



Seirbhís Thithe
an Oireachtais
Houses of the
Oireachtas Service

EVE: a model of indirect taxes using household micro-data

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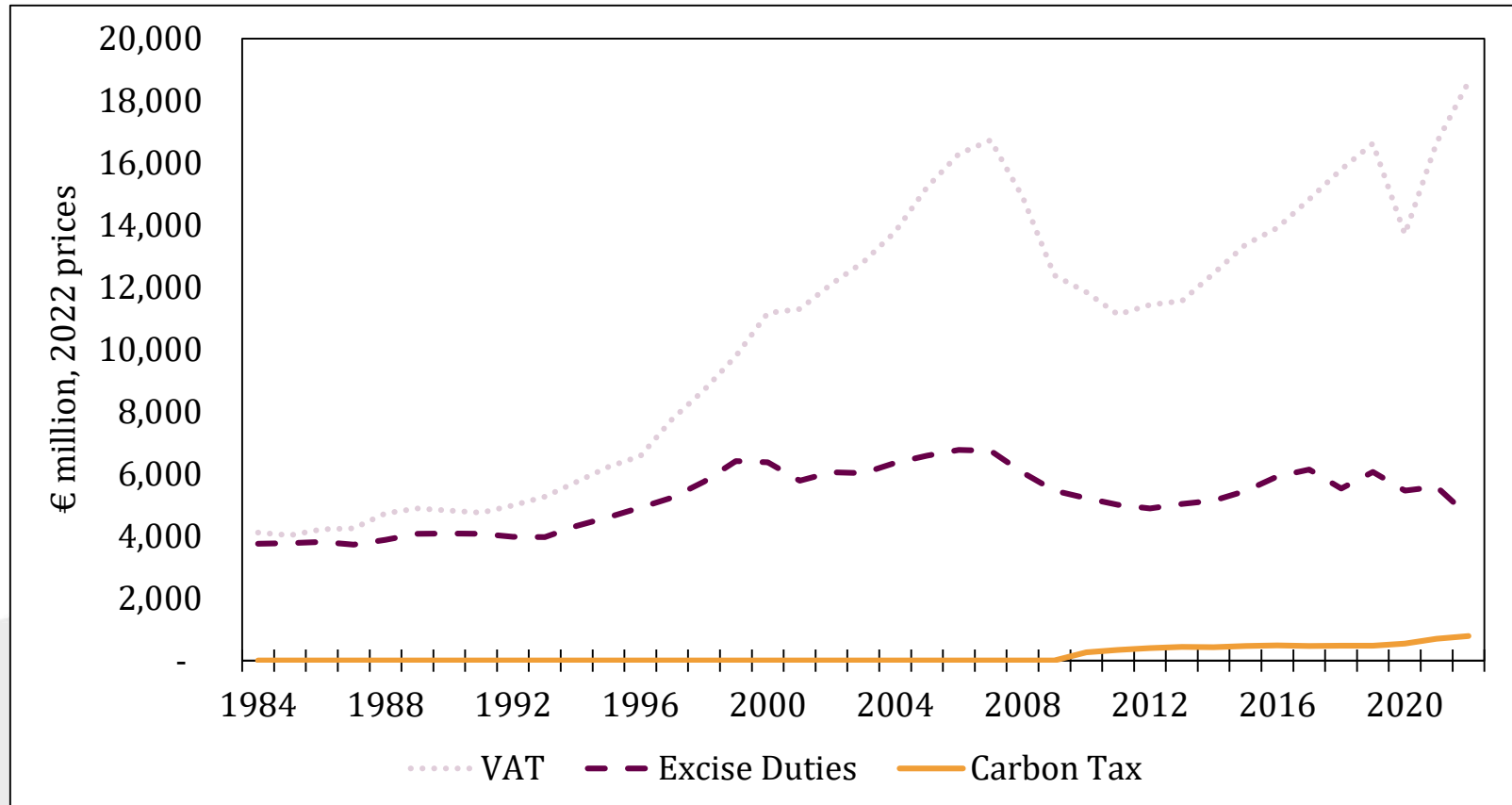
NERI Labour Market Conference

16th May 2024

Introduction

Aggregate indirect tax yields rising in real terms over the long-run

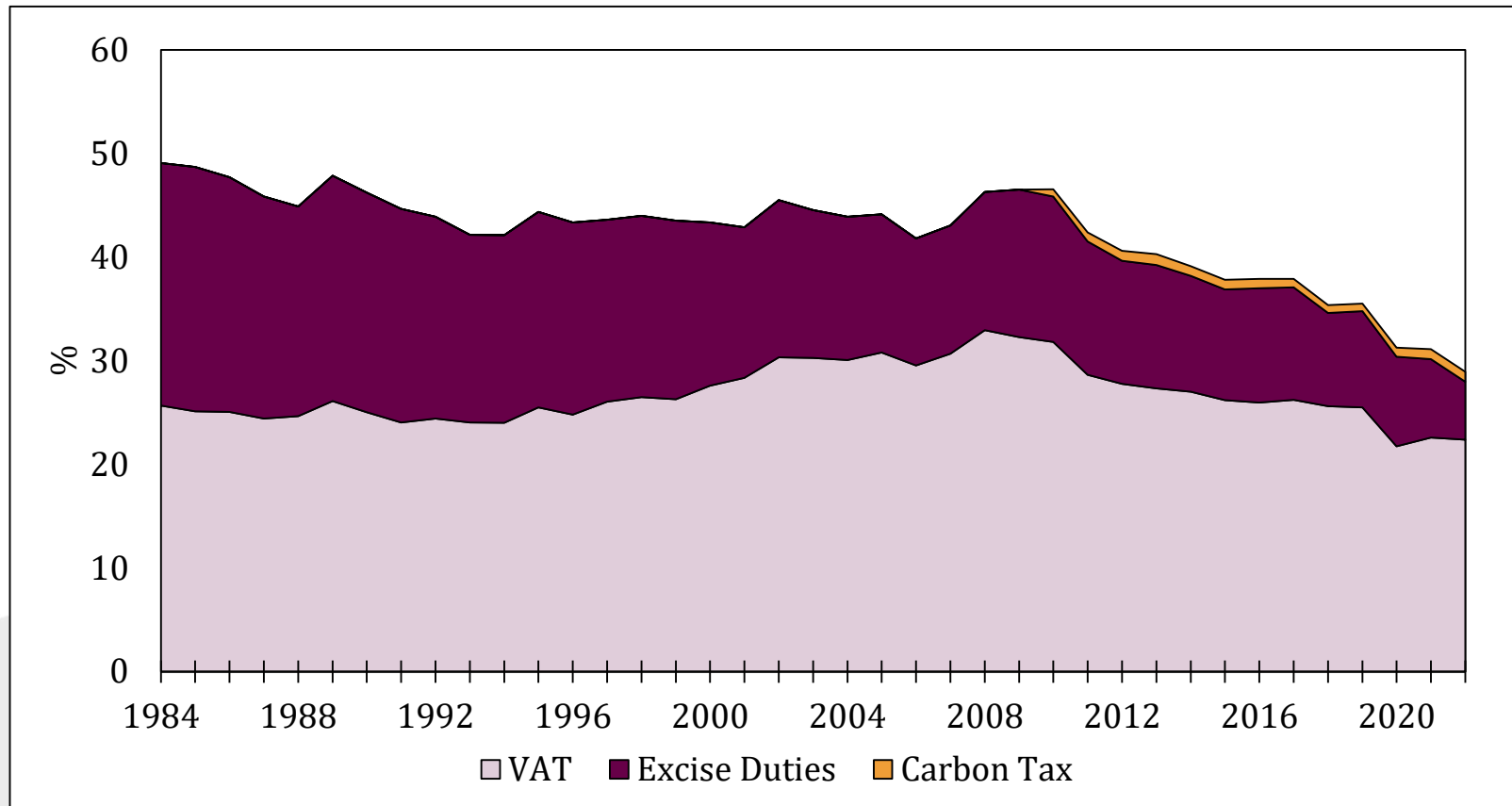
- Significant rise in VAT in real terms, excises more stable



