International Microsimulation Association

RESEARCH ARTICLE

Inflation and Government Response – Distributional Impact on Austrian Households

Paul Eckerstorfer[1], Markus Riegler[1]*, Friedrich Sindermann[1]

[1]Austrian Parliamentary Budget Office, Vienna, Austria

Abstract Austrian consumer prices rose by 8.6% in 2022, followed by a 7.8% increase in 2023, with projections indicating a 4.0% rise in 2024. In response, the Austrian government introduced various support measures targeted at households, amounting to between 1.3% and 1.6% of GDP per year from 2022 to 2024. We use the tax-benefit microsimulation model EUROMOD and statistically matched data from the Household Budget Survey to analyse the effects on disposable income and expenditures. Households with lower income are on average more heavily affected by inflation, primarily because of their higher average propensity to consume. In total, relief is disproportionally allocated to the upper half of the income distribution in absolute terms, but relative to income it is higher in the lower deciles. Together with nominal increases in other sources of income, on average, households receive enough income to cover their additional expenditures. However, as there is significant heterogeneity across households, this result does not hold for all households, particularly not for those in the lower parts of the income distribution.

JEL classification: H12, H23, C81, D31

DOI: https://doi.org/10.34196/ijm.00328

1. Introduction

The sharp increase in consumer prices in the aftermath of the COVID-19 crisis led to substantial discretionary policy action across Europe. While in some countries the focus of policy measures was to reduce energy prices through tax cuts, subsidies and regulatory measures, other countries relied more on measures to stabilize household income.[1] The latter is particularly true for the case of Austria, which, above all at the beginning of the inflation crisis, strongly relied on rather broad-based measures to stabilize household income.

Austrian consumer prices increased by 8.6% in 2022, by 7.8% in 2023 and are expected to increase by 4.0% in 2024. While the inflation rate was roughly in line with the euro area average in 2022, it was substantially higher in 2023, and is forecast to remain above the euro area average in 2024 as well.[2] To some extent, this inflation differential might be explained by the policy strategy of the Austrian government, as debt-financed, broad-based income-stabilizing measures keep private demand high, while price-reducing measures are of minor relevance in Austria's policy mix.

In this paper, we study the impact of consumer price increases on Austrian households and the effect of government measures set in response to high inflation rates on disposable income. We obtain changes in disposable income for 2022, 2023, and 2024 with respect to the reference year

***For correspondence:**
markus.riegler@parlament.gv.at

Author Keywords:
microsimulation, redistribution, inflation, taxes , transfers

1. See ***Prammer and Reiss (2023)*** for an overview of government measures in Austria compared to the EU.
2. According to the European Commission's Winter Forecast 2024, the annual inflation rate (HICP) for the euro area was 8.4% in 2022, 5.4% in 2023, and is forecast to be at 2.7% in 2024.

2021, and compare them with expenditure changes over the same period. Income changes result from inflation relief measures, the implementation of an eco-social tax reform during this period, and from other income changes, such as increases in wages and social transfers, which are basically indexed to the lagged inflation rate. The rise in expenditures is measured as the additional amount necessary to afford the same consumption basket after the rise of consumer prices. As we abstract from behavioural responses, the measured inflation burden can be interpreted as an upper bound for the welfare cost. Both income and expenditure changes are obtained for different parts of the income distribution. This analysis enables us to assess whether government measures are sufficient to compensate households, on average, for their increased consumption costs in different parts of the income spectrum.

For this purpose, we use the EUROMOD microsimulation model based on EU-SILC data. We statistically match the income data with consumption data from the Household Budget Survey. The input data are uprated and reweighted to account for changes in income and employment. We use actual inflation data until the end of 2023 and the macroeconomic forecast by the Austrian Institute of Economic Research (WIFO) from December 2023. We include government measures in response to inflation for households legislated until February 2024.

Households with lower incomes are, on average, more heavily affected by inflation. This is primarily driven by their higher consumption expenditure relative to income. In 2022, price increases for the average consumption basket of lower-income households tended to be smaller, as these households spend a smaller share on fuel. However, this result reversed in 2023 with falling fuel prices and rising household energy prices. In general, differences in average inflation rates between income deciles are small in the analysed period when compared to movements in aggregate inflation.

The Austrian government has responded with a variety of measures targeting households. They primarily increased disposable household income. A smaller share of these measures aims at reducing prices by decreasing energy taxes and subsidising electricity cost. The estimated annual fiscal cost of these measures is between 1.3% and 1.6% of GDP for the years 2022 to 2024.

Measures in 2022 primarily included one-time social transfers and temporary tax breaks. Starting in 2023, a permanent change was introduced with the indexation of important nominal values in the personal income tax code to prevent bracket creep. Likewise, some social benefits are linked to inflation from 2023 onwards. Further measures in 2023 and 2024 include one-off payments to low-income households and to vulnerable families. Overall, a larger portion of the relief volume is allocated to the upper half of the income distribution. However, as the relief in relative terms amounts to a higher share of income in the lower parts of the income distribution, the overall fiscal effect is progressive.

The measures on their own were sufficient to compensate lower-income households, on average, for their higher cost of consumption in 2022. Once we also account for the nominal growth of wages and transfers (e.g. pensions), the additional income from 2022 to 2024 is, on average, enough to cover the additional cost of the consumption bundle. Especially in 2023, however, this does not hold for the lower deciles. Moreover, there is substantial heterogeneity in income relief even within deciles, indicating that some households are hurt more by inflation than they are relieved by the additional income.

A related analysis for Austria, conducted by ***Maidorn and Reiss (2023)***, examines measures taken in 2022. In addition to the income dimension, they differentiate between other household characteristics like car ownership or type of heating. They find that the fiscal measures did not fully offset the inflation-induced increase in consumption expenditure for households severely affected by the inflation shock across the income spectrum. Another recent study by ***Fessler et al. (2023)*** examines the impact of rising consumer prices on Austrian households. They analyse the heterogeneity of inflation rates for different household types and look at which households are most likely to experience financial distress due to inflation. According to their analysis, most households have the financial means to afford the overall increase in the price level. The group of households that struggle predominantly consists of those already facing a challenging financial situation during periods of low inflation (e.g. unemployed, working poor, single parents).

Several other recent studies investigate the distributional impact of high inflation for other countries. ***Sologon et al. (2023)*** analyse the distributional and welfare impact of price changes since the start of the cost of living crisis for a selection of European countries. They take into account behavioural responses of households to (relative) price changes to account for the capacity of households to

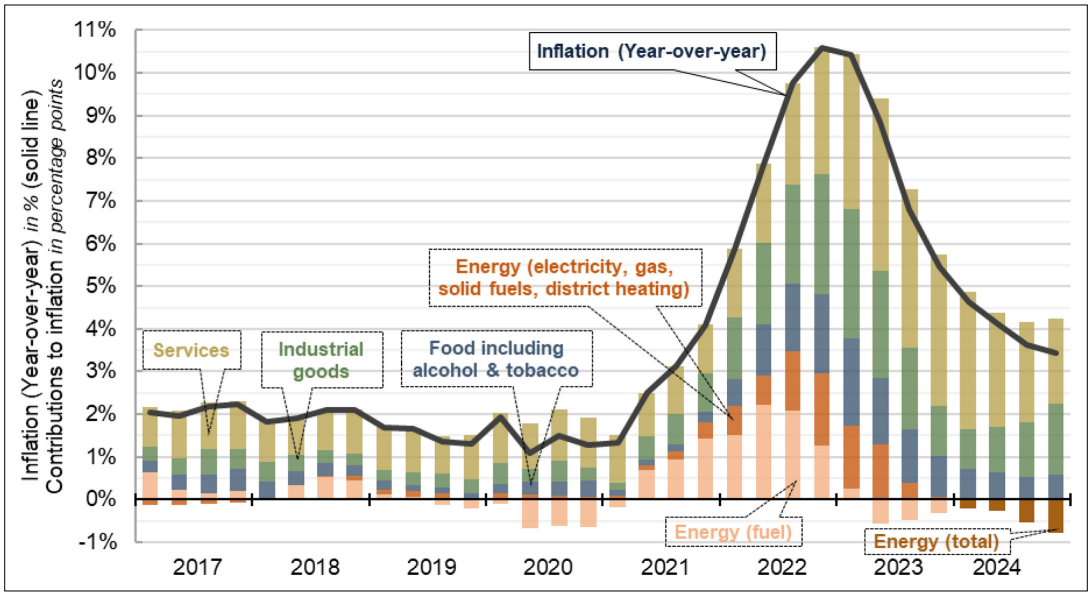

Figure 1 Development of the Consumer Price Index in Austria.

Source: Statistics Austria, WIFO macroeconomic forecast December 2023.

compensate the price induced welfare losses to some extent. As in our study, they also account for different consumption patterns in different parts of the income distribution, confirming our result that households with low savings are disproportionately affected by the increase in expenditures. ***Ari et al. (2022)*** also adopt a European perspective to study the impact of the surge in fossil fuel prices on the cost of living for European households and discuss different options to support households. They also find a regressive burden from surging energy prices and argue that policy makers should provide income relief to the vulnerable instead of broad-based price-suppressing measures, thus allowing the price signals to operate more freely. ***Curci et al. (2022)*** analyse, in a microsimulation study, the redistributive effects of inflation in Italy and quantify the extent to which government measures have mitigated the impact of the inflationary shock. According to their analysis, government intervention reduced the drop in purchasing power in 2022 from €3,200 to €2,000 per household on average.

