effects induced by the carbon tax. We employ the QUAIDS demand system model to estimate the behavioural changes of households once the new pricing mechanism enters into force. The behavioural changes refer to the new patterns of expenditure and are the result of a dynamic iteration. This allows us to observe the evolution of expenditure patterns that account for how different redistribution and tax regimes smoothen consumption in the long run.

QUAIDS analyses data from the national Household Budget Surveys (HBSs). The HBSs are national, representative surveys focusing mainly on household expenditure patterns on many goods and services. The HBSs expenditure groups were structured into six categories: food, other non-energy goods and services (e.g., education, healthcare), electricity, transport fuels, transport services (e.g., public transport, air travel), and other energy goods (e.g., natural gas, coal). The HBS data used for Romania covers four years, namely 2016-2019, therefore, the current quantitative analysis does not treat the effects of the COVID pandemic or the energy crisis started in February 2022 on household's consumption behaviour.

Our model uses each household's total consumption level as a proxy measure for income. As for prices, because HBS does not provide individualized price information, we rely on national aggregate price indices for the six categories of goods and services provided by the national institute of statistics and Eurostat.

Welfare losses are measured at the household level and aggregated across income deciles to enable a discussion of redistributive policies, using the compensating variation (CV). The compensating variation is the adjustment in income that returns the consumer to the original utility after the introduction of the new tax. A positive value for CV represents a welfare loss, while a

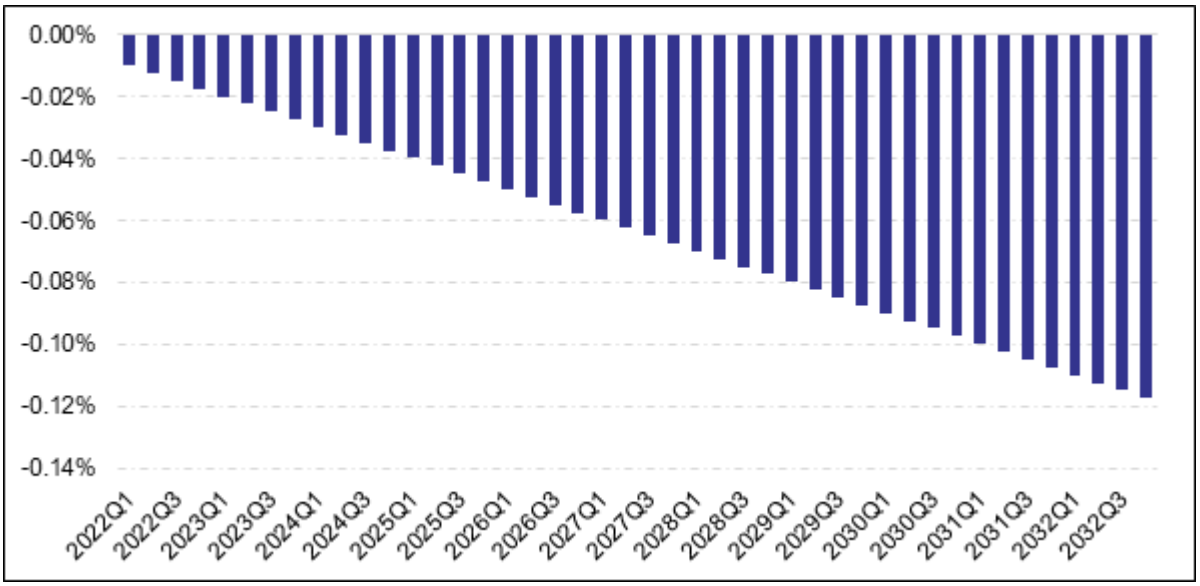
negative value represents a welfare gain. The actual value of the CV for each household should be interpreted as follows: for example, a 0.12 CV indicates that in order for a household to reach its initial levels of utility, its income should grow by 12%.

Impact on macro-economic indicators

While empirical evidence is mixed (Köppl and Schratzenstaller, 2022), there are fears that a carbon tax can affect economic growth and employment. The tax directly increases prices for emissions intensive goods, particularly energy, leaving lower disposable income for households and firms. This can lead to lower consumption and investment, which would translate into lower output and employment over the longer term.

However, in countries that implemented carbon taxes there is no evidence of a significant negative economic effect (Metcalf, 2019). This can be partly explained by the availability of lower-emissions alternatives at comparable (or declining/ subsidized) prices – for example switching from coal to gas or renewables. The low economic effect can be also explained by the strategic deployment of the collected revenues, which Governments can use to reduce other, more growth-inhibiting, taxes (such as labour taxes).