Introduction

But falling as a share of all tax receipts over the long-run

- Rise in corporation tax receipts & structural change in the Irish labour market



Introduction

- Important and complex area of Exchequer revenue, modelling warranted
- Fairness?
 - “Indirect” tax, incidence unknown *ex ante*
 - Regressive patterns empirically highlighted in O’Donoghue et al., (2004); Barrett & Wall (2006); Decoster et al., (2010); Collins (2014), and Savage (2017)
 - Leahy et al., (2011) also find VAT is regressive
 - Multiple papers examining the static incidence of carbon taxes using household data – Callan et al., (2009); Verde & Tol (2009); Bercholz & Roantree (2019); O’Malley et al., (2020) and Reaños & Lynch (2022)
- If unfair, then why have indirect taxes?
 - Public health goals- taxes on “bads”
 - Environmental goals – carbon taxes & mineral oil taxes
 - Revenue raising from a broad tax base

Data

- The Household Budget Survey (2015/2016) contains detailed expenditure data
- Households (n=6,839) keep detailed expenditure diaries for two weeks
- Data biased towards non-durable consumption
- Over 500 expenditure item categories:
 - 237 food items, 22 alcohol/tobacco, 18 clothing & footwear, 4 fuel & light, 24 housing, 10 household non-durables, 46 household durable, 37 transport, 115 miscellaneous goods & services
- Timeliness concerns?

Making the data more timely

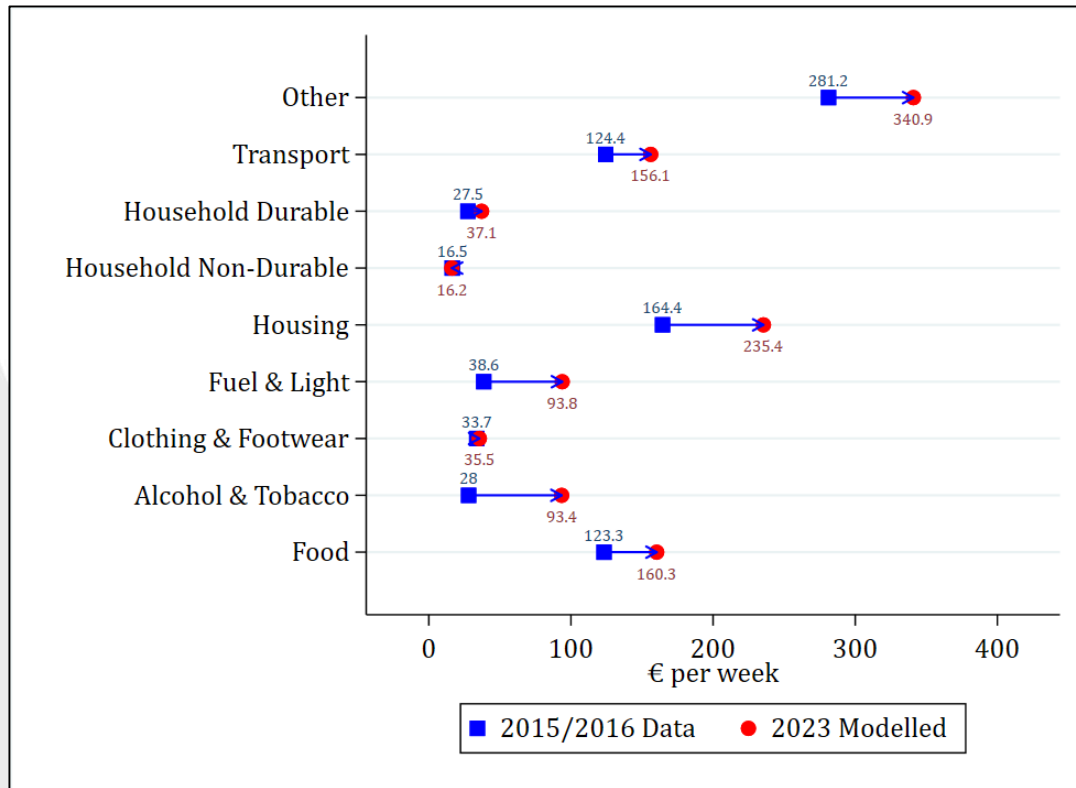
1. Basket of goods/services consumed in 2023 is the same as in the 2015/2016 data



2. Uprate by real per capita consumption growth: larger basket
 - Consume proportionally more of every good/service
 - Scalar, doesn't affect the share of expenditure on different goods/services
3. Uprate by price growth: need to spend more money to afford the initial basket
 - Prices have grown differentially, affects expenditure shares
 - Uprate prices at the commodity level for most non-durable items e.g., meat, milk, etc.