2. Inflation dynamics

After a long period with inflation rates close to or below 2%, inflation began to surge in mid-2021. By the end of 2022, it reached a peak with a year-over-year increase in the consumer price index (CPI) of 10.6% in the fourth quarter. Over the course of 2023, inflation decreased gradually and reached 5.4% in the fourth quarter. The Austrian Institute of Economic Research (WIFO) expects a further reduction in 2024. In their macroeconomic forecast released in December 2023, they project an average CPI increase of 4.0% in 2024 after 7.8% in 2023 (***WIFO, 2023***).

Figure 1 depicts the quarterly year-over-year change in the CPI from 2017, also covering the forecast period 2024, and shows the contribution of different product and service categories to inflation. At the onset of the high-inflation period in mid-2021, inflation was primarily driven by increasing energy prices for fuel (Diesel, petrol, heating oil). It then broadened to other product categories in 2022. In 2023, inflation was largely influenced by services and industrial goods. Energy prices for fuel fell in 2023, while strong price increases of gas and district heating led to a positive contribution of other energy prices in 2023.

Table 1 shows the distribution of consumption categories across income deciles for 2021. As expected, food accounts for a larger share of consumption among lower-income households, while industrial goods are more prevalent in the consumption baskets of higher-income households. Fuel, which saw a strong price increase in 2022 followed by dampening effect in 2023, makes up a larger share of energy consumption for higher-income households. In contrast, for lower-income households, other forms of energy, such as electricity and gas, are more important.

Table 1. Components of consumption across the income distribution.

	Inflation			Share of consumption in deciles of disposable income										
	2022	2023	2024	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	total
Services	4.6%	7.9%	5.4%	47%	49%	45%	46%	46%	46%	44%	47%	46%	47%	46%
Industrial goods	7.4%	7.6%	4.4%	25%	27%	29%	31%	33%	31%	34%	33%	34%	35%	32%
Food incl. alcohol & tobacco	9.0%	10.1%	4.3%	19%	16%	17%	15%	14%	15%	14%	13%	13%	12%	14%
Energy (electricity, gas etc.)	31.0%	20.5%	-6.6%	6%	5%	5%	4%	4%	4%	4%	4%	3%	3%	4%
Energy (fuel)	46.6%	-9.0%	-6.6%	3%	3%	4%	3%	3%	4%	4%	4%	4%	3%	4%
Total	8.6%	7.8%	4.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Statistics Austria, IHS, WIFO macroeconomic forecast December 2023, Household Budget Survey 2020, authors' calculations.

The individual inflation rates of households differ significantly along many dimensions like income, place of residence (rural or urban), household size, education, or age. Even households with similar observable characteristics are likely to face different inflation rates due to preference heterogeneity. For this study, the inflation heterogeneity in different areas of the income distribution is of relevance, as we compare the higher cost of consumption with the relief volume of government measures in different parts (deciles) of the income distribution. ***Figure 2*** shows the inflation rates in 2022, 2023 and 2024 across the income distribution.[3]

The estimated inflation rates in 2022 tend to be lower in the first deciles. They range from 7.8% in the first decile to 8.6% in the third, sixth and ninth decile. In total, in 2023, annual inflation rates

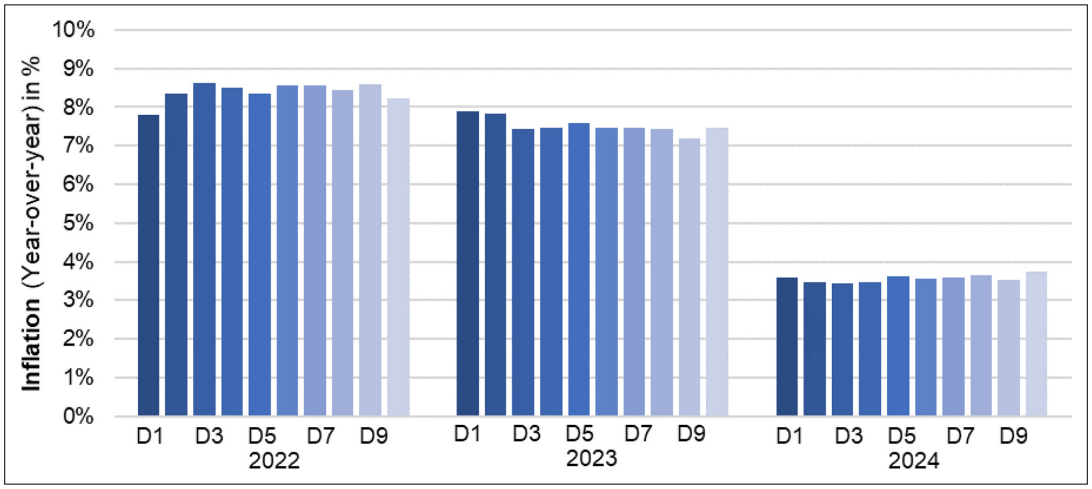

Figure 2 Inflation rates across the income distribution.

Deciles of equivalised disposable income: D1, D2, … , D10.

Source: Statistics Austria, WIFO macroeconomic forecast December 2023, Household Budget Survey 2020, authors' calculations.

3. Inflation rates across the income distribution are calculated using the structure of equivalised consumption expenditure from the household budget survey. The resulting aggregate annual inflation rates for the years from 2022 to 2024 are, on average, about 0.3 percentage points lower than the official inflation rates shown in ***Figure 1***, which use the CPI-basket.

Table 2. Underlying forecast.

	2019	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
	index (2019=100)						change (year-over-year in %)				
real GDP	100.0	93.4	97.3	102.0	101.2	102.1	-6.6	+4.2	+4.8	-0.8	+0.9
nominal GDP	100.0	95.9	102.0	112.6	121.4	128.0	-4.1	+6.4	+10.4	+7.8	+5.4
consumer prices	100.0	101.4	104.2	113.2	122.1	127.0	+1.4	+2.8	+8.6	+7.9	+4.0
indexation of income tax brackets	100.0	100.0	100.0	100.0	105.2	115.6	0.0	0.0	0.0	+5.2	+9.9
average annual wage	100.0	102.2	104.9	109.9	118.9	128.2	+2.2	+2.7	+4.7	+8.2	+7.8
indexation of pensions	100.0	101.8	103.3	105.2	111.3	122.1	+1.8	+1.5	+1.8	+5.8	+9.7
property income	100.0	51.5	70.7	97.7	106.4	113.1	-48.5	+37.2	+38.3	+8.9	+6.3
population	100.0	100.4	100.8	101.8	102.6	103.2	+0.4	+0.4	+1.0	+0.8	+0.6
employed	100.0	98.0	100.4	103.3	104.5	105.2	-2.0	+2.5	+3.0	+1.1	+0.7
unemployed	100.0	135.9	110.1	87.3	90.0	91.0	+35.9	-19.0	-20.7	+3.0	+1.1
pensioners	100.0	103.1	104.8	106.1	107.4	109.0	+3.1	+1.7	+1.2	+1.3	+1.4

Source: Statistics Austria, WIFO macroeconomic forecast December 2023, authors' calculations.

decreased slightly with increasing income, spanning from 7.2% in the ninth decile to 7.9% in the first decile. For 2024, using the forecast from December 2023, no substantial differences between average inflation rates in the deciles are expected. They range from 3.4% to 3.7%. In summary, while there is some heterogeneity across households, differences between average inflation rates across deciles of the income distribution are small compared to the variation in inflation over time. Hence, it is average inflation that dominates the results when calculating the burden of inflation. Differences in inflation rates between deciles play a minor role in these years (see Section 5.2 for a decomposition of the inflation burden).

3. Methodological approach

We simulate the effect of income-related measures using the tax-benefit microsimulation model EUROMOD and data from EU-SILC 2020. To assess the effect of price reducing measures we use the Household Budget Survey 2020. The two samples are matched statistically following ***Lamarche et al. (2020)*** using a random hot-deck method (see Appendix A.4 for more details).

We recalibrate the weights of households and uprate income and transfers in the EU-SILC data to account for changes in the population and the macroeconomic environment since 2019. For this procedure we mainly rely on the macroeconomic forecast provided by WIFO from December 2023. ***Table 2*** shows the most important time series used for uprating.

For our distributional analyses we calculate the equivalised disposable income of households using the OECD-modified scale.[4] We divide households into deciles with the same number of persons by their equivalised disposable income before reforms in each year. Within each decile, the average equivalised disposable income before and after reforms is compared to calculate the reform effect.

To calculate consumption expenditure in each year, we inflate households' consumption expenditures from the Household Budget Survey 2020 using the Austrian consumer price index (CPI) at the COICOP class level (four-digit level, e.g. electricity, gas, fuels and lubricants).[5] While we use realised CPI data up to the end of 2023, we extend the CPI for 2024 using the inflation forecast provided by

4. The first adult is assigned a weight of 1.0, further persons aged 14 and over receive a weight of 0.5 and children under the age of 14 are given a weight of 0.3.
5. For COICOP categories with no exact match in the CPI we use the lowest available CPI category. As part of the survey period of the Household Budget Survey 2020 (March 2020 until mid-June 2020) falls into the period of COVID-19 restrictions, we apply a correction factor to consumption in this period. We calculate the correction factor as the percentage difference between the actual average per capita consumption during the COVID-19 period and the per capita consumption that would be observed if the seasonal pattern in 2019/20 was similar to the seasonal pattern in the last Household Budget Survey in 2014/15. We only apply this correction factor to goods for which consumption data is collected via a household book, while we don't correct consumption data that is collected via a questionnaire covering the past six or twelve months. The quantitative effects of applying this correction are minor.