Figure 19. Effect of carbon tax on GDP versus baseline (without carbon tax).



Source: own computations using the MEMO model

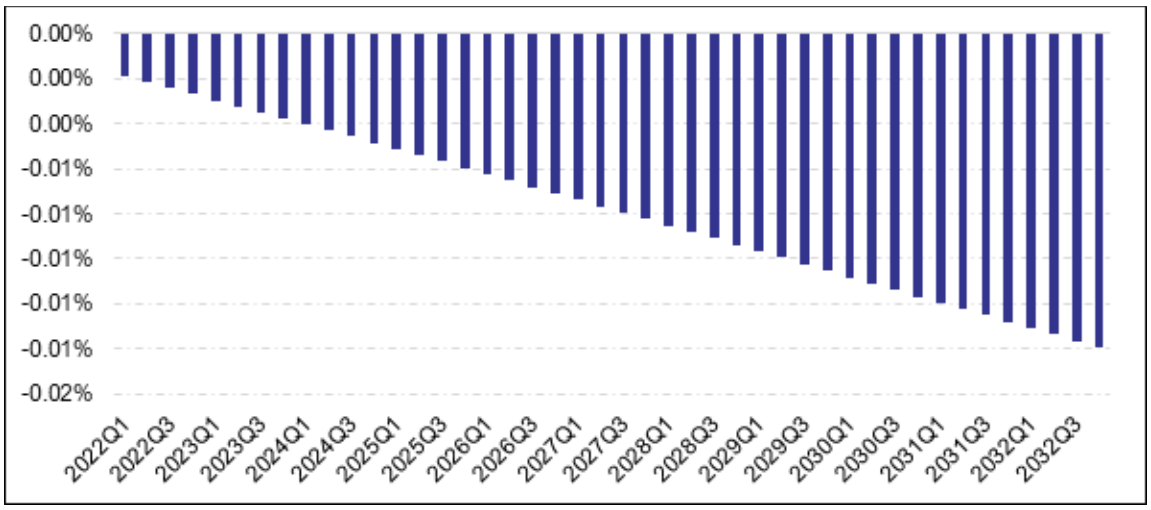
Our analysis also finds a limited macroeconomic effect of the modelled carbon tax in Romania; gross domestic product would deviate from a non-tax scenario by a maximum of 0.12%, reached in 2032.

The carbon tax would have different effects on the sectors of the economy (Figure 22). The most affected sectors are industry and services. The added value in industry would see a decrease of

1.17% in 2032 reflecting the carbon intensity of this sector. In services, the impact of transport is the likely driver of the 0.37% decrease associated with the carbon tax. On the other hand, the tax would have a slightly positive impact on the energy sector by an estimated 0.18%. In agriculture and construction, the impacts are negligible.

The cumulated impact that the introduction of a carbon tax would have on the labour market is also relatively low (Figure 20).

Figure 20. Impact of carbon tax on employment versus baseline.



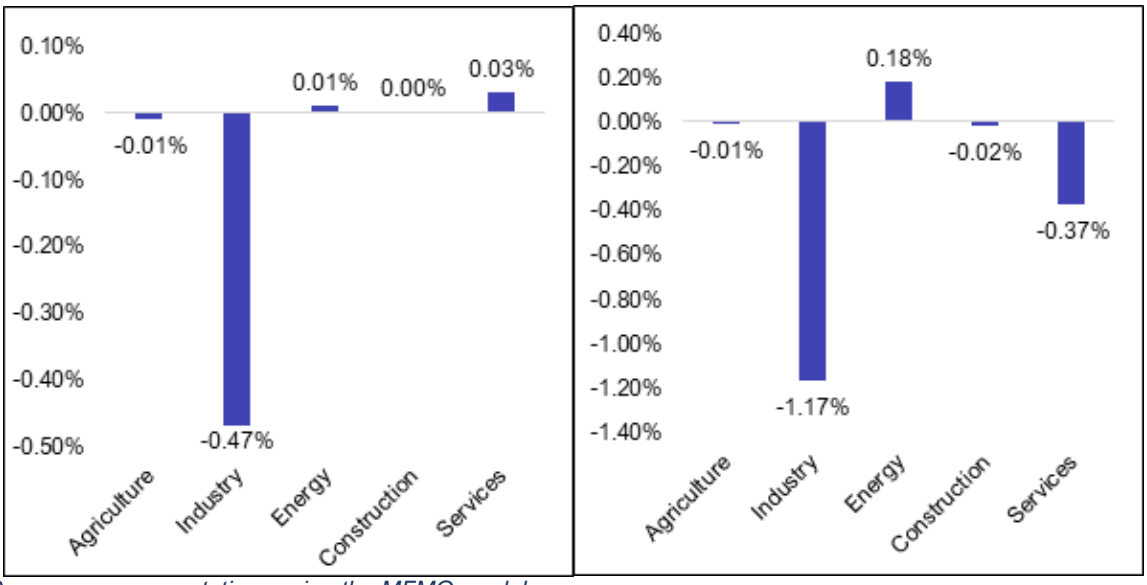
Source: own computations using the MEMO model

The decrease in employment every year until 2032 would be almost zero until 2025 and below 0.02% throughout the entire period.

