Kyoto trapped by the Tabula Rasa myth?

Jean-Charles Hourcade
CIRED – CNRS/EHESS

The economic wisdom behind the Kyoto framework relies on two basic principles presented as grounded in the textbooks of economic sciences: first to equate marginal costs across countries and sectors in order to minimize total costs of meeting a given abatement targets, second to prevent distortion in international competition. These principles back the idea of a common incentive system applying to all countries and sectors and political wisdom dictates to keep it as simple as possible to minimize risks of strategic behaviours by governments and administrative arbitrariness.

In the early nineties, one of the possible translations of such a system, namely internationally harmonized carbon taxes was ruled out for reasons of political acceptability: anti-tax reflex of energy consumers, protection of national sovereignty in fiscal affairs, uncertainty about the environmental performance of price incentives. The cap and trade system was then presented as a way of reconciling environmentalist political will, national sovereignty and economic rationality with the advantage of avoiding the unpopularity of carbon taxes and the hopeless cumbersome process of coordinating internationally dozens of policies and measures.

The semi failure/semi success of COP6 and the rejection of the Kyoto framework by the most important GHGs emitter in the world, forces to revisit this view. The political hazard of the election of a US president reluctant to internationally coordinated policies should not indeed mask that, during three years, discussions among delegations of governments supportive of the system, were unsuccessful in settling the 'technicalities' necessary to the enforcement of the Protocol. We argue hereafter that the *unfinished Kyoto business* reveals a fundamental intellectual trap: both the carbon tax and the cap and trade approach were often presented as an open sesame solution, forgetting that the real world is not the homogenous "tabula rasa" of the metaphors described by the simple models for the first year economic textbooks, but a world full of asperities capable to undermine a clever grand architecture.

1. Simple signals in a heterogeneous world?

Three simple observations will suffice in resuming the dramatic tension to be solved, namely between the level of carbon price consistent with the long term objectives of the UNFCCC and its immediate acceptability:

- a $150/tc carbon tax in France would lead to price increases of 8.6% for gasoline, 9% for electricity, 34% for gas, 260% for coke; hence, without affecting significantly trends in transportation sectors, it will impose important burdens industries such as steel. Uncertainty aggravates the diagnosis: based on the results presented in the third assessment report of the IPCC, the likelihood space of carbon prices to meet Kyoto targets is $/tc [6 ;74] under a full trade no transaction costs assumption and $/tc [39 ; 204] if transaction costs on CDM and

trading are accounted [1]. Neither $/tc 6 nor $/tc 39 will trigger structural changes and represent the long term development cost of meeting ultimate concentration targets while $/tc 204 would entail an unbearable shock for some activities and regions.

- in 2000, apparent carbon taxes on unleaded gasoline were as high as $ 1.43/l in France against $ 0.18/l in the USA. This gap immediately raises legitimate questions about the legitimacy of imposing the same price of carbon to all countries; but it should also lead to observe that France levied this apparent carbon tax for reasons unconnected with climate change among which energy security and the equilibrium of trade balance.

- one $ or € increase in energy prices will have a totally different welfare impact for the 'average' Frenchman and the 'average' Indian whose levels of income differ by a factor of 14. Contrary to the economic vulgate, public economics shows that, to maximize global welfare, marginal welfare losses and not marginal abatement costs should be equated; assuming, such as in many growth models, that the marginal utility of income decreases logarithmically with the level of income, then the average French should, coeteris paribus, be faced with a price increase 14 times higher than the average Indian. This assumption is a modelling trick rather than a realistic measure, but it helps picturing the dramatic equity issues stemming from applying a single carbon prices without any compensation for low income people.

