Institut des Politiques Publiques

THE REDISTRIBUTIVE EFFECTS OF CARBON TAXATION IN FRANCE

IPP Policy Briefs

No. 34

July 2018

Thomas Douenne

www.ipp.eu

Summary

Although widely endorsed by economists, carbon tax is struggling to establish itself on the agendas of public decision-makers. One of the reasons for its slow development is the fear that it might generate major redistributive effects, and in particular discriminate against the lowest-income households. This policy brief presents the findings of an ex ante assessment of the redistributive effects on households of the environmental taxation reforms in France in 2018. Carbon tax is intrinsically regressive, but it generates additional revenue. By transferring this revenue neutrally to all households, a progressive reform would be obtained. However, even in such a situation, the reform would generate considerable redistributive effects within the income groups. Such horizontal transfers, which are more difficult to correct, suggest that other tools are necessary for reducing the impact of the reform on the most vulnerable. Looking to the long term, it appears essential to invest in improving the energy performance of housing and of transport. Such policies meet not only environmental requirements, but also the need to reduce the vulnerability of the lowest-income households to future energy price rises. ■

- Carbon tax is regressive: the lower-income households spend a larger share of their resources on this tax. Replacing "social tariffs" ("*tarifs sociaux*") with the "energy cheque" ("*chèque énergie*") does not make it possible to compensate for the regressivity of the tax.
- If the net revenue from the tax were paid back homogeneously to households, the reform could become progressive. However, it would still generate major redistributive effects within income groups, and many "losers" among the lowest-income households.
- Lump sum transfers, even targeted on the most vulnerable households, do not make it possible to correct these redistributive effects. Other instruments helping households to reduce their energy needs are essential in order to mitigate these long-term redistributive effects.

The Institut des Politiques Publiques (IPP) has been developed through a scientific partnership between the Paris School of Economics (PSE) and the Centre for Research in Economics and Statistics (CREST). IPP's aim is to promote quantitative analysis and evaluation of public policy using cutting-edge research methods in economics.

CREST
http://crest.science

PARIS SCHOOL OF ECONOMICS
ECOLE D'ECONOMIE DE PARIS
www.parisschoolofeconomics.eu

With the Climate Plan that is presented in July 2017, the French Government intends to position itself as a leader in energy transition and ecological transition. The roadmap for the French National Low-Carbon Strategy (SNBC) has thus been revised, and it now makes provision for carbon neutrality at the horizon of 2050. With this aim in view, the transport and residential housing sectors are being called upon to play a major part because they respectively account for 27% and for 12% of greenhouse gas emissions[1]. In order to make a gradual transition towards less polluting modes of consumption in these sectors, the French Government has opted for the strategy of sending a stronger price signal by accelerating the trajectory of the Climate-Energy Contribution (CCE, cf. box No. 1) that taxes energies on the basis of their CO_2 content.

The aim of taxing energies on the basis of their carbon footprints is to change the behaviour of individuals, and to steer their consumptions towards lower-emission energies. This mechanism is often considered by economists as being the most effective one for reducing pollution, because it makes it possible to pass on its social cost to the private cost that consumers have to bear, so that they then take into account the environmental externalities. However, the acceptability of such a mechanism regularly comes up against resistance due to it generating additional cost for consumers. In particular, since energy consumption takes up a large share of income for low-income households, it is to be feared that this new tax will be regressive. In a context in which energy poverty, or "energy precarity" as it is known in France (cf. box No. 2), is taking on increasing importance in the public debate, introducing additional taxes on energy raises the issue of the fairness of environmental policies. It is therefore necessary to analyse the redistributive effects that could be generated by an increase in the carbon price, and to think about the compensation mechanisms that could be put in place to mitigate those effects.