WIFO from December 2023. This forecast contains separate inflation forecasts for the sub-aggregates food (including alcohol and tobacco), industrial goods, services and energy (see ***Figure 1***).

We calculate the effects of inflation on consumption expenditure without any demand response and ask whether the same consumption basket can be afforded using the additional income. In practice, households will substitute between different goods when their relative price changes and they can or have to adjust their total consumption. The approach taken in the welfare analysis by ***Sologon et al. (2023)*** allows for this substitution. They find that the behavioural component is relatively small.

4. Government measures and their distributional effects

Starting in spring 2022, the Austrian government implemented a number of measures to cushion the effect of rising energy cost and inflation on households and firms. In section 4.1 we provide an overview on the budgetary volume and the type of measures targeted at households. The distributional effects of these measures on household income are shown in section 4.2, details on the design of measures are provided in Appendix A.1.

4.1. Government measures in response to high inflation

The measures targeted at households are a combination of income supporting and price reducing measures, of means-tested and non-means-tested measures, and of temporary and permanent measures. In the beginning of the energy and inflation crisis, the focus was on income support measures. Starting in autumn 2022, as inflation began affecting a wider range of products and services and turned out to be more persistent than initially expected, price-reducing measures became more relevant. ***Table 3*** provides a list of measures included in the distributional analysis, along with their associated relief volumes.

The total relief volume of government measures to support households amounts to between 1.3% and 1.6% of GDP per year in the analysed period 2022 to 2024. In 2022 and 2024, the focus is on income support measures with a share of the total relief volume of more than 80%. In 2023, price reducing measures gain relevance due to temporary electricity price subsidies and the share of income support measures amounts to 63%. Details on the design of measures are provided in Appendix A.1.

Table 4 provides a summary on the type of measures (tax, transfer or subsidy), on means-testing (yes/no) and on the time span (temporary or permanent).

In 2022, government measures were largely characterised by temporary, non-means-tested transfer measures. The relevance of permanent measures increases from 2023 onwards, with the start of the annual indexation of income tax brackets and of further social transfers.[6] By 2024, already 80% of the total relief volume announced so far stems from permanent measures. The share of means-tested measures is low throughout the entire period.[7] In 2022 and 2023, roughly one quarter of the total relief volume is allocated to means-tested measures, dropping to only 5% in 2024. On the one hand, the low share of means-testing results in broader parts of the population benefitting from the measures. On the other hand, it increases the fiscal cost and higher incomes can result in higher demand and fuel inflation.

The relevance of tax measures increases from 29% of the total relief volume in 2022 to 73% in 2024. Subsidy measures primarily are of relevance in 2023 with a share of 31%. Transfers dominate in 2022 and lose relevance over time.

4.2. Distributional effects of government measures

In this section, we analyse the distributional effects of the measures by deciles of equivalised disposable income. ***Table 5*** shows the allocation of the total relief volume from 2022 to 2024 for each measure and decile.

6. In the past, tax brackets were adjusted at irregular intervals and the last major reform (eco-social tax reform) was passed in early 2022. The resulting share of income tax revenues to taxable income would have been comparably low in the years 2022 to 2024. The counterfactual for our analysis is that there wouldn't have been any further changes to the income tax code until 2024.
7. In ***Table 3*** we differentiate between means-tested measures at the household and the personal level. From the latter also households in the upper part of the income distribution can benefit, if a person benefiting from such a measure lives in a high-income household (e.g. one-time payments for unemployed persons).

Table 3. Government measures to support households.

	Categorisation			Total relief volume in % of GDP		
	means-tested (yes/no)	type	temporary or permanent	2022	2023	2024
Income support				**1.28**	**0.82**	**1.39**
One-off payments to all households				**0.70**	**0.00**	**0.00**
Increase of a lump-sum climate bonus	*no*	*transfer*	*temporary*	*0.62*	0.00	0.00
Transfer for electricity bill	*no*	*transfer*	*temporary*	*0.09*	0.00	0.00
One-off payments to low income households				**0.35**	**0.27**	**0.01**
One-off payments to vulnerable households	*yes (household)*	*transfer*	*temporary*	*0.05*	*0.01*	*0.00*
One-off payments to unemployed persons	*yes (person)*	*transfer*	*temporary*	*0.05*	*0.00*	*0.00*
Tax credit for employees and self-employed	*yes (person)*	*tax*	*temporary*	*0.16*	*0.00*	*0.00*
One-off payments to pensioners	*yes (person)*	*transfer*	*temporary*	*0.09*	*0.11*	*0.00*
Transfer for housing and heating	*yes (household)*	*transfer*	*temporary*	*0.00*	*0.15*	*0.01*
Measures for families				**0.15**	**0.04**	**0.07**
One-off payment per child	*no*	*transfer*	*temporary*	*0.08*	*0.00*	*0.00*
One-off payment per child to vulnerable families	*yes (household)*	*transfer*	*temporary*	*0.00*	*0.04*	*0.07*
Earlier increase of a child tax credit	*no*	*tax*	*temporary*	*0.06*	*0.00*	*0.00*
Increase of a child tax credit for low income earners	*yes (household)*	*tax*	*permanent*	*0.01*	*0.01*	*0.00*
Increase of commuter tax allowances and credits	***no***	***tax***	***temporary***	**0.07**	**0.05**	**0.00**
Indexation of income tax brackets	***no***	***tax***	***permanent***	**0.00**	**0.38**	**1.12**
Indexation of further social transfers	***no***	***transfer***	***permanent***	**0.00**	**0.07**	**0.19**
Price reduction				**0.12**	**0.47**	**0.26**
Energy tax measures				**0.09**	**0.07**	**0.07**
Reduction of tax rate on electricity and gas	*no*	*tax*	*temporary*	*0.05*	*0.07*	0.07

Continued

Table 3. Continued

	Categorisation			Total relief volume in % of GDP		
	means-tested (yes/no)	type	temporary or permanent	2022	2023	2024
Delayed introduction of CO_2-price (non-EU-ETS)	*no*	*tax*	*temporary*	*0.04*	*0.00*	0.00
Electricity price subsidy				**0.03**	**0.40**	**0.18**
Price cap for basic electricity consumption	*no*	*subsidy*	*temporary*	*0.03*	*0.33*	*0.18*
Subsidy of power grid loss cost	*no*	*subsidy*	*temporary*	*0.00*	*0.07*	*0.00*
Total in % of GDP				**1.40**	**1.29**	**1.64**
Total in million €				*6,264*	6,228	8,351

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

Altogether, the relief volume increases with income. While 9% are allocated to the first decile, the top decile receives 12%. This is mostly driven by income support measures, which are more unevenly distributed[8] – besides also making up a higher share of the total volume. Within income support measures, the indexation of income tax brackets, which accounts for 45% of the volume, has a steep gradient. The first decile receives 2% of its relief volume, while the tenth decile receives 19%.[9] In contrast, lower-income deciles receive more than a proportional share of measures for families, of targeted one-off payments to low-income households, and of the indexation of further social transfers. Certain households in the upper part of the income distribution also benefit from these measures, as

Table 4. Categorisation of measures.

	2022		2023		2024	
	in % of GDP	*share in category*	in % of GDP	*share in category*	in % of GDP	*share in category*
Total	**1.40**		**1.29**		**1.64**	
Type of measure						
Transfer measures	0.97	*69%*	0.38	*29%*	0.26	*16%*
Tax measures	0.40	*29%*	0.51	*40%*	1.20	*73%*
Subsidy measures	0.03	*2%*	0.40	*31%*	0.18	*11%*
Means-testing						
Means-tested measures	0.37	*26%*	0.31	*24%*	0.08	*5%*
Non-means-tested measures	1.04	*74%*	0.98	*76%*	1.56	*95%*
Permanent or temporary						
Permanent Measures	0.01	*1%*	0.46	*36%*	1.31	*80%*
Temporary Measures	1.39	*99%*	0.83	*64%*	0.33	*20%*

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

8. To estimate the distributional effect of the price cap on basic electricity consumption, it was assumed that electricity contracts do not differ systematically across the income distribution. Estimated differences between households result only from the amount of their consumption and the location of their main residence.
9. It should be noted that this measure undoes the burden from bracket creep that would similarly increase with income.

Table 5. Distribution of relief volume 2022 to 2024.