This tension reveals the trap of the 'tabula rasa' utopia and implies to integrate:

a) the heterogeneity of sector dynamics; activity domains concerned by climate policies can be grouped in five clusters depending upon the inertia of their capital stock, their sensitivity to energy prices and their exposure to international competition:

- electrical power: characterized by high inertia, high sensitivity to carbon prices and moderate international exposure,
- carbon intensive exposed industry (including refineries): sensitive to carbon price and with a low turnover of capital stock, their international competitiveness may be threatened by unbalanced carbon constraints (with risks of carbon leakage),
- other industry and services: marked by a relatively high turnover of capital stock, these sectors are low sensitive to carbon prices because energy represents a small portion of their production costs; the risk of carbon leakage is very low,
- residential and commercial sectors: characterized by both a high (buildings) and low (end-use equipments) inertia, these sectors should be sensitive to carbon prices; however they offer many typical examples of the 'efficiency gap', due to the lack of information of energy consumers and sources of transactions costs,
- passengers and goods transportation: this is probably the sector with the highest inertia and experience demonstrates its low sensitivity to carbon prices (and all the more so as the pre-existing taxation is high).

b) the complexity of policy signals: cross sectional analysis of energy consumption demonstrates that energy prices matter for all sectors. However carbon prices operate through interplays with non price incentives and other pricing policies. This is typically the case for transport. Trends in this sector are governed by interactions between five decision levels: 1) utilisation rate (km/car) which are daily decisions by private agents, 2) selection of end use equipments which have a 5-10 years turnover; this selection is made by private agents but result also from the expectations of automobile industry, 3) infrastructure equipment with a turnover measured in decades and that are governed by public decisions in interaction with highly capitalistic private or public industry 4) the evolution of the prices of real estates which

[1] These figures are derived from an exercise through the SAP12 model which incorporates reduced forms of twelve global energy-economy models, most of them reviewed in the Energy Modelling Forum.

determine the location decisions of the households 5) town and country planning which shape urban forms result from a complex interplay between public decisions by central governments, regional and local authorities, and network externalities. This generates *self-reinforcing loops and lock-in configurations* (such as forced mobility, difficulty of mass transits in suburbs, vested interests in road freight transport) very hard to revert overnight. The key point is that trying to prevent and unlock these situations cannot be done by carbon prices only (because extreme levels would be required leading to dramatic equity problems). Other incentives will be far more efficient to achieve the same objective: speed norms and pause obligations for transport by lorry, ban of lorry driving or cars in some areas, car ownership taxes road and park pricing, land legislation and property taxes.

c) the heterogeneity of other pre-existing conditions (income levels, structures of the energy sector and of economic product, tax system, labour legislation) that determine the wedge between macroeconomic and private costs of climate policies. The message from table n°1 derived from the Ipcc Tar should not be overlooked to this respect. This table gives the results of six global energy economy models for three Annex B regions (the US, the EU and Japan; we have excluded the very heterogeneous CANZ for clarity sake); it is remarkable that Japan which appears four times the first and one time the second in the ranking in function of the domestic carbon price stays almost always the last in the ranking in function of the total GDP losses, which means that Japan is likely to suffer the lowest welfare loss. These numerical experiments assume pure 'lump sum' recycling of the revenues of carbon taxes (or of auctioned permits) and reflect the role of pre-existing conditions in the wedge between tangible private costs for energy consumers and total welfare losses. This wedge would be obviously widened if one considers more targeted recycling of the revenues of carbon taxes.

d) the country specifics of the ancillary benefits of climate policies; the willingness of governments to modify transportation trends is very dependent on their responses to a wide diversity of country specific issues: speed norms and pause obligations for lorries to upgrade road security and workers protection, combined rail-road systems to solve local acceptability problems in mountain passes such as in Switzerland and Austria, ban of car driving to mitigate urban congestion and local pollution, urban policies to prevent social dualism and violence in suburbs. More generally, if one considers discussions about the double-dividend of tax reforms, or about the internalisation of energy security or trade balance constraints it seems obvious that the use of the 'ancillary' to encompass all these decisions parameters is semantic convenience which lead to misinterpret the real policy context; in this context public decisions apt to curb significantly trends in many sectors will be taken for reasons others that climate change. Moreover this internalisation of other policy objective is necessary if one keeps in mind that, given the competitive advantage of conventional gasoline, even a $/t 200 carbon price will not encourage industry to conduct steady R&D efforts and to take investments risks on carbon free vehicles. In this sense *climate mitigation is the ancillary benefit of other policies* and the key issue is how to incite governments pursuing various public objectives to select those policies that generate such a climate benefit.

