THE INTERNALISATION OF EXTERNAL COSTS IN THE TRANSPORTATION SYSTEM

Pierre Kopp[1] and Rémy Prud'homme[2]

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[1] Professor at Panthéon-Sorbonne university (Paris I).
[2] Professor emeritus at Paris XII university (Paris XII)

I — INTRODUCTION

The Commission is currently developing a model for the assessment of external transport costs. This was requested by the European Parliament when it approved the "*Eurovignette*" Directive in May 2006. For many years, the Commission has been advocating the need to internalise external costs of transport (Green Paper,1995 and White Paper, 1998)[3].

This paper is devoted to discussing the Commission proposals as they are summarized in a recent document: "Preparation of an impact assessment on the internalisation of external costs, Consultation document" (2007)[4].

A large consensus exists in favour of internalising external costs. The costs of transport can be divided into private/internal costs (those directly borne by the agent engaged in transport activity) and external costs (i.e those that are imposed on others but are not supported by the users). The sum of private and external costs represents the social cost. The boundary between internal and external costs is defined by the costs that a person takes into account when deciding to use transport. This means that when engaging in transport activity, a person will incur private costs which are linked to the use of a mode of transport but will not be aware of effects imposed on others (congestion, pollution). His/her decision will not be based on the full social cost of his activity. The person will choose the quantity of transportation which equalizes his marginal willingness to pay and the marginal cost of transportation. The latter is mainly composed of the price of the transportation trip (i.e. price of fuel, fare, amortization of the vehicle, and the value of the time spent in transport). In doing so, the person will not choose the optimal quantity of transport, but a higher quantity. The optimal quantity of transportation is given

[3] Commission des Communautés Européennes. 1995. *Towards Fair and Efficient Pricing in Transport : Green Paper*. COM(95)691 final. 51p. Commission des Communautés Européennes. 2001. *Livre Blanc : La politique européenne des transports à l'horizon 2010 : l'heure des choix*. Luxembourg : Office des publications officielles des Communautés Européenne. 127p.

[4] The document can be found on http://ec.europa.eu/transport/white_paper/consultations/index_en.htm)

by the equalization of the marginal social cost (instead of the private cost) with the marginal willingness to pay. In this configuration, the full cost of transportation (private + external) is considered by the agent and the quantity of transportation set at the optimal level.

The main external transport costs are congestion costs, accidents[5], pollution and the green house gas effect. The other externalities, i.e. noise, damage to the biodiversity or the landscape, must also be taken into consideration. All of these costs must be internalised using the appropriate policy.

This objective cannot be reached by letting market forces play. At different level state intervention is required to force individuals to integrate the external cost into their private cost calculation and reach the optimal. Many tools can be mobilized. The most important are (i) regulations, which can set out new standards (i.e. emission level for cars) or prohibit an activity or a behaviour (drinking while driving or driving without a seat belt);(ii) taxation, that increases the price paid by the consumer and drives it to the optimal level. The taxes must be exactly equal to the difference between the marginal social cost and the marginal private cost, at the optimum. If the taxation level is too high, the use of the transport system will be exaggeratedly reduced and society will suffer from a lack of transportation. Conversely, a too modest taxation would not reduce the level of externality enough; (iii) caps and trade permits is a sophisticated system where the level of externalities attributed to a country (or activity) is set at a certain level. Those who are not able to reduce their externalities to this level can buy "permits" sold by those who are over accomplishing their goals.

Primarily, when trying to apply the textbook schemes to reality it appears that some theoretical aspects are not so clear. Designing a public policy reveals many caveats of the theoretical corpus and recalls that the devil lies in the details. Secondly, the correct implementation of these schemes is crucially dependent on the magnitude of the externalities. Estimating the level of externalities relies on sophisticated techniques such as hedonic pricing or contingent valuation. We will not discuss these techniques in depth but focus on much simpler assumptions made by the Commission which can flaw the calculation.

[5] The case of road accidents is not that clear. Road accidents are not externalities but a consequences of the traffic. This difference has theoretical and practical implications. (See below page 15)

What is at stake is not clarification of a rhetorical controversy among specialists, but the mere calibration of the Commission's whole transportation policy.