Industry would see the largest reductions in employment, but even those are below 0.5% of the total workforce. This is again explained by industry being the most emissions intensive sector analysed here. The impact on other sectors is minimal but positive, for example services would see an estimated .003 increase in employment by 2032. Innovation is not included in the modelling, therefore the negative impact on industry may be even smaller.

Figure 21. Impact of carbon tax on employment by sector in 2033.

Figure 22. Carbon tax effect on added value by sector in 2032

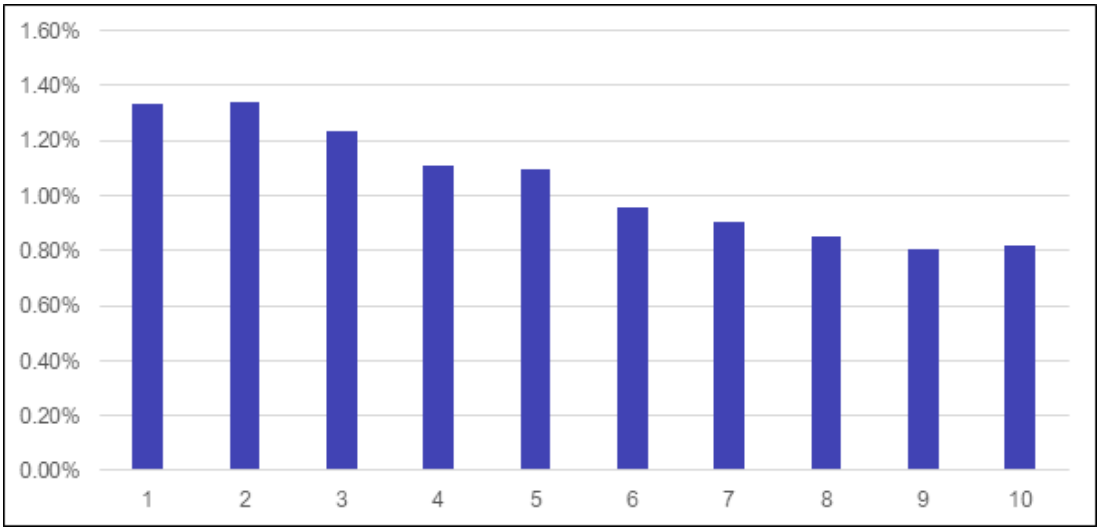


Source: own computations using the MEMO model

Impact on micro-economic indicators

Overall, before redistribution, the carbon tax seems to display minor regressive tendencies. This means that the relative burden imposed by the tax on households belonging to the lower income deciles is higher than the burden for more affluent households. In Romania, the highest decile would have a welfare loss of 0.8% compared to almost 1.4% for the bottom decile. The average welfare loss in Romania would be around 1%.

Figure 23. Welfare losses (%) by expenditure decile



Source: own computations using the QUAIDS model

The revenues collected from the carbon tax can be redistributed. Three scenarios for redistribution were tested:

1. Lump-sum transfer - scenario that redistributes the revenues equally for all households. The transfer size does not depend on the socio-demographic characteristics of households or their estimated welfare losses. Instead, the government gives the same amount of money to each household.
2. Price subsidy - scenario where revenues are used to alleviate the welfare effects of the price increases for lower income households. From the carbon tax collected from all households, the ones in the lower deciles get a price subsidy thus reducing their welfare losses. As such, the transfer is inversely proportional to the total budget of the households and proportional to the welfare losses.
3. Double-dividend - scenario in which revenues are used to reduce other distortionary taxes. The model uses the assumption that the tax reduction is proportional to household income, therefore acts as income tax rebate.

The total revenue collected through the carbon tax is presented in Table 2.