Expenditure levels & shares

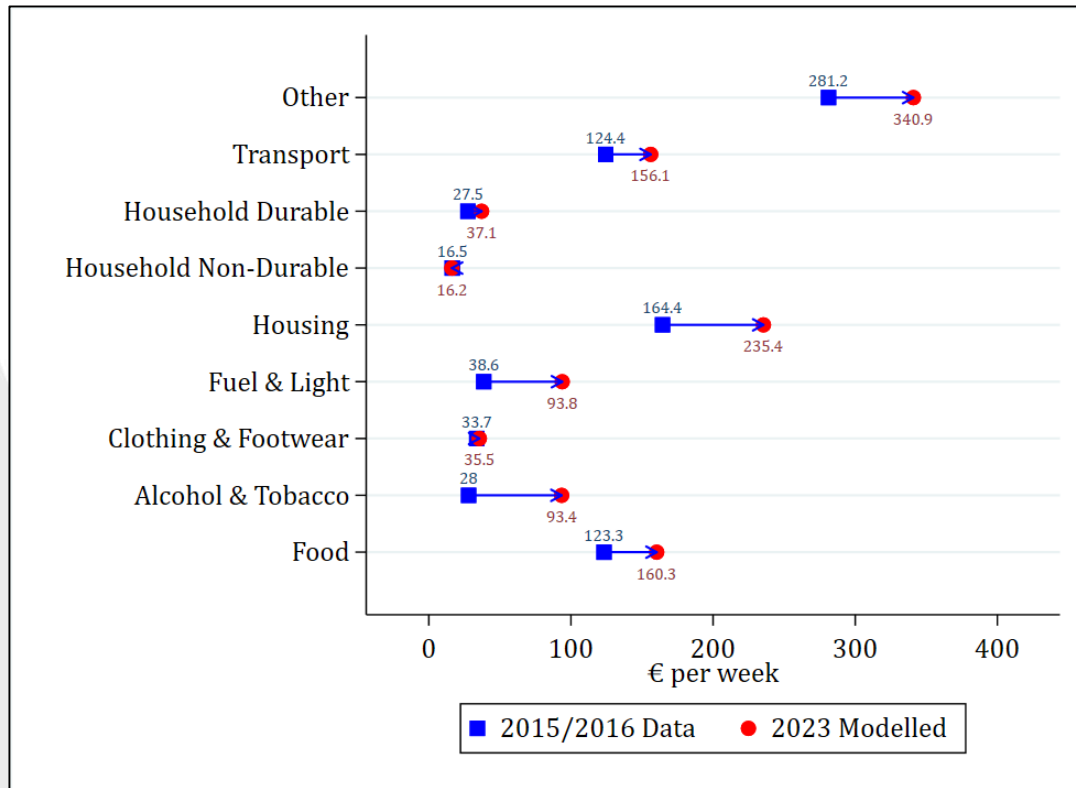
A. Mean expenditure, nominal € per week



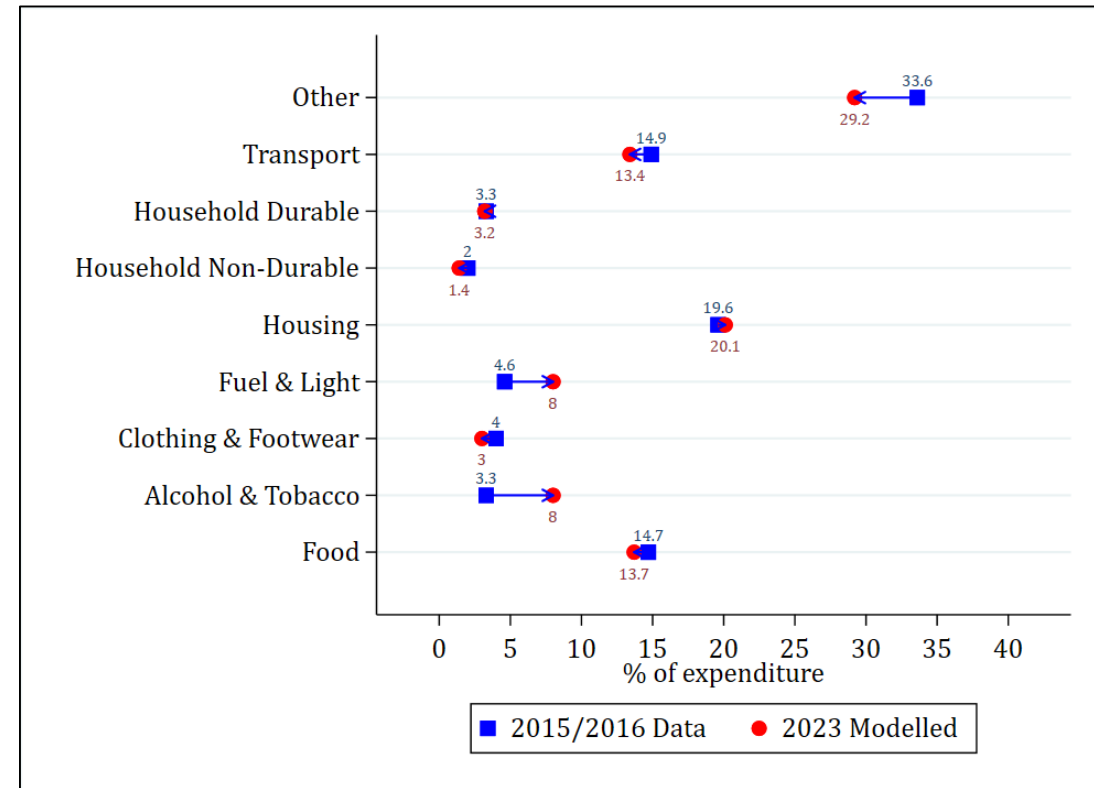
- Mean household expenditure increases from €837 per week to €1,169 per week (+40%)

Expenditure levels & shares

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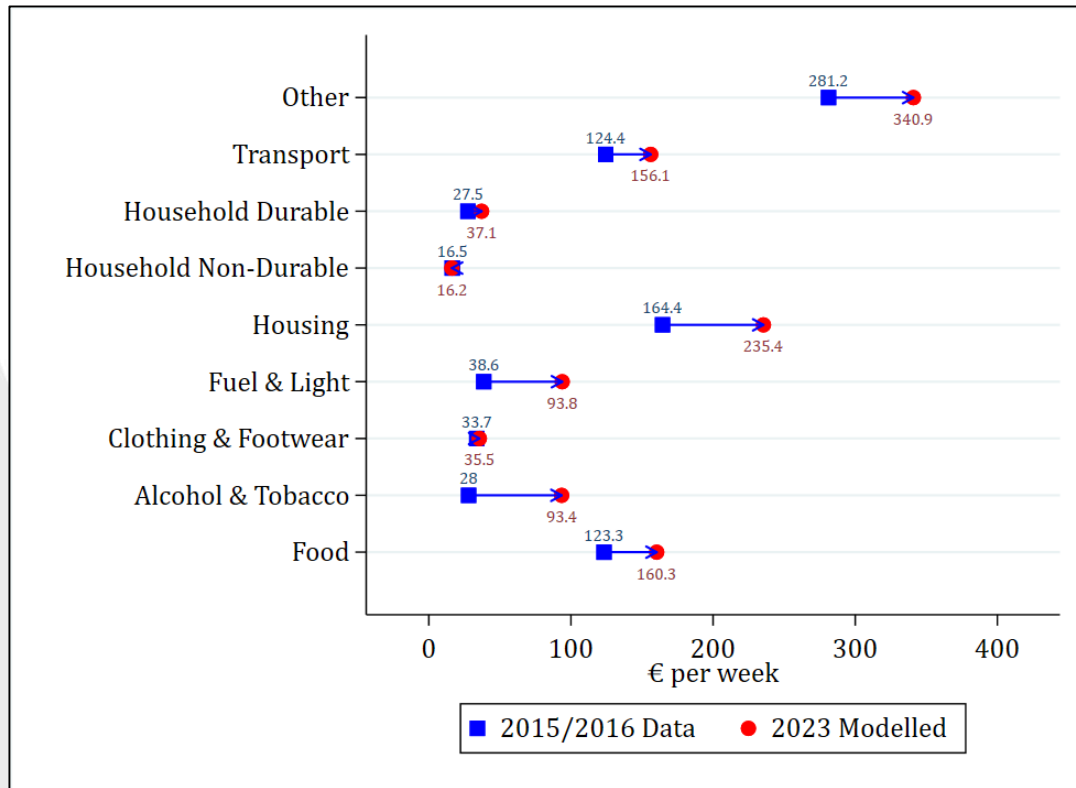
B. Mean expenditure shares