2. Coping with heterogeneity: what level of coordination matter?

Setting aside for a moment the problem posed by income discrepancies, the previous section showed that equating net marginal abatement costs does not implies automatically that all carbon prices need to be equated across countries and sectors. The net marginal abatement cost for a country can indeed be defined as follows:

Net marginal abatement cost= domestic carbon price +/– tax interaction and general equilibrium effects – 'ancillary' environmental benefits
= marginal cost of other incentives

= international carbon price + shadow cost of imports (trade balance plus energy security)

This statement should be viewed as trivial; however, it has been forgotten under the influence of interplays between ideological reflexes, apparent commonsense of the economic vulgate and oversimplification of messages during diplomatic gesticulations. Its implication is far for being trivial; it indicates that a global cap and trade framework equating the international price of carbon across countries and sectors requires government intervention a) to account for the many sources of wedge between the price of carbon and the net marginal abatement costs b) to provide incentives other than carbon-prices, c) to control the interaction between international carbon trading and domestic legislation d) to compensate the losers of the systems or differentiate domestic carbon prices.

The paradoxical (and rarely debated) consequence is that the most practical way to conciliate the pure cap and trade framework with the heterogeneity or the real world is that carbon trading occurs mainly amongst governments which will internally operate the required differentiation. One of the consequences is the risk that, in some countries, governments will operate strategic behaviours leading to distort international competition, while, in other countries, governments will impose to industry, the burden they cannot, for political reasons, pass directly to consumers. In total, this may result into a progressive fragmentation of markets. Another line of reasoning is to take stock of the fact that carbon prices do not need (in fact should not unless due compensations) to be equated across sectors and countries and that the ***only necessary equalisation at the international level is for energy intensive industry exposed to international competition***. For the other domains of climate policy, the key is to articulate a real subsidiarity which allows for managing the heterogeneity of the real world, with a global architecture securing a distribution of efforts acceptable by all parties. We suggest here below three basic principles to go out of existing traps.

a) disconnecting the treatment of energy intensive industries exposed to international competition from the rest of the emitting sectors. The dilemma can be sketched with tables 2, 3, 4 and 5. Table 2 displays the result from 33 studies for most of the countries of the EU plus Norway regarding the net welfare variation due to a switch between payroll taxes; 26 out of 33 studies demonstrate a slight increase in welfare and all the authors conclude, that, in any cases, this switch is, in the European context, superior to any other policy (reduction of other taxes, grandfathered permits, technical standards). This is easily explainable by many aspects of the European conditions among which the level of labour taxes and the labour legislation which is far different from the US case.

Table 3 confirms this point for France under four assumption regarding technical change and the price elasticity of energy consumption (taxes ranging from $/t120 to $/t 200 for a full respect of the Kyoto targets.

The critical difficulty is that; as shown in Table 4 for a price of $/t 120 production costs of French industry decrease in most of the industry and rise significantly in sectors representing 9% of total product and 4% of employment. This helps understanding the political economy of such a tax switch: on the one hand there may be economic shocks in some regions high enough to offset part of the expected double-dividend; one the other, if governments do not levy taxes on households, the costs increase are more dramatic (15% for refineries, or 6% for steel) since industry no longer benefits from the 3,5 G€ decrease

of its fiscal burden, due to the fact that a generalized carbon tax affects revenues from social transfers or rents (through higher taxation of households energy consumption) and does not fall back on the production sector such as labour taxes.