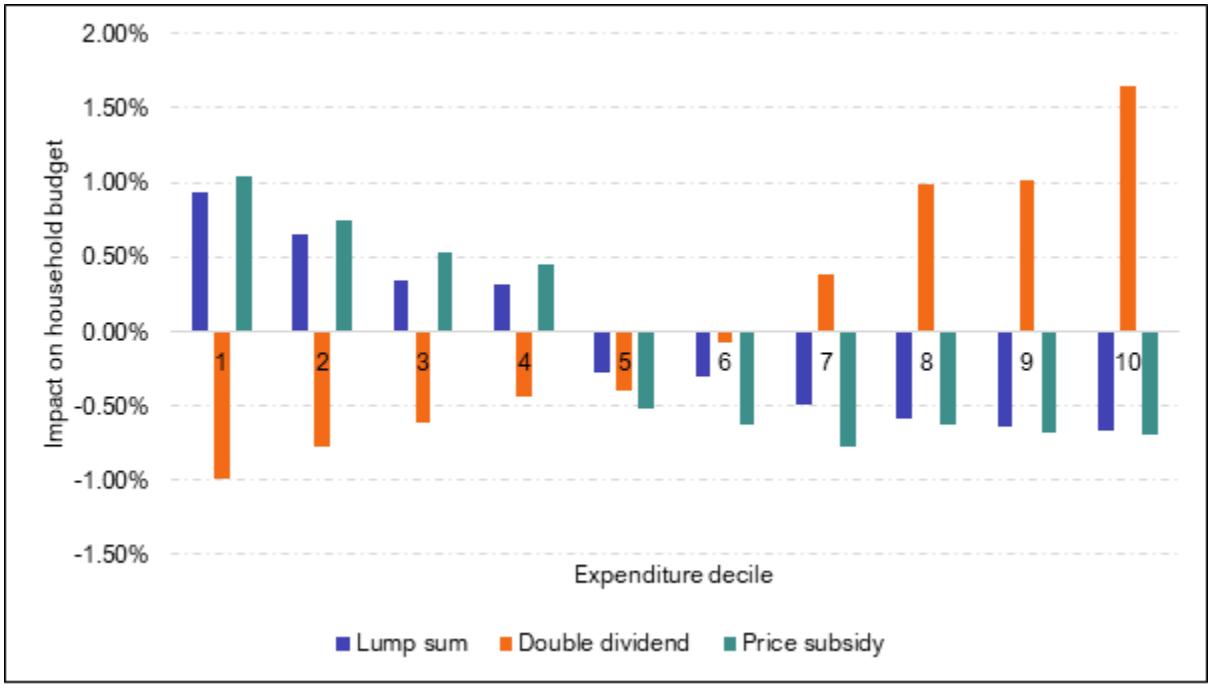
Table 2. Carbon tax revenues in the first and last year of the forecasted period

	Revenues in 2022 (million EUR)	Revenues in 2033 (million EUR)
Romania	337.18	1,040.34

Source: own computations using the MEMO model

Based on the three scenarios, we observe that carbon pricing can improve the welfare of the least affluent when coupled with the right redistribution strategy (Fig 24). Furthermore, the average losses of the lowest deciles are reduced significantly after redistribution. In addition, some revenue redistribution approaches produce macro effects. For example, reducing other distortionary taxes with the revenues obtained from the carbon tax is likely to have a positive effect on economic growth, but would primarily benefit the more affluent households in the short run.

Figure 24. Impact of the carbon tax on household budgets, by expenditure deciles (positive value represents a welfare gain).



Source: own computations using the QUAIDS model

The impact on energy poverty rates can also be estimated. We use one of the indicators of energy poverty built by the EU Energy Poverty Observatory, which also uses HBS data (EPAH, 2022a). The indicator defines energy poor households as those whose total energy expenditure falls below M/2, with M being the median value of the population. Table 3 compares estimates of energy poverty from the 2022 baseline values without a carbon tax with 2033 estimates for a scenario with a carbon tax but without redistribution, as well as for each of the three revenue recycling scenarios in 2033. The carbon tax with redistribution through price subsidy or lump sum results in lower energy poverty rates than in the baseline. The double-dividend scenario is associated with slightly higher rates of energy poverty. However, the results seem to indicate that the impact on energy poverty is rather small, whether positive or negative, if the carbon tax is complemented by revenue recycling.

Table 3. Energy poverty levels before and after tax.

	Baseline scenario (2022)	Post-tax scenario (2033)	Post-redistribution scenarios (2033)		
			Lump-sum	**Double dividend**	**Price subsidy**
Romania	18.83%	21.64%	16.75%	18.85%	14.85%

Source: own computations using the QUAIDS model

Policy implications

Carbon pricing is politically sensitive even at the level of the EU. Several MSs, civil society organizations and political leaders have criticized it on the ground of its potential impact on lower income households, particularly given the cost-of-living crisis driven specifically by the high energy prices after the invasion of Ukraine.

