



# Sustainability and transformation in European Social Policy

Valencia 8-10 September 2011

## 9th Annual ESPANet Conference **Sustainability and transformation in European Social Policy**

Valencia, 8-10 September 2011

### **Stream 7: Climate change and sustainability of European social policy: towards a research agenda**

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## Carbon Tax, Pensions and Public Deficits in France

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Preliminary version – June 2011

France, like most of the industrialized countries is facing three long-term problems: the fight against climate change, the ageing of its population and the cutting of its public deficits. Those problems must be faced simultaneously but they are usually treated separately (Quinet, 2009; Rocard, 2009; COR, 2010).

However, one cannot identify some possible economic synergies or antinomies from separated analysis. How to be sure that a solution identified for any of these problems do not jeopardize the settlement of others? How to plan the possibility of a mutually beneficial solution? This justifies to address these problems together, especially as a comprehensive response would clearly constitute a strategy for sustainable development (Godard et Beaumais, 1993; Jospin et Aglietta, 2010) and could ease the political acceptability of a major tax reform (Agell *et al.* 1996).

This intuition matches with the idea of implementing a carbon tax (or carbon-energy) and contain the rise in social contributions by allocating these revenues to a fund for financing pensions. Since 1960, improvements in automobiles has reduced by 46% the cost of fuel needed to travel 100 km, while payroll taxes per employee have increased by 6 and the number of unemployed by 7. The relative cost of labor compared with energy has therefore been rising, which has deeply driven innovation and investment decisions (Aghion *et al.* 2010). Regarding the maintenance of energy at a price lower than its social cost, it has hindered the improvement of energy efficiency and maintained our dependence on fossil fuels, especially for the low-income households (Theulière and Merceron, 2010).

Yet this idea is confronted with a theoretical scepticism. The possibility of a carbon tax reform at a negative net cost ("strong double dividend") assumes that the tax system is suboptimal initially and therefore that there is potential for economic improvement (Guesnerie, 2010).

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Financial support has come from the ADEME, the CFDT-IRES, and the *Chaire de Modélisation Prospective au Service du Développement Durable*. We would like to thank the rest of the *IMACLIM* modeling team. Especially, Frédéric Gheri and Camille Thubin working on the *IMACLIM-S France* version and Ruben Bibas and Céline Guivarch on the *IMACLIM-R France* and *World* versions.

Although the existence of such potential is a controversial hypothesis (Goulder, 1994): it is rejected by static analysis applying for perfect markets and reversible economic processes (Bovenberg and de Mooij, 1994), but confirmed by those who assume the existence of imperfect competition and involuntary unemployment (Chiroleu-Assouline, 2001; Combet et al., 2010).

To our knowledge few studies consider this issue in a dynamic and forecasting prospect. But a tax system even initially at an optimum can "drift" and enter "crisis" (Esping-Andersen, 2003). This is then likely if the changes in the context and in the public objectives are not properly anticipated and if these changes are faster than the political process of reform. As the future is uncertain, and sources of technical and institutional inertia are numerous (Boyer et al., 1991), it is necessary to evaluate the influence of past and present decisions on future possibilities.

This is what we do in this article, which gathers information from a set of prospective works and explores digitally the French macroeconomic situation by the 2020. We especially wish to remove the idea that the repeated failures of carbon tax projects in France<sup>1</sup> are justified due to an absence of any prospect for improvement and we would like to show that they mainly result from other kind of difficulties (political, institutional, informational).

The reasoning proceeds in two stages. After a brief presentation of the modeling framework (§ I), we first point out that the scenarios of the *Conseil d'Orientation des retraites* (COR) without additional funding leads France into an impasse, where the energy, economic and social tensions are exacerbated (§ II). We then compare this scenario of "impasse" with various reform scenarios. We will show that in the future context systems of compulsory levies, which integrates a carbon component offer more leeway than they remove (§ III) and that they appear superior to the alternatives to the tax reform mentioned in the debates (§ IV).

## A model for the synthesis and the debates

To consider this crossing of issues and the numerous macroeconomic interdependences, it is necessary to use a numerical model of general equilibrium. The model IMACLIM-S (Ghersis and Hourcade, 2006; Ghersi et al., 2009) is designed for comparative static exercises (Samuelson, 1947) applied to the assessment of domestic climate policies. It represents an open French economy, disintegrated into four categories of agents (households divided into twenty classes of income, companies, public administration and "the rest of the world") and four products (crude oil, fuel, other energies, and a composite good incorporating all non-energy goods and services).

It is possible to analyze realistically tax reforms with regard to the diversity of objectives of sustainable development because it relies on a coherent system and enhanced with macroeconomic accounting:

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<sup>1</sup> Carbon Tax of the Inter ministerial Task-Force for climate change (1990), eco tax from Jospin' gouvernement (1999) and carbon tax from Fillon' gouvernement (2009).

- the volumes of energy traded are not deducted from monetary transactions, but the result of an effort to harmonize the energy balances and data from national accounting. This "hybridisation" is required prior to any climate policies analysis and eases the dialogue with the engineering expertise which allows defining realistically the available technical leeway.
- The distribution of incomes, the state and the structure of public finances are precisely described. The channels of revenues associated with the production of goods begin with the remuneration of factors of production from which is added to the balance of foreign trade incomes that gives the wealth available. It proceed with sharing out operations in between the four categories of agents: mandatory contributions (social contributions, VAT, Domestic consumption tax on petroleum products (TIPP), corporate tax, income tax, etc...), social transfers (unemployment, retirement, others), etc... Once they agents have taken their decisions of consumption and investment they lend or borrow on the financial markets depending on whether their savings are positive or negative. This changes their net financial position and the income flows associated with it.
- The household account is disintegrated into twenty classes of economic<sup>2</sup> standard of living from the data of the survey of *Budget des familles* 2001. Each "social layer" has specific features of structure of income and expenditure, savings rates and tax and net financial position.

