INTERNALISING THE SOCIAL COSTS OF TRANSPORT

Chapter 8

Summary and Conclusions

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A problem that has to be seen as part of a coherent strategy

The other contributions to this volume have all shown that the external costs of transport are generated by a mix of environmental, economic and social factors, and it should first be stressed that these factors relate to the three conventional instruments of transport policy: investment in infrastructure, regulation/enforcement, and funding/pricing the system.

In the first place, a transport system takes shape in a geographical context in the form of infrastructure. Irrespective of whether this infrastructure is public, or is run by what may be a private operator under concession, the decision to construct it (or to have it constructed) is the responsibility of the public authorities. What is also involved here is a major decision among policy options relative to the allocation of resources -- a vital step in the development of the structure of transport networks, and also a decisive act with regard to competition between routes, or among modes.

Cost/benefit analysis can provide a theoretical solution to the problem of optimal investment. Although very widely used, this method of evaluating investment projects does give rise to problems which have not yet all been resolved. Since the social and economic return on projects takes account of non-market factors, such as time-saved or safety, it is sometimes claimed that such analysis "conceals" the strictly financial return on these factors -- a situation that may be incompatible with specific policy aims, such as the fact that the public authorities want particular operators to ensure a balanced budget in running their network.

On the other hand, cost/benefit analysis is often reproached for its failure to incorporate all the external effects of projects being evaluated, such as their environmental impact or their structuring effects on land use. To the extent that these (positive or negative) externalities are being recognised as important factors in the social utility of the networks and that their monetary equivalents are now being determined more effectively, they are gradually being taken into account more systematically in cost/benefit analysis. However, as we shall see further on, the question of putting a price on externalities (avoided or caused) is still a matter of some controversy.

New transport infrastructure investments directly influence traffic patterns. However, the demand for transport is also shaped by the system of regulation. In many countries, the regulation of transport has long been regarded as a direct means of modulating economic supply and demand. For example, policies for "co-ordinating" rail and road activity were introduced, whereby levels of supply were to be determined by means of licences, and prices by means of mandatory tariff structures for both modes. Most transport systems have now been deregulated -- or are in process of deregulation -- since it has been decided that market mechanisms are more efficient than those of co-ordination. Almost all networks are therefore moving
towards a system of co-ordinating traffic by means of costs and prices, although the process of transition is sometimes somewhat chaotic and painful.

Therefore, a deregulated network is not totally without a pilot, since the public authorities still have the above-mentioned three basic instruments to influence the formation of costs and, therefore, the terms of competition.

Regulation and its enforcement continues to play a role, even where transport when the sector has been liberalised: as a rule, regulations seek to control the external effects associated with transport, such as problems of safety, noise or other forms of disamenity. Cost formation is obviously affected by these regulatory measures, such as limits on driving time for road haulage, standards for polluting emissions by motor vehicles, aircraft noise, etc. The external effects prevented are thereby "internalised", even under a regulatory regime.

The formation of prices, and accordingly the terms of competition, are also influenced by charges for the use of infrastructure in the form of a combination of taxes on vehicles, duties on fuels, and various tolls. This charging system should lead to an optimal pattern of demand and, more generally, to an optimal allocation of scarce resources, such as clean air, silence, or even road space, which are not market goods. Economic theory tells us that these optimal results can be obtained by pricing at marginal social cost -- a principle that is open to debate, insofar as its application can entail the operation of networks with low marginal costs, combined with a deficit, thus requiring substantial public funding. This debate is, of course, similar to that between those arguing for a social and economic return, and those arguing for a financial return. The same arguments can be advanced in both cases, and it is clear that we have not heard the last word on either debate.

Thus, once the control of external effects of transport is accepted as a major policy objective, it must be seen as part of a coherent strategy that requires these effects to be taken into account in everything that contributes to the formation of costs and prices, if it is to lead to an optimal allocation of resources. It is not so much a question of resolving everything by means of the market as one of adjusting the market when it distorts this optimal allocation of resources.