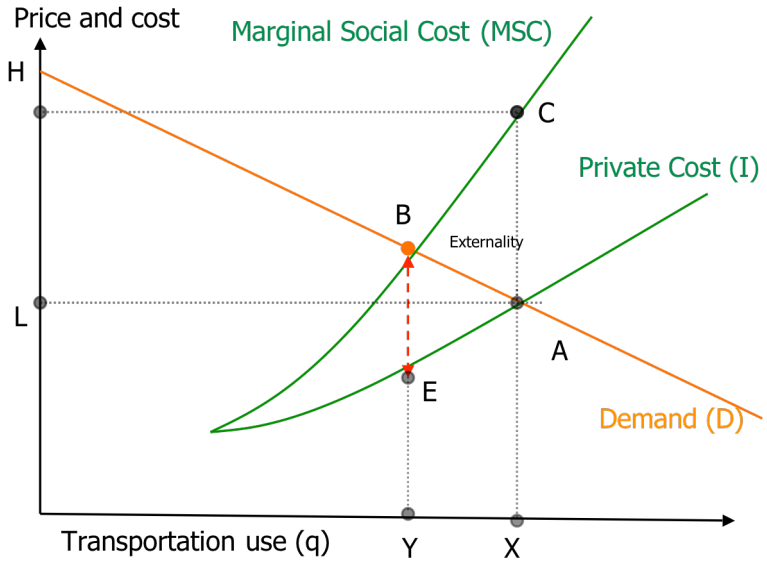
II — INTERNALIZING THE CONGESTION COST

Congestion costs usually refer to road congestion. This leads to evaluating these costs and discussing the public policies devoted to their internalisation. Congestion also affects public transportation and leads to time loss but also to a decrease in the quality of the service. Interestingly, there are thousands of papers, studies, policy proposals on road congestion, but virtually nothing on public transport congestion. This should also be addressed by the public policy. Congestion is usually tackled using taxes (on fuel or by tolling the traffic) which decrease road usage.

Road Congestion: a Theoretical Approach

The Commission emphasises that it is widely acknowledged that the charging approach that would respond to efficient and fairness principles would be the marginal social cost pricing (MSCP). Such an approach means that transport prices should be equal to the short-run additional cost created by an additional user of the infrastructure.

Figure 1. Marginal social cost pricing



In the preceding figure, the demand, or marginal willingness to pay for transportation, declines with the price (D). Curve I represents the unit cost for the individual user, which increases with road usage because of congestion, the private cost. The private cost is incremented of the externality and gives the Marginal Social Cost (MSC) represented by S, which also increases —faster— with road usage. Imposing a tax on road usage equal to BE would drive the quantity of road usage (X) towards its socially optimal level (Y). Congestion tolls are an illustration of this principle.

Marginal social cost pricing

According to the textbooks and as shown in figure 1, the correct level of the tax must be equal to the amount of the externality at the optimum (BE). Marginal social cost (MSC) pricing leads users to reduce their road usage and leads to the optimal. They have been experienced in Singapore for more than thirty years and more recently in London, Stockholm, Oslo and elsewhere. Some problems still remain.

Unfortunately, most of the empirical costs calculations are done under the current situation of road usage. This means that the marginal social cost which is measured is AC instead of BE. Because AC is much higher than BE would be, using the first instead of the latter would lead to an over taxation of road usage and would reduce it to a suboptimal level, on the left, possibly much to the left, of Y. In such a case, the cure would be worst than the illness.

To bypass this problem it is sufficient to assume that the externality is proportional to the road usage. Doing so, the curves of private cost and marginal social cost would be parallel. Then AC would be equal to BE and the problem would vanish. Such an assumption is not very realistic because congestion, a typical externality of road usage, is a growing phenomena linked to traffic. According to the current level of traffic, an additional road user will slightly slow the traffic or freeze it. The slope of the marginal social cost is greater than the private cost precisely to illustrate this phenomenon. In consequence, marginal social cost pricing should be based on the congestion level at the optimum. Such a calculation is much more complex but is indispensable to lead to an optimal result.

Free flow versus optimum

Another problem with MSC pricing lies in the mere position of the optimum. The Commission states that the optimal level may vary from one country to another. Moreover the paper refers to COMPETE (2006) and cites a travel index for cities other than London where congestion is defined as the difference between the time length of a trip in free flow and during peak hours. The optimal must not be defined relative to a technical state of the traffic on the road but at the intersection of the demand for transportation and the marginal social cost. It suggests that both the demand and the marginal social cost have been calculated. Using the difference between the free flow and peak is an economic non sense and suggests that the normal status of a road is to be empty. On this point, every car using the road would be defined as a factor of congestion.

This is why the evaluations often proposed for congestion costs should be considered with great reserve. The European Commission for a long time (notably in its White Paper of 2001) announced a figure of 2% of GDP. It now speaks of 1% of GDP. The UNITE report (Unification of accounts and marginal cost for transport efficiency) announces for France a figure of 3.5% of GDP[6]. This evaluation is greatly overestimated. Evaluations based on the economic definition of congestion costs, meaning what society looses by not being at optimal usage level (or congestion), being at X rather than at Y leads to much more meaningful —and lower— results.

Fortunately, the London and Stockholm tolls offer a very precious set of numbers on this key issue. It happens that they have effectively reduced congestion to more or less its optimal level. The gain in time created by the toll is a measure of the cost of congestion in the centre of these cities. Thanks to these real life experiences the cost is reasonably well known.

In these two cities (or more precisely reduced zones of these cities) tolls in fact have been introduced, the effect of which was not to eliminate congestion, which has no sense, but to reduce it to its optimal level. We know the gain from this measure. In the London toll zone it amounts to around 70 million euros per year, according to those who operate the toll themselves. Carried over to

[6] The report Mobility, Transport & Environment of the Ministry of Ecology and durable development (2006) taking the results of a study of the Ministry of Economy and Finance, suggests the figure of 92 milliard euros, or more than 5% of GDP.