ASSESSING THE REDISTRIBUTIVE EFFECTS OF INDIRECT TAXATION: THE MICRO-SIMULATION APPROACH

This policy brief presents the findings of a study assessing, ex ante, the redistributive effects of the recent changes in energy taxation in France. The study takes 2016 as the reference year, and uses micro-simulation to analyse the redistributive effects of going over to the 2018 legislation. This change in legislation involves a carbon price that is higher, going from 22 euros per tonne of CO_2 (€/tCO_2) to 44.6 €/tCO_2, and an additional rise of 0.026 euros per litre (€/litre) for diesel, so that taxation on diesel starts gradually to catch up with taxation on gasoline. These increases in taxation are accompanied by a new compensation mechanism for the lowest-income households, namely the "*chèque énergie*" or "energy cheque" (cf. box 1). It was introduced in January 2018 and replaces the "*tarifs sociaux*" or "social tariffs" for electricity and gas. This new transfer, indexed on the size and on the taxable income of the household, is therefore no longer reserved for consumption of those two energies, and should apply to about 4 million households.

The data used in this study are the data from the latest "*Budget de Famille*" survey ("Family Budget" survey, BdF 2011) conducted by Insee (France's national statistics office). The French national accounts data were used to obtain a sample that was representative for the year 2016. Statistical matching methods also enabled the BdF survey to be matched up with observations drawn from the *Enquête Revenus fiscaux et sociaux* (Survey on taxable income and benefits income), the *Enquête Logement* (Housing Survey), and the E*nquête Nationale Transports et Déplacements* (National Transport and Travel Survey). That data was then incorporated into the *Institut des politiques publiques* (IPP) micro-simulation model known as "TAXIPP". In order to study the redistributive effects of the reform, the reaction of households to the changes in energy prices was estimated from the BdF data by using a demand model.

BOX 1 - THE "CONTRIBUTION CLIMAT-ENERGIE"

The "Contribution Climat-Energie" or "Climate-Energy Contribution" (CEE) is an excise tax applied to the CO_2 content of energies. It was introduced in 2014 at 7 €/tC02, and it was initially scheduled to reach 100 €/tCO_2 by 2030. The French Government announced in 2017 that the objectives would be toughened up so that it would reach 86.2 €/tCO_2 as of 2022. The tax applies to the price of goods before VAT, and it is passed on to the price paid by consumers. Since electricity is already taxed on the market of the European emissions trading system (EU-ETS), it is not concerned by the CCE. The Climate-Energy Contribution fits into the system of already existing taxes on consumption that includes the TICPE (domestic duty on energy product consumption) that taxes petroleum products, and the TICGN (domestic duty on natural gas consumption) on gas. As regards road vehicle fuels, it currently represents only a small proportion of the taxation since it corresponds respectively to 16% and to 20% of the total TICPE on gasoline and on diesel.

This policy brief assesses the effect of going over to the 2018 legislation from the legislation in force in 2016. This involves: 1) an increase in the price of CO_2 from 22 €/tC0$_2$ to 44.6 €/tCO_2; 2) an additional increase of 0.026 €/litre on diesel with a view to gradually catching up taxation on gasoline, and 3) replacing the "social tariffs" ("*tarifs sociaux*") for electricity and gas with the "energy cheque" ("*chèque énergie*"). This cheque enables households to pay energy bills or to pay for renovation work aiming to improve the energy performance of their homes. It is granted to them on the basis of their taxable income and of their number of consumption units. The amount of this cheque is up to €227 for a family of 4 or more whose taxable income is less than €5,600 per consumption unit. According to the French Government, 4 million households will be eligible for the energy cheque that they will receive automatically provided that they have sent in their income tax returns. They can then use it by registering it on line or by sending it by mail to their supplier. By comparison, since 2012, the social energy tariffs had been automatically allocated to the beneficiaries. However, that beneficiary status itself depended on the beneficiary taking up their right to universal and supplementary health cover (CMU-C) or to them taking up the right to receive help (ACS) with paying for a supplementary health insurance scheme. Unfortunately, the percentage of people eligible for those rights but who did not take them up was high. In 2015, the French Ministry for Ecology, Sustainable Development, and Energy considered that about 3 million households were beneficiaries of social tariffs for electricity, and 1.2 million were beneficiaries of social tariffs for gas.

