


Monetising the social impact of bus travel

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Content

1. Introduction

This note sets out a method for identifying the monetised social impacts of bus travel in scheme appraisal. It can be applied to any transport scheme, policy, or other intervention which affects the number of bus trips being made. It should be read in conjunction with WebTAG guidance on the appraisal of transport schemes.

The monetisation of social impacts is based on research carried out by Mott MacDonald and the University of Leeds (Mott MacDonald 2013). The basic principle is that the social impact of the provision of bus services comes from enabling certain trips to take place that otherwise would not have done. While existing WebTAG guidance captures the economic and environment impact of bus use, it does not explicitly identify monetised values for the social impact.

We equate the social impact with the value that travellers place on the activity that they undertake at the destination of their trip. In terms of the impact of bus services, the benefit only accrues to those who would not make the trip at all in the absence of bus[1]. Bus travellers who would use a different mode in the absence of bus would still participate in the activity and receive the associated benefit. For this latter group the provision of bus services is primarily an economic benefit in that it affects their travel time and/or their out of pocket expenses (public transport fares or car-related costs), and is therefore captured elsewhere in a WebTAG appraisal.

It is important to note that the social benefits quantified in this way are not necessarily additional to any economic benefits calculated using the “rule of a half” method, as set out in WebTAG. The purpose of this note is to be able to separate the social impacts from the purely economic (i.e. generalised cost of travel) impacts, thus providing a better, more detailed, understanding of the effect of the intervention being appraised.

In broad terms, including the monetisation of the social impacts of bus use in appraisal requires the following steps:

1. Estimate the change in the number of bus trips caused by the intervention being appraised.
2. Estimate what proportion of these would not take place if bus was not available.
3. Apply the recommended values per trip to this proportion.

The remainder of this note goes through each of these steps in more detail, including a simple worked example, and explains how the results could be reported as part of a transport business case.

It should be noted that this approach only captures the direct social benefits to the individual concerned. In many cases there will be external benefits to the wider society that are not included in this method.

[1] Which may mean that bus is physically not available, or has a generalised cost of travel (i.e. a combination of fare, access/egress time, waiting time and in-vehicle time) that is so high that it is not used.

2. Step 1: The change in the number of bus trips

For the purposes of this note, we assume that the change in the number of bus trips is determined exogenously. For forecasting of an intervention that has not yet been implemented, this will be obtained from some form of transport demand model. For post-opening evaluation of a scheme it will be calculated from observed data.

This data should be segmented by the following variables:

- Household car ownership (No cars, 1 car, 2 or more cars)
- Trip purpose (Shopping and Leisure, Commuting, Education, Employers Business, Visiting Friends or Relatives, Personal Business or Healthcare)
- Concessionary travel pass ownership (i.e. whether the traveller has such a pass or not)

Where the required level of segmentation is not available from the original model then the proportions set out in Table 2.1 can be used. This lists the proportion of all bus trips made by each possible combination of household car ownership, trip purpose and concessionary travel pass ownership. Separate proportions are provided for a number of area types; figures should be used for the area type that most closely corresponds to the area affected by the intervention being appraised.

As an example, the table shows that 4.4% of all bus trips in London are shopping trips made by people with a concessionary travel pass and no cars in the household.

In some cases the change in the number of bus trips will be available by some, but not all, of the segmentation variables. Table 2.1 can be used to provide the further segmentation required.

For example, suppose a model provides the change in the number of bus trips by car ownership and trip purpose, but not concessionary travel pass ownership. Suppose the intervention applies to the whole of England and leads to 10,000 more shopping trips made by people in non-car owning households.

Table 2.1 says that 8.74% of bus trips are shopping trips made by people in non-car owning households with a concessionary travel pass and 12.46% are shopping trips made by people in non-car owning households without a concessionary travel pass. These percentages can be used to split the 10,000 trips, e.g. the number of shopping trips made by people in non-car owning households with a concessionary travel pass is:

$$10{,}000 \times \frac{8.74}{8.74 + 12.46} = 4{,}123$$

Typically, information on the change in the number of bus trips will only be available for one or two years of the appraisal period. It will then be necessary to interpolate and extrapolate the values to cover the whole appraisal period. This should be done after the initial application of the values for the social impact per bus trip – see Step 3.

Table 2.1: Proportion of trips by car ownership, trip purpose and concessionary travel pass status.