GDP of the toll zone in[7], this makes 0,1%. In the toll zone in Stockholm, gain amounts to 56 million euros per year according to the toll promoters, to 14 million euros according to our estimates. Carried over to GDP of the toll zone in Stockholm, this makes 0,14% to 0,035%. In both cases, we then have an estimate of congestion cost in two city centres: around 0,1% of GDP of these centres.

From these figures we could suggest an estimate of the ration cost of congestion in European cities on GDP in Europe. This ratio is certainly inferior to 0,1% for two obvious reasons. The first is that it concerns the most congested zones of the country where at least one of them (United Kingdom) passes for one of the most congested in Europe. The ratio for the whole of the London agglomeration (or Stockholm) would certainly be lower, and would itself certainly be inferior to the ration for the whole of agglomerations United Kingdom or Sweden. The second reason is mechanical. The GDP of the cities is inferior by 15 or 20% to the ration of congestion costs of cities to the GDP of cities. In total the ratio of urban congestion cost to GDP of Union countries is no doubt in the neighbourhood of or inferior to 0,05%. This is twenty times less than the figure of 1% suggested by the Green Paper on Urban Mobility (2007). The first of the pillars upon which the Green Paper's analysis is based is then a gross overestimation. We repeat : not 20%, but twenty times.

Note that the benefits of tolling are not equal to this very real gain, which is a "gross grain". One has also to take into account the cost of operating the toll, which is significant, and likely cost of increased public transport congestion, in order to obtain the "net gain" of an internalizing toll. This net gain turns out to be small or even negative in London and Stockholm, and would probably be even smaller or more negative in most, perhaps not in all, European cities.

The London and Stockholm experience also give us a ceiling on marginal congestion costs in Europe. They are given by

[7] To estimate the GDP of our two toll zones, we took the GDP of the agglomeration (Greater London in the case of London, the county in the case of Stockholm) multiplied by the number of jobs in the toll zone and divided by the number of jobs in the agglomeration. This procedure, which supposes that the productivity in the centre is equal to the productivity in the periphery underestimates certainly, perhaps by 15 or 20%, the GDP of the toll zone, and thus overestimates certainly the cost of congestion ratio in the zone on GDP of the zone.

the actual optimal tolls, which were equal to about 7€ in London and 1€ in Stockholm. There must be very, if any, roads in Europe as congested as central London roads. The much lower Stockholm figure is a better indication of marginal congestion costs in fairly congestioned roads in Europe. For most of the roads, MCC would be much lower. Indeed it would be close to zero on most if not all rural roads.

Tendencies

The Commission (p.2) indicates that external costs are growing: "*The high and growing proportion of the external costs of transport endanger its sustainability, which calls for policy action* ". There is no doubt that numerous problems and notably, we will see, that of green house gas must be treated by an adequate policy. On the other hand, the affirmation that all external costs are growing is disputable.

Concerning congestion, we have shown that the level of congestion is inferior to that indicated by the Commission. As far as the trend is concerned, the demand for urban transport does not follow an exponential curve as we imagine sometimes, rather it follows a logistic curve and we are then in the almost horizontal part. This is due to the existence of three rules which regulate the demand for urban transport. Firstly, the number of daily displacements is stable and between 3,5 and 4,0 per day. It increased slightly in the 90s. Secondly, and this partially explains the first, daily time allocated to travel is stable, as time is a scarce resource. The speed of intra-urban travel has increased in the last 20 years. On the one hand because new infrastructures (highways) have been created and on the other because the greater part of intra urban travel is from suburb to suburb and the change from collective transport to the car accelerated the displacements. There too, and contrary to that which is suggested, in the city the car is a quicker mode of travel than public transport. In the Paris agglomeration, but also in Stockholm, two cities endowed with a good and expensive public transport system, one moves about 50% faster in a car than in public transport. In the realm of interurban transport the text mentioned indicates that " *The density of traffic in Europe has increased over the past years, raising the probability of congestion in some areas* " but does not produce references on congestion outside of cities[8]. Congestion is not a

[8] Measured in reference to free flow of which we have said what we think.

homogenous phenomenon but by definition applies to particular times and places. It is striking to observe the absence of data on speed of travel (which is the opposite of congestion)[9].

Congestion is a phenomenon which merits more empirical study showing the evolution of speeds of travel over the last decades. In the meantime, congestion should not be presented as a homogeneous increasing phenomenon.

Road usage and the cost of infrastructure

Prud'homme (2006)[10] already mentioned that MSC was not the only principle for pricing. It competes with other principles (average cost pricing or Ramsey-Boiteux prices).

The Commission recalls correctly that to lead to an efficient use of infrastructure the approach should include price-relevant cost user cost (infrastructure use cost, congestion, scarcity costs) and marginal cost external cost (environmental costs, external accident cost[11]). But arguing that traditionally infrastructure has been borne by public authorities or by operators linked to public authorities completely ignores the basic issue of the financing of infrastructure and its cost recovery is not developed.