(1) Source: European Environment Agency

CONSUMER REACTION TO ENERGY PRICES

The estimations reveal budget elasticity of about 0.5 for fuels and for residential energy: when the total budget of the household increases by 10%, its energy spending increases by an average of 5%. As regards price elasticity, we obtained a value of -0.45 for transport and a value of -0.2 for the home. These elasticity values indicate that if the energy prices increase by 10%, households will, on average, reduce their fuel consumption by 4.5% and their residential energy consumption by 2%. These results confirm the most frequent estimates in the literature. They show that households react significantly to fuel prices, and to a lesser extent to residential energy prices. In order to bring heterogeneity into the reactions to prices, we calculated these elasticity values for various different groups of households on the basis of their incomes and of their places of residence. We observed that energy price elasticity – in absolute terms – decreases with increasing income, and is higher for rural populations and residents of villages and small towns than for urban households in large towns and cities. This finding has two implications. Firstly, the lower-income households living in rural areas or in villages and small towns will thus reduce the monetary impact of the reform by adjusting their spending to a greater extent in reaction to the price rises. Secondly, those households will sacrifice a larger proportion of their consumption, and will thus suffer a greater loss of well-being that will not be picked up by analysing the monetary transfers.

THE ENVIRONMENTAL IMPACTS OF THE REFORM

By applying the above elasticity values to the consumptions of the households, it was possible to calculate the reductions in consumption implied by the reform. It was then possible to transcribe these quantities into reductions in greenhouse gas emissions. It was estimated that the price changes implied by the reform should, all other things remaining equal, reduce annual emissions by 3 million tonnes of CO_2 equivalent, i.e. about 0.6% of French emissions and 1.5 % of French transport and residential emissions. By way of comparison, from 1990 to 2013, the emissions from these two sectors grew on average at a rate of 0.5% per year[2]. Considering only the direct effect of the reform, with technology remaining constant, the environmental effects are therefore relatively limited. With a view to achieving carbon neutrality at a horizon of 30 years from now, it appears essential for the price rises to induce a transition towards cleaner technologies. The reduction in consumptions implied by these price elasticity values is, at least in the short term, insufficient to satisfy the French Government's ambitions.

Considering emissions reductions per energy, we observe that transport fuels contribute more than residential energies (71% as against 29%) even though they represent a smaller proportion of household spending (2.8% as against 5%[3]). This result can be explained by various factors, in particular by the high carbon content of road transport fuels, by the new additional tax on diesel, and also by the larger price elasticity on fuels compared with residential energies. This result implies that while price signal is effective in inducing changes in behaviour in the transport sector, it could be insufficient to make any real difference in the residential sector. This lower sensitivity to price would suggest that other mechanisms could be complementary for facilitating the energy transition, such as, for example, policies aiming to develop investment for improving the energy efficiency of housing.

REDISTRIBUTIVE IMPACTS BETWEEN INCOME GROUP

Graph 1 shows the tax burden ratio for households of the tax changes being studied (cf. box 1), i.e. the proportion of their resources that households will have to spend on the new tax. When the resources are shown according to the disposable income of households, the tax appears as being very regressive since the households in the first decile bear a tax burden that is almost three times larger than the households in the last decile (0.55% as against 0.20%). However, when the tax is compared with total household spending, these conclusions are less clear-cut: the profile of the tax burden ratio is relatively constant between income groups, at about 0.35%. The choice of the second method can be justified by the fact that since consumption is less subject to temporary variations than income, it is more representative of standard of living. This applies in particular to many students or self-employed workers whose current income is less than their actual purchasing power. In view of the significance of the implications of this methodological choice, the most relevant approach appears to be to compare the two results. It is then difficult to deny the regressivity of the tax, even though the scale of this effect should be qualified.