		Share of relief volume in deciles of disposable income									
Relief volume in million €	Total	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
All measures for private households	**20,840**	**9%**	**10%**	**9%**	**9%**	**9%**	**10%**	**10%**	**10%**	**11%**	**12%**
Income support	**16,720**	**9%**	**10%**	**9%**	**9%**	**9%**	**9%**	**10%**	**10%**	**11%**	**12%**
One-off payments to all households	*3,170*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*9%*
One-off payments to low income households	*2,900*	*17%*	*18%*	*14%*	*11%*	*10%*	*8%*	*8%*	*7%*	*5%*	*3%*
Measures for families	*1,260*	*26%*	*20%*	*9%*	*10%*	*9%*	*7%*	*7%*	*5%*	*4%*	*3%*
Increase of commuter tax allowances and credits	*550*	*0%*	*2%*	*3%*	*4%*	*6%*	*10%*	*11%*	*18%*	*21%*	*24%*
Indexation of income tax brackets	*7,530*	*2%*	*5%*	*7%*	*8%*	*9%*	*10%*	*12%*	*13%*	*15%*	*19%*
Indexation of further social transfers	*1,300*	*13%*	*13%*	*11%*	*12%*	*11%*	*10%*	*10%*	*8%*	*7%*	*5%*
Price reduction	**4,130**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**11%**
Energy tax measures	*1,140*	*8%*	*9%*	*10%*	*9%*	*9%*	*10%*	*10%*	*10%*	*11%*	*14%*
Electricity price subsidy	*2,980*	*10%*	*11%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

some targeted measures (e.g. one-off payments to unemployed) as well as some social transfers (e.g. child benefits) are not subject to means-testing based on household income. Broad-based one-off payments to all households are distributed almost equally across deciles.[10]

In a next step, we analyse the progressivity of the measures by calculating relative changes in average equivalised income across deciles of the income distribution.[11] ***Figure 3*** shows the results for each year and measure. Overall, there is a clearly progressive effect in all years. The relief amounts to between 8.5% and 9.4% of income per year in the lowest decile and between 1.3% and 2.5% in the top decile.

The one-off payments in 2022 led to a higher relative increase of incomes in the lower deciles as they were distributed almost equally across deciles in absolute terms. They increased the average equivalised disposable income by 4.6% in the lowest decile and by 0.7% in the highest. One-off payments targeted to low-income households are more progressive by design. They raise incomes in the first decile by 2.7% in 2022 and 3.0% in 2023.

10. Differences primarily exist due to some means-testing and taxation for high-income earners and due to the unequal distribution of children.
11. Formally, price-reducing measures increase real disposable income of households. We calculate their relief as the reduction of equivalised household expenditures relative to (nominal) equivalised disposable income.

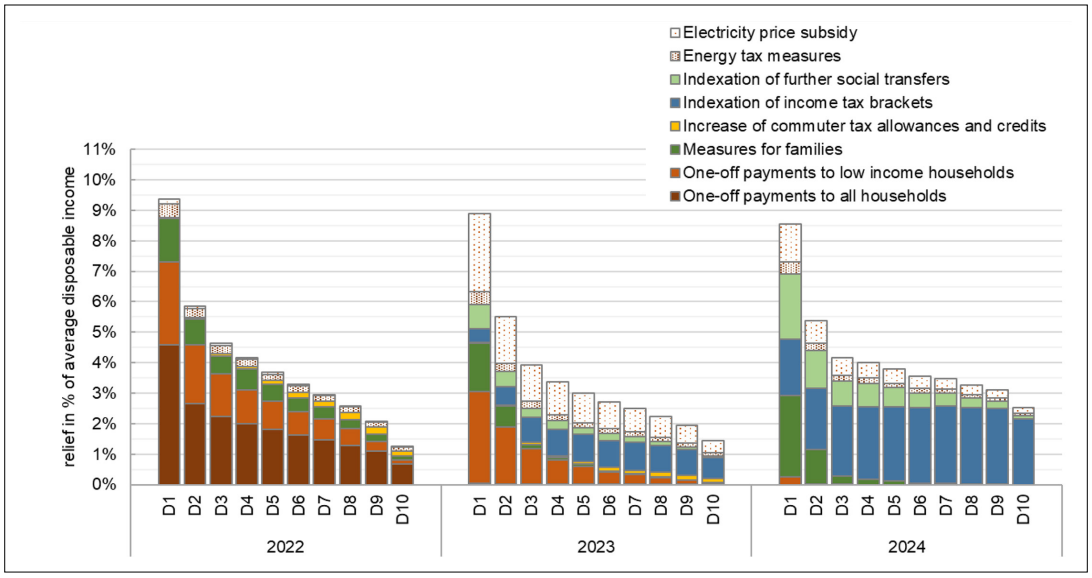

Figure 3 Relief relative to equivalised disposable income.

Deciles of equivalised disposable income: D1, D2, … , D10.

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

Measures for families have a progressive effect in all years, but especially so in 2023 and 2024 when they contain transfers and tax credits for low-income earners. Their biggest effect on average equivalised disposable income is in the first decile in 2024 (+2.7%).

The temporary increase of commuter tax allowances and credits is a regressive measure, primarily because the share of commuters rises with income. Compared to the other measures, it has a smaller volume, and it increases income by rounded 0.0% at the bottom and by up to 0.2% in 2022 and 2023 in the higher deciles.

The indexation of income tax brackets starting in 2023 has an inverse U-shaped relative relief. The biggest effects on income occur in the seventh decile, with increases of 0.9% in 2023 and 2.5% in 2024. In contrast, the indexation of further social transfers is progressive, increasing average equivalised disposable incomes by up to 0.8% in 2023 and 2.1% in 2024 for the bottom decile.

The price reduction through energy tax measures and the electricity price subsidy both have a progressive effect, benefitting the bottom deciles most relative to income. The biggest effect is in 2023, when electricity prices before applying the subsidy were higher than in 2024. In addition, power grid costs were only subsidised in 2023. In total, the estimated relief due to price reduction amounts to 3.0% of disposable income in the bottom decile and to 0.5% in the top decile in 2023.

Analysing the effect on average disposable income of each decile masks the high degree of heterogeneity even across households within the same decile. ***Figure 4*** shows the dispersion of relief due to the income support measures.[12] In general, this dispersion is greater in the lower deciles of the income distribution than in the higher deciles. First, differences between incomes across households within the same decile are relatively larger in the bottom deciles. Then, the relief from one-off payments expressed relative to income varies more. Second, not all households benefit from the targeted measures as they are tied to certain requirements (e.g. social assistance, unemployment, minimum pensions, children in the household). In the higher deciles, income tax-related measures are a more important component of relief, and their effect varies less across households with similar income.

12. There is not enough information available on electricity price differences between households to estimate the dispersion due to the electricity price subsidy. Therefore, we cannot calculate the heterogeneity for the price reducing measures.

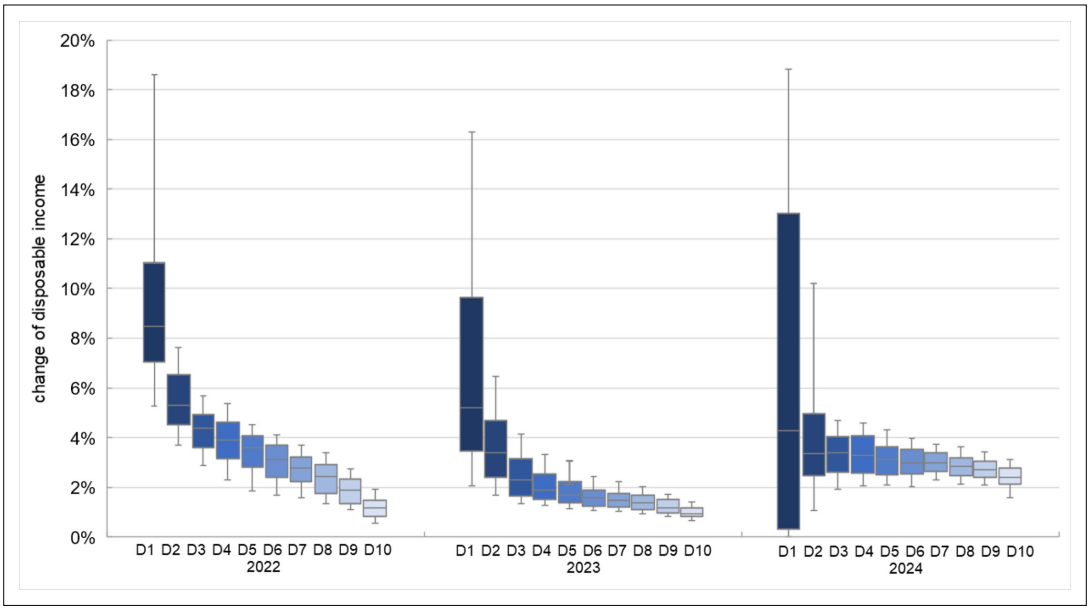

Figure 4 Heterogeneity of income support

Deciles of equivalised disposable income: D1, D2, … , D10. The whiskers run from the 10th to the 90th percentile, the columns cover the 2nd and 3rd quartile.

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

5. Development of household income and expenditure

In this section, we analyse how households' disposable income changes across the income distribution compared to 2021 and assess how households are affected by inflation.

The counterfactual for this exercise is a steady growth of nominal income and prices by 2% per year. In practice, nominal income grows by more than 2% per year in the years 2022 to 2024 in all deciles. We decompose this excess growth into three components. First, income support in response to inflation, as described above, raises disposable incomes. Second, the eco-social tax reform, passed before the start of the energy and inflation crisis, increases net income, mostly by lowering tax rates and increasing tax credits.[13] Third, the residual income growth is due to nominal wage growth, adjustment of gross pensions and a favourable development of the labour market.