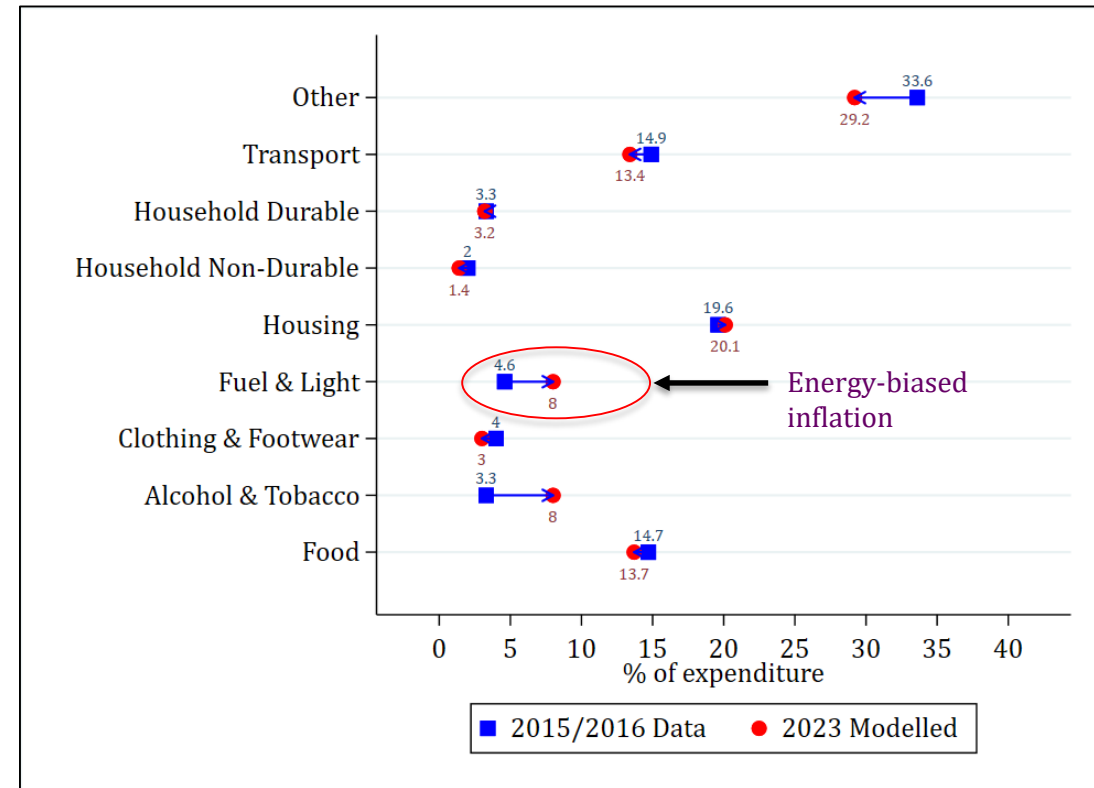
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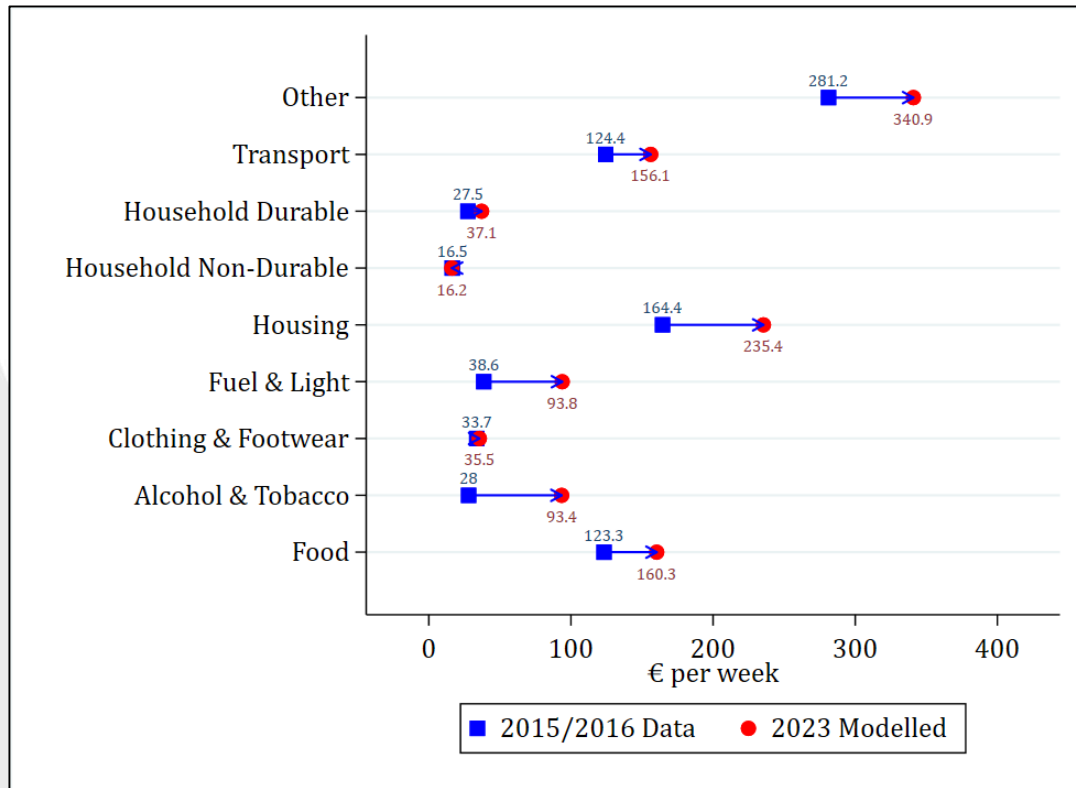
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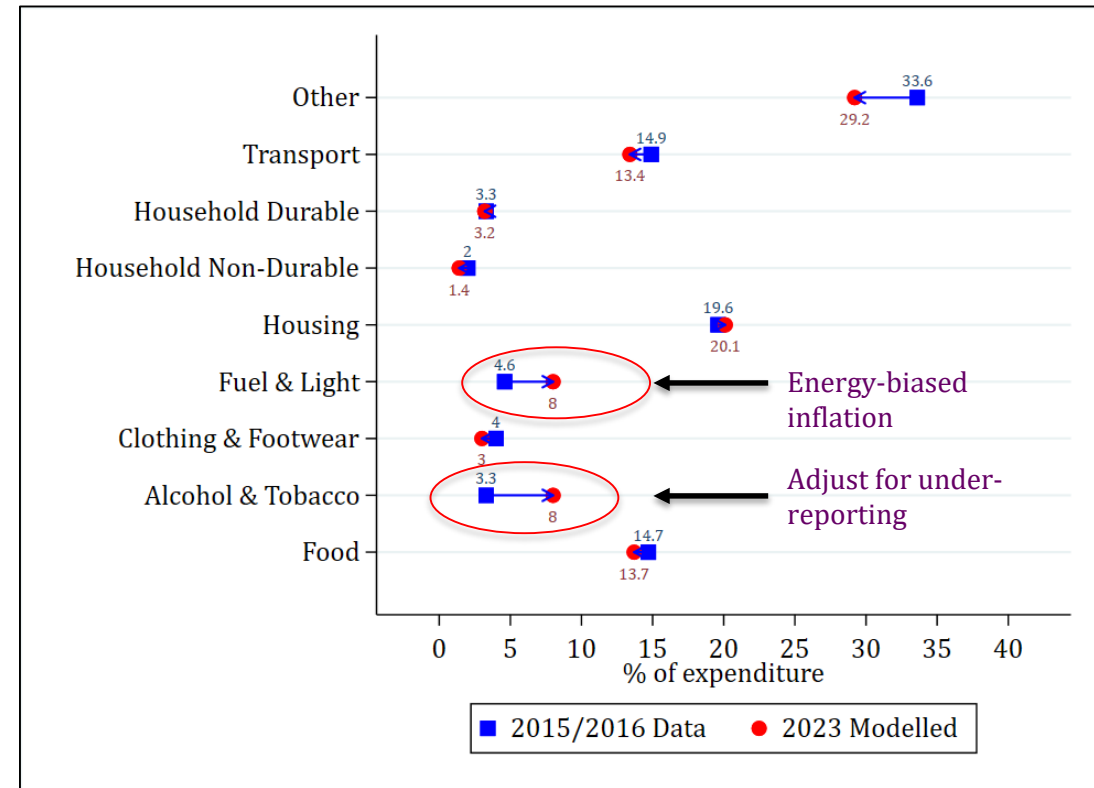
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Expenditure levels & shares