Fortunately, since the main cause of the double-dividend is the alleviation of the fiscal burden on industry, a special treatment for carbon intensive and exposed industry does not affects so much the potential for a double-dividend (a strong form of double-dividend appears under exceptional conditions if the carbon tax falls back entirely on the production sector).

b) harmonizing quota allocation rules to industry? The existence of an international carbon trading avoids, at least in first approximation, distortions in international competition at the product level. However, governments can provide strategic advantage to their industry by giving generous emissions permits allocation by comparison with countries who auction a lower amount of quotas. This affects neither the equilibrium price of the market nor product competitiveness, but may have a significant impact on the equity value of the firms and on their relative capacity to finance investments necessary to adapt the new constraint. Three questions remain unresponded: how much quotas? to which sector and on what basis (grandfathering? auctioning? in function of voluntary agreements?). The EU directive gives no provision to this respect and the EU directive guarantees a large latitude to governments, which does not guarantee the absence of competitive distortion in the system. This may not be viable in case of significant carbon constraints.

c) articulating international coordination and subsidiarity for domestic public policies: literature on negative costs potentials and double-dividends, together with past experience, demonstrate extensively the importance of transaction costs of removing market imperfections and fiscal distortions. This rises a two sided legitimacy challenge; first, the existence of a global commitment may provide government a legitimacy to confront domestic vested interests which block measures which may be ultimately be proven Pareto optimal; second, in the opposite direction, undertaking such measures is the first step to make credible the political will of governments to tackle seriously climate change. Thus the existence of an international framework is necessary to unfreeze intellectual routines which cause national administrations do not pay a systematic attention to the carbon benefit in defining their policy mix in pursue of other public objectives. Finally, the legitimacy effect of international agreements is important to upgrade the credibility of climate policies and embark long term efforts of fundamental research and public and private R&D on carbon saving technologies. In their absence indeed there will be always a suspicion that these policies be submitted to the vagaries of domestic political life cycles of each individual country.

3. Cap and Trade revisited

In the previous sections we pointed out the reasons why a cap & trade approach cannot be the open sesame solution that was advocated in public arena (it is not either the quintessence of a marketisation of a public good). This does not means that this approach should be rejected (there is indeed no alternative since a tax coordination approach raises the same equity issues and does not organize systematic North/South transfers); this indicates that it should be revisited to tackle seriously the heterogeneity of the real world. We will venture to suggest some key principles for reshaping the Kyoto framework in this direction:

a). Securing good faith commitments despite costs uncertainty: an agreement about an effective compliance regime poses the question of the conditions under which countries will accept legally binding commitments in a context of huge uncertainty about compliance costs. The risk is that good faith governments will commit themselves only for non stringent targets.

To overcome this difficulty the safety valve concept was proposed by Resources for the Future in 1997. The idea was to facilitate commitments by capping the carbon prices and by using the revenues of the 'safety valve' to recuperate at least part of the 'missing tons' through GHGs abatement activities. This price-cap would be part of the commitment and would act as a payment in full discharge. In a sequential negotiation process it would operate as a 'truth telling' incentive: having an insurance against excessive costs countries would be less reluctant envisage more ambitious targets in a 'try and error' process. This proposal was criticized by some environmental NGOs for providing a loophole to full compliance, thus threatening the environmental integrity of the Protocol. However, it can be argued that, given existing compliance provisions which allow for accumulating and environmental debt, this critic does not hold (Hourcade, Ghersi 2002); to the contrary, a safety valve comes to add some economic 'teeth' to the system by minimizing the total of tons borrowed from the future. In other words, these missing abatements are pre-paid which comes to upgrade and not to downgrade the integrity of the system.

b) Securing effective compliance systems with economic consequences. Except if one assumes that countries adopt a 'Candide conduct' and comply whatever the cost, the only credible threat against the temptation of compliance defect, is economic in nature. But the compliance penalty in the Marrakech agreement comes to a pure borrowing facility (with no time limit for reporting the environmental debt from one period to the other) and this is indicative of the difficulty to impose an external payment to a government in these affairs. The only credible sanction for non compliance would be trade barriers under the WTO rules; this linkage was not tabled so far, for many reasons including the 'Seattle syndrome'; however, it cannot but be, in whatever form, part and parcel of a robust long term framework.