The model is calibrated on data from 2004 (INSEE, 2004, IEA, 2007) and then projected for 2020, its formal structure, the data tables for both dates and values of parameters are available in our work papers (Combet, 2011).

### Tax reforms and prospective of the « France-2020 »

Body of the simulated operations differ only in the structure of public finances, the other assumptions that determine the state of the French economy in 2020 are common (Table 1). These include the following evolutions of:

- the active population, the number of retirees and retirement benefit levels, the last prospective exercise of the *Conseil d'Orientation des retraites* (COR, 2010). Their distribution among the twenty income classes is assumed to be identical to that observed in 2004. Other social transfers and unemployment benefits evolving as the average level of net wages;
- the total population and the number of people per household, exercises projection realized in 2006 by INSEE (Insee 2007 et 2006);

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<sup>2</sup> According to the definition of INSEE: annual household disposable income divided by the number of consumption units (equivalence scale of the OECD: 1 CU to the first adult of the household, 0.5 CU to the other people aged 14 and older, 0.3 CU to the one under 14).

- international prices for the four goods, a prospective global energy scenario produced by the model IMACLIM-R (Sassi et al. 2010), which represents the major factors of change of the global system (energy resources, technical change, technological adjustment, location patterns, consumption patterns, etc.);
- the saving rate of households, a scenario of global growth regime produced by the model INGENUE2 (Aglietta and Borgy, 2008). Its strong decrease (-37%) is mainly due to the impact of population aging on savings-consumption behavior;
- the energy future of France (intensity and energy mix, carbon content, elasticity of energy consumption of households), a set of scenarios produced by the French version of IMACLIM-R.

		Exogenous evolutions on the 2004-2020 horizon				Sources
<i>Demography</i>						
	Totale population					INSEE (2006)*
	Working population					COR (2010)**
	Number of retired					COR (2010)**
	Size of the households					INSEE (2007)
<i>Publiques finances</i>						
	Retirement benefits					COR (2010)**
<i>Environnement international</i>						
	International prices	Comp.				IMACLIM-R World***
		C.O				
		Fuels				
		O. E				
<i>Households saving</i>						
	Saving rate					Aglietta and Borgy (2008)****
<i>French energy future</i>						
	Price elasticity (households)	Fuels				IMACLIM-R France***
		O. E				
	Income elasticity (households)	Fuels				IMACLIM-R France***
		O. E				
	Emissions coef. (households)	C.O				IMACLIM-R France***
		Fuels				
	Technical coef. (production)	Comp	Fuels	C.O	O.E	IMACLIM-R France***
		Comp.	-	+40,4%	+0,1%	
		Fuels	-	+4,1%	-2,1%	
		C.O	-14,9%	+11,1%	-45,7%	
		O. E	-13,3%	+4,1%	+17,9%	
	Emissions Coef. (production)	Comp	Fuels	C.O	O.E	IMACLIM-R France***
		Fuels	-	id.	id.	
		C.O	-0,2%	-0,2%	-0,1%	
		O. E	-28,3%	-	id.	

Comp.: Composite of the non energy goods and services Composite des biens et services non énergétiques

C.O: Crude Oil

O.E.: Other energies (for residential use)

\* "Central" demographic scenario (median assumptions of fertility, life expectancy, and net migration).

\*\* Level of retirement benefits evaluated by the schemes given the economic assumptions of the scenario A (adjustment of the crisis effects). The projections of the employment rate are common to the three economic scenarios and correspond to the fiscal projection of INSEE in 2006. Only an effect of the postponing of the retirement age induced by the Fillon reform-2003 is added.

\*\*\* Scenarios characterized by the absence of global climate commitments and by little effort on the infrastructures French level (low energy efficiency of buildings and increase in the capacity of public transport and rail freight railway and river). We purposely choose to place us into the "worst case", the one of unilateral French action and of a median technical potential (neither optimistic nor pessimistic), to integrate the state of misunderstanding on the effect of a carbon tax system.

\*\*\*\* Scenario without pension reform of Aglietta and Borgy (pg. 25-26), characterized by a low retirement age (62.5 years on average for Western Europe) and a rather high replacement rate (45% on average).

**Table 1 Hypotheses on the future constraints  
The context of the fiscal reform**

Given these trends, the effects of reforms on other lines of the French economy (level of growth and employment, CO2 emissions, income distribution, public debt, etc.) are determined by the structure of the model of which we just outline here the main assumptions.