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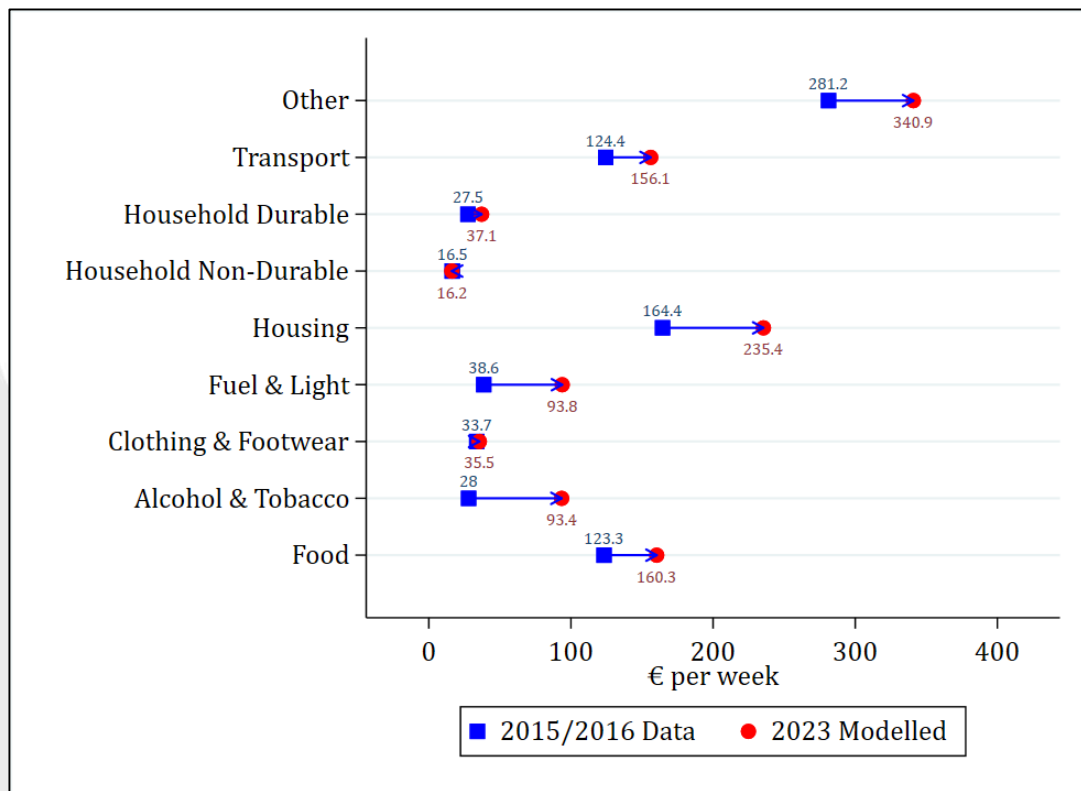
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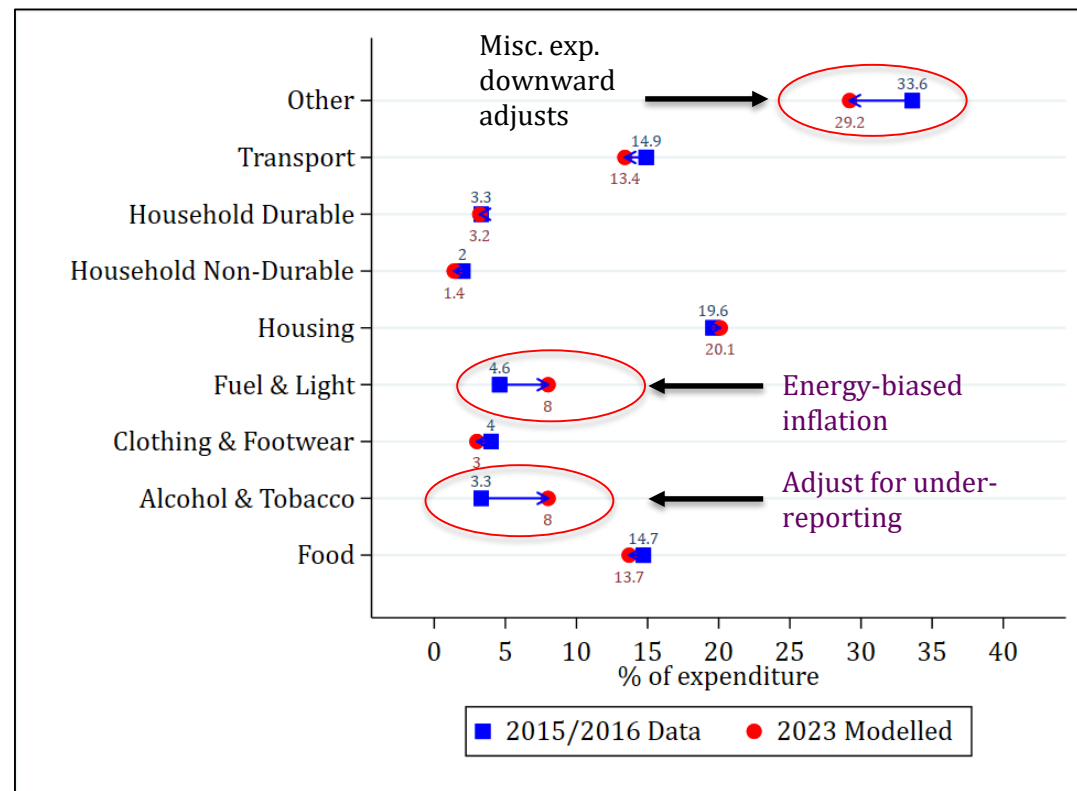
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Expenditure levels & shares

A. Mean expenditure, nominal € per week



B. Mean expenditure shares



- Mean household expenditure increases from €837 per week to €1,169 per week (+40%)



Modelling indirect taxes

- **VAT:**

- VAT based on final expenditure
- Map each expenditure line item to the relevant VAT rate as per the Revenue Commissioners
- VAT and non-VAT share of expenditure easily discriminated

- **Excises on alcohol, fuel and tobacco:**

- Excises based on the quantum of a commodity consumed (not in the data)
- Approximate by dividing by national average prices of relevant commodities

- **Carbon Tax:**

- Divide expenditure on taxable items by national average prices
- Estimate carbon content based on the legislative specification of the carbon tax
- Specified differently for natural gas, mineral oils and solid fuels

EVE replicates outturn data well

Item	Modelled (2023) € million	Revenue (2022/2021) € million
Excises		
Beer	390	392
Wine	326	375
Cider	52	52
Spirits	310	411
Diesel	605	1,430*
Petrol	473	445
Tobacco	173	181
Cigarettes	1,284	1,137
Carbon Tax	560	563
VAT (Household Sector)	9,231	9,776**