The burden of inflation is defined for each household as the increased cost of its consumption bundle since 2021 that exceeds 2% per year. This is calculated using realised inflation rates and the WIFO's inflation forecast as of December 2023. On top of that, we calculate the counterfactual additional burden, if the price-reducing measures described above had not been taken. Note that this burden only considers the effect of inflation on consumption expenditures. In addition, inflation also reduces the real value of savings. For households with a positive savings rate, this means that higher nominal savings are needed to maintain the same level of real savings. Furthermore, inflation can also have valuation effects on the owned assets. High-income households tend to be affected more heavily on average because of their higher wealth.

Interest payments by households are not included in their consumption expenditure by definition. Rising interest rates in response to inflation affect especially households with variable rate mortgages negatively on top of their inflation burden.

13. The main parts of the reform were passed in early 2022. Some measures targeting low incomes and the first tax bracket were already introduced from 2021. Our counterfactual income in 2021, which serves as the basis for the calculation is income in the absence of the eco-social tax reform.

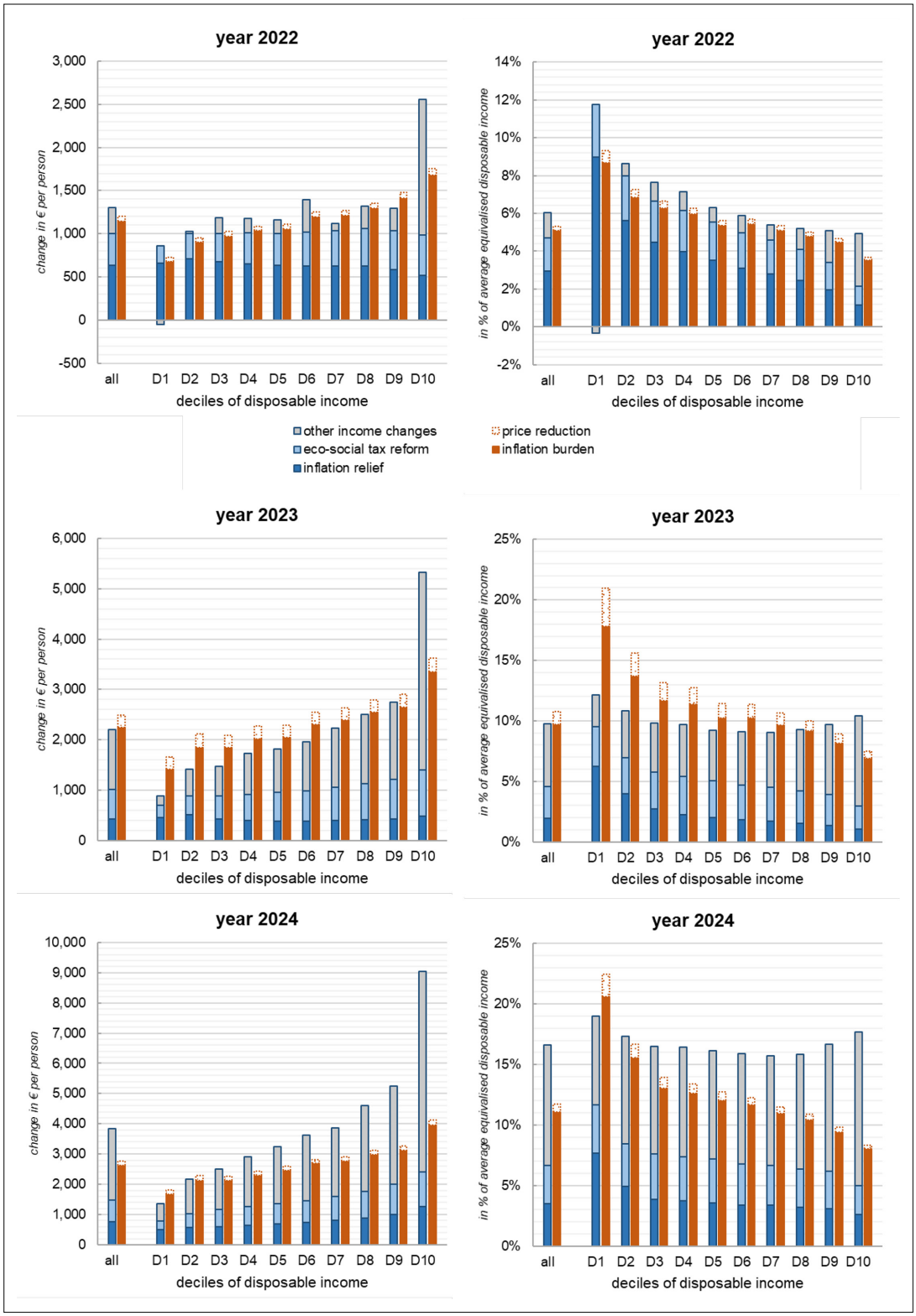

Figure 5 Change in income and expenditure compared to 2021 (in excess of 2% annual growth)

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

5.1. Changes in income and expenditure across the distribution

Figure 5 displays our results for income and expenditure in the years 2022 to 2024 compared to the year 2021. The left panels show the average change in income and the inflation burden per capita for the total population as well as for the deciles of the income distribution. The right panels show these numbers relative to the respective average equivalised disposable income.

As shown in Section 4, income support from the government response to high inflation has a progressive effect and leads to a higher relative increase in disposable income in the lower deciles. In 2022, persons in the lower deciles received a higher inflation relief per capita, not only in relative but also in absolute terms. In 2023 and 2024, the indexation of income tax brackets favours high earners more in absolute terms. In those years, the higher relative relief in the lower deciles is due to the denominator effect arising from their lower disposable incomes. Similarly, the eco-social tax reform favours high-income earners more in absolute terms but leads to higher relative increases in disposable income for low-income households. In contrast, the estimated residual of other income changes tends to increase income in the upper deciles by more, even in a relative sense. This result is explained by income from employment being more important in the higher deciles and by expected wage growth per person being stronger than the growth of transfers. An additional factor especially in the top decile is investment income, which was comparably low in 2021 and grew strongly in 2022.[14]

The burden of inflation increases in absolute terms with income but decreases in relative terms. Hence, the excess inflation has a regressive effect. Even though we do take account of different consumption baskets, the burden is roughly proportional to consumption and heterogeneous inflation rates play a minor role (see discussion in the next subsection). As a result, the increase with income in absolute terms mostly reflects higher consumption levels of higher-income households. The decrease of the burden relative to disposable income in the higher deciles reflects average propensities to consume that are decreasing with income. In the lower parts of the income distribution, the average propensities to consume are larger than one (negative saving), which drives the result that income increases are not sufficient to cover expenditure increases in 2023 and 2024 in the bottom decile. Price reducing measures only played a minor role in 2022 and are most important in 2023. Their relief volume is distributed relatively equally across deciles, such that the relief per capita is similar. Relative to disposable income this results in a higher relief for low-income households, on average.

Comparing the absolute change in nominal income with the burden of inflation lets us answer the question, whether households on average receive enough income to cover their additional expenditures without changing the consumption behaviour. If the changes in income and expenditures were equal, nominal (dis)savings of households would remain unchanged. Real (dis)savings would go down in this case, however. If the average propensity to consume is larger than one, even a constant real disposable income is not sufficient to cover the increase in expenditures.

Note that this question compares households in a decile of the income distribution with those households that were in the same decile in 2021. Those are not necessarily the same households as there is income mobility. Furthermore, the results show averages within deciles. The affectedness of single households may deviate significantly from these averages (see for instance ***Figure 4*** on the dispersion of income relief measures).

In 2022, nominal income increases were enough to exceed the inflation burden on average. Overall, the positive effect was €160 per person or 1.0% of equivalised disposable income. In terms of equivalised income the effect is positive on average in all deciles.[15] While this result holds on average, it does not hold for all households, as there is substantial heterogeneity of nominal income changes and households' inflation burden.[16]

14. See Appendix A.3 for a decomposition of this income component into earned income, pension income, unemployment income, and other income sources.
15. Looking at income and expenditure per person, the effect is slightly negative in two deciles. This is due to the equivalisation of income when calculating relative changes as opposed to displaying the (non-equivalised) per capita change in absolute terms. The same absolute increase in income raises the average equivalised income by more when it goes to multi-person households than when it goes to single-person households.
16. Here, the heterogeneity of average propensities to consume within deciles plays an important role. We do not show this dispersion across households due to concerns of overestimating the variance. Because parts of the consumption expenditures of an individual household are only recorded over two weeks and extrapolated for the whole year in the household budget survey, some households might spend exceptionally high or low amounts

In 2023, the estimated nominal income increase for the total population (9.8% in excess of trend growth of 2% per year) is about the same as the burden of inflation (9.7% of equivalised disposable income). Especially in the lower deciles, the burden significantly outweighs the relief. In the first decile, the gap is around €520 per person or 5.7% of equivalised disposable income. Partly, this is due to income support being smaller overall and less progressive in 2023 than in 2022. In addition, the regular indexation of pensions lags inflation, such that real pension incomes decrease. Wages are also adjusted with a lag, but from 2021 to 2023, the real decrease of average wages (-3.3%) is significantly smaller than that of pensions (-8.1%).