HH car owner ship	Trip purpose	Concessionary pass status	London Boroughs	Metropolitan built up areas	Large and medium urban areas (over 10k population)	Small urban and rural areas (10k and under population)	All areas (excluding London Boroughs)	All areas (including London Boroughs)
0	Shopping	Holder	4.40%	11.44%	11.68%	10.31%	11.45%	8.74%
0	Commuting	Holder	0.55%	0.56%	0.71%	0.43%	0.63%	0.60%
0	EB	Holder	0.11%	0.00%	0.11%	0.00%	0.06%	0.08%
0	Education	Holder	0.06%	0.01%	0.02%	0.03%	0.02%	0.03%
0	Health	Holder	0.51%	1.08%	1.08%	0.92%	1.06%	0.85%
0	PB	Holder	1.27%	2.36%	2.06%	1.15%	2.05%	1.75%
0	VFR	Holder	1.66%	2.86%	2.86%	2.01%	2.77%	2.34%
1	Shopping	Holder	2.66%	3.87%	6.47%	6.94%	5.69%	4.53%
1	Commuting	Holder	0.65%	0.49%	1.00%	0.31%	0.76%	0.72%
1	EB	Holder	0.04%	0.18%	0.02%	0.15%	0.08%	0.06%
1	Education	Holder	0.04%	0.03%	0.00%	0.04%	0.02%	0.03%
1	Health	Holder	0.26%	0.34%	0.63%	0.86%	0.56%	0.45%
1	PB	Holder	0.78%	0.62%	0.76%	1.03%	0.74%	0.76%
1	VFR	Holder	0.73%	0.93%	1.52%	0.74%	1.24%	1.04%
2+	Shopping	Holder	0.63%	0.35%	1.21%	2.54%	1.09%	0.91%
2+	Commuting	Holder	0.07%	0.10%	0.19%	0.11%	0.15%	0.12%
2+	EB	Holder	0.00%	0.00%	0.00%	0.40%	0.05%	0.03%
2+	Education	Holder	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2+	Health	Holder	0.08%	0.00%	0.12%	0.28%	0.10%	0.09%
2+	PB	Holder	0.16%	0.04%	0.12%	0.39%	0.13%	0.14%
2+	VFR	Holder	0.15%	0.03%	0.14%	0.63%	0.16%	0.16%
0	Shopping	Non holder	13.03%	14.25%	12.13%	5.98%	12.10%	12.46%
0	Commuting	Non holder	16.78%	9.37%	5.87%	1.98%	6.54%	10.48%
0	EB	Non holder	2.29%	0.83%	0.57%	0.11%	0.60%	1.25%
0	Education	Non holder	8.12%	5.36%	3.72%	1.31%	3.97%	5.57%
0	Health	Non holder	0.81%	0.63%	0.99%	0.22%	0.79%	0.80%
0	PB	Non holder	5.44%	3.06%	2.79%	0.70%	2.64%	3.72%
0	VFR	Non holder	7.55%	6.32%	5.66%	2.70%	5.53%	6.31%
1	Shopping	Non holder	4.91%	5.68%	6.30%	4.17%	5.86%	5.49%
1	Commuting	Non holder	8.09%	6.45%	6.42%	6.86%	6.48%	7.10%
1	EB	Non holder	1.27%	0.26%	0.59%	0.15%	0.44%	0.76%
1	Education	Non holder	5.37%	6.29%	4.31%	8.53%	5.43%	5.41%
1	Health	Non holder	0.30%	0.32%	0.39%	0.63%	0.39%	0.36%
1	PB	Non holder	1.49%	1.25%	1.10%	0.85%	1.12%	1.26%
1	VFR	Non holder	2.55%	2.38%	2.68%	2.40%	2.56%	2.55%
2+	Shopping	Non holder	1.27%	2.66%	3.46%	6.57%	3.56%	2.68%
2+	Commuting	Non holder	2.40%	2.90%	4.37%	3.98%	3.85%	3.30%
2+	EB	Non holder	0.15%	0.19%	0.20%	0.71%	0.25%	0.21%
2+	Education	Non holder	1.83%	4.33%	5.10%	17.98%	6.33%	4.60%
2+	Health	Non holder	0.05%	0.10%	0.12%	0.33%	0.14%	0.10%
2+	PB	Non holder	0.47%	0.44%	0.64%	1.10%	0.63%	0.57%
2+	VFR	Non holder	1.00%	1.63%	1.87%	3.49%	1.98%	1.60%

Source: National Travel Survey 2009/10

3. Step 2: The proportion of bus trips to which the social value applies

As stated in the introduction, the social value of bus travel only applies to the proportion of trips which would not travel in the absence of bus. This proportion can be predicted using a model summarised in Appendix A and described in detail in Mott MacDonald (2013).

For ease of application, that model has been applied and the results are presented in Table 3.1 below. This shows, for each of the segments presented earlier, the proportion of trips which would not travel in the absence of bus.

A sensitivity test should be carried out in which the proportion of trips that would not travel is set at 21% for all segments. This figure comes from a summary of the evidence on diversion rates set out in Table 9.9 of TRL (2004) and corresponds to the proportion of new bus trips that are "generated", i.e. do not switch from another mode[2].