### Determinants of the macroeconomic effects

The insertion of the scheme disrupts the system, that when adjusting, distorts the image of a scenario without reform. The direction and the extent of this deformation are determined by the interplay of five sets of assumptions that define:

- *Adaptation of the productive system*, by adjusting the intermediate consumption of labor and capital according to their relative prices, the total factors productivity (technical endogenous progress according to cumulative investments and the decreasing returns static);
- *The tradeoff of consumers*, governed by a price elasticity and income elasticity for each of the final energy (fuel and home energy);
- *The labor market*, synthesized by a wage-unemployment loop (Blanchflower and Oswald, 2005) describes a negative correlation between unemployment and net salary;
- *The terms of international competition*, that are evolving in accordance with the variations in domestic production costs relative to the composite international good which is the currency of the model (with a constant exchange rate, assuming that France is a small country across the euro area);
- *The administrations fiscal behavior*: consistency of the ratio between GDP and public expenses (the actual volume of services and public investments result from the evolution in nominal wealth and the price of the composite); indexation of social transfers on the average level of net wages.

Among these assumptions, the representation of the labor market and the potential energy savings are critical. The model represents a structural situation of underemployment with limited wages flexibility: due to the decline because of labor law, to be rising due to the tightening of the competitive constraints influencing greatly the job market<sup>3</sup>. It also represents the fact that the potential energy savings for producers and consumers are limited on the horizon under consideration and that with the help of price-elasticity that, rather than being constant, decrease as and when consumptions approach the technical<sup>4</sup> asymptotes or incompressible needs.

With constant propensities to save and a capital formation adjusting to the demand that is addressed to the production system, the model "ends" by estimating the outside flows of capital which cancel out the excess demand on financial<sup>5</sup> markets. The equilibrium is defined by joint adjustment of the quantities traded with the rest of the world, domestic prices, the level of activity and level of interest rates.

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<sup>3</sup> This hypothesis is consistent with a model of negotiation between employers and employees, where nominal wages do not necessarily grow as companies generate profits and create jobs (Hahn and Solow, 1997, pg.101-102). The markets opening may come with a "wage restraint" if, as assumed here, it tends to increase the bargaining power of employers (uncertainty about future sales, risk of relocation, risk of loss attractiveness to investors).

<sup>4</sup> For production systems, this representation requires a certain level of inertia of installed capacity (assuming 'putty-clay') and limits the available frontier of production for a given time horizon. This defines an "innovation possibility Curve". The potential for available substitution in the production and consumption synthesizes then the various elements of technical controversies: possibilities of technical change, replacement of the installed capacity and structural change in the economy.

<sup>5</sup> This macroeconomic "closure rule" is used to represent different debt situations and imbalances: the current account and external position of France may be in deficit or surplus.

## Determinants of the distributives effects

The Reform affects unlikely the twenty different income classes according to three main factors:

- *the sensitiveness of the structures of income* to the changes in wages and interest rates, given the assumptions of indexation of allowances and welfare payments on such wages;
- *classes situation on the labor market* : the variation in employment are divided among income classes according to their unemployment rate and their own social contribution rates, in addition, changes in income that go with the transition from unemployment to business or activity to unemployment are specific to each class (according to the differences observed in 2004).
- *the heterogeneity of potential energy savings of households*, in the disposals in which a carbon tax is incurred, the ability of classes to ease the burden of taxation is so more reduced as they are close to their incompressible needs.

This type of model is above all useful to conduct several sensitivity tests on the controversial issues (as we did in Combet and al. (2010)) and confront different perceptions of the future. But since our objective here is just to show that it isn't unrealistic to believe that the point of a carbon tax for sustainable development may extend beyond the single climate issue, we limit ourselves to this unique set of assumptions.

## A « deadlock » scenario: the France-2020 without reform of the *Conseil d'Orientation des Retraites (COR)*.

Since 2001, the COR<sup>6</sup> conducts prospective exercises that benefit to the consultation and to the pensions reform debates. The latest was published in order to prepare the reform of Fillon (COR, 2010). We take as a starting point for our reasoning the vision of the future offered by the COR scenario A, scenario that describes the evolution of financing needs in the absence of reform.

## The terms of the debates and the limits of the analysis

In this scenario, the French economy is rapidly catching up the lost of production caused by the crisis. On average over 2011-2020, the labor productivity is growing by 2.1% per year - which is above its long-term trend (1.8%) - but unemployment remains high (7.8% in average against 4.5% in the long term). These assumptions match with an optimistic scenario in which the crisis has no effect on potential growth. Two more pessimistic scenarios reflect uncertainty about

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<sup>6</sup> The COR is a permanent structure created in 2000, involving parliamentarians, representatives of social partners, experts and state officials. Its mission is to monitor the follow-up and the concerted expertise of the French system of retirement provision, to make proposals and publish documents to feed the debates.

the effect of the crisis, but only differ by the long-term trends of labor productivity and unemployment.

Given these assumptions of growth and employment, the receipts of the schemes are simply deduced by a projection of labor force and two simplifying assumptions: a share of fix added value and a constant tax rate. The need for funding of the pension system is then obtained by the schemes spending projections (produced by each of the major pension schemes) and their extrapolation.

In this analysis frame, the reasoning is purely accounting and the pension issues only redistributive. Reform - here, the absence of reform - has no effect on production costs, wages, household demand, etc.; so that in the end, it is almost neutral for activity and employment. We will see that in this context, only the lengthening of the effective worked hours mechanically favors growth. In fact, the basic assumption is that the potential of the offer as define above *always* finds the macroeconomic conditions of his release.

Therefore, the collective choice is only focused on a harrowing dilemma of intergenerational equity, since it is practically impossible to envisage that a solution can be worse or better for all: either workers contribute more or retirees receive less, and if we justify more *naturally* the rise in contributions and the decrease of benefits by linking the extension of the contribution period to the increase of life expectancy, issues of distributive justice remain strong because the individuals are unequal in the labor market, as in the retirement (Chérèque *et al.*, 2010).