Saying that investment decisions and usage decisions are and should be completely separate is the traditional answer to this issue (p. 15). Sound cost-benefit analysis should determine investments. MSCP should determine their usage. Who could claim that all investment projects that pass the test of "sound cost-benefit analysis", and only those projects, are effectively undertaken? De facto, it is assumed that these investments are optimal. But what if they are not? Consider two links, A and B, with a similar transport demand.

For A, a very generous highway has been built, and this highway is never congested. MSCP implies that there will be no congestion charges on link A. For B, by contrast, not much has been done, and there is only a two-lane road. Congestion is heavy, and MSCP implies high congestion charges. Over-investment will lead to low prices and under-investment to high prices. Not only is this in

[9] Although collected, the data on speed is, strangely, rarely diffused. We find none in the numerous publications of the European Commission
[10] Prud'homme R. (2006) "*Marginal social cost pricing in transport policy*" Discussion Paper, 7th ACEA SAG Meeting.
[11] We will discuss that point later.

contradiction with many of the other transport policy objectives, but it creates a perverse incentive against transport investment. Under-investment “pays". Why invest, then? Ministers of Finance would be quick to learn that lesson. When both investments and charges are the business of government, separating investment decision and pricing of road usage might make sense. If charges were greater than investment needs, fine; if not, the general budget would pick up the deficit. But now that everybody, including the EU, wants to bring in the private sector, that reasoning is no longer possible.

What about the other modes of transportation?

It is interesting to notice the Commission text only briefly touches on the question of congestion in the other forms of transport.

Congestion in air and rail transport can be analysed using a model analogue to that of road congestion. The Commission text indicates that congestion « *does not lead to queues* » which is most surprising when a few lines further on it is written that « *congestion leads to delays and problems of arrival or departure times* » (p.19). The text does not evoke congestion in urban public transport (metro and bus) where congestion appears also by a loss in quality of service (traveller standing up is less valorised than travel sitting down).

The main problem resides in the absence of any discussion at the level of users of rail and air transport. Remember that the principle indicated by the Commission is that users must pay the cost they engender. It is not because external costs of congestion are low that the question of whether internal costs are covered should be forgotten... The question does not apply for air travel where the passengers pay the price of their transportation but what about rail travel, which is largely subsidised? In France, user payments cover about half the total expenses or “*internal costs*” of the service, even without considering external costs (which are modest). If we consider only operating costs- bizarre procedure in a sector as highly capitalistic as railway- the answer is still negative, as the expenditure for salaries only is almost equal to user payment; if we add the expenses for energy and maintenance, operating expenses are clearly higher than payments[12].

[12] If we wish to learn the marginal cost, independent analyses are lacking. It is sometimes equal to zero, when we put an additional

We observe then at the end of this first section that internalisation of operating costs and externalities of congestion is not obtained for rail transportation as is for road[13] and air transport. Does this conclusion remain valid if we consider the other external costs, in particular the pollution and the CO2?

III — POLLUTION AND GREEN HOUSE GAS

The Commission's discussion text fortunately slices into the recent Green Paper on urban mobility (2007) which indicated that air pollution in the city was regularly increasing. Today's discussion text shows that air pollution by the principle pollutants has diminished in Europe by more than half in ten years. This improvement is due to emission norms imposed on new vehicles by the European Union. It is however true that *« air pollution still remains a challenge in dense and high traffic areas* » (p.6). The transport sector's contribution to European atmospheric pollution is generally equal to 30% and should continue to decrease with the renewal of the fleet. In France, atmospheric pollution originating from roadways decreases from 3 to 6% according to the components and this despite an increase in traffic of 2,2% per year. The principle environmental question which remains to be resolved is then that of CO2.

The cost of reducing green house gas emission?

The Commission text evokes three main possible solutions to limit CO2 emission: regulation, the cap and trade system, and of course, more taxation. The implementation of a tax destined to limit CO2 emission is based on the following observations:

- CO2 emission is not a local but a worldwide problem. A ton of CO2 emitted in France or in China has the same effect on warming. Inversely, the same is true for reduction of a ton of CO2.