For example, the proposal of the EC to introduce ETS2 generated significant controversy, with several stakeholders calling for either changing, postponing, or scrapping it altogether. Trade unions in particular argued that carbon pricing would be ineffective in lowering emissions because of the low price-elasticity of demand, especially for lower income households. Because of the essential character of most emissions intensive goods and low availability of low-carbon alternatives, the argument goes, consumers would not respond to changes in prices by lowering their consumption or switching to alternatives. Instead, since suppliers would pass on the cost to consumers' bills, the latter would be burdened with a higher cost of living.

However, the potential to reduce emissions and mitigate negative effects on the economy and lower income households should not be ignored. For example, a recent World Bank report (World Bank, 2022) discussed two scenarios: (1) low-ambition starting at €15/ton in 2021 and reaching €50 in 2030, and (2) Paris-aligned starting at €45/ton and reaching €90 in 2030. Both scenarios result in reduced GHG emissions - the low-ambition scenario generates between 5 and 7% reductions compared to the baseline, while the Paris-aligned scenario results in a 9% reduction in Romania. If the revenues are used to reduce labour taxes, the GDP impact of the carbon tax would be positive in the short run and neutral in the longer run under both scenarios. In terms of employment, Romania would see net job growth under both scenarios.

The political discussion in Romania on the possibility of introducing carbon pricing at the household level has been marginal. Even the existing ETS for industry and the power sector has been seen domestically as too ambitious and hurting jobs in coal-fired power plants and mines. The Modernization Fund and article 10c of the ETS directive – which redirect part of the revenue from auctioned allowances under ETS1 improved the political acceptance of carbon pricing, as it was directed mostly at helping ailing coal-fired generators to switch to lower emissions technologies.

The issue of household energy prices tends to be politically sensitive, as illustrated by the generalized retail price cap imposed immediately after the first signs of the post-Covid recovery and then after the war in Ukraine. Hence, the appetite for additional carbon pricing is unlikely to be home-grown in Romania, a country still dealing with poverty and convergence with the EU, where the climate agenda is less prominent. However, the possibility of redistribution at the EU level – through the Social Climate Fund – where Romania may get one of the highest allocations, can be attractive enough compared to the relatively low expected effect on prices, at least in the short term.

The administrative capacity of the country is also relevant to this discussion. The experience with the heating aid, where bureaucracy and lack of coordination made the policy ineffective for several years may be illustrative for the challenges associated with a potential carbon tax. In Romania, social policy suffers from large inclusion and exclusion errors, which may extend to the revenue redistribution component of carbon pricing.

Our economic simulations provide evidence on the macro- and microeconomic impacts of carbon pricing, through a generalised theoretical carbon tax on all consumption goods, at levels required to achieve emissions reductions by 2033 in line with climate neutrality by mid-century. The findings suggest negligible impacts on GDP and employment. At the household level, welfare losses are between 0.8% and 1.4% of expenditure, slightly higher for lower income households. However, they could be mitigated by revenue recycling, particularly by targeting the lower deciles. Importantly, after revenue recycling, low-income households can improve their situation compared to a scenario in which no additional carbon tax would be imposed. In other words, carbon pricing combined with the right revenue recycling mechanisms can even have a progressive redistributive effect. Through adequate targeting, the carbon tax can reduce the rate of energy poverty. In this context, we conclude that carbon pricing can play a complementary role in promoting emission reductions in Romania.

Recommendations:

- Carbon taxes with revenue redistribution should be considered as a complementary policy option to pursue reductions in emissions and energy poverty at the same time.
- Carbon pricing should not be analysed in isolation. By being exposed to a carbon price, consumers are incentivised to seek lower carbon alternatives that are offered or subsidised through other policies. When considering carbon pricing, the mechanism should be planned and assessed together with other EU and MS level policies, such as energy efficiency, renewable energy expansion, electrification of transport, social benefits and others.
- Carbon pricing generates significant revenues, at least in the beginning. That revenue needs to be redistributed back to specific segments of the population, helping them cope with increased prices and invest to reduce their emissions in the long term, by switching to low carbon alternatives for heating such as heat pumps, insulating their homes or buying electric vehicles.
- The issue of implementation should also be addressed. The targeting required to reduce energy poverty and the impact of carbon pricing on the poorest will be more challenging for countries where existing welfare policies are plagued by large inclusion and exclusion errors such as Romania. Revenues should also be used for improving administrative capacity, particularly in the social policy sector.

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