### **From a partial picture to a complete scenario**

We have outlined the fact that the partial nature of this representation, if not embarrassing for the measurement of the funding requirements of schemes (Blanchet, 2003), it might be penalizing for the collective choice by the way he sets the terms of the debate. By restring the analyses to the existing institutional framework, it prevents to consider the funding of pensions in an overall reform of the tax burden, which is however a possible alternative. Moreover, it escapes from the question of whether, given the profound mutation at work and the constraints to come, the sustainability of this institutional structure is credible.

Although, the reproduction of the COR scenario in a "sealed" frame as the Imaclim model requires some conditions in order to respect the coherence of the system<sup>7</sup>. This consistency is ensured by macroeconomic identities, which guarantee the conservation of the quantities and values. The review of these conditions helps to clarify what implicit assumptions that involve the realization of this scenario and therefore, to judge whether these assumptions are credible in the light of current economic context.

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<sup>7</sup> We do not comment here the obvious inconsistency between the hypothesis of a share of fixe value added and our representation of the labor market by a "wage curve". This specification should be temporarily abandoned.

Assuming the achievement by 2020 of major global developments, energy and demographic described above, then the reproduction of the scenario A of the COR from the historical France in 2004, requires:

- an increase in actual labor productivity by 38%;
- an explosion of the deficit of the external balance (multiplied by 70).

The first of these conditions let's not forget, quite directly result from the assumptions of the COR, the ones of an increasing of the working population by 1.9%, a fall in unemployment of 3.2 points and a GDP growth of 49%.

The second follows less directly. Although it results that the ageing population induced an increase in the weight of social transfers in GDP (16%), but also a decline in the share of savings in household income (-37%). Under these conditions, and without a rise in the mandatory contributions or restriction of public expenditures, the public deficit is multiplied by 10 and can just be financed by the rest of the world.

Indeed, the national economy can't either finance its social spending by foreign trade: its imports are rising sharply mainly due to the explosion of its oil bill (+180%) and its exports are forced down by the rise in production costs (relative to the ones of the rest of the world). These costs increase because of the assumptions of rise in energy prices and wages growth. As a result, the French economy, slightly creditor in 2004, see its external position sharply deteriorated in 2020, its national debt reaching twice the level of GDP.

This situation of over-indebtedness is only possible in the model, because no mechanism of financial instability is represented there. This modeling choice is made necessary, otherwise it would be impossible to replicate this scenario in general equilibrium. Under these conditions, only a debt service still higher must be served more to foreign creditors. This outflow is thus increased by more than 500, since to the explosion of the debts may be added a rise in interest rates that are necessary for investments financing. Nevertheless, this financial situation has no effect on the real economy since at the end *the country run into debt more and more to pay its debt*, without any limit imposed by its creditors.

### **Energy, economic and social tensions deepened**

Admittedly the U.S. have known a steady growth even as the current external deficit was exploding and that public debt was growing<sup>8</sup>, but the econometric study of Reinhart and Rogoff (2010) shows that in general there is a threshold of intolerance to debt. Using a panel of 44 countries over almost 200 years, they found that when the public debt/GDP ratio exceeds 90%, growth is significantly reduced. It is therefore likely that before reaching the level of debt indicated either the country will be forced to conduct drastic "rigorous policies"

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<sup>8</sup> This precisely because the interest rate and the income paid to foreign investors remained low. This unique situation is difficult to consider outside the context of leadership, growth and mutual interdependence with China, which has credited the U.S. economy over the decades (Frey and Moëc, 2005).

(like Greece), or the risk premium on bonds will fly, to the best foreign investors will refuse to lend more, at worst they will retire massively.

In addition, it is noteworthy that despite the effort to maintain a high level of national solidarity - as social transfers are indexed to wage growth - and despite the unreality of an excessive debt neutral for economy, the income inequality increase (the Gini<sup>9</sup> index rise by 0.3 points), as energy inequality: on average, 50% of the less wealthy households see their budget share increase by 1.8 point, against 0.5 for the 50% of the richest. Indeed, low-income households are closer to their basic needs for energy and enjoy less the rise in retirement benefits. This result illustrates the concern expressed in the debates that pension reform is limited to simple financial viability, without tackling the problem of intragenerational inequalities. It also highlights the risk of a worsening of energy insecurity in this context of high energy prices.

Ultimately, this preliminary analysis shows that pursuing to fund pensions by the public deficits is not a realistic option. Considering the most optimistic scenario of the COR without any reform, we see that it involves of course an unsustainable debt. Since the tool of monetary policy cannot be handled individually by the states of the union, two requirements are necessary. On one hand, the one of creating a budget and solidarity at Europe scale, in order to avoid the extreme scenario of state-owned bankruptcy. On the other hand, the one of credible national reforms to reduce *gradually* the public debt *at the lowest cost for economic development*, because it is important to underline that, a too strict debt reduction policy would have the opposite effect to that intended, the debt extent being strongly related to the level of activity: thus, the need for funding in the pessimistic COR scenario is easily higher (+20% in 2020 and +60% in 2050).

### Comparison of five schemes of tax reform

To fill the need for funding of the pensions and avoid this scenario of "impasse", each of the considered alternatives must fund over the period 2011-2020 a social debt of 385 billion Euros in 2008, what is representing a reduction requirement of 6.2% of the ratio of public debt to GDP by 2020.