- The GIEC (IPC) estimates that stabilisation of CO2 concentration at 450 ppm would limit the average increase in world temperature to 2°. To do this, annual planetary

traveller in a half full train, sometimes very high when we add an extra train

[13] The case of merchandise road transport must be discussed in more detail and be verified whether the greater usage of roads by trucks alters our conclusions.

emissions in 2050 must be reduced to about 30 billion tons of CO2. This is about 20% less than at present, and half the usual scenario of what would be produced worldwide in business - CO2 emission varies from country to country. Carbon intensity (CO2 rejects divided by GDP) varies greatly from one country to another and in each country from one sector to another. France is the world country which produces the least CO2 per million dollars of GDP, largely due to the domination of nuclear and hydraulic electricity. Carbon intensity is 180 tons. It is much less than that of other European countries: 260 tons in Italy, 270 tons in United Kingdom, 290 tons in Germany, 320 tons in Spain. The United States, with 520 tons, does less well of course. The developing countries are also particularly inefficient. Brazil and Mexico have the United States' carbon intensity. The worst results are China and Russia's, with more than 2.500 tons of CO2 per million dollars of goods and services produced, 14 times greater than France. CO2 emissions increase with economic growth and decrease with the adoption of 'green' technology. It is neither probable nor desirable that growth slows down. It is not certain that the various activities (industry, lodging, transport) scattered about the planet spontaneously adopt "green" technology to place the planet on the desired track of reducing CO2. Instauration of a tax on CO2 would place the various activities in the following dilemma: pay the tax or choose "clean" technologies. Figure 1 can be adapted to illustrate this situation. With a tax BE per ton of CO2 emitted, the activities are indifferent between paying the tax or adopting "green" technology.

- The whole question is to know how to fix the tax level. We would attach more weight to the extensive report the G8 ordered from the International Energy Agency (AIE), published in 2007, which concludes that « *none of the necessary technologies required to place us upon the road of virtue should have a marginal cost of more than 25 $ per ton of CO2 avoided*», which means 18 €. Stern's report is cautious, but by basing himself notably on the AIE analyses, he refers to a range of 10 to 40 $, which makes a ton of CO2 from 10 to 29 €. He writes about the social cost of carbon: « *a base of 35£/ton of carbon- which corresponds to 12 €/t of CO2- is reasonable in a decisional context which attempts to reduce the threat of dangerous climatic change*», adding that this base is very cautious. Consequently, tax on CO2 should be fixed at around 20 € per ton. This being done, activity would adopt technology permitting the elimination of CO2 for a cost inferior to 20€ ton.

- The figure 20 €/ ton also indicates the opportunity cost of a ton of CO2 avoided. Effectively, the AIE report chose this figure as it corresponds to the average cost of the switch from one technology to another to avoid a ton of CO2 worldwide. In fact, 20€ per ton is the result of the benchmarking of the best practice available to avoid CO2. It is the cost of the best alternative (the average best alternative, in fact) to avoid a ton of CO2, which is nothing else than the social opportunity cost of avoiding CO2. Choosing a strategy which permits saving CO2 at a cost superior to 20€/t is a waste of resources as it is possible to do as much at less cost.

- Implementing a tax would be expensive but tolerable, which Stern's report evaluates at 1% of world GDP. (This 1% is understood as being the actualised sum of reduction costs over 50 years, and corresponds, despite actualisation, to a cost in GDP slightly increasing). The planet's CO2 emissions are currently around 35 million tons. A tax of 35$ (25€) is completely coherent with the estimate in Stern's report. This would accomplish two things. Firstly, it would create, according to Stern's report and as we have seen above, the desired 50% reduction in CO2 emission, meaning from 17,5 billion tons, to a cost certainly inferior to 17,5 x 35=610 billion dollars, let's say to 400 or 450 billion dollars. This represents about 1% of current world GDP. Secondly, it would bring in 610 billion dollars in taxes, which are not a cost and could be usefully employed or compensated by a reduction in taxes more toxic to growth.

Fairness, efficiency and the green house tax

The pools of CO2 savings are not in developed countries, but in countries such as China, Russia, India or Brazil. Opportunities for savings in CO2 at less than 25€ a ton are rare in Europe. These opportunities are, on the contrary, abundant in these countries. It is there much more than in Europe that savings in CO2 must be achieved. This is what an international carbon tax would do automatically.

This solution, as is, is of course politically unacceptable for the countries least efficient in CO2, which often happen to be poor countries. Furthermore, they have a strong argument to use. Over the last two centuries, the countries that are now rich produced CO2 without paying tax, and the CO2 thus accumulated is one of the components of the problem of global warming. The solution thus necessarily requires "carbon assistance" compensation from the rich countries to the poor ones.

We should then help these countries on whom a carbon tax – and their own current inefficiency- would be an unjust burden. This is the best use we could find for our scarce resources. Not spend 1000€ to save a one ton emission in Europe, but spend it in China to avoid a 100 ton emission. This assistance could take different forms, largely to be invented. One of them, perhaps the easiest to implement, is based precisely on the carbon tax, which could, in a way, be the solution to the distribution problem which arises.

Suppose that a carbon tax of 25€ is imposed on all countries (and which is a substitute for all the constraints packages often discussed). In China, it would have strong incentive power and would, without doubt, decrease emissions by 2 or 3 billion tons of CO2 per year, at an economic cost of 20 or 30 billion euros. It would also produce 70 or 80 billion euros of taxes which would obviously be kept by the Chinese government, which would undoubtedly reduce other taxes of an equivalent amount, in order to not slow down the country's development.