[2] The numbers in Table 3.1 come from a model derived from 2012 survey data. After combining with the trip proportions in Table 2.1 they imply an overall proportion of between 15.0% and 18.3% bus trips not going in the absence of bus (depending on area type).

Table 3.1: Proportion of trips by car ownership, trip purpose and concessionary travel pass status that would "not go" if bus not available.

HH car owner ship	Trip purpose	Concessionary pass status	Proportion of trips which would not go if bus not available
0	Shopping	Holder	37.31%
0	Commuting	Holder	5.74%
0	EB	Holder	0.00%
0	Education	Holder	17.52%
0	Health	Holder	8.96%
0	PB	Holder	19.75%
0	VFR	Holder	27.95%
1	Shopping	Holder	27.75%
1	Commuting	Holder	3.78%
1	EB	Holder	0.00%
1	Education	Holder	12.06%
1	Health	Holder	5.97%
1	PB	Holder	13.71%
1	VFR	Holder	20.02%
2+	Shopping	Holder	19.37%
2+	Commuting	Holder	2.40%
2+	EB	Holder	0.00%
2+	Education	Holder	7.90%
2+	Health	Holder	3.82%
2+	PB	Holder	9.04%
2+	VFR	Holder	13.54%
0	Shopping	Non holder	30.90%
0	Commuting	Non holder	4.37%
0	EB	Non holder	0.00%
0	Education	Non holder	13.76%
0	Health	Non holder	6.88%
0	PB	Non holder	15.60%
0	VFR	Non holder	22.57%
1	Shopping	Non holder	22.39%
1	Commuting	Non holder	2.87%
1	EB	Non holder	0.00%
1	Education	Non holder	9.34%
1	Health	Non holder	4.55%
1	PB	Non holder	10.66%
1	VFR	Non holder	15.83%
2+	Shopping	Non holder	15.29%
2+	Commuting	Non holder	1.81%
2+	EB	Non holder	0.00%
2+	Education	Non holder	6.05%
2+	Health	Non holder	2.90%
2+	PB	Non holder	6.95%
2+	VFR	Non holder	10.53%

4. Step 3: Applying the recommended values

4.1 Main calculation

From Step 1 we have the change in the number of bus trips for a number of different segments, for one or more years of the appraisal period. From Step 2 we have the proportion of trips in each segment that would not travel if bus were not available. Applying the latter proportions to the former numbers gives us the number of trips in each segment that would not go if bus were not available. The following values should then be applied to these trips:

Table 4.1: Value of the social impact per return bus trip, 2010 values and prices

Concessionary travel pass status	Value of social impact per return bus trip
Holder	£3.84
Non-holder	£8.17

Source: Mott MacDonald (2013)

It is important to note that these are values per return (two-way) trip. In most cases a transport model (or observed trip data) will provide information on single (one-way) trips. In these situations the number of single trips should be halved to provide an estimate of the number of return trips.

4.2 Interpolation and extrapolation

The appropriate appraisal period should be determined in accordance with TAG Unit 3.5.4 Cost Benefit Analysis. Typically, the calculations described above will only have been carried out for a subset of years in the appraisal period. Impacts for the remaining years should be estimated using interpolation and extrapolation, as set out in TAG Unit 3.5.4.

4.3 Growth in values

The numbers in Table 4.1 are in 2010 values and prices. To calculate future year values, still in 2010 prices (i.e. to calculate growth in real terms, over and above inflation), we assume that willingness to pay increases with respect to real GDP per capita with an elasticity of 0.8. This is analogous to the growth in the value of travel time savings for non-working trips, which is also based on a willingness to pay analysis. The growth rates in the "Non-Work VOT Growth" column of Table 3b of TAG Unit 3.5.6 Values of Time and Operating Costs should therefore be applied to Table 4.1 above to obtain future year values.

4.4 Discounting

Benefits and disbenefits in future years should be discounted in accordance with TAG Unit 3.5.4 Cost Benefit Analysis.

5. Worked example

This section sets out a simple worked example.

Suppose we are looking at an intervention in a large urban area that starts in 2015. In year 1 (2015) the number of bus trips increases by 100,000 single trips (compared to no intervention), and in year 15 (2029) by 150,000.

The application of the method in year 1 is illustrated in Table 5.1.

Column A corresponds to Step 1 of the process and is the result of applying the proportions from Table 2.1 (for large urban areas) to the figure of 100,000 extra bus trips.

Column B corresponds to Step 2 and is the result of applying the proportions from Table 3.1 to Column A.

Column C corresponds to the beginning of Step 3 and is the result of applying the appropriate value from Table 4.1 to the trips in Column B. As part of this calculation the numbers in Column B have been halved to provide an estimate of the number of return trips (as opposed to single trips).

The headline results of the calculations show an increase in social benefit equivalent to £56,777 (2010 values and prices) in year one.