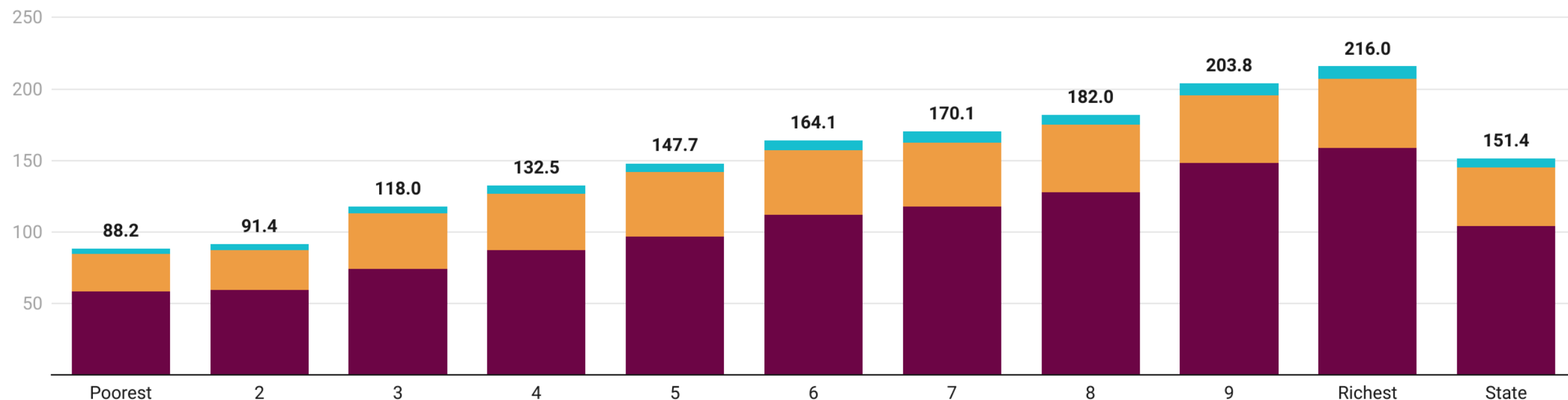
*~43% of diesel used in transport attributable to private care usage- SEAI Energy Balance Accounts 2019

**Revenue 2022 figure with relativities from European Commission VAT Gap 2022 for VAT origin in 2019

In € terms, low-income households pay less indirect taxes

Average indirect tax liabilities (€ per week)

Value-Added-Tax Excise Duties Carbon Tax



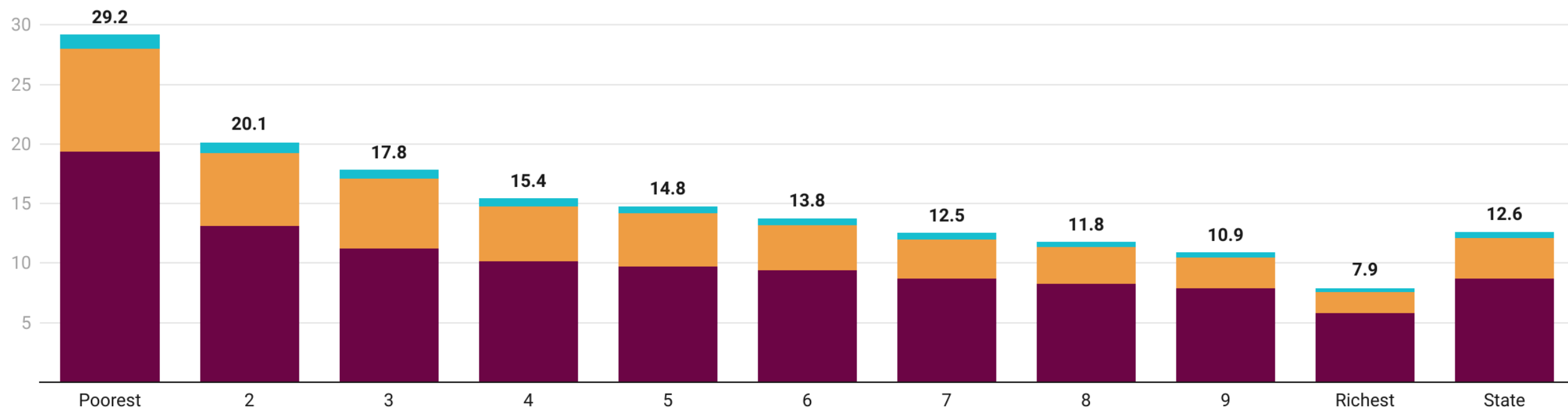
Notes: Households are sorted into ten equally sized groups based on equivalized household disposable income.

Source: PBO analysis using the EVE model • Created with Datawrapper

...but indirect taxes are regressive when compared to income

Average indirect tax liabilities (% household income)

Value-Added-Tax Excise Duties Carbon Tax



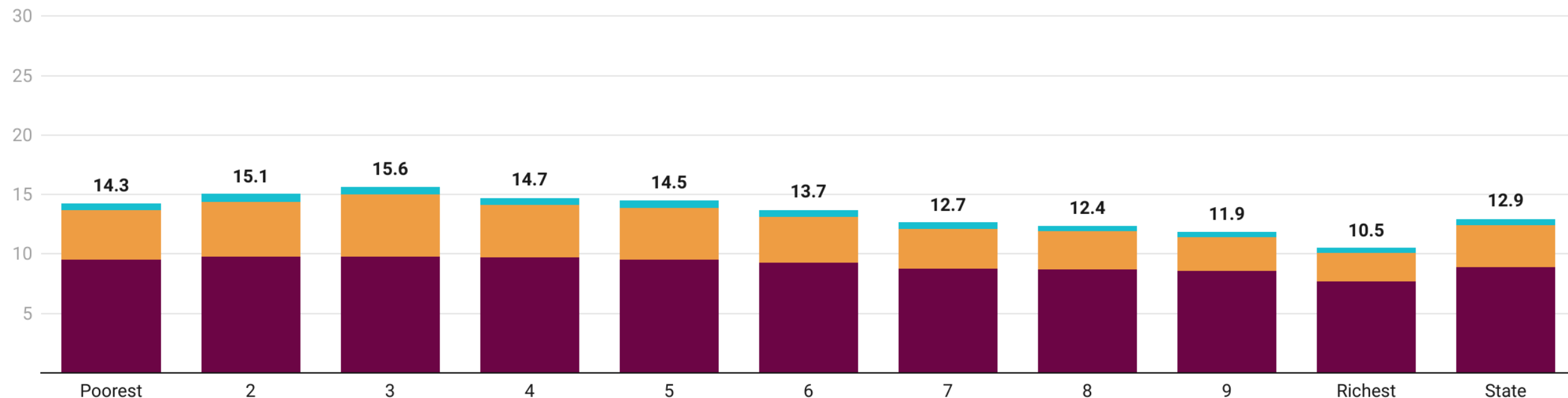
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...less so when compared to aggregate expenditure

Average indirect tax liabilities (% household expenditure)