In France, this same tax would not greatly reduce emissions, at most 10%, or 40.000 million tons, at a low economic cost, probably inferior to 1 billion euros. But it would produce close to 9 billion euros in taxes that could be made available, all or in part, for developing countries. This would cost, at most, 10 billion per year (as the tax in question would be an economic cost for France as compared to a kept tax).

The rule would then be: all countries impose the same carbon tax of 25€ per ton of CO2-for efficiency-but the rich countries donate all or part of the proceeds of this tax-for justice.

How to implement a green house tax in the transportation sector?

Failing a world carbon tax which corresponds to the principles evoked earlier, it is probable that targeted transport features are implemented. However elementary efficiency rules should be respected.

- A policy is only good if it eliminates CO2 at a cost inferior to the social opportunity cost of avoiding a ton of CO2 (25€ per ton).

- In order to be efficient, the struggle against CO2 must force internalisation of external costs generated by all types of transport (air, rail, and road). The policy of

modal shift from road to rail is the typical example of a bad idea. Construction of new infrastructures to divert part of the transport demand to rail would be carried out at a cost much superior to 20€/t of CO2 thus avoided —at a cost in hundreds of euros per ton avoided. This policy fortunately seems to have been abandoned by the Commission in the paper which is discussed here. For the same reasons, implementation of a new tax should not create distortion between types of transport; overtaxing one type at the cost of another leads to orienting the demand to one type of transport and limiting the emissions of CO2 but at a cost higher than that which is acceptable; meaning that the same result can be obtained with a lesser withdrawal from wealth (GDP). Lastly, any new tax should not be additional to existing taxes except if the total amount is lower than the optimal tax. It is the total amount of tax paid by the user, and not the amount of the new tax which guides consumer behaviour and brings it back to optimum.

IV — OTHER COSTS

Road accidents are a major consequence in term of social cost of road traffic. They are decreasing, which now and hopefully recognized by the commission. They are not an externality, contrary to what commission states and it has a major impact on the design of public policy. Surprisingly, the policy proposed by the commission is meaningful.

Road accidents are decreasing

Road accidents decreased by 21.4% between 2000 and 2004 (despite increased traffic) in the EU (p5)[14]. The

[14] This assertion is interesting and contradicts the Commission Green Paper in which road accidents are increasing in Europe. In France, the number of persons killed on the roads has regularly decreased over the last twenty years, going from 8.412 in 1995 to 5.731 in 2003, or an average variation of about -5% per year. The mode of calculation changed in 2004, but we know that the reduction in mortal accidents has accelerated since 2003. Today it is (using the new definition) below 5.000. Nosocomial illnesses kill more people in France than the road. Curves relating to bodily accidents or serious injury evolve at the same rate. Is it different if we only consider cities? Certainly not in France. French statistics distinguish between 'urban' and countryside accidents. In urban areas the number of deaths goes from 2.757 in 1995 to 1577 in 2003, or a reduction of more than 7% per year. Far from increasing more in the city than in the countryside, road accidents decrease there on the contrary more rapidly. The

Commission text underlines correctly that road accidents impose great cost on the community. The Commission is right to say that costs of accidents are already partially internalised by vehicle drivers. "*External costs are those which are not covered by risk-oriented insurance premiums. The levels of external costs depend upon the level of accidents, but also upon the insurance system and legal practices. Aside from human suffering, the majority of the costs are material damages, administrative costs, medical costs, production losses and risk value*" (p13).

Externalities or adverse consequences

Qualifying road accidents as externalities is not trivial. We know that economic theory considers that externalities are the consequences of third party behaviour of an agent, where this last does not receive material compensation. Taxation of behaviour which generates externalities aims at reducing its level. We tax gasoline to bring road circulation to its optimal also. The important point to remember is that the quantity of externalities and the level of activity are linked; this connection is not probabilistic but functional[15]. The fact that sky-diving provokes a percentage of accidents is a probabilistic connection. We must not confuse the fact that some high risk activities (skiing, bicycling, sky-diving) create a percentage of accidents with interdependence of the profit function of an enterprise which pollutes and that of one which is useful for the consumer. This distinction is very important because no one wants to reduce the number of skiing accidents by taxing winter sports in order to reduce the practice of sport. Similarly, no one suggests reducing the number of baths taken by the French even if these are accompanied by a certain amount of flooding. This is precisely why economic theory suggests internalising the social cost of accidents by the system of liability insurance.

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evolution is not different in other Union countries. The Commission itself publishes the evolution of number of deaths on the roads. It goes, for Europe, from 70.628 in 1990 to 42.556 in 2004, a reduction of about 3,5% per year. Reduction was characteristic of all countries, except Cyprus and Malta. We do not have the breakdown of the figures between city and countryside but we don't see why evolution observed in France (number of accidents decreasing more quickly in cities than in the countryside) would be inversed in other countries.

[15] For an externality to exist functions of profit or productive or consumer utility must be interdependent.