**Terms and values**

If externalities are to be taken into account, the question of measurement obviously arises, and this in turn calls for some definitions. A broad consensus seems to be available for a basic definition of an external effect of transport -- namely, that it is a negative (or positive) consequence of a transport activity, but that the person who generates it (or benefits from it) does not have to offset the cost in monetary terms. The term "internalisation" is therefore used when a regulatory, fiscal or pricing instrument gives rise to this monetary compensation.

Under this definition, externalities that may be internalised would include the effects of transport with regard to wear and tear on infrastructure, safety, congestion, air and noise pollution, as well as improvements to a given space by means of positive externalities, etc. It is quite clear that the diversity of external effects calls for a new type of vocabulary -- or at any rate, a more precise one -- and that the concepts of social costs, external costs or even externalities can be confusing, if they are not given more rigorous definitions. The first requirement therefore seems to be to define the meaning (or even the different meanings) of the terms used in these analyses.

The difference between private and social cost may perhaps be illustrated by the car driver who uses a congested road, and therefore the space that can be considered to be a limited resource. If he decides to travel in these conditions, it is because he believes the journey to be worth the total of his monetary cost and the associated disamenities. In sum, he is willing to agree to a "generalised cost" for the journey, which
is of course a marginal private cost. In doing so, he increases congestion, and therefore the marginal costs of all road users, including his own. Thus, from the community standpoint, the driver’s activity may have a higher marginal social cost than his own marginal private cost.

If this state of affairs presents a problem from the standpoint of economic theory, it is because there is seen to be an inconsistency between the optimal behaviour of the driver -- who weighs his marginal private cost against the benefit derived from his journey -- and the conditions for the social optimum, which calls for equality between the market price (here the "generalised cost" accepted by the driver) and his marginal social cost. This inconsistency is conventionally regarded as being attributable to an imperfect market, associated with the fact that the scarcity of resources is not adequately reflected in terms of cost. In classical economic theory, the problem is resolved by the existence of a "right of ownership", held by a public or private agent, which entitles him to demand payment for the use of scarce resources. In the same way that an owner of agricultural land or a mineral deposit is compensated for activities occurring on his land, the agent would receive an income from granting the right to use his property, while market mechanisms (including those determining the income) would produce an optimal allocation of resources.

In the initial situation, the difference between marginal social cost and marginal private cost is frequently identified as an external cost -- the term "external" in this case implying that it is outside the sphere of costs borne by our driver. The establishment of a "right of ownership" and a use price may serve "to bring into" this sphere the difference between social cost and private cost -- in other words "to internalise it". In theory, therefore, this internalisation is a means of making the economic optimum and social optimum coincide.

However, this classical approach by the economist is still somewhat over-simplified, and calls for some further consideration. The private and social costs differentiated in the case of the driver are comparable with the external economies and diseconomies in the analysis proposed by Alfred Marshall nearly a century ago. Marshall was considering the effects external to the accounts of a firm whose activity had some impact on the production costs of other firms. The effects he described were subsequently referred to as "pecuniary" external effects, in that they modified the prices of goods and services bought or sold by agents other than the firm which originally produced these effects. The "non-pecuniary" external effects -- sometimes referred to as "technological" externalities -- in fact, correspond to a broader concept of external effect or externality. Since we are concerned with the environment, this broader concept is, of course, germane.

So, in order to define the concept of external effect, it is first necessary to specify "external in relation to what?". We have to establish a typology of these effects with reference to the "sphere" used to determine the externality, and also according to the nature of the effects under consideration. Figure 8.1 illustrates one such typology, the categories of external effects being set out with the corresponding spheres.