To achieve this goal, we consider the four following sources of funding:

- the creation of a carbon tax (CT) only on the carbon content of all the sales of fossil fuels, adopted unilaterally by France from today, without border adjustment and progressing until 2020;
- uniform increase of social contributions (SC);
- uniform increase in VAT rates;

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<sup>9</sup> Inequality of the distribution of tax free available incomes in between the twentiles.

- uniform increase in income tax rates (IT).

## Performances of the « pure » schemes

Comparing the performances of the disposals by using only one of these levers at a time (Table 2 disposals 1 to 4) shows that the funding of pensions may be accompanied in 2020 by very different levels of CO<sub>2</sub> emissions, of activity and employment.

Budgetary objective Disposals of reform	Financing pensions deficit from 2011 to 2020			
	1-CT	2-SC	3-VAT	4-IT
Adjustement of the rate required	614 €/tCO <sub>2</sub>	+7,1 pts	+1,7 pts	+1,3 pts
Emissions of CO <sub>2</sub>	-54,2%	-2,7%	-2,5%	-1,7%
Real Gross Domestic Product	-5,2%*	-3,8%	-1,6%	-1,7%
Unemployment rate (points in %)	+2,5	+3,9**	+1,3	+1,6
Labour intensive of the composite	+1,1%	-0,3%	+0,1%	id.
Weight of the oil bill in the GDP	-25,7%	+1,3%	-1,3%	+2,3%
Production costs of the composite	+1,5%	+0,1%	-1,3%	-2,0%
Net Nominal wages	-5,7%	-8,7%	-3,2%	-3,9%***

\* A decline in GDP of 5.2% compared with the "impasse" scenario corresponds to a variation of 0.46 points in the annual growth rate over the period 2004-2020, which represents a growth delay of a few less than two years.

\*\* Unemployment higher than 3.9 points compared with the "impasse" scenario correspond to an increase of 0.8 points from its 2004 level (from 9.6% to 10.4%) or at an average destruction of about 14 000 jobs per year.

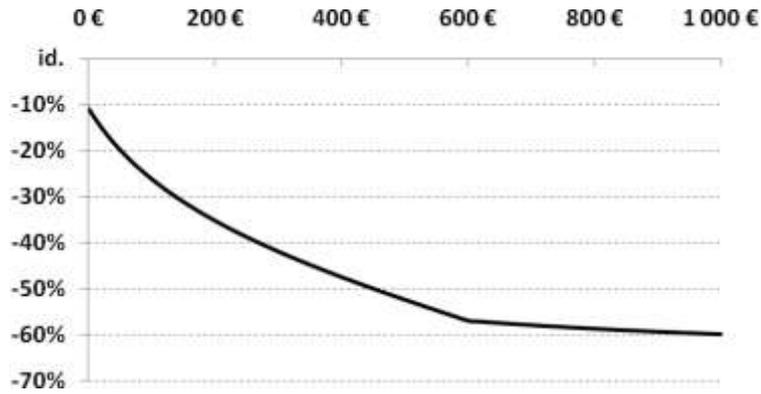
\*\*\* A 3.9% decline in purchasing power in net wages compared with the scenario of "impasse" correspond to a variation of 0.35 points in the annual growth rate over the period 2004-2020, that is a delay in wages progression wage a little less than a year.

**Table 2 Reform of the compulsory cotisations  
Comparison of the performances of « purs » disposals**

The first notable result is that a newly created carbon tax can't fund alone the social protection unless by making it at a higher cost for activity (-5.2% of GDP as against -3.8 %, -1.6% and -1.7%). Indeed, it should reach a very high level in 2020 (614 €/tCO<sub>2</sub>). Certainly, this level would greatly reduce CO<sub>2</sub> emissions (-54.2%) and the weight of the oil bill in GDP (-25.7%), but would lead to an impact on the energy prices (+162% for fuel, 84% for residential energies<sup>10</sup>).

However, Figure 1 shows that in this tax level, the potential of "decarbonisation" of the economy are soaked. Below, the rise in the rate does not generate sufficient receipts because it comes with an erosion of the fiscal base. This level is therefore doubly inefficient : in terms of incentive as in the point of view of activity. Finally, the energy bill weighs heavily on household budgets (+4 points) and domestic production costs (+1.5%).

<sup>10</sup> Despite a "mattress" of stronger taxes (TIPP) the *ex ante* impact on the price of fuel is higher than the one of residential energy, due to the weight of electricity (whose consumption doesn't emit carbon therefore is not taxed) in this energy. These increases also include the amplification due to VAT.



**Graph 1** Variation of the growth CO<sub>2</sub> compared with 2004 according to the level of non recycled carbon tax reach in 2020 (0 to 1000€/tCO<sub>2</sub>)

The second significant result is that the "conservative" option of the pensions financing by a rise in social contributions doesn't really favor a decrease in CO<sub>2</sub> emissions (-2.7%), but also, worsens sharply activity (-3.8% of GDP) and further depressed employment (+3.9 points of unemployment). This mainly because it increases the cost of labor relative to energy and unlike the carbon tax, it induces a decrease in labor intensity of composite production (-0.3% against +1.1%) and an increase in the weight of the oil bill in GDP (+1.0%). But in the context of an economy in competition, it also carries on a higher pressure on net wages, which fall more (-8.7%). These two effects together are eroding the tax base of levies and the rise in the rate should reach 7.1 points to cover the pension deficit.