c) Providing incentives to governments to mobilize policy tools other than carbon prices: the safety valve mechanism contributes to such an incentive if complemented by provisions that place a constraint on the use of the funds collected to restore the missing abatements; a weak form of this constraint is to use the funds in a reversed auction mechanism to select abatement projects world wide, a strong form is to add the obligation of funding projects in developing countries only in order to provide an incentive to early action in this part of the world. This restoration payment would then entail, even in its weak form, significant risks of additional foreign payments that governments would try and minimize in function of their own valuation of the shadow cost of foreign currencies (with a special case for geographically polarized imports). In sum such a restoration payment would operate as a 'double safety valve': an insurance against excessive costs, an insurance against excessive borrowing from the future by providing a significant additional incentive to governments to act domestically.

d) Diversifying types of commitments: the rationale of a global system including all countries, sectors and GHGs is to let governments managing the 'messy details' of the real world (to the risks of strategic behaviors distorting international industrial competition); it requires in addition progresses in measuring and monitoring non CO2 GHGs and carbon sequestration in order to prevent the risks of loophole and to secure the economic value of abatement investments. This diversification should be conducted along two dimensions:

- *by sectors*: one should really examine the implications a co-existence of three carbon markets resulting from a) harmonized quota allocation rules for energy intensive industry (possibly based on performance criteria) which support a trading system restricted to these industries b) country targets for CO2 in the sense of the Kyoto Protocol for the other sources of emissions (electricity, transportation, and other sectors) c) country targets for other gases which should non be tradable with CO2 in a first step in order to minimize the 'loophole' risks). Even though it leads to three carbon prices, this line of exploration contradicts

economic wisdom only in first analysis; it takes stock of the fact that economic, technical and political barriers make the idea of a unique carbon market in part illusory for a long period of time but does not precludes the search for an economically sounded distribution of efforts amongst sectors. This equalization will result from both a unique price-cap for all markets and a sequential target setting process in which Parties readjust the targets in function of information from the previous period.

- *by countries*: the viability of the climate regime is totally dependent upon the participation of developing countries to some form of commitment, including because this is the only way of exerting a pressure on the US to re-join the system. But these countries will not cooperate as long as they perceive climate policies as a new form of *Malthusianism*. Speculating on what criteria could support a fair allocation of the 'burden' is probably hopeless; the only way out is to abandon, for a long while the idea of binding commitments which cannot but evoke the idea of a constraint to development. A menu of possible commitments should thus be presented: binding global commitments for Annex B countries would co-exist, for developing countries, with non binding global quotas whereby countries would have access to the revenues of international carbon markets if they meet their targets but would not be penalized in case of overshoot, and with extended forms of clean development mechanisms to support commitments at the sector level.

e) Securing a leverage effect of climate policies on development : naive interpretations of global models suggests that inflows of revenues is synonymous of development benefits. A more in depth examination of the general equilibrium effects of international carbon trading shows this is far from being obvious. Table ???? displays the paradoxical outcome of a carbon price equalization scenario for 2030 in which, despite 22 G$ of carbon exports revenues, the per capita consumption of Indians decreases by more than 2%. The cause of this paradox is straightforward: a carbon price of 43 $/tc generates a dramatic decrease of the households purchasing power in India. The intuition of the underlying mechanism is given by figures in parenthesis that show the price to which the 43$/tc corresponds in terms of welfare losses with a logarithmic utility function: if we normalized in such a way that a 43$/tc carbon price generates a welfare loss of 43 in the US, and of 390 in India. To put it in another way a 43$/tc tax in India is equivalent, in welfare terms, to a 390 tax in the US. Certainly, Indian governments will not play such a scenario; they will keep control of the amount of carbon to be traded and will use the part of the revenues to compensate for adverse effect of higher domestic energy. This means that the potential benefits of carbon trading are uncertain and that developing countries will not be attracted by such an offer unless it is complemented by real discussions on how the institutional devices capable to secure the development contribution the Kyoto mechanisms.