Insurance and incentives

Civil responsibility (liability) is a system which enables reduction of the number of accidents[16] by reducing driver negligence and not the number of kilometres driven. Its economical function is not only compensatory, but deterrence of avoidable accidents. Compensation permits indemnifying the victims which settles the problem of risk distribution between parties. If compensation is perfect, the victim is indifferent to either of the two states: not having an accident, or having an accident and being compensated. With liability, the cost to the negligent inflictor of injury in an accident is no longer the victim's loss; it is the current value of the increase in premium that the inflictor of injury experiences as a result of being found negligent. The role of insurance is not only to ensure victim compensation but also to incite those who cause accidents to decrease their level of negligence by a system of franchise and "bonus malus".

Three elements are important here; the first is that the system adopted for treating road accidents does not treat them as externalities. This is why the objective is not to reduce the number of kilometres driven, but diver negligence; some of which are ineluctably linked to road traffic. These should be reduced without deprivation of positive road externalities. Secondly, the system of liability and insurance aims at internalising an externality by compensating damage, transferring the responsibility to the aggressor, mutualising the cost of risk among drivers, persuading dangerous drivers to modify their behaviour. Thirdly, liability thus settles a distribution problem and insurance provides positive incentive to change behaviour and not the quantity of activity at stake, while the tax settles a problem of inefficiency by decreasing the activity. Nosocomial illnesses (illnesses caught in hospitals) in France kill as many people as road accidents (and presumably also in other European countries). Nobody describes these fatalities as a hospital externality and suggests that they should be reduced by means of an internalizing tax on hospital use. Health ministries and authorities try rather

[16] Calabresi G. (1970), The Cost of Accident, A Legal and Economic Analysis, Yale University Press.

to develop codes of conduct and material that will decrease this most regrettable occurrence of nosocomial illnesses.

Similarly, reducing road accidents then supposes improving road infrastructures, perfectioning vehicles, regulating speed and other factors which determine the accident level exogenously. The Commission thus is right to suggest internalisation via expansion of insurance liability as public policy strategy. The option of charging the insurance company involved a lump sum at the level of external costs for each accident is correct (p21) because insurance companies have information on driver cost and could then pass this cost on to drivers through differential premiums according to their accident risk profile. This is an incentive public policy strategy and would allow reducing accidents and not the traffic. The Commission suggests the right solutions but should specify that the framework for treatment of externalities by taxation does not apply to accidents, as it shows by the policy it recommends. A great deal of confusion would thus be avoided.

V — CONCLUSION

In fine, it is interesting to verify if, in the present state of things, road users effectively pay the costs they engender.

We are not able to answer this question for all European countries, but the case of the French is enlightening. Road users of course pay the cost of capital of vehicles, supplies and fuel they use. They pay the cost of infrastructure they use in the form of taxes specific to road transport. In addition in the case (14% in terms of vehicles*km) of conceded highways they pay tolls that fully cover infrastructure construction and maintenance. It suffices then to compare the specific taxation to the cost of infrastructures. Specific taxation in France amounted in 2004 to 34 milliards Euros, greatly superior to 18.8 billion of public spending for roads. Meaning the creation and maintenance of road infrastructures.

Do road users also pay the external cost of congestion they create? The examples of London and Stockholm where we can measure the gain suggest that it represents from 0,1% to 0,2% of GDP of the zones considered (Prud'homme et Kopp, 2006), which were the most congested of the countries considered. By taking 0.1% for France and by

dividing by the circulation we obtain 0,022 €/vehicles*km, or 2 cents of a euro. On one side the road users pay O.44 euro per vehicle*kilometre (35 in TIPP) and on the other they create a cost for the infrastructures of 35 euro cents and a congestion of 2 euro cents.

Road users then pay the cost of congestion they create. The Commission text goes in the same direction and suggests that this is the same for Europe *" It is true that transport activities, including vehicle purchase, ownership and use, are already subject to numerous taxes and charges, which may overall compensate, and in some cases even over compensate, for some of their social costs* »(p.8).

One can just disagree with commission conclusion when it states that "*existing taxes have not been established for this specific purpose, and consequently there is often no direct relation between the cost pay by an individual transport users and the additional cost they impose on society*" (p.8). It is a strange refinement of theory. A cost is a cost. Whether it has been increased by a tax dedicated to decrease congestion or by a tax created for any other purpose has no incidence. Individual are adjusting their behaviour to cost (price-elasticity) and not to labels. At the end, the only remaining question is whether road users are paying a price that covers their cost. If France is representative of Europe, the answer is yes.

Road CO2 already pays much more than 25€/t, somewhere in the area of a hundred euros- to be "shared" with congestion costs, road maintenance, etc. The politically incorrect truth is that a carbon tax should barely affect the road, at least in Europe. It is the sector which, because of high taxation, is already energy efficient, which the normal rise in petroleum will improve even more, and which constructors will cause to progress. But the idea, (dominant in France and sanctioned by de Boissieu in a report called factor 4)[17] according to which all sectors and all countries should reduce emissions by the same percentage is economically absurd. Even, and above all, from an environmental point of view.