Finally, increases in VAT and income-tax have higher macroeconomic performances (respectively -1.6% and -1.7% of GDP, +1.3 and +1.6 points of unemployment) because they do not damage the intensity in work and support activities by reducing levies on productive systems that see their production costs fall (-1.3% and -2.0%). The slight superiority of the VAT increase comes from the fact that it also reduces the relative cost of labor relative to energy, which induces a slight increase in labor intensity (+1.0%) and lower the weight of the oil bill in GDP (-1.3%). But the reductions of CO<sub>2</sub> emissions are too limited to achieve the goal of a "-20% in 2020" (compared to 1990 emissions); it should be further reduced by 21% and 22% respectively. Under these conditions, the extremely ambitious goal of a division by four of these emissions by 2050 (POPE Law of July 13, 2005) is either impossible or extremely costly to achieve in the future.

### Performances of « trade-off » disposals

A review of previous simulations suggests that the systems playing on several of these levers could provide higher performances to conciliate the objectives of the fight against climate change and the financing of pensions. We consider now two sets of "trade-off" systems:

- The first combines the creation of a Carbon Tax (CT) gradually reaching the high level (but more reasonable) 200 €/tCO<sub>2</sub> in 2020, either an increase of VAT (disposal 5), or an increase of income-tax (disposal 6).
- The second affects the receipts of the same level of a CT, not to the general budget, but as a partial substitute for social contributions in the resources of the pensions system (CT200/SCC). As previously, the remaining need of funding is fulfilled either by an increase in VAT (disposal 7), or an increase of income-tax (disposal 8).

Budgetary objective	Financing pensions deficit from 2011 to 2020			
	5-CT200 VAT	6-CT200 IT	7-CT200/SCC VAT	8-CT200/SCC IT
Adjustment of the rate required	+0,6 pts	+0,5 pts	+2,6 pts	+2,0 pts
Reduction of social contributions	-	-	-6,9 pts	-7,0 pts
Emissions of CO <sub>2</sub>	-29,6%	-29,4%	-29,5%	-28,8%
Real Gross Domestic Product	-3,0%*	-3,1%	-1,2%	-1,1%
Unemployment rate (points in %)	+1,7**	+1,7	-0,7	-0,4
Labour intensive of the composite	+0,7%	+0,6%	+1,1%	+0,9%
Weight of the oil bill in the GDP	-17,1%	-16,2%	-19,4%	-15,5%
Production costs of the composite	+0,4%	+0,1%	-0,7%	-1,7%
Net nominal wages	-4,0%	-4,2%***	+1,8%	+1,1%

\* A 3, 0% decline in GDP compared with the « standstill » scenario corresponds to a variation of 0,26 points of the annual growth rate over the 2004-2020 period, which represents a growth backlog of approximately a year.

\*\* An unemployment rate upper of 1,7 points compared with the « standstill » scenario means a reduction of 1,5 point in relation to it 2004 level (from 9,6% to 8,1%), or, an average job creation of 23 000 jobs per year.

\*\*\* A reduction of 4,2% of the purchasing power of net wages 4, in comparison to the « standstill » scenario equals a 0,37 points variation of the annual growth rate over the 2004-2020 period, which represents a slowdown in wage increases of more than a year.

**Table 3 Reform of statutory contributions  
Comparison of the « trade-off » disposals performances**

These four trade-off systems are higher than the conservative option of a pure increase in social contributions, whatsoever in terms of CO<sub>2</sub> emissions, than in terms of activity and employment (Table 3). All induce an increase in labor intensity (from 0.6% to 1.1%) and a decrease in weight of the oil bill (from 15.5% to 19.4%). However, if these two sets of systems come with a decline in emissions quite similar (from -28.8% to -29.6%), the second (disposals 7 and 8), substituting the receipts of the carbon tax to social contributions, presents clearly higher performances for activity (-1.2% and -1.1% of GDP against -3.0% and -3.1%), employment (-0,7 and -0.4 unemployment points against +1.7), and wages growth (+1.8% and 1.1% against -4.0% and -4.2%).

To understand this difference, it is worth noting that the first set of disposals increases the cost of composite production (+0.4% and +0.1%), while the second promotes its decline (-0.7 and -1.7%). We now understand the importance of recycling the receipts in the decrease of social contributions: by blocking the spread of higher energy production costs, it preserves the competitiveness of domestic production and encourage a greater use in labor. This virtuous

circle allows that the demand addressed to the French production unit progresses, but without being at the expense of wages (+1.8% and +1.1%)<sup>11</sup>. This mechanism acts in the opposite direction in the absence of recycling, hence a drop of the same indicators for the first set of disposals.

Ultimately, the comparison of these disposals illustrates the existence of three mechanisms of which the combination is in favor of easing energy, economic and social tensions. The first, bases on the "signal effect" and the incentives produced by the reform. It induces in the medium-term structural change in the economy in favor of employment, energy independence and lower CO<sub>2</sub> emissions. The second do result from it, since it is induced by the decrease in oil bill paid to exporters countries. The Improvement of the purchasing power of households and the costs of domestic production systems loosens the constraint weighing on demand, at the same time generating a "multiplier" effect on the production and national wealth. In an economy strongly in competition, this effect is reinforced by the third of these mechanisms, which stems from the shift of tax burden that the reform operates. By broadening the base of compulsory taxation of work for all the sources of income, she makes contribute more non-wage incomes (real estate, financial, etc.). And thus, indirectly, collects more the private rents of the non-competitive sectors. This move reduces the overall tax burden that is based on production costs and promotes profitability of labor-intensive activities.