In 2024, the expected annual adjustments of nominal wages and pensions are significantly above the annual inflation rate. This means that average annual wages are expected to get close to the level of 2021 in real terms (+0.2%). The indexation of pensions from 2021 to 2024 will be 3.0% short of inflation, compared to 8.1% from 2021 to 2023. Together with the income relief from fiscal policy, the rise in nominal incomes is expected to significantly outweigh the inflation burden. On average, across all households, the surplus is around €1,230 per person or 5.5% of equivalised disposable income. As the income relief becomes less progressive in 2024 (see ***Figure 3***) and wages grow faster than pensions, there is still an estimated gap in the first decile. But it is smaller than in 2023, amounting to around €300 per person or 1.6% of equivalised disposable income.

5.2. Decomposition of inflation burden

In this subsection, we analyse the differences in the inflation burden across deciles of equivalised disposable income. The overall effect of inflation is regressive as shown in ***Figure 5***. In theory, this could be due to higher personal inflation rates in households with lower income. The dominant effect in the years 2022 to 2024, however, stems from variation in average propensities to consume. The same amount of inflation hurts households with higher propensities more relative to income. As propensities to consume on average decrease with income, so does the inflation burden. To show the importance of this effect compared to idiosyncratic inflation rates, we decompose the total burden into three components:

1. Effect of average inflation: The burden from this effect is calculated by applying the same average inflation rate to all households. In addition, we keep the population constant in all years. That is, we don't adjust the weights in our sample to account for e.g. population growth and employment changes and we also keep the classification of households into deciles constant over time. The resulting burden is proportional to the average propensity to consume.
2. Effect of idiosyncratic inflation: In the second step, we use the idiosyncratic inflation rates resulting from the different consumption patterns to calculate the burden. But we still hold the population constant across time. The difference to the burden after the first step reflects heterogeneity across inflation rates.
3. Effect of changes in population: This is the residual burden not explained after step 2. It reflects changes in the weights of our sample households as they are calibrated for each year to reflect e.g. changes of employment (see Appendix A.4 for the methodology). In addition, even with constant weights, households can switch between deciles of the income distribution over the years due to the uprating of income and changes in taxes and transfers.[17]

Table 6 shows the results of this decomposition exercise for the years 2022 to 2024. For each of the three effects, we calculate the difference between the effects in the deciles and the effects in the total population. For example, in 2022 the total inflation burden is 3.6 percentage points higher in the first decile than in the total population. This primarily results from a deviation of +4.4 percentage points due to average inflation and the average propensity to consume (first effect). Below-average idiosyncratic inflation rates in the first decile reduce the burden by 0.8 percentage points (second effect) and changes in the population have a minor impact (+0.1 percentage points).

The effect of idiosyncratic inflation across deciles varies between -0.8 percentage points and +0.3 percentage points in the three years. Its mean absolute deviation is around 0.1 percentage points and the standard deviation around 0.2 percentage points. It is dominated by the first effect of the

in those weeks. For income data, this is less of a concern as it is recorded for the whole previous year for each household in the dataset.

17. Deciles are classified in each year according to equivalised disposable income in the baseline scenario without fiscal reforms.

Table 6. Decomposition of inflation burden.

	Total population	Deciles of disposable income D1	D2	D3	D4	D5	D6	D7	D8	D9	D10		
Year 2022	Burden of inflation since 2021 (in excess of 2% p.a.), *in % of disposable income*												
Total burden	5.1	8.7	6.9	6.3	6.0	5.4	5.4	5.1	4.8	4.5	3.5		
Effect of average inflation	*5.1*	*9.5*	*7.1*	*6.0*	*5.8*	*5.5*	*5.3*	*5.0*	*4.7*	*4.4*	*3.6*		
Effect of idiosyncratic inflation	*0.0*	*-0.8*	*-0.1*	*0.2*	*0.0*	*-0.1*	*0.1*	*0.1*	*0.0*	*0.1*	*-0.1*		
Effect of changes in population	*0.0*	*0.1*	*-0.1*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		
		Deviation from total population, *in percentage points*										mean absolute deviation	standard deviation
Total burden		3.6	1.8	1.2	0.9	0.3	0.3	0.0	-0.3	-0.6	-1.5	1.1	1.4
Effect of average inflation		*4.4*	*2.0*	*1.0*	*0.8*	*0.4*	*0.2*	*-0.1*	*-0.3*	*-0.7*	*-1.4*	*1.1*	*1.5*
Effect of idiosyncratic inflation		*-0.8*	*-0.1*	*0.2*	*0.1*	*-0.1*	*0.1*	*0.1*	*0.0*	*0.1*	*-0.1*	*0.2*	*0.3*
Effect of changes in population		*0.1*	*-0.1*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*
Year 2023	Burden of inflation since 2021 (in excess of 2% p.a.), *in % of disposable income*												
Total burden	9.7	17.8	13.7	11.7	11.4	10.2	10.3	9.6	9.1	8.2	6.9		
Effect of average inflation	*9.7*	*18.1*	*13.5*	*11.5*	*11.2*	*10.5*	*10.1*	*9.6*	*9.1*	*8.4*	*7.0*		
Effect of idiosyncratic inflation	*0.0*	*-0.3*	*0.3*	*0.1*	*-0.1*	*0.0*	*0.1*	*0.1*	*0.0*	*-0.1*	*-0.1*		
Effect of changes in population	*0.0*	*0.0*	*-0.1*	*0.0*	*0.3*	*-0.3*	*0.1*	*0.0*	*0.1*	*-0.1*	*0.0*		
		Deviation from total population, *in percentage points*										mean absolute deviation	standard deviation
Total burden		8.1	4.0	2.0	1.7	0.5	0.6	-0.1	-0.6	-1.5	-2.8	2.2	2.9
Effect of average inflation		*8.3*	*3.8*	*1.8*	*1.4*	*0.7*	*0.4*	*-0.1*	*-0.6*	*-1.3*	*-2.7*	*2.1*	*2.9*
Effect of idiosyncratic inflation		*-0.3*	*0.3*	*0.1*	*0.0*	*0.0*	*0.1*	*0.1*	*0.0*	*-0.1*	*-0.1*	*0.1*	*0.2*
Effect of changes in population		*0.0*	*-0.1*	*0.0*	*0.3*	*-0.3*	*0.1*	*0.0*	*0.1*	*-0.1*	*0.0*	*0.1*	*0.1*

Continued

Table 6. Continued

	Total population	Deciles of disposable income D1	D2	D3	D4	D5	D6	D7	D8	D9	D10		
Year 2024	Burden of inflation since 2021 (in excess of 2% p.a.), *in % of disposable income*												
Total burden	11.1	20.6	15.6	13.0	12.6	12.0	11.6	11.0	10.4	9.4	8.0		
Effect of average inflation	*11.1*	*20.7*	*15.4*	*13.2*	*12.8*	*12.0*	*11.5*	*11.0*	*10.4*	*9.6*	*8.0*		
Effect of idiosyncratic inflation	*0.0*	*-0.3*	*0.1*	*0.0*	*-0.2*	*0.1*	*0.1*	*0.1*	*0.0*	*-0.1*	*0.0*		
Effect of changes in population	*0.0*	*0.2*	*0.0*	*-0.2*	*0.1*	*0.0*	*0.0*	*-0.1*	*0.0*	*0.0*	*0.0*		
		Deviation from total population, *in percentage points*										mean absolute deviation	standard deviation
Total burden		9.5	4.5	1.9	1.5	0.9	0.5	-0.1	-0.7	-1.7	-3.1	2.5	3.4
Effect of average inflation		*9.5*	*4.3*	*2.1*	*1.7*	*0.9*	*0.4*	*-0.1*	*-0.7*	*-1.5*	*-3.1*	*2.4*	*3.4*
Effect of idiosyncratic inflation		*-0.3*	*0.1*	*0.0*	*-0.2*	*0.1*	*0.1*	*0.1*	*0.0*	*-0.1*	*0.0*	*0.1*	*0.1*
Effect of changes in population		*0.3*	*0.0*	*-0.2*	*0.1*	*0.0*	*0.0*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

interaction between aggregate inflation and varying average propensities to consume. The dispersion due to the first effect increases over time as aggregate inflation (in excess of 2% per year compared to 2021) increases in years 2022 to 2024. Already in 2022, the deviations from the burden in the total population vary between -1.4 percentage points in the tenth decile and +4.4 percentage points in the first decile. The resulting mean absolute deviation across deciles is 1.1 percentage points and the standard deviation amounts to 1.5 percentage points. The third effect due to changes in the population is small and also less important than idiosyncratic inflation rates.

6. Conclusions

We employ a microsimulation approach to estimate changes in household income and expenditures, enabling us to analyse the distributional effects of inflation and of the relief from the government's response in Austria. Inflation has a regressive effect, hurting lower-income households more relative to their income than higher-income households. This is primarily because of their higher average propensity to consume.

Overall, the measures set in the years from 2022 to 2024 have a progressive effect, increasing average disposable income relatively more in the lower deciles across all years. Apart from targeted measures, also lump sum transfers to almost all households have a progressive impact. The indexation of income tax brackets, implemented from 2023 onwards, produces an inverse U-shaped effect. This is in line with the fact that middle and high-income households are affected more heavily by bracket creep in the absence of indexation.