The inside sphere entitled "the firm" could also be that of any agent, a consumer or user. It is because this agent’s budget is not affected by effects that he generates that we use the term "external effects". The latter can, however, be differentiated according to the sphere in which they occur:

- From the sphere of the firm towards the market sphere, the effects are external in Marshall’s sense of the term, i.e. external economies and diseconomies. For example, a road haulier who enters a road on which traffic is congested will slow down the other vehicles, thereby increasing the production costs of other hauliers.
- From the sphere of the firm to that which encompasses, not only market goods and services, but also social goods and services, which consist of external costs funded by the community (for example, expenditure on the maintenance of infrastructure which has suffered wear and tear from road traffic).
• From the sphere of the firm to that also including personal satisfaction, i.e. *inter-personal external* effects, such as time wasted by individuals in congestion; traffic noise; or lack of safety.

• From the sphere of the firm to that which encompasses the quality of the environment or, in the widest sense, the biosphere, i.e. *external effects on the environment*, such as motor vehicle emissions.
Difficulties involved in internalisation

It can be seen that, as we move from the first to the fourth category of Figure 8.1, the effects are less and less closely bound up with "pecuniary" counterparts. This "solution of the economist" to the problem of external effects therefore calls for a means by which they can be internalised -- in the sense that their production implies pecuniary counterparts -- and which integrates them directly or indirectly in the market sphere. It is in this way that pricing the use of an asset, such as a road network, serves to transform the network into a market asset. Similarly, a pollution control standard laid down for engines serves to internalise -- through vehicle production and use costs -- the external effects on the environment that are avoided.

It should be noted in passing that, in a (highly hypothetical) situation in which such a solution might be applied to all the external effects to which individuals are sensitive (or which society must try to control), the price system would lead to an optimal allocation of resources. In this case, the evaluation of investment projects would become easy and quite thorough and the national accounts would begin to measure something that would resemble "Gross National Satisfaction". In other words, the three basic policy questions in the public economy mentioned earlier would be more or less cleared up.

While the problem may thus be resolved in theory, such is clearly not the case in practice. Nothing has been done to resolve the difficulty of measuring the social costs of external effects, if only because of the range of solutions available, depending on the particular position in the following chain:

Emission --> Reception --> Direct damage --> Indirect damage

In the case of noise alone, there have been a good half dozen lines of approach to the evaluation of this disamenity : avoidance costs as a result of standards limiting engine noise; costs accepted by the community in funding noise control facilities; expenditure by individuals, on sound-proofing for example; compensation for loss of amenity, such as that determined by courts to compensate local residents; diminished value of property through noise exposure, as determined by the market; or even expenditure on health care ultimately required as a result of the indirect consequences of noise.

Each of these lines of approach runs up against formidable methodological difficulties -- and even certain problems of principle. Suffice it to say that, depending on the method used, the same level of disamenity can lead to entirely different evaluations. Even in the context of a specific option, such as that of the values indicated by behaviour patterns, such patterns can reflect a very wide range of preferences or opportunity costs. The public authorities therefore have inadequate information with which to compare the marginal cost of measures that might be adopted (standards, public expenditure, taxes or charges) with the marginal external costs that are prevented or offset by compensation. In the United States at the end of the 1970s, for example, a number of researchers endeavoured to show that the pollution control measures taken with respect to cars were costing a great deal more than could be expected in return in the form of benefits.

In order to throw some light on such trade-offs, it is worth reviewing the reasoning behind internalisation, since each of the above-mentioned lines of approach to the evaluation of external costs corresponds to a particular process of internalisation. As a general rule, it can be said that every method of evaluating an externality is based on a particular type of internalisation. Accordingly, it is not possible to identify the best methods, without also determining the corresponding approaches to internalisation that lie behind each of these methods.

Means of internalisation

In order to provide a clearer picture of the movement from one sphere to another within it, Figure 8.2 renames the three spheres concerned. For the sake of clarity, the sphere of the firm or consumer
becomes "the culprit’s purse", i.e. whoever is responsible for the external effects. The market sphere becomes the "private pecuniary" sphere, and the third sphere encompassing public goods and services, is therefore the "private or public pecuniary sphere". Ten forms of internalisation (10 arrows) can then be identified. These are based on very different mechanisms but can be classified, as suggested in the diagram, in four quite separate groups, from the standpoint of their economic significance.