Conclusion

To refute the *grand architecture* of world carbon trading systems as an open sesame does not mean that the balance seems should be tilted in the opposite direction:

First, there is no alternative option capable to generate North-South transfers in a credible manner. The issue is how to utilize these transfers as leverage for development, and this cannot be solved on a pure domestic basis. So far, climate negotiations have been deliberately disconnected from discussions about overseas aid, international funding policies, scientific cooperation policies and international trade organization. Such a disconnection prevents to discuss further the condition under which the climate regime really provides opportunities for governments to foster development policies consistent with the long run objectives of the UNFCCC.

Second, an integrated framework remains necessary to manage a global public good such as climate, both for reasons of economic efficiency and political credibility. The challenge is conceive a framework flexible enough to secure the co-existence and consistence of institutional devices adapted to the asperities of the real world. So far, the prevalence of the 'tabula rasa myth' both amongst the advocates and the critics of the Kyoto Protocol prevented to progress quickly enough in this direction.

Table 1

Private and social economic costs of Kyoto targets (IPCC : TAR)

	Carbon price in 2010 (1990$s)			GDP losses in 2010 (%)		
Model	USA	EU	Japan	USA	EU	Japan
ABARE-GTEM	4 322	1 665	2 645	1 1,96	3 0,94	(4) 0,72
AIM	3 153	2 198	1 234	2 0,45	3 0,31	4 0,25
G-Cubed	4 76	1 227	3 97	4 0,42	2 1,50	3 0,57
MERGE3	2 264	4 218	1 500	2 1,06	3 0,99	(4) 0,80
MS-MRT	2 236	4 179	1 402	1 1,88	4 0,63	3 1,20
RICE	4 132	2 159	1 251	2 0,94	4 0,55	3 0,78
Average	3 202	2 320	1 408	2 1,30	3 0,98	4 0,80