## **The alternatives to the fiscal reform**

But still, couldn't we go without a reform in the compulsory levies? Before concluding, it is necessary to dwell on the two other options that are commonly advanced in the debate: a decrease in public spending (PSD, disposal 9) and the postponement of the legal age of retirement (ARP disposal 10).

### **Fall of the public expenditures: increased risk of depression of the demand and the long term sacrifices**

The decrease in expenses catches up with the question of the level of compulsory taxation and the weight of the state in the economy. This issue is primarily political in nature. But it is useful to consider this option of a macroeconomic point of view, given the heavy trends and the triple challenges facing our current economies.

With a structure of unchanged compulsory levies, government spending (consumption and investment) must be reduced by 4.2% compared to the "impasse" scenario to ensure the same level of debt. Compared with those of our two most favorable tax reforms (Table 4), the performances are worse, in terms of activity and employment, as for the environment point of

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<sup>11</sup> The activation of this potential virtuous circle is certainly not automatic it depends on a set of constraints, mainly the functioning of the labor market and the sharing of reductions in charges between net wages, labor costs and profits. Its numerical extent also depends on the switching capacities of the production systems and individuals, the sensitivity of foreign trade at the cost of production, the indexing rules and on the adopted fiscal policies. Readers interested in further analysis can refer to Combet and al. (2010).

view: the decline in GDP of 1.7% against 1.2 and 1.1%, unemployment rise by +1.7 point while it was decreasing by 0.4 and 0.7 points, and CO<sub>2</sub> emissions are reduced by only 1, 5% when they were nearly 30%.

Budgetary objective	Financing pensions deficit from 2011 to 2020		
	7-CT200/SCC VAT	8-CT200/SCC IT	9-PSD
Required Adjustment	+2,6 pts	+2,0 pts	-4,2%
Reduction of the social contributions	-6,9 pts	-7,0 pts	-
Emissions of CO <sub>2</sub>	-29,5%	-28,8%	-1,5%
Real Gross Domestic Product	-1,2%	-1,1%	-1,7%*
Unemployment rate (points in %)	-0,7	-0,4	+1,7**
Labour intensive of the composite	+1,1%	+0,9%	id.
Weight of the oil bill in the GDP	-19,4%	-15,5%	+2,5%
Composite Consumption of households	-0,8%	-1,4%	-1,4%
Net nominal wages	+1,8%	+1,1%	-4,0%***

\* A 1.7% decline in GDP when compared to the « standstill » scenario corresponds to a 0,15 points variation of the annual growth rate over the 2004-2020 period, which represents a growth delay of a few less than seven months.

\*\* An unemployment rate higher of 1,7 points than the « standstill » scenario correspond to a reduction of 1,5 point compared to its 2004 level (from 9,6% to 8,1%), or an average job creation of 23 000 jobs per year.

\*\*\* A reduction of 4% of the net wages purchasing power in relation to the « standstill » scenario correspond to a 0.36 points variation of the annual growth rate over the 2004-2020 period, which represents a slowdown in wage increases of more than a year.

**Table 4**                      **The alternatives to the fiscal reform**  
**The decrease in public expenditures**

In the 2020 context characterized by an important decrease in the rate of household savings, the sustainable reduction of public spending has a multiplier effect on the contraction in effective demand. The downturn impacts employment since this time, it is not constrained by a higher labor content, by a decrease of the weight of the oil bill, and at the offer level, by reduce charges on inputs. Finally, as the rise in unemployment is associated with slower growth of net wages (-4.0%), household demand suffers as much as when it is subjected to a tax increase (-1.4 % against -0.8% and -1.4%).

One should note that this numerical exercise assumes that the decline in public expenditures has no effect on the overall productivity of factors, which is obviously unrealistic if applied over the decade. In particular, the decline in national education spending can have disastrous effects on potential future growth and inequalities (Askénazy, 2010; Glomm and Ravikumar, 1992). Finally, the transition to a low-carbon economy wouldn't be without a major effort conduct on R&D, the development of new know-how and the organisation of new fields (Bompard, 2009).

Nevertheless, the outcome of this exercise emphasizes that without tax reform, the required reduction in public expenditure is not marginal. Under these conditions, if no private entity is created to ensure the production of these utilities, it is likely that this orientation becomes socially and economically too expensive.

## Postponement of retirement age: the conditions for an effective increase in employment

The last two pension reforms have focused on the postponement of retirement age (ARP) and lengthening of the contribution period that it should allow. This promise is based on the implicit assumption that if the law is altered, the excess labor supply will actually find a comparable excess of demand. In a purely accounting frame, the growth is indeed mechanically favored: the measure increases the labor force without reducing productivity, unemployment and wage bill.

If this condition is met, the eighth report of the COR estimates that it will take "an additional gap of the effective retirement age average of more than 3 years (a total of over 4 years compared to 2008)" to achieve by this single lever the balance of the schemes in 2020 (COR 2010, pg. 46). However it is essential to consider the uncertainty on the reaction of the labor market to judge the feasibility of policies dedicated to upturn the employment rate at older ages (Chérèque et al., 2010, Blanchet, 2003). But to our knowledge no study has taken into account this reaction while comparing to the prospective evaluation of potential offers a proactive assessment of potential demand.