First, the term *radical internalisation* is applied when whoever is responsible for the external effect or disamenity has to pay something in return, such as compensation paid by the government to a farmer whose land diminishes in value because it is crossed by a new road (arrow 1). It may be a system of pricing the use of infrastructure, based on the marginal cost of wear and tear (arrow 2). It may also be the extra cost
of a vehicle that is subject to a more stringent noise standard (arrow 3) as mentioned earlier. Lastly, it may be a pollution standard, which also entails extra cost to the polluter (arrow 4).

Radical internalisation essentially corresponds to the *Polluter-pays principle* and, in theory, calls for the equalisation of private and social costs, although this means that the marginal costs and benefits of internalisation have to be equalised. The economic validity of the measure therefore depends on the assumption that the legislator has undertaken the relevant processes of evaluation, in order to determine that this is actually the case.

Secondly, the term *pecuniary internalisation* is applied to increases or decreases in market values resulting from the various externalities, and differs from the preceding type in that it is not "radical". Far from affecting the culprit’s purse, it relates to parties being injured by the externalities (or benefiting from them, since it must be borne in mind that some externalities can be positive, as in the case of the extra income obtained by the owner of a building near a new metro station) (arrow 5). However, we also have injured parties when the disamenities result in either a fall in real estate values, or in increased private expenditures for soundproofing, for example (arrow 6); injury also results when "biosphere" effects ultimately give rise to expenditures on health care, or when additional health insurance premiums are required (arrow 7).

This type of non-radical pecuniary internalisation is the only one able to provide information on externality values on the basis of "revealed" preference. It is therefore the only one consistent with methods which take "time" into account in calculating the social and economic return to be expected from investment projects in the transport sector. In such cases, the usual practice is to base the calculations on the price-time trade-offs, whereby users make their choice between a fast but expensive mode, and a cheaper but slower mode. It is this type of behaviour vis-à-vis a scarce good -- which has become a market good -- that indicates the value being assigned to it, what we shall call a "behaviour-related value".

The third type is *budgetary internalisation* from the standpoint of public finance, so it relates to the taxpayer, and is the outcome of a decision by the public authorities. For example, when the public authorities decide to improve an untolled road, they internalise the personal dissatisfaction of its users (arrow 8). Budgetary internalisation also occurs when medical treatment of the effects of disamenities are ultimately funded by the community, as when a social security system is budget-funded (arrow 9). As with radical internalisation, an evaluation is called for, in order to determine whether the internalisation in question warrants the budgetary funds to be supplied by the public authorities.

The fourth type of internalisation does not involve monetary values, since it relates to a move from biosphere effects to the sphere of personal satisfaction or dissatisfaction (arrow 10). However, this "internalisation by perception" is fundamental, since it corresponds to the act of becoming aware of what the biosphere involves. While biosphere externalities may be a subject of some controversy, as in the case of the greenhouse effect, it is worth taking them into account, if only in terms of the risk, because such perception offers the only means of raising soundly-based environmental policy issues.

To sum up, the above four types of internalisation differ in their approach to the problem of evaluation (i.e. actually putting a value on the externalities). For instance, internalisation by perception is not directly related to the problem of evaluation, other than from the standpoint of its usefulness in determining what is really at stake. Budgetary internalisation is a good example of the need for evaluation, insofar as public resources are to be allocated on a scale commensurate with the benefits expected, and will therefore vary with the “value” of the externalities in question. Any allocation presupposes that the problem of value has been resolved. Pecuniary internalisation can be used for this purpose, inasmuch as it reveals types of market behaviour which have monetary equivalents. Radical internalisation is supposed to ensure that the person generating the effect pays either monetary compensation or avoidance costs, both of which should be equal to the value of the damage. Here too, the measure presupposes that the problem of evaluating such damage has been resolved.