Switch from payroll taxes to a carbon tax in European countries *(IPCC: TAR)*

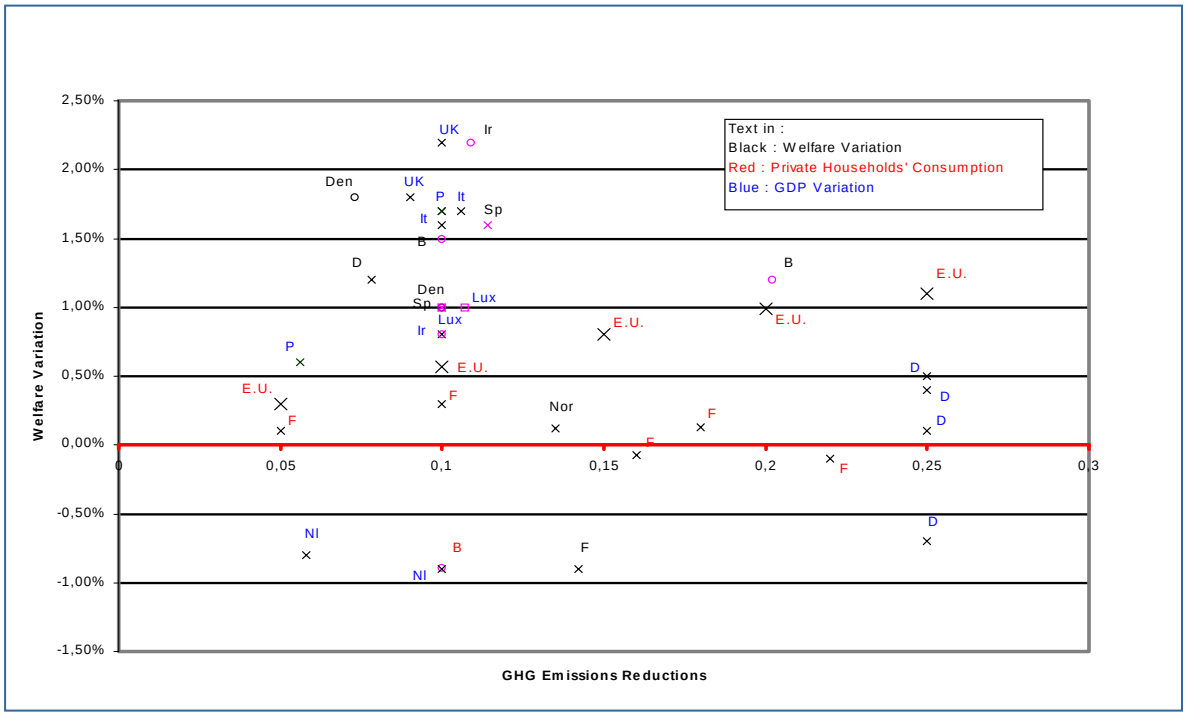

Table 2

Carbon tax and household consumption : French case

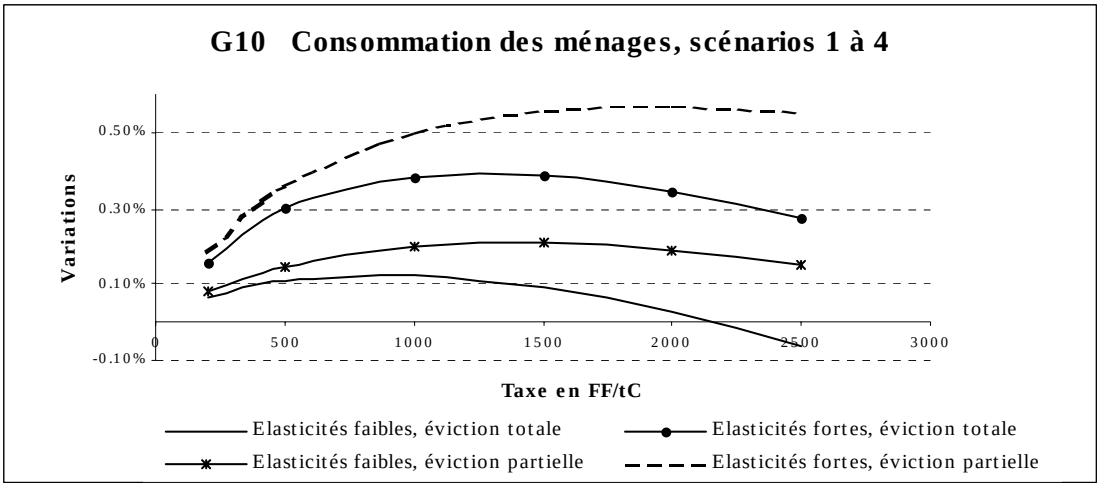

Table 3

Sectoral distribution of cost variation

(general carbon tax with decrease of payroll taxes)