We simulate the 3 years delay (Table 5, device 10) by taking into account these elements. This report is equivalent to a 13% increase in the demographic ratio (labor force population on retirees)<sup>12</sup>. Compared with the performances of our two most favorable fiscal reforms, we observe that this measure is also lower than the triple point of view of CO<sub>2</sub> emissions (-1.5% against -29.5% and -28.8%), of activity (-1.4% of GDP against -1.2% and -1.1%) and employment (+1.4 points of unemployment against -0.7 and -0.4). Ultimately, it does not produce the intended effect on public finances, since the social debt is only financed at 79%.

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<sup>12</sup> The equilibrium constraint of the schemes is detailed in the fourth report of the COR page 89 (COR, 2007)

Budgetary objective			
Disposals of reform	7-CT200/SCC VAT	8-CT200/SCC IT	10-ARP 3 years
Financing pensions deficit from 2011 to 2020	100%	100%	79%
Adjustement of the rate	+2,6 pts	+2,0 pts	-
Reduction of the social contributions	-6,9 pts	-7,0 pts	-
Emissions of CO <sub>2</sub>	-29,5%	-28,8%	-1,5%
Real Gross Domestic Product	-1,2%	-1,1%	-1,4%*
Unemployment rate (points in %)	-0,7	-0,4	+1,4**
Labour intensive of the composite	+1,1%	+0,9%	id.
Weight of the oil bill in the GDP	-19,4%	-15,5%	+1,9%
Composite Consumption of households	-0,8%	-1,4%	-2,4%
Net nominal wages	+1,8%	+1,1%	-3,3%***

\* A 1.4% decline in GDP when compared to the « standstill » scenario corresponds to a variation of 0,12 points of the annual growth rate over the 2004-2020 period, which represents a growth delay of a few more than five months.

\*\* An unemployment rate higher of 1,4 points compared with the « standstill » scenario means a reduction of 1.8 point compared to its 2004 level (from 9,6% to 7,8%), or an average job creation of 22 000 jobs per year.

\*\*\* Net wages purchasing power 3.3% lower than the « standstill » scenario equals a 0.29 points variation of the annual growth rate over the 2004-2020 period, which represents a slowdown in wage increases of a few more than nine months.

**Table 5**                      **The alternatives to the fiscal reform**  
**The deferment of the retirement age**

Indeed, under this model the growth of the workforce not only improves the supply potential. It also exacerbates tensions on the labor market, driving down wages (-3.3%) and affecting household consumption (-2.4%). As previously, the rise in energy prices also induces a high increase in the weight of the oil bill (+1.9%), since no action induces a decrease in energy intensity of growth.

Of course this exercise is only illustrative, it leaves out a number of mechanisms that extending the period of activity can trigger, notably those that involve a response from the general labor productivity following the new conditions of complementarity-substitutability between qualifications, or the one of increased transmission of abilities. But it shows that the lengthening of working is not a magic bullet solution to improve the actual production. On the one hand, its effectiveness depends on the employment needs of the supply side, which depend on the competitiveness of domestic production and of the opportunities outlook, but also of technological choices and the structural orientation of the economy. In addition, its effects on productivity, unemployment and effective demand are complex and marked by strong uncertainties. On the other hand, it doesn't resolve at all the question of our strong dependence on energy and CO<sub>2</sub> emissions.

## Conclusion

This article has addressed the issue of tax reform in France considering the three challenges of funding pensions, the fight against climate change and the control of public deficits. It shows that by 2020 their effectiveness will be greatly subjected to the world changes: an aging

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population, rapid development of the large emerging countries as industry competitors, globalization of capital flows, increasing tensions on the fossil fuels energy resources.

A preliminary analysis applied to complete the purely accounting frame used in the projection exercises of pensions, taking into account the tightening of these constraints. It shows that pursuing funding the pension schemes by the public deficit is not a realistic option. Inaction leads France in a situation of "deadlock", where energy, economic and social tensions can only be exacerbated. It should not obscure the need to reform the financing.

The comparison of the macroeconomic performances of ten disposals of reform financing the social debt shows first that the three "classic" options - namely, a pure increase in social contributions, a reduction in public expenditures, and a *legal* lengthening of the period of activity - are not the most efficient. They do not address the heart of the problem of long-term: energy and carbon dependency of the economy, the competitiveness of French productions, the systemic constraints to job creation. Besides, they do not achieve the objective of reducing CO<sub>2</sub> emissions.

The reform schemes of the compulsory levies that combine the introduction of a carbon tax to an increase in VAT or income tax, presents higher performances. They induce three favorable mechanisms that mutually reinforce: a structural change towards production and consumption patterns more labor intensive, the weight lightening of the oil bill on national incomes, and the transfer of the burden of compulsory levies from the productive systems to the individual income tax. These three mechanisms are even more enhanced when the proceeds of the carbon tax are directly affected to the resources of the joint schemes as a partial substitute for social contributions.

Our findings therefore suggest that a "carbon taxation" is a credible alternative in the long term to a policy of austerity. Because ultimately the only real room for maneuver in the long term can only come from the promotion of a new economic system, freeing itself from excessive dependency on fossil fuels and greenhouse gas emissions. In addition, it brings forward economic synergies effects that could be a lever for a right fork to a path of sustainable development. It also helps to anticipate the difficulties and to support the transition of households and the most vulnerable activities, trapped in locations, modes of habitats and types of equipment that make them very vulnerable to the inevitable increase in prices energy (Combet et al. 2010).

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