The total relief volume of measures for households taken in response to higher inflation amounts to between 1.3% and 1.6% of GDP per year from 2022 to 2024. Along with other sources of increased income – especially higher nominal adjustments of wages and pensions – the resulting nominal

increase in average disposable income is roughly equivalent to the additional cost of the consumption basket in 2022 and 2023. In 2024, it is expected to exceed the inflation burden significantly.

While these results hold on average across all households, they do not apply across all deciles of the income distribution. Especially in 2023, the inflation burden is higher in the bottom deciles. Even more so, they do not hold at the individual household level, where already the income relief varies significantly between households with similar income levels.

The primary goal of most government measures was to stabilize real household income which for the most part was achieved. However, these measures increased aggregate demand and subsequently partly offset the impact of price reducing measures (e.g. electricity price subsidy) on the inflation rate. It is likely that this policy strategy, with rather broadly designed income support measures, contributed to the currently positive inflation differential between Austria and the euro area. We argue that by targeting income support measures more strongly to low-income households, the budgetary cost of measures would have been considerably lower, and the inflationary effect of measures would have been reduced significantly.

Relying on measures well-targeted to low-income households and to households particularly hit by high inflation[18] can also be justified by the fact that households in the middle and upper part of the income distribution, unlike low-income households, usually can rely on savings to maintain their consumption standard in case of temporary real income losses. Moreover, they typically have more options to adapt their consumption behaviour in response to price hikes, which is not the case for low-income households, whose consumption primarily covers their basic needs.

In our analysis, we abstract from behavioural responses to price changes. The measured inflation burden can thus be interpreted as an upper bound, as households can potentially reduce the inflation burden by adapting their consumption behaviour. Furthermore, macroeconomic effects and the potential impact of income-stabilizing measures on inflation are also not part of our analysis, which focuses on the distributional effects of inflation and government response. These aspects are left for future work.

ORCID iD
Paul Eckerstorfer https://orcid.org/0009-0005-0124-3324

Acknowledgements

We are thankful for comments from participants of the 2nd Banca d'Italia Workshop on Microsimulation Modelling and the 9th World Congress of the International Microsimulation Association. The comments from three anonymous referees helped to improve the paper substantially. The views expressed in this paper are the sole responsibility of the authors and do not necessarily reflect the views of the Austrian Parliamentary Budget Office.

Conflict of Interest

No competing interests reported.

Data and code availability

EU-SILC data and the household budget survey for Austria were obtained from Statistics Austria, being available for scientific use upon registration (https://www.statistik.at/services/tools/services/amdc-mikrodaten-fuer-die-wissenschaft/scientific-use-files). Economic forecasts by the Austrian Institute of Economic Research (WIFO) are publicly available (https://www.wifo.ac.at/en/research/thematic-platforms/business-cycles-and-forecasting/short-and-medium-term-forecasts/).EUROMOD is an open-source tool available from https://euromod-web.jrc.ec.europa.eu/. The results presented here are based on EUROMOD version 3.6. We updated policy functions to incorporate recent policies in response to inflation. We commit to preserving data and code for a period of no less than five years following publication of the manuscript, and to providing reasonable assistance to requests for clarification and replication.

18. ***Fessler et al. (2023)*** find that the group of households that struggle predominantly from high inflation consists of those already facing a challenging financial situation during periods of low inflation (e.g. unemployed, working poor, single parents).

References

Ari A, Arregui N, Celasun O, Iakova D, Nineshima A, Mylonas V, Parry I, Teodoru I, Zhunussova K. 2022. Surging Energy Prices in Europe in the Aftermath of the War: How to Support the Vulnerable and Speed up the Transition Away from Fossil Fuels. IMF Working Papers.

Curci N, Savegnago M, Zevi G, Zizza R. 2022. [The Redistributive Effects of Inflation: A Microsimulation Analysis for Italy]. Banca D'Italia Working Paper 738. DOI: https://doi.org/10.21203/rs.3.rs-2611447/v1

Deville J-C, Särndal C-E. 1992. Calibration Estimators in Survey Sampling. *Journal of the American Statistical Association* **87**: 376–382. DOI: https://doi.org/10.1080/01621459.1992.10475217

Fessler P, Fritzer F, Salish M. 2023. Who pays the price when prices rise. *Monetary Policy &Amp; the Economy, Q4/22-Q1/23* 67–84.

Lamarche P, Oehler F, Rioboo I. 2020. European Household's Income, Consumption and Wealth. *Statistical Journal of the IAOS* **36**: 1175–1188.

Maidorn S, Reiss L. 2023. How effective were fiscal support measures in absorbing the inflation-induced rise in consumption expenditures in 2022? *Monetary Policy &Amp; the Economy, Q4/22-Q1/23* 107–116.

Prammer D, Reiss L. 2023. Fighting (the effects of) inflation: government measures in Austria and the EU. *Monetary Policy & the Economy* 95–106.

Sologon DM, O'Donoghue C, Linden J, Kyzyma I, Loughrey J. 2023. Welfare and Distributional Impact of Soaring Prices in Europe. SSRN Electronic Journal. DOI: https://doi.org/10.2139/ssrn.4285835

WIFO. 2023. [Konjunkturerholung verzögert sich - Prognose für 2023 bis 2025]. WIFO Konjunkturprognose 4/2023.

Appendix A

A.1. Design of government measures in response to high inflation

The income support measures introduced by the government to cushion the effects of high inflation are the following:

- One-off payments to all households: In 2022, the climate bonus, with a regular amount of €100 to €200 per adult[19] (halved for children), was increased to €500 per adult (halved for children). In addition, each household received a voucher of €150 to reduce the electricity bill and a subgroup of self-employed persons received an (additional) one-off payment of €410 to tackle high energy cost.[20]
- One-off payments to low-income households: Vulnerable groups, like recipients of unemployment benefits, social assistance, or a minimum pension received additional one-off payments. To also support low-income earners and low-income pensioners excluded from these one-off payments a tax-credit for employees and self-employed and two separate one-off payments for pensioners (2022 and 2023) were introduced. In addition, in 2023 local state governments received a transfer from the federal government to fund transfers related to higher housing and heating costs.
- Measures for families: In August 2022, the regular child benefit was increased by €180 per child. From July 2023 to December 2024, vulnerable families (transfer recipients, lone parents, and lone earners with low income) receive an additional €60 per child and month. An already scheduled increase in a general tax credit for children was brought forward, and a tax credit for children targeted at low-income parents was increased permanently.
- Commuter support measures: Commuter tax allowances and tax credits are increased from. 2022. to June 2023.
- Indexation of income tax brackets: Starting in 2023, tax brackets are indexed with inflation each year.
- Indexation of further social transfers: Some social transfers, most importantly a non-means tested child benefit, were not indexed with inflation in the past. From 2023 onwards, the list of indexed social transfers was extended.

Most transfers are exempt from income tax, an exception being the top-up to the climate bonus, which is partly taxable for persons with a taxable income above €90,000 in 2022.

In addition to these income support measures, the government introduced the following price reducing measures which also lower the inflation rate:

- Energy tax measures: From May 2022 to December 2024, the tax rate on electricity and gas consumption is reduced by approximately 90% to the minimum tax rate according to EU legislation. In addition, the introduction of the carbon price on emissions not covered by the EU-Emissions Trading System was postponed by three months to October 2022.
- Electricity price subsidy: A price cap of 10 Cent per kWh for basic electricity consumption (2,900 kWh per year per household) was introduced from December 2022 until the end of 2024. The difference between 10 Cent and the household's actual electricity price is subsidised by the government up to a maximum of 30 Cent per kWh until June 2024 and up to 15 Cent per kWh from July to December 2024 Households with more than three persons and low-income households receive additional transfers via the electricity bill. The relief volume of the price cap is subject to uncertainty as it depends on the individual household's electricity contract. In our estimation, the fiscal cost of this subsidy is €2.7 billion, well below the provided funds (€3.8 billion) according to the law. A further

19. The climate bonus was introduced along with the introduction of a tax on carbon emissions in the non-EU-ETS sectors. The amount is differentiated depending on the rural typology and the access to public transport.
20. The voucher and the one-off payment to self-employed are partly means tested. High-income households (approximately 10% of households) are not entitled to redeem the voucher. Regarding the voucher, a non-take-up rate of 30% of eligible households was taken into account.

measure to reduce electricity cost is a subsidy which partly covers power grid loss cost in 2023 with an additional fiscal cost of €0.3 billion.

A.2. Modelling of the electricity price cap

This appendix describes how we model the electricity price subsidy, in particular the price cap for the first 2,900 kWh per year and household. The household budget survey contains data on expenditures for electricity, which we convert to kWh per household by using Eurostat's electricity prices for household consumers from the survey period. In particular, we use a fixed cost of €135 per year and a variable cost of €0.171 per kWh, including all taxes and levies.

The relevant electricity price for the subsidy from December 2022 to December 2024 does not include taxes and levies. For the relevant period from 2021, we collected public data from the Austrian regulator E-Control, which are available on a monthly basis. For each region, we use the prices of the local electricity provider as well as the prices of the cheapest available provider. In line with E-Control's statistics, 80% of our households in the sample are allocated the price of the local provider. For the remaining 20% we use the cheapest price. Minimum contract periods are applied such that only some fraction of households may change the contract each month.[21]

The resulting time series of energy prices are matched to our sample by region. In terms of the income distribution, the underlying assumption is that contracts do not differ systematically by income. However, due to the fixed cost in the contracts, households with lower consumption pay a higher price per kWh on average. This is in line with the statistics published by E-Control.