In anticipation of the regressive effects of the increase in the CCE, the French Government has introduced a mechanism aiming to compensate the low-income households. After being tested in four French *départements* from 2016, the "*chèque énergie*" or "energy cheque" (cf. box 1) replaced the "*tarifs sociaux*" or "social tariffs" for electricity and for gas in January 2018. This mechanism is, above all, intended to be simpler and more neutral that the "social tariffs" mechanism that preceded it. However, the amounts of these transfers represent only a very small proportion of the revenue generated by the tax. According to the calculations of the model, it is estimated that the tax should generate an annual revenue of 4.1 billion euros, as against a cost of 354 million euros for the energy cheque, i.e. 8.6% of the total revenue. The net impact of this change of mechanism on regressivity should be limited and will depend to a large extent on how the percentage of eligible households not taking up their right to use the benefit changes, and this, for the moment, is difficult to estimate (cf. box 1). With a default assumption of a rate of take-up of rights that is equivalent for both mechanisms, the tax burden ratio for each income decile is affected very little and the reform remains regressive. The energy cheque coming into effect only just compensates for the disappearance of the social tariffs for low-income families.

(2) Source : Median household spending according to the BdF 2011 survey
(3) Source : Citepa, SECTEN report

GRAPH 1 - Tax burden ratio for the increase in the taxes on energy, per income decile

NB : For households in the first decile, the increase in the duties represents, on average, 0.55% of their disposable income, as against 0.21% for the households in the last decile. In percentage of their total spending, this increase in duties represents respectively 0.37% and 0.32%.

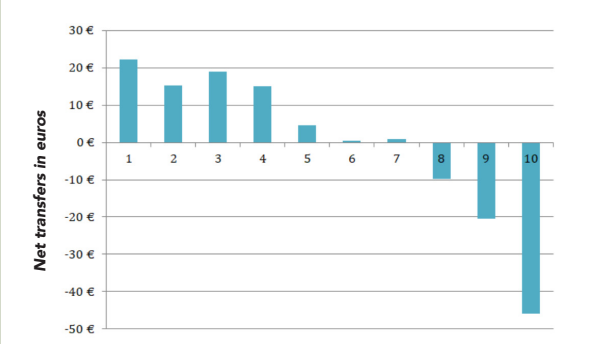
In anticipation of the regressive effects of the increase in the CCE, the French Government has introduced a mechanism aiming to compensate the low-income households. After being tested in four French *départements* from 2016, the "*chèque énergie*" or "energy cheque" (cf. box 1) replaced the "tarifs sociaux" or "social tariffs" for electricity and for gas in January 2018. This mechanism is, above all, intended to be simpler and more neutral that the "social tariffs" mechanism that preceded it. However, the amounts of these transfers represent only a very small proportion of the revenue generated by the tax. According to the calculations of the model, it is estimated that the tax should generate an annual revenue of 4.1 billion euros, as against a cost of 354 million euros for the energy cheque, i.e. 8.6% of the total revenue. The net impact of this change of mechanism on regressivity should be limited and will depend to a large extent on how the percentage of eligible households not taking up their right to use the benefit changes, and this, for the moment, is difficult to estimate (cf. box 1). With a default assumption of a rate of take-up of rights that is equivalent for both mechanisms, the tax burden ratio for each income decile is affected very little and the reform remains regressive. The energy cheque coming into effect only just compensates for the disappearance of the social tariffs for low-income families.

CAN WE CORRECT THE REGRESSIVE EFFECTS OF ENVIRONMENTAL TAXATION?

A central issue is thus to determine what use will be made of the surplus revenue[4]. Assuming it is redistributed identically to all households in proportion to their numbers of consumption units, we would obtain a reform having a progressive profile (graph 2). The first four deciles would gain, the last three would lose, and the intermediate three deciles would contribute as much as they would receive. However, if in the case of the French reform, this revenue were used for less neutral purposes than for such homogeneous transfers – such as for lowering the taxes on labour or on capital – the reform could remain regressive.

The above results suggest that the regressivity of environmental taxes, calling into question their acceptability, can be corrected through homogenous lump sum transfers. Thus, by focusing on the vertical redistributive effects between income groups, the economic literature has so far failed to explain the reticence of decision-makers to adopt such policies on the basis of fairness criteria. In order to understand the problems of acceptability that a progressive reform could raise, it is thus necessary to look at the horizontal redistributive effects, i.e. within the income groups.