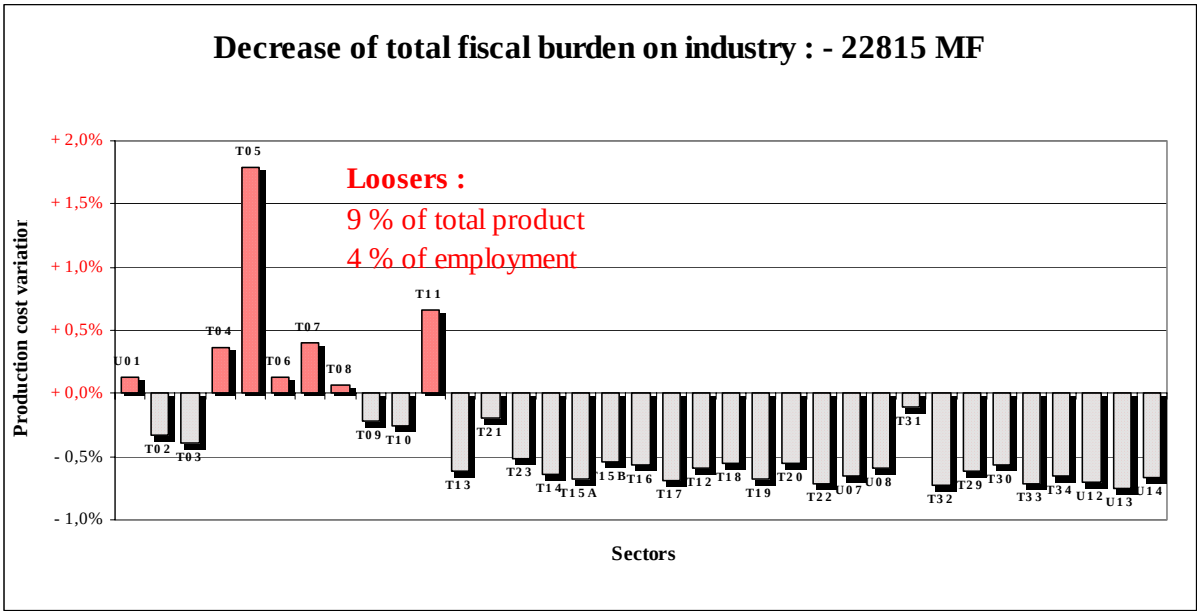

Table 4

Sectoral distribution of cost variation (carbon tax on industry only)

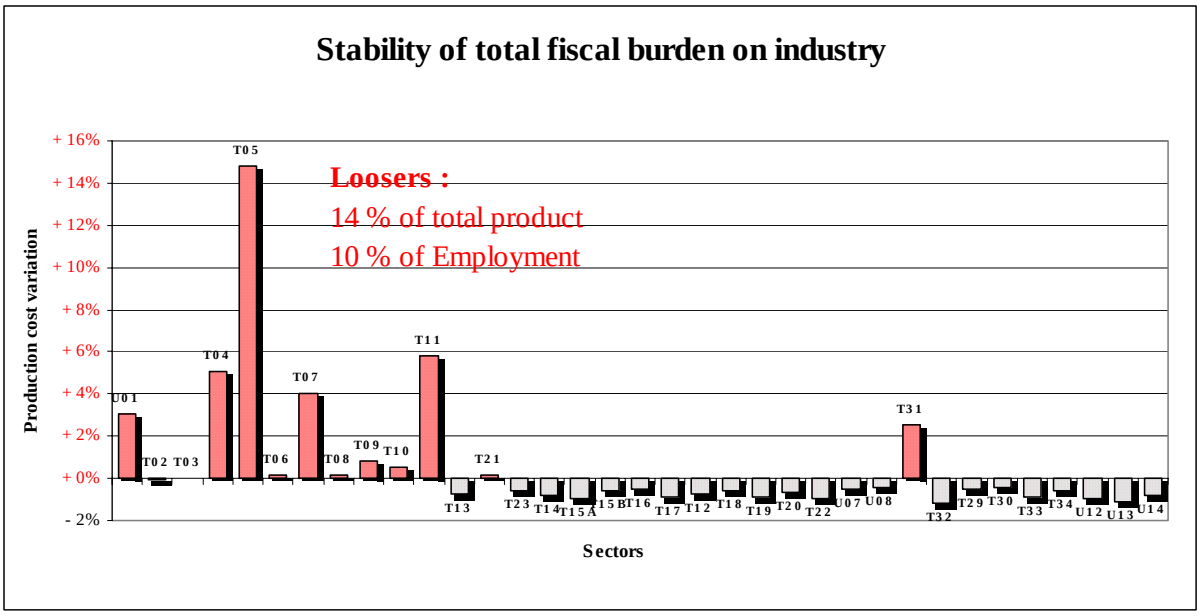

Table 5