We can compare our estimated volume of the subsidy to estimates by the Austrian Ministry of Finance and to actual payments in 2023. In its Draft Budgetary Plan 2024 from October 2023, the Ministry of Finance specified a total volume of €2.19 billion for the original period from 2022 December 2022 to July 2024. Our corresponding estimate is €2.22 billion for this period out of €2.66 billion in total for the extended period until the end of 2024.

In our analysis, we allocate the relief on an accrual basis to the year of electricity consumption. Under the assumption of an equally distributed time lag of 1 to 13 months between the consumption of electricity and the payment of the subsidy to electricity providers (annual electricity bill), we can obtain an estimate of these payments. According to our model, €0.92 billion are paid to electricity providers by the end of 2023, which is close to the actual number (€0.90 billion).

A.3. Decomposition of income changes without fiscal measures

In Section 5, it was shown that a substantial part of nominal income increases in 2023 and 2024 is due to factors that are not directly explained by fiscal measures ("other income changes" in ***Figure 5***).[22] These factors include wage and pension increases as well as nominal changes in transfers. In addition, they also reflect changes in the population, mainly due to lower unemployment and higher employment.[23]

21. We take into account that in some months local energy providers also allowed existing customers to change to a cheaper contract.
22. Note that, for this definition, fiscal measures not only include those in response to inflation but also those that are part of the eco-social tax reform.
23. In 2022, the recovery from the COVID-19 crisis was still taking place and the number of unemployed fell by 20.7% compared to 2021 (see ***Table 2*** in Section 3).

In this appendix, we show components of households' disposable income across deciles in 2021 and how they contributed to the nominal changes in years 2022, 2023, and 2024 compared to 2021. We distinguish between the following four components.[24]

- Earned income from employment and self-employment
- Pension income
- Unemployment income
- Other income, including further transfers (e.g. family benefits, social assistance), investment income, and alimony payments

The first part of ***Table A3*** shows the importance of these components across deciles in 2021. In the total population, earned income amounted to 66% of equivalised disposable income. Its share varied from 32% in the bottom decile to 76% in the top decile. The share of pension income was more equal across deciles, varying from 14% in the top decile to 29% in the second and third deciles. Unemployment income was only 2% of total disposable income, but its share was 14% of income in the bottom decile. The remaining income was also more important in the lower parts of the distribution due to means-tested transfers and because the same absolute amount (e.g. child benefits) is more important in the lower deciles. In the upper deciles, investment income becomes a substantial share of this component.

The bottom parts of ***Table A3*** show changes in equivalised income per capita without fiscal measures compared to 2021 and how the four components contributed to them. In all cases, a 2% trend growth is subtracted as in the calculations in Section 5. Therefore, the total nominal change in each year and decile corresponds to the shown effect of other income changes in the right panels ***Figure 5***.

Lower unemployment and higher employment have a noticeable effect especially in the bottom deciles. Therefore, earned income per capita has one of the highest contribution to income changes in the first decile in 2022, even though its share of total income is the smallest in the first decile.

Pension income has a negative contribution in some upper deciles in 2022 and 2023, which means that the net equivalised pension per capita grew by less than 2% per year. To some extent this is due to a smaller adjustment of gross pensions in 2022 (at most +1.8% for pensions above €1,300 per month). In addition, also composition effects matter, because households with pension income tend to drop in the income distribution compared to households with earned income.[25]

Table A3. Decomposition of income changes.

	Total population	Deciles of disposable income									
		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Year 2021	Income components, *in % of disposable income*										
Earned income	66	32	40	52	60	65	63	68	74	73	76
Pension income	21	23	29	29	23	24	26	22	18	18	14
Unemployment income	2	14	7	5	4	2	2	1	1	0	0
Other income	11	31	24	13	13	9	9	9	7	8	9
Year 2022	Income changes without fiscal measures since 2021, *in % of disposable income*										
Nominal change in excess of 2% p.a.	1.3	-0.3	0.7	1.0	1.0	0.7	0.9	0.8	1.1	1.7	2.8
Contribution of earned income	*2.3*	*3.0*	*1.7*	*1.8*	*2.3*	*0.7*	*2.7*	*1.4*	*2.2*	*2.7*	*3.0*

24. All components are net of social insurance contributions and taxes. If a person has different kinds of income (e.g. pension and employment income), the average income tax rate is applied to all parts.
25. Only in 2024, gross pensions are expected to grow faster than gross average wages.

	Total population	Deciles of disposable income D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Contribution of pension income	*0.0*	*0.1*	*1.1*	*1.0*	*0.4*	*1.3*	*-0.6*	*0.2*	*-0.2*	*-1.2*	*-0.3*
Contribution of unemployment income	*-0.5*	*-3.6*	*-1.5*	*-1.1*	*-1.1*	*-0.3*	*-0.2*	*-0.2*	*-0.1*	*0.0*	*-0.1*
Contribution of other income	*-0.4*	*0.2*	*-0.6*	*-0.7*	*-0.7*	*-0.9*	*-0.9*	*-0.6*	*-0.8*	*0.2*	*0.1*
Year 2023	Income changes without fiscal measures since 2021, *in % of disposable income*										
Nominal change in excess of 2% p.a.	5.2	2.6	3.9	4.1	4.3	4.2	4.4	4.5	5.0	5.8	7.5
Contribution of earned income	*5.3*	*4.6*	*1.6*	*5.0*	*4.3*	*2.3*	*4.8*	*5.0*	*6.0*	*6.7*	*7.4*
Contribution of pension income	*0.7*	*1.5*	*4.1*	*0.2*	*2.0*	*3.4*	*0.1*	*0.9*	*-0.1*	*-1.0*	*-0.2*
Contribution of unemployment income	*-0.4*	*-3.1*	*-1.1*	*-1.0*	*-1.0*	*-0.3*	*0.0*	*-0.2*	*-0.1*	*0.0*	*-0.1*
Contribution of other income	*-0.4*	*-0.4*	*-0.7*	*-0.2*	*-1.0*	*-1.2*	*-0.5*	*-1.2*	*-0.7*	*0.0*	*0.4*
Year 2024	Income changes without fiscal measures since 2021, *in % of disposable income*										
Nominal change in excess of 2% p.a.	10.0	7.4	8.9	8.9	9.1	9.0	9.2	9.1	9.5	10.5	12.7
Contribution of earned income	*8.4*	*7.4*	*5.6*	*6.6*	*8.0*	*5.6*	*8.2*	*7.7*	*8.3*	*9.7*	*11.3*
Contribution of pension income	*2.1*	*2.4*	*3.4*	*3.4*	*3.4*	*4.6*	*1.4*	*2.3*	*1.9*	*0.5*	*1.2*
Contribution of unemployment income	*-0.3*	*-2.3*	*-0.8*	*-0.9*	*-0.8*	*-0.1*	*0.1*	*-0.1*	*-0.1*	*0.1*	*0.0*
Contribution of other income	*-0.3*	*-0.1*	*0.7*	*-0.2*	*-1.4*	*-1.1*	*-0.5*	*-0.8*	*-0.6*	*0.3*	*0.3*

Source: Authors' calculations using EU-SILC 2020, Household Budget Survey 2020, and EUROMOD.

A.4. Statistical matching, uprating and recalibration of the input data

To provide a better statistical match of EU-SILC 2020 and the Household Budget Survey 2020, we obtained additional data for households in both datasets from Statistics Austria. They include the commuter allowance and the quality of public transport at their main residence. This is especially relevant for measures targeting commuters and the regional component of the climate bonus.

We match households using a random hot-deck method as in ***Lamarche et al. (2020)*** based on the following characteristics:

- number of adult women, adult men and children,
- age, education and employment status of the reference person,
- usage of heating oil, natural gas and cars,
- deciles of equivalised disposable income.

We recalibrate the weights of households and uprate income and transfers in the EU-SILC data to account for changes in the population and the macroeconomic environment since 2019. The underlying assumption is that for example households with employed persons in 2019 are representative for the additionally employed persons from 2022 onwards. As employment increases and unemployment falls, the weights of households with employed persons are increased while those of households with unemployed are decreased.

For each year, we recalibrate the following variables:

- number of households with 1, 2, 3, and 4 or more persons,
- number of women and men,
- number of persons in five age categories,
- number of women and men receiving pension payments and number of households receiving a minimum pension,
- employment and unemployment of women and men,
- number of households using natural gas, heating oil and cars and amount of consumption of natural gas, heating oil and fuels,
- number of commuters within seven distance categories and joint distribution of commuters in four income categories and two commuting categories.

Our calibration targets for the adjustment of weights are mostly taken from the demographic forecast from Statistics Austria from 2023 and the economic forecast by WIFO from December 2023. The forecast for the number of women and men receiving pension payments is based on WIFO's long term forecast from 2022. The number of commuters is assumed to remain constant. As a result of the higher CO_2-price from 2022, the number of households using heating oil is assumed to decrease by 2% per year and the number of households using natural gas and cars with fossil fuels by 1% per year. To implement the calibration, we use the logit method of the calib-function in the sampling-package in R, which implements the methods in ***Deville and Särndal (1992)***.