GRAPH 2 - Net transfers per consumption unit, assuming homogeneous redistribution of the surplus revenue

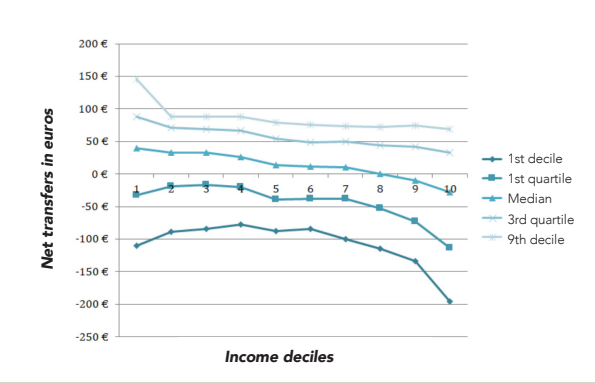


NB : If the revenue from the tax after distribution of the "energy cheque" benefit were redistributed equally to the households per consumption unit, the reform as a whole would give an average of €22 per year to the households in the first decile, while the households of the last decile would, on average, lose €46 over a period of one year.

In the case of the French reform, it appears that, after distribution of all of the revenue, as described above, more than 30% of the households in the first three deciles would lose, while 40% of the households in the last decile would gain. Graph 3 shows the distribution of the gains and losses in net transfers after redistribution of the revenue, per decile. While it shows slight progressivity for the reform after the homogeneous transfers, it also shows that horizontal heterogeneity predominates very largely over vertical heterogeneity. It can be seen, in particular, that 25% of the households in the first decile would lose more than the median household of the last decile. This is also the case for 35% of households in situations of energy poverty (cf. box No. 2), even though they are all in the first three income deciles. Despite a progressive profile, a policy aiming to redistribute the revenue from carbon tax homogeneously to households should therefore generate considerable losses for many households in situations of "poverty" or "precarity". With the prospect of a continual rise in carbon price over the coming years, these effects could rapidly exert a strong constraint on environmental policies.

(4) Officially, 3 billion euros of the revenue from the tax is being allocated to funding the "competitiveness and employment tax credit" (CICE), and the remainder is being allocated to spending on the energy transition. However, the question is: what spending currently taking place would be discontinued in the absence of this additional revenue?

GRAPH 3 - Distribution of the net transfers of the reform, per income decile



Lecture : After total redistribution of the revenue, it is estimated that the reform would result in 25% of the households in the first decile losing more than €32 per year and per consumption unit. It would also result in 10% of the households in the last decile gaining more than €68 per year and per consumption unit.

BOX 2 - ENERGY POVERTY

The French Law of 12 July 2010 on the national commitment for the environment defines a person in a situation of energy poverty, or of "energy precarity" as it is known in France, as "someone who, in their home, is experiencing particular difficulties in procuring the supply of energy necessary for satisfying their elementary needs, in particular due to them having inadequate resources or being inadequately housed". Statistically transposing this definition has aroused a long debate from which a clear consensus has not yet emerged. In this study, we identify households as being in situations of energy poverty on the basis of the criteria proposed by the *Observatoire national pour la précarité énergétique* (French National Energy Poverty Observatory). Households in such "poverty" or "precarity" satisfy at least one of the following criteria: 1) if they spend more than 10% of their income on energy and are in any one of the first three income deciles; 2) if they are below the poverty line (60% of median income), and above median energy spending; and 3) if they declare they have suffered from the cold in their home for financial reasons, and are in any one of the first three income deciles. The first two criteria apply both for residential energy and for transport fuel. They identify the households who need to spend a considerable portion of their budget to satisfy their energy needs, and thus constrain their other spending. The third criteria identifies the households who do not satisfy their energy needs because of financial constraints. Since transport deprivation is more complex to identify, it is not considered in this study.

The significance of the horizontal redistributive effects shows that income is merely one of the many dimensions that determines the heterogeneous impact of energy taxation. To determine what other factors lie behind these disparities, the impact of many characteristics of the households on the net transfers received per consumption unit was estimated. This estimation was conducted by linear regressions that made it possible to identify the various determinants without advancing preconceptions about what the potential dominant effects would be. It appears from the estimation that the most significant determinant is by far the type of energy used by the home: households using domestic heating oil or natural gas are clear losers compared with those using electricity, to the tune of €70 per year and per consumption unit[5]. Furthermore, the significance of the energy used is robust to electricity being included in the reform, given the lower carbon content of that energy in France.