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Logically enough therefore, economists in the public sector have, until recently, kept to two types of evaluation of externalities, namely a *behaviour-related* evaluation, based on the observation of revealed preferences (and therefore on pecuniary internalisation) or, for the sake of expediency, *evaluation by the authorities* which amounts to a preference revealed by the public authorities. Behaviour-related values were therefore placed on time and comfort, and taken into account in calculating the social and economic return on transport infrastructure. As a general rule, however, the safety benefits derived from the infrastructure are taken into account by using the evaluation made by the authorities to place a ”money value” on the fatalities avoided.

A recent system, now used in Sweden, consists of *establishing values by objective*, whereby an objective such as a reduction of 50 per cent in pollution is set for a given period. The cost of the relevant pollution control measures are then calculated, yielding values which are both established by the authorities and related to economic realities. In this case, however, it is clear that the initial choice of the objective is decisive for the eventual valuation process.

**A few (highly) provisional conclusions and suggestions**

The first and most obvious conclusion stems from the preceding considerations: *if an internalisation measure is to be politically and economically acceptable, it must be based on sound processes of evaluation*. One of the major -- if not the main -- obstacles to the implementation of such a policy in the transport sector at present is the diversity of the quantified findings concerning external effects, and the impression that these studies are based on arbitrary calculations. The objections arising in this connection may be gradually overcome by working along three lines:

- **Establishing more precise terms and concepts**: even a key concept such as ”externality” does not necessarily have the same meaning for all specialists. A glossary of terms used in the analysis of internalisation should therefore be drawn up promptly. It is precisely this lack of precision with regard to the concepts which justified our earlier attempts at clarification.
- **Clarifying the methods of evaluation**: on the basis of earlier work, the various methods of putting a value on external effects could be made more precise. The type of internalisation required for each type of external effect would be determined in this way, together with the method of calculating the monetary equivalents most appropriate for ensuring the comparability and robustness of the findings, which would probably be considerably less disparate and, accordingly, more credible.
- **Dissemination of the findings**: as in any other field, progress can only be made in this research by means of the on-going comparison of results, leading eventually to the convergence of methods and empirical approaches.

In these circumstances, and assuming that the internalisation policy is not rejected by those concerned, it might be defined with reference to long-term objectives which result from short- or medium-term consequences. It is beginning to be accepted that, while we still may not know whether the monetary equivalent of a given pollutant is 100 or 200, it is reasonable to assume that a good estimate is more likely to be above 100 than close to zero, so it is better to take the first steps towards such an estimate than to do nothing.

The systematic comparison of policies pursued in the various countries is likely to encourage minimalist strategies, unless the major problems of political and social acceptability can be resolved. First of all, therefore, it will be necessary to understand the conditions governing the public acceptability of any internationalisation policy. This has three basic elements:
• *The redistributive aspects* of a policy concerned with regulation, taxes and charges or tolls must be given the most careful consideration. It is clear that, in contrast with a progressive policy, a regressive policy (one which increases inequalities) is difficult to accept. The inequalities or redistributive effects to be taken into account in this regard are of both a geographical and social nature.

• *The specific characteristics of particular cases must be respected.* For example, there is no reason why the same internalisation measures should be applied in countries in which levels of pollution per inhabitant differ too widely. The countries of Eastern Europe are the most clear-cut example of specific characteristics of this kind.

• *The transparency of internalisation measures* is a prerequisite for their success, and this does not relate solely to the above-mentioned problem of clarity of terms and robustness of values, but also applies to the ability of the price signal to actually influence behaviour. The policy of internalisation therefore calls for training and information -- factors that are of particular importance because the policy will inevitably be based on complex mechanisms, and may be handicapped by a certain reluctance to change established practices. In short, what has to be explained is that some scarce resources have no *price* -- which should be easy -- but that they do have a *cost* -- and that will not be so easy to get across to the general public.

To conclude, although it is relatively easy to stake out the difficulties involved in internalising the social costs of transport, it seems clear that many of these difficulties can be overcome in time. But, as we know, when a policy can only be introduced gradually over the longer term, that is an additional reason for implementing it as soon as possible.