ENVIRONMENTAL IMPACTS OF THE FRENCH FINAL CONSUMPTION

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Overview

Following the Intergovernmental Panel on Climate Change recommendations, some countries set ambitious greenhouse gases (henceforth GHG) emissions reduction targets. In particular, France officially committed to a four-fold reduction in its territorial GHG emissions by 2050 compared to 1990 levels[1]. In this context, 2030 is an important step on the road towards a 2050 low-carbon society: emissions in 2030 will have to comply with the self-imposed target, were we to meet it. Yet, focusing on territorial impacts leads to overlook imports-embedded impacts. As a matter of fact, French territorial GHG emissions have slightly decreased since 1990 (0.6% per year, [3]), whereas consumption-based emissions have been shown to increase (by more than 0.2% per year, [2]). Furthermore, in addition to climate change, there are other important environmental impacts to be taken into account.

We propose an exploratory prospective of the French households consumption environmental impacts in 2030. We take three environmental impacts into account: global-warming potential, air acidification and photochemical oxidation. Two scenarios are simulated and then compared: first, the reference scenario, in which the current trends of final consumption are not strongly contrasted; secondly, the main scenario, in which ambitious changes in consumption are simulated. Each potential impact comes from four sources: direct emissions from the households, emissions from the domestic production, emissions from the imported intermediate consumption and emissions from the imported final consumption.

Methods

We first take a census of actions aiming – *a priori* - at decreasing environmental impacts, such as: sharing and pooling cars, insulating buildings, throwing less food products away, increasing appliances life cycles, energy efficiency in industry, etc. Then, we quantify the magnitude of these actions (*e.g.* a 60% decrease in food waste), convert them into euros, and finally inject them into the model.

The input-output model we built is multi-regional: one core country (France) and two trading-partner economies, in order to take the heterogeneity in production systems as well as the heterogeneity in per unit environmental impacts of production into account. Eurostat national accounts data (NACE 2007 rev.1) are used, in which economies are disaggregated in 59 "products" (*i.e.* goods and services). In addition to final consumption spending, production and intermediate consumption, some physical primary flows (then converted into environmental impacts) are available for the 59 products. This allows us to conduct a multi-regional environmentally extended input-output analysis.

The two scenarios are built according to the following steps. First, households final consumption grows along with the -exogenously determined- real GDP. Then, this increase in spending is converted into an increase in physical quantities on the one side, and an increase in quality on the other side. Two forces make physical quantities increase: first, demographic growth (+11%); second, the poorest 20% are assumed to spend their increase in income into buying more goods and services rather than higher quality ones, unlike the 80% others. In other words, the growth of consumption per capita is immaterial but for 20% of the population. Assuming fixed budgetary coefficients as well as relative (after-tax) income inequalities, we obtain a projection of the households consumption in 2030.

In a second step, two different sets of hypotheses are applied to the latter projection: a set of moderate changes, corresponding to the reference scenario, and a set of deeper changes, corresponding to the main scenario. In each scenario, assumptions are made on: the final demand, the technical coefficients –though most of them remain unchanged - and finally the per unit environmental impacts of production. As far as final demand is concerned, we quantify the possible additional spending (*e.g.* investments to insulate homes) as well as the related economic gains (*e.g.* a decrease in energy bill subsequent to an increase in energy efficiency), and thus estimate the (possible) net "avoided" spending. In order to control for possible rebound-effects, we redistribute it according to the budgetary coefficients observed in 2007. The input-output analysis based on scenario-specific final demand, technical coefficients and per unit impacts gives us the total impacts of the French households final consumption.

The impacts of imported products are taken into account by replicating the input-output analysis on: first, the German economy, assumed to represent the relatively rich countries; secondly, the Polish economy, assumed to represent France's other trading-partner economies.

[1] Cf Loi POPE, 2005

Finally, we run sensitivity analysis in order to determine the hypotheses leading to the most significant environmental impact reductions.

Results

- The levels of the three potential impacts in 2030 are quantified in the reference scenario and in the main scenario. First, GHG emissions in the main scenario are 20% lower than in the reference scenario. Compared to 2007, it is a 26% reduction. Secondly, given the importance of energy efficiency and carbon cuts in our scenarios, air acidification and photochemical oxidation decrease only by 1% and 3% respectively in the main scenario compared to the reference scenario;
- As about half of the emissions are embedded in imported products, the assumptions made on technical coefficients and unitary impacts in the French production system have but limited effects, and assumptions on the final consumption and direct emissions have more tangible effects;
- The reduction of the global-warming potential in the main scenario compared to the reference scenario is mainly due to efforts on energy products (71% of the decrease), food products (8%), and car industry (6%);
- The impacts of each product have different origins: some products exhibit high unitary impacts (*e.g.* motor fuels, natural gas) whereas other products count for an important share of the total spending (*e.g.* buildings, health, education);
- Results are highly sensitive to budgetary coefficients. Moreover, a reduction in final consumption of a given product does not, as total spending is fixed, necessarily imply a decrease in environmental impacts.

Conclusions

Concerning the global-warming potential, the main scenario evaluates the impact of the French households consumption in 2030 at 6.6 tCO_2e per capita. It is a significant reduction compared to 2007 (about -30%). Yet, this remains far above 1.6 tCO_2e per capita, which corresponds to the average individual quota with a global 15-Gt-carbon-recycling capacity shared among 9 billion people in 2050. On the other hand, important reductions of potential impacts are to be expected from both changes in the structure of the economy (input-output analysis main flaw), as well as new forms of exchange such as collaborative economy or functional economy. Both are hardly taken into account in this study. Furthermore, serious data availability issues concerning low-income trading-partner economies might lead to underestimate the impacts. Finally, a deeper analysis of cumulative emissions is a further research path.

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