Beyond energy type, other factors play an important part. In particular, it appears from our simulations - all other things remaining equal – that households living in the country will lose €7 per year compared with residents of medium-sized towns, and €22 compared with residents of the Paris conurbation. However, it should be noted that this effect, which is very prevalent in the public debate, is significantly lower than the effect of energy type, and is comparable to the effects of other characteristics. Having mainly double-glazing would make it possible to reduce the cost of the reform by €11, living in a house rather than a flat would increase it by €16, while students would receive average additional gains of €53. The largest households would also benefit: for each additional consumption unit, a household would gain, on average, an extra €43 per consumption unit. Although significant, the effects on the rural/urban dimension should not be the main focus of the debate.

WHAT ALTERNATIVES FOR COMPENSATION MECHANISMS?

Based on these results, we might wonder whether compensation mechanisms other than the one proposed by the French Government could constitute better responses to the redistributive issues of energy taxation. In particular, on the basis of the main determinants identified above, is it possible to target vulnerable households better in order to reduce their loses? In order to study this possibility, two alternative scenarios were tested in which firstly the rural households and secondly the households using heating oil or gas receive additional transfers. These transfers, offsetting the relative losses of these groups of households, are in addition to the energy cheque that is reduced uniformly in such a manner as to keep a constant budget. Compared with the official reform, cheques that target rural households do not make it possible to reduce the redistributive effects. Cheques indexed on energy type enable a slight improvement to be made in the situations of the losing households in the first decile and of the households in energy poverty, but they do not have any effect for the second and third deciles.

These results illustrate the very limited capacity of targeted transfers for significantly reducing the redistributive effects of energy taxation.

The strategy consisting in increasing the number of criteria for these transfers so as to target vulnerable households better would also seem to be unpromising.

(5) If gas consumers appear to be as significantly impacted as heating oil consumers, despite the higher carbon content of heating oil, this can be explained by social tariffs being replaced by the energy cheque, for which heating oil consumers are now eligible.

Firstly because, due to the fact that a large proportion of the heterogeneity cannot be observed, targeting vulnerable households is necessarily limited. Then because, as the precision of the targeting improves, the incentives to reduce emissions are lower, and the compensation policy would go against the initial objective of the tax. At the most, it can be imagined that such transfers could be used in the short term, in order to compensate the households who suffer significant losses and whose consumption is temporarily constrained. In the long term, the option consisting in helping households financially to improve the energy performance of their homes offers many advantages. In addition to the environmental benefits that such investments would bring, they would make it possible to reduce households' energy bills sustainably. This is the intention pursued by the French Government through the *Crédit d'impôt sur la transition énergétique* (Cite, the Energy Transition Tax Credit). A cost-benefit study of such a policy is necessary, but the limitations encountered by the compensation policies would suggest that such mechanisms will be able to play an essential part in combating energy poverty.

CONCLUSION

The scheduled increase in energy taxation is part of an ambitious objective to reduce France's greenhouse gas emissions. Although fundamental, this policy could come up against some acceptability problems if the redistributive effects it will generate are not taken into account.

The lump sum transfers proposed by the government will not make it possible to compensate for the regressivity of the taxes. Given the wide disparity of household energy needs, putting in place targeted transfers does not appear to be able to mitigate these problems of fairness any better either. Therefore, efforts should be focused on improving the efficiency of energy consumption. Transfers such as the "energy cheque" can only provide short-term solutions when households are temporarily constrained to have high levels of consumption. In the long term, reducing energy consumption is necessary not only to satisfy our ambitions on climate, but also to solve the problems of the unfairness of environmental policies.

Reference of the study: this policy brief is based on the following working document: "The vertical and horizontal distributive effects of energy taxes: A micro-simulation study of a French policy", Thomas Douenne.

Author : Thomas Douenne is a PhD student at the Paris School of Economics and at the University of Paris 1 Panthéon Sorbonne. He is a PhD student affiliated to IPP.