

1 Designing fair environmental taxation requires anticipating the distributional impacts it has on society.

A carbon tax was introduced in France in 2014. It affects all fossil fuels except electricity (already covered by the EU ETS). The tax level rises over time to achieve the 2030 and 2050 GHG emission reduction targets.

Carbon tax trajectory in France

Year	2013	2014	2015	2016	2017	2018	2019	2020	2030
Carbon tax level	0€/tCO ₂	7€/tCO ₂	14.5€/tCO ₂	22€/tCO ₂	30.5€/tCO ₂	39€/tCO ₂	47.5€/tCO ₂	56€/tCO ₂	100€/tCO ₂

Source: Budget laws and Law on energy transition

The carbon tax increases the cost of fossil fuels, and affects households differently:

- by type of energy consumed,
 - higher burden for households using heating oil vs natural gas. Electricity consumption are not affected.
 - higher burden for households driving with diesel vs gasoline.
- by type of households,
 - higher burden for low income households
 - higher burden for households constrained in their behaviour: poorly insulated housing, no alternative for car use, etc.

Using a microsimulation model built on a representative sample of the French population (Phebus, 2012), I simulate for each household the taxes levied on its consumption of energy for housing and travelling, as well as the benefits they receive. This model allows analysing the distributional effects of rising costs of energy and the vulnerability of households to carbon taxation.

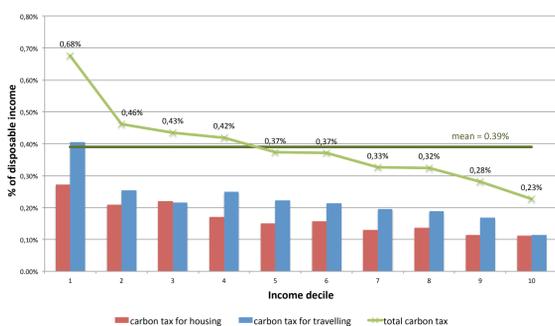
Data → Tax parameters → Simulation → Analysis

2 The carbon tax causes a decline in purchasing power and places a higher burden on low-income households (in the short-term*).

*without taking into account recycling of carbon tax revenue, meaning only direct & non-equilibrium impacts.

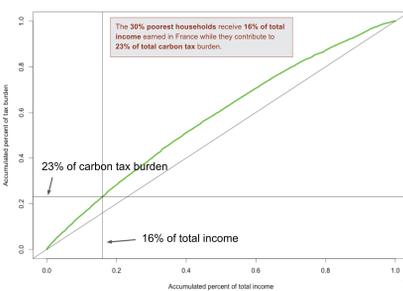
A carbon tax set at 22€/tCO₂eq is estimated to increase households' energy spending by 120€/year on average. It represents 3.5% of their energy bills. Low-income households bear the highest **tax burden**. They spend a higher share of their income on paying the carbon tax: 3x more than the 10% richest and 2x more than the average household.

Carbon tax as a % of a household's disposable income (22€/tCO₂eq)



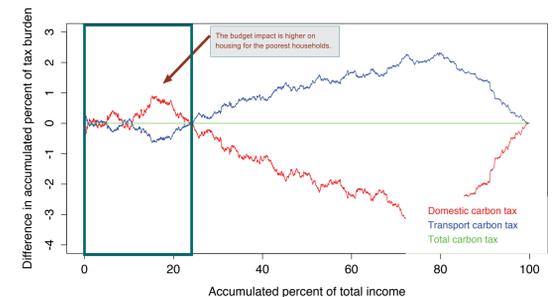
The **Suits Index** of progressivity measures more precisely the distributional effects of a tax by looking at its deviation from proportionality. A **regressive** tax is one in which the tax burden – the share of income paid in taxes - decreases with income. Plotting the accumulated % of carbon tax burden against the accumulated % of income, a proportional tax would be a diagonal line. A curve located above is regressive.

Share of total population	Share of total income	Share of total carbon tax
10%	4%	7%
20%	10%	15%
30%	16%	23%
40%	24%	33%
50%	32%	42%
60%	41%	52%
70%	52%	63%
80%	63%	74%
90%	78%	86%
100%	100%	100%



Results for transport and domestic spending independently show that taxing carbon on **transport** energy use is more regressive (Suits Index = -0.18) than taxing domestic energy use (Suits Index = -0.13). Yet taxing **domestic** energy use has a higher impact on the 40% poorest households (up to 23% of cumulative income in the dark red frame in the graph).

Deviation from the mean regressivity of the carbon tax



3 It is possible to correct this regressive impact, if the tax is accompanied by measures which compensate for loss of income.

Revenues generated by the carbon tax offer an opportunity to design a progressive carbon taxation package:

- aim at budget neutrality for households
- respect equity principles between affected groups of the population

How?

Households can be offered monetary compensations. Options for recycling of tax revenue differ in terms of size and eligibility:

- flat recycling: same amount transferred to every household
- size-based recycling: the amount transferred is adjusted to the household composition
- targeted recycling (income poor): only households with an income below the poverty line are eligible
- combination: flat recycling + targeted at the income poor

For each recycling option, the objective is to evaluate the minimum amount of cash transfer which makes the carbon tax become **progressive**, based on the Suits index of progressivity.

Combining a flat recycling scheme with a cash transfer targeted at the income poor could correct for regressivity by recycling between 17 and 60% of the revenue generated by the French carbon tax.

	% of tax revenue recycled	% of population eligible	mean cash transfer (eligible population)
no recycling	0.0%	0%	- €
flat recycling	59.2%	100%	71 €
size-based recycling	58.2%	100%	70 €
targeted recycling (income poor)	16.6%	12%	168 €

A carbon package should include measures to compensate for tax regressivity and to support vulnerable households.