Value-Added-Tax Excise Duties Carbon Tax



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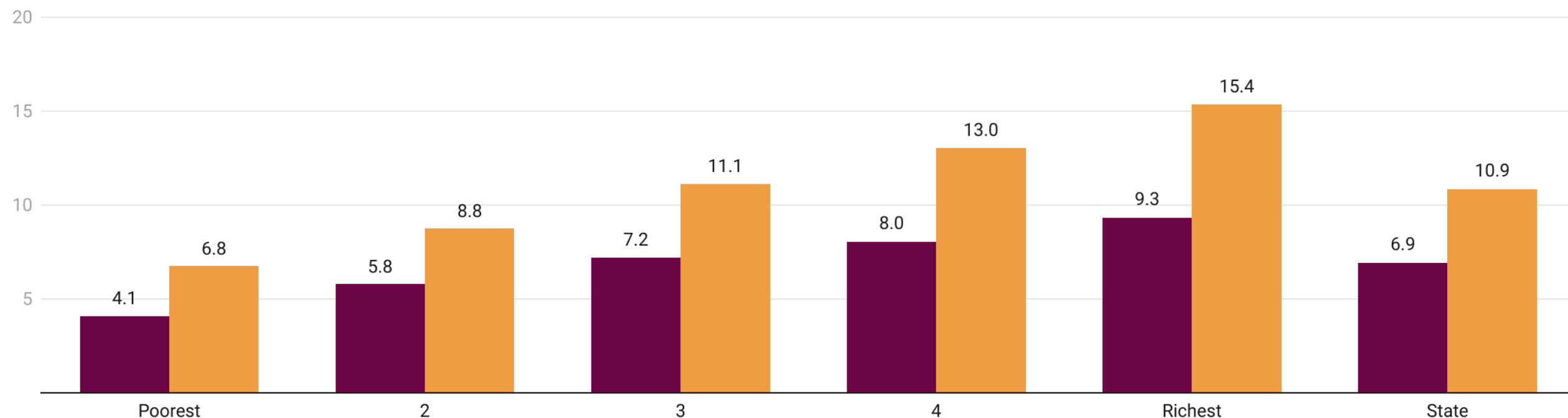
Application: carbon tax increase from €48.50 to €100\tonne

- To show what the EVE model can do, we simulate the effect of scheduled carbon tax increases
- Carbon tax set to rise by €7.50 per annum in order to tax carbon at €100\tonne by 2030
- Simulate an increase in the carbon tax from €48.5\tonne to €100\tonne using EVE
 - Demand for energy (level and composition) held at 2023 levels
 - No behavioural response considered
 - No wider macroeconomic effects considered
- Estimate how this carbon tax increase would affect urban and rural households
- EVE also accounts for the VAT implications of a carbon tax increase

Rural households most affected by this carbon tax increase

Increase in indirect taxes (€ per week)

Urban Rural



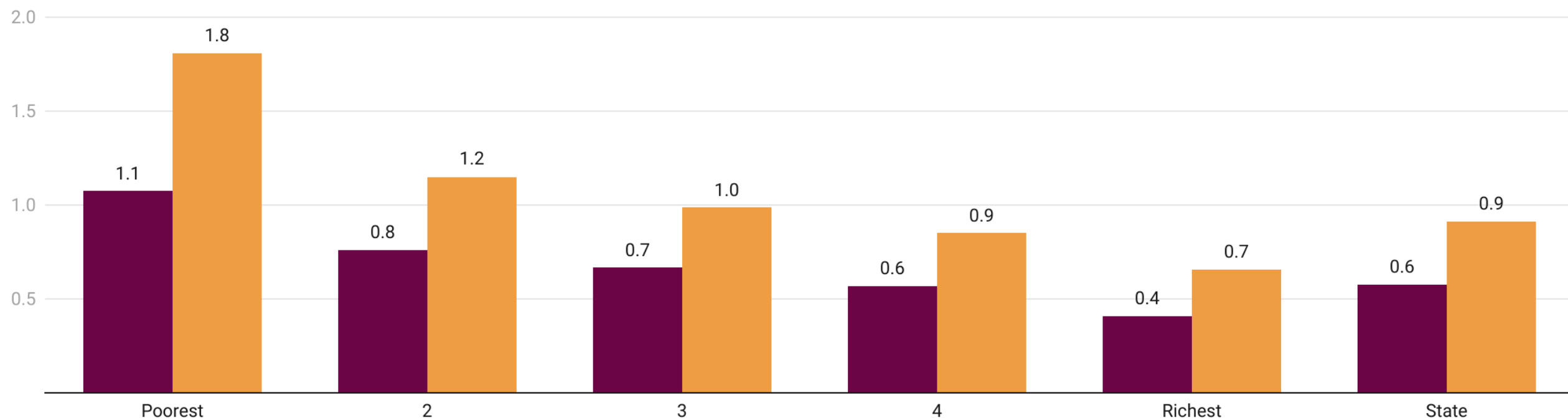
Notes: Households are sorted into five equally sized groups based on equivalized household disposable income.

Source: PBO analysis using the EVE model • Created with Datawrapper

...with low-income households seeing their resources stretched

Increase in indirect taxes (% household income)

Urban Rural



Notes: Households are sorted into five equally sized groups based on equivalized household disposable income.

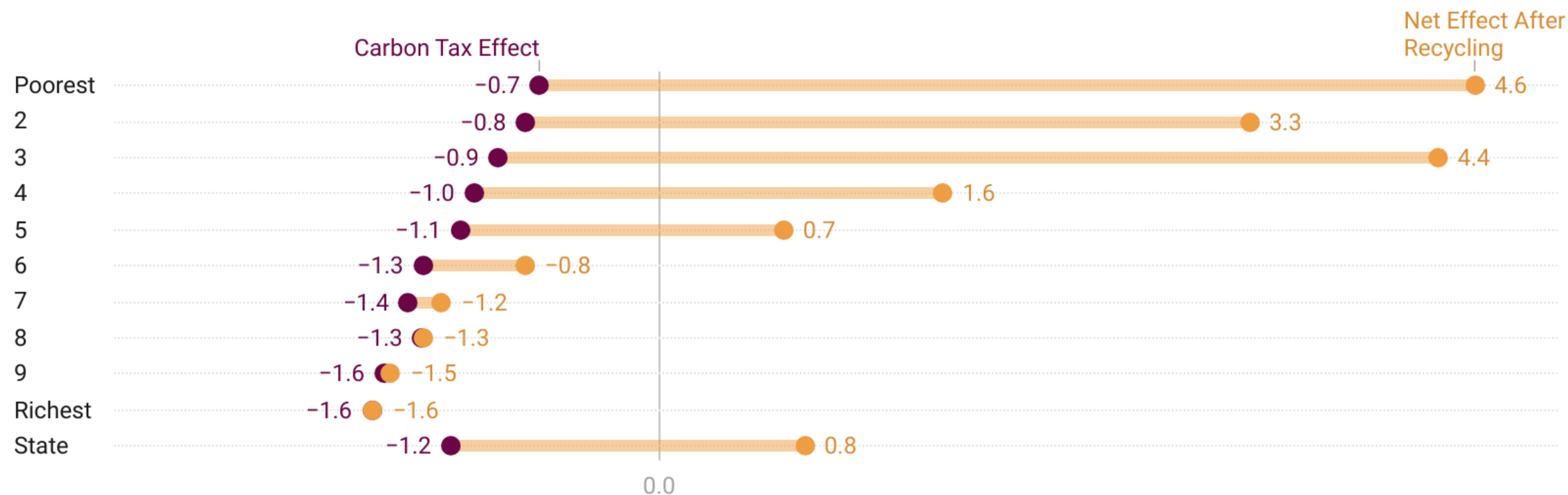
Source: PBO analysis using the EVE model • Created with Datawrapper

Revenue recycling of carbon tax yields

- Since Budget 2020, yields from increases to the carbon tax have been allocated to the Carbon Tax Fund
- A portion of these revenues are recycled directly to households to offset the known regressivity of carbon tax increases
- In Budget 2024, these measures were via the social welfare system:
 1. A €4 per week increase to Increase Qualified Child Payments
 2. A €54 increase to the weekly income limits for the Working Family Payment
- Joint effect of increased taxation and subsequent recycling?

