

Summary:

Transport cost benefit analysis: A framework

This report provides a consistent framework for all transport cost benefit analyses. It is part of TOI's contribution to the ongoing effort in the Norwegian Public Roads Administration to upgrade its cost benefit analysis (CBA) manual, Handbook 140, so as to cover multimodal analysis. Also, it contains a set of formulas for the computation of all elements of benefits and costs entering the analysis. The framework and the formulas are the basis for programming the new software needed for multimodal analysis. In an accompanying report (Samstad, Killi and Hagman 2005), TOI provides recommendations regarding unit values, parameters and procedures for updating such values.

The main features of the methodology are the accounting framework and what we call the inclusive method. The main inspiration for the accounting framework is the Common Appraisal Framework (MVA et al 1994), which functioned as the standard in UK multimodal analysis in the nineties. The parties involved or affected by a policy are divided into four main sectors – travellers, operators, government and third parties – with a suitable subdivision by mode and trip purpose, type of operator, government agencies etc. Costs and benefits for each sector or sub sector are computed separately and entered into the sector account. To this end, we use the unit prices and costs that the agents of the sector themselves experience and perceive. If the agents will have to pay VAT and transport taxes, prices are inclusive VAT and taxes, etc. However, fares, tolls and parking charges are transfers to operators and thus are entered as revenue in the operators' accounts. Taxes are transfers to government and are entered (with the modifications described below) in the government account. The principle of entering perceived costs and treating transfers explicitly is what we call the inclusive method.

Applying the inclusive method in such a system of accounts, two things are achieved: By summing each account, the net benefits of the various groups of agents transpire as the groups themselves perceive them, and (subject to qualifications described below) by summing over all accounts, the net benefit to society appears. The summary table is reproduced as Table 1 in the main text.

This is the main principle. There are a number of qualifications.

First, the transport model probably ignores some of the real costs of travelling, such as wear and tear on tyres, the consumption of lubricating oil, distance dependent maintenance and repairs and depreciation. In other cases, the unit values in the model do not conform to official guidance. Changes in the unperceived costs must be added to the user benefits, and if model values are out of line with standard or official values, user benefits must be corrected for this. The correct method of doing this was already set out in Neuburger (1970). The same principle and method applies to accident costs and environmental costs, which are entered in the third parties account.

Secondly, a marginal cost of funds is applied to the net result of the government account. If the net result is negative, it must be financed by increased taxes outside the transport sector, and if positive, it admits of reduced taxes outside the transport sector. A tax raise

normally brings about an efficiency loss in the economy by increasing the wedge between prices and marginal costs, and vice versa for tax reductions. Thus the net result on government accounts is weighted by one plus a “tax factor”, which in Norway is officially set to 0.2.

Thirdly, for each of the resources consumed or produced in the project at hand, we must make clear what its social cost is. The principle to apply is the alternative value: The social cost of a resource is what it would have been worth in its best alternative use. Thus if the use of the resource in the project implies that less of it must be used in places where the user would have been willing to pay a price including taxes for it, the social cost is the price including taxes. Conversely, if more of the resource can be had by producing it or importing it at a fixed price, the social cost is the producer price or the price at the border. In the first case, the correct thing to do is not to enter taxes in the government account. This is logical: The tax paid by the agent in our accounts will be equal to the tax lost from some agent outside our accounts. In the second case, the change in tax revenue should be entered in the government account, which means that all in all, the resource is valued net of taxes.

Of the resources in transport analyses, we broadly consider labour and electricity the only exceptions to the rule that resources may be imported at fixed world market prices. Thus in the main, taxes are treated as transfers to government.

Fourthly, if households spend more on transport, they must perforce spend less on other taxed goods and services or work more. Ignoring the last option, when we enter transport tax revenue in the government account, we must make a deduction for the tax revenue lost on other consumption. The formula used for this is

$$R = s - \frac{s_0}{1 + s_0}(s + q) = \frac{s - s_0q}{1 + s_0}$$

where R is tax revenue per unit of the resource, q is the production price, s is the total tax on the use of the resource in money units, and s_0 is the average rate of indirect taxation on non-transport goods and services. R might be called an indirect tax correction factor, but note that unlike the current UK practice (TAG), it only concerns how taxes are entered in the government account.

Finally, it should be noted that with respect to time benefits, it has been decided to use official values of time directly in the calculation of user benefits, instead of model values and the subsequent correction. The reason is that it should not matter to the outcome of the analysis whether the implicit values of time of the model are in line with official values or not.

In Norway, the Ministry of Finance issues official guidelines and guidance on cost benefit analysis. Since our framework is different from the framework that the ministry had in mind, the application of these guidelines to multimodal transport is a matter of interpretation. We believe to have followed the spirit of the guidelines.

Comparing our framework to current UK practice, we do definitely apply the willingness to pay calculus, as in the UK, as opposed to the social cost calculus. The other main distinction made in the UK Transport Appraisal Guidance (TAG), between using a market price unit of account and using a resource cost unit of account, seems inappropriate to us. We definitely use market prices for each of the accounts, but end up valuing most resources at “resource cost” by what we enter in the government account. For a more thorough comparison, see Minken (2005).