Our comments focus on external costs (congestion, air pollution, green house gas) and the cost of risk (accidents) linked to transport. We have centred our

[17] Les travaux du groupe de travail sur la division par quatre des émissions de gaz à effet de serre de la France, à l'horizon 2050, dit « facteur 4 ». *DGEMP-Observatoire de l'énergie. http://www.industrie.gouv.fr/energie/prospect/facteur4.htm*

remarks essentially on road transport which is essentially the focalisation point of the Commission recommendations. Several positive points represent a salutary rupture with previous Commission publications, in particular its Green Paper (2007). From a factual point of view it clearly appears that atmospheric pollution decreases as well as road accidents. The central problem remains CO2 emission. The fact that the text nowhere mentioned the modal shift as a positive public policy is good news because we know how costly and inefficient this policy would be. On the other hand, we still regret that the figures put forward on road congestion are quite probably over estimated in light of the empiric studies carried out recently. The Commission undoubtedly shares this point of view as it has decreased its evaluation of congestion in Europe from 3% to 2% of GDP. This overestimation comes from a bad definition of congestion optimum, which is defined in reference to an empty road and not by equalising the marginal social cost of the road and its marginal benefit. Likewise, it is still unfortunate that extreme focalisation on external costs prevents the Commission from discussing the fact that public transport does not cover private costs which is a prerequisite to the discussion of internalisation of external costs.

In matters of public policies choices, much importance is accorded to taxation policy. We will continue to regret that its implementation remains imprecise. What should be done is to calculate optimal tax by taking into account taxes already paid, in reference to optimum. It is not what the Commission proposes. It uses marginal observed cost data and not at optimum and recommends excluding taxes already paid as psychologically drivers would not link these to external costs, which has no theoretical basis and would lead to abnormally increasing the cost of automobile circulation. The policy suggested in matters of fighting green house gas seems badly informed on economic problems accompanying reduction objectives. Summarily, reduction efforts should be concentrated there where a ton of CO2 can be avoided at a cost of less than 20€ because otherwise there will be waste, simply because the same amount spent elsewhere would produce a greater reduction of CO2. Road accidents also represent an example of imperfect mastering of economic aspects of proposed strategies. As much as the idea of increasing the cost of insurance for dangerous drivers is good, it is also based on an analysis of road accidents which obstinately presents these as externalities. These are risks; the consequences of which must be reduced without reducing transport activity, which has nothing to do with other

external costs we combat by reducing the activity which is a source of nuisance.

Table 1 – Generous estimates of marginal costs and conservative estimates of contributions associated with road usage (France 2005)

	€/100 per vehicule.km
Marginal contributions	
- without highways tolls [a]	4.88
- Including highway tolls [aa]	6.00
Marginal costs:	0.57
- CO^2 [b]	0.10
-Congestion costs [c]	
-Operation and maintenance costs [d]	1.94
-Air Pollution [f]	0.17
-Noise [g]	0.04
Accidents [e]	0.02
Total	2.84
Marginal (contribution-costs)	
-excluding highway tolls	2.04
-including highway tolls	3.16

Notes

(a) Specific fuel taxes (27.1 billion €) divided by the total number of vehicle*km on French roads (556 billion); one could argue that non specific taxes which are a function of road usage, such as VAT or types or lubricates or vehicles repairs, should be included.

(aa) Specific fuel taxes as above, plus tolls payed (6.3 billion €), divided as above by the total number of vehicle*km on French roads.

(b) $C0^2$ emissions of road transport (128 million t) x unit price of CO^2 (25€/t), divided by the total number of vehicles*km.

(c) Generous estimate of costs ranging from 0 in rural roads to 0.30 in downtown Stockholm and 0.81 in downtown London.

(d) calculated from data on French conceded highways. Share of labor costs + operation costs + repairs (23%) in total receipts multiplied by total receipts (6.3 billion €), divided by number of vehicle*km on such highways (77 billion). This is a gross overestimate, since a number of these highway expenditures (e.g. wages) are independent of road usage.

(e) [casualties (5,318) x unit cost of casualty (1 million €) – taxes on insurance and taxes on insurance for social security (3.1 billion €] divided by total number of vehicles*km. As argued in the text, counting accidents as a road externality is highly questionable.

(f) Official French government number; the number is for 2000; air pollution levels have declined by about 40% since 2000; air pollution costs by even more (because of then linear dose-effect relationship; the numbers given here overestimate marginal costs of air pollution by a large margin.

(g) Motor vehicle noise damage is estimated to be about ¼ of air pollution damage.

Sources

Most of the numbers utilized come from a compilation of official statistics entitled *2006: Faits et Chiffres: Statistiques du Transport en France*, published by Union Routière de France, and available on the web (www.urf.asso.fr). The government estimates of air pollution costs

comme from the *Instruction–cadre relative aux methods d'évaluation économique des grands projets d'infrastructures de transport*, dated Marc 25 2004, issued by the ministry of Transportation, and based on the findings of report produced by a high level commission chaired by Marcel Boiteux, known as Boiteux II Report.

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