More than offsetting average income increases

Change in disposable income (€ per week)

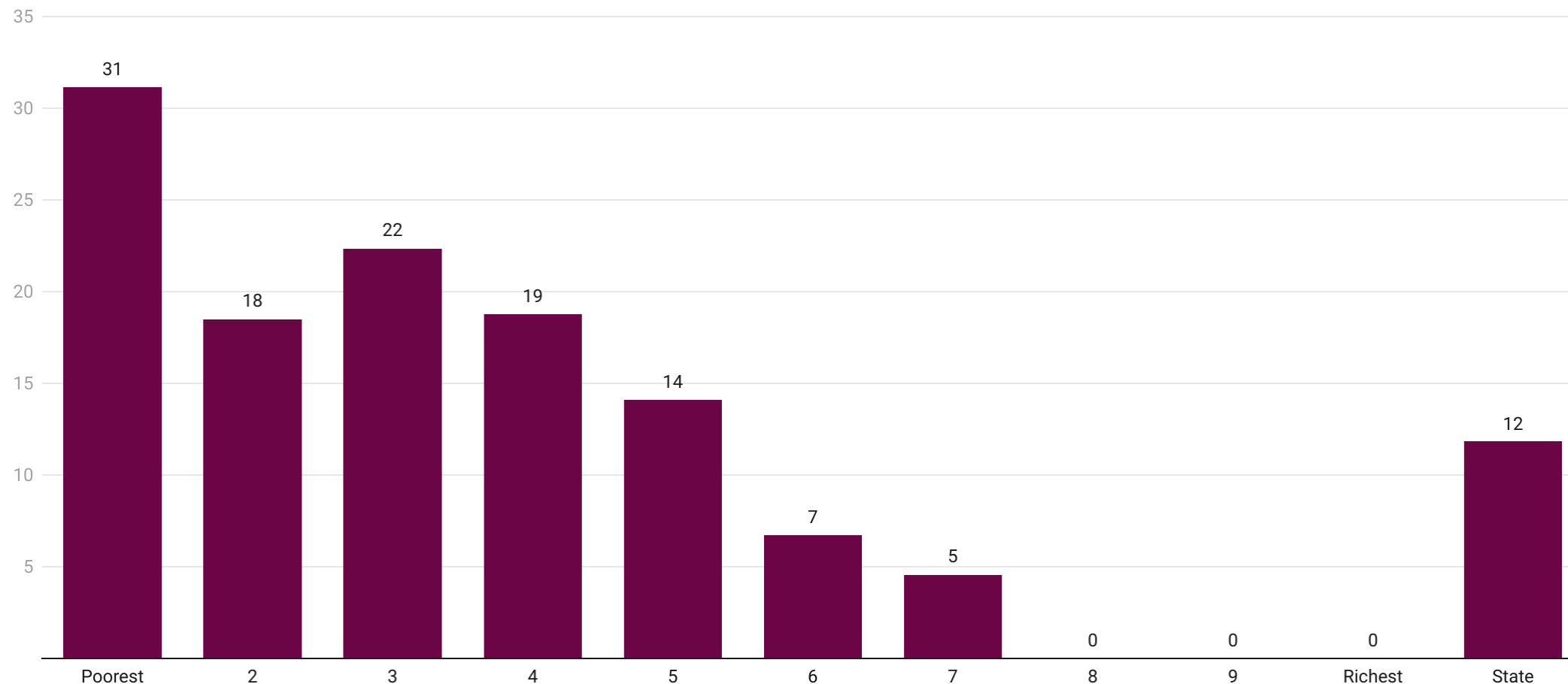


Notes: Households are sorted into ten equally sized bins based on equivalized household disposable income.

Source: PBO analysis using EVE and SWITCH v7.0 • Created with Datawrapper

...average income changes mask concentrated redistribution

% of households who received recycled revenues



Notes: Households are sorted into ten equally sized groups based on equivalized household disposable income. Chart shows the share of households in each decile who benefitted from 1) a €54 increase to the Working Family Payment income limits or 2) a €4 rise to Increases for a Qualified Child on social welfare schemes.

Source: Notes: PBO analysis using SWITCH v7.0 • Created with Datawrapper

Conclusions

- EVE model a powerful tool for analysing costs and distributional effects of indirect taxes
- Indirect taxes are regressive
 - Particularly when liabilities are compared to household income: 29.2% of the poorest decile disposable income on average vs 7.9% for the richest
 - VAT is the largest and most regressive element
- Scheduled carbon tax rises are regressive in our static analysis
 - Continued monitoring of how revenues are recycled warranted
 - Analysis on the benefits of capital investments via retrofits to low-income households from the Carbon Tax Fund would also be very useful

Appendix

Excises in the model

Table 1: Excise parameters, modelled 2023 scenario

Tax Heading	Tax Rate
<i>Alcohol Product Tax</i>	
Spirits	€42.57 per litre of alcohol
Beer/Stout/Ale/Lager (>2.8% ABV)	€22.5 per hectolitre per cent alcohol of beer
Cider (>2.8% & <6% ABV)	€94.46 per hectolitre of wine
Wine (Still, >5% & <15% ABV)	€424.84 per hectolitre of wine
Fortified Wine (Still, >15% ABV)	€616.45 per hectolitre of wine
Sparkling Wine (>5.5% ABV)	€849.68 per hectolitre of wine
<i>Tobacco Product Tax</i>	
Cigarettes	€403.32 per 1,000 cigarettes
+ Cigarettes (Ad Valorem)	Ad valorem charge of 8.73%
Cigars	€454.071 per kilogram
Fine-cut tobacco	€436.842 per kilogram
<i>Mineral Oil Tax</i>	
Petrol	€541.84 per 1,000 litres
Diesel	€425.72 per 1,000 litres
Home heating oil	€14.78 per 1,000 litres
<i>Carbon Tax</i>	
Petrol, Diesel, LPG, Natural Gas, Kerosene, Coal & Peat Briquettes	€48.50 per tonne of carbon

Modelling menu

Tax Header	Sub-components modelled	Modelled?
Excises		
Mineral Oil Tax	Light Oil (Petrol), Heavy Oil (Diesel), Fuel Oil (Home-heating oil)	✓
Alcohol Products Tax	Beer (>2.8%), Wine (Still >5.5%, Still >15% & sparkling >5.5%), Spirits, Cider & Perry (>2.8% and <6.6%)	✓
Tobacco Products Tax	Cigarettes (per thousand & ad valorem), Cigars, Fine-cut tobacco	✓
Carbon Tax	Petrol, Diesel, Kerosene, LPG, Solid Fuels (Coal & Peat), Natural Gas	✓
VAT	Domestic household sector (4 VAT rates & >500 expenditure items)	✓