Applying the same process to year 15 gives a social benefit of £85,165 (2010 values and prices). To complete step 3 of the process we then need to interpolate and extrapolate these values, apply real growth from 2010, and discount. This is shown in Table 5.2.

Column D linearly interpolates the benefits between 2015 and 2029, and assumes a flat profile after 2029. This is consistent with DfT appraisal software such as TUBA. We have assumed that a 60 year appraisal period is appropriate, but this will vary according to the nature of the intervention (see TAG Unit 3.5.4 for details).

Column E applies real growth in the social value per trip, using the “Non-Work VOT Growth” column of Table 3b of TAG Unit 3.5.6.

Column F calculates a discount factor using the discount rates in TAG Unit 3.5.4[3]

Column G applies the discount factor in Column F to the values in Column E.

The final result is a present value for the social benefits of £2.64M (2010 prices, discounted to 2010). The results in Table 5.1 can be used to provide a more detailed breakdown of the impact on particular groups of bus users.

As noted earlier this figure of £2.64M cannot be considered additional to user benefits calculated using the rule of a half method set out in WebTAG. Section 6 explains how to report the social benefit value in the transport scheme business case.

[3] We have taken the current year as 2012, so the discount rate is 3.5% up to 2042 and 3.0% thereafter.

Table 5.1: Worked example: calculation of social benefit in Year 1

Household car ownership	Trip purpose	Concessionary pass status	Column A Increase in bus trips (p.a.)	Column B Number of these trips which would not go if no bus	Column C Social benefit (2010 values and prices)
0	Shopping	Holder	11,679	4,357	£ 8,366
0	Commuting	Holder	706	40	£ 78
0	EB	Holder	111	0	£ 0
0	Education	Holder	18	3	£ 6
0	Health	Holder	1,076	96	£ 185
0	PB	Holder	2,061	407	£ 782
0	VFR	Holder	2,864	800	£ 1,537
1	Shopping	Holder	6,470	1,795	£ 3,447
1	Commuting	Holder	1,001	38	£ 73
1	EB	Holder	17	0	£ 0
1	Education	Holder	5	1	£ 1
1	Health	Holder	627	37	£ 72
1	PB	Holder	760	104	£ 200
1	VFR	Holder	1,521	305	£ 585
2+	Shopping	Holder	1,213	235	£ 451
2+	Commuting	Holder	193	5	£ 9
2+	EB	Holder	5	0	£ 0
2+	Education	Holder	-	-	£ -
2+	Health	Holder	122	5	£ 9
2+	PB	Holder	120	11	£ 21
2+	VFR	Holder	143	19	£ 37
0	Shopping	Non holder	12,128	3,747	£ 15,307
0	Commuting	Non holder	5,874	257	£ 1,049
0	EB	Non holder	568	0	£ 0
0	Education	Non holder	3,724	513	£ 2,094
0	Health	Non holder	990	68	£ 278
0	PB	Non holder	2,792	436	£ 1,780
0	VFR	Non holder	5,660	1,277	£ 5,218
1	Shopping	Non holder	6,299	1,410	£ 5,762
1	Commuting	Non holder	6,423	184	£ 752
1	EB	Non holder	590	0	£ 0
1	Education	Non holder	4,314	403	£ 1,646
1	Health	Non holder	386	18	£ 72
1	PB	Non holder	1,104	118	£ 481
1	VFR	Non holder	2,685	425	£ 1,736
2+	Shopping	Non holder	3,460	529	£ 2,161
2+	Commuting	Non holder	4,367	79	£ 323
2+	EB	Non holder	196	0	£ 0
2+	Education	Non holder	5,101	309	£ 1,262
2+	Health	Non holder	119	3	£ 14
2+	PB	Non holder	636	44	£ 180
2+	VFR	Non holder	1,871	197	£ 804
Total			**100,000**	**18,276**	**£ 56,777**

Table 5.2: Worked example: interpolation and extrapolation, growth and discounting

Year	Column D Benefit (£, 2010 prices and values)	Column E Benefit (£, 2010 prices, future year values)	Column F Discount factor	Column G Discounted benefit (£, 2010 prices)
2015	56,777	59,346	0.842	49,968
2016	58,804	62,609	0.814	50,932
2017	60,832	65,868	0.786	51,772
2018	62,860	68,949	0.759	52,361
2019	64,888	72,105	0.734	52,906
2020	66,915	75,333	0.709	53,405
2021	68,943	78,764	0.685	53,949
2022	70,971	82,224	0.662	54,415
2023	72,998	85,774	0.639	54,845
2024	75,026	89,488	0.618	55,284
2025	77,054	93,230	0.597	55,648
2026	79,082	97,071	0.577	55,981
2027	81,109	101,014	0.557	56,285
2028	83,137	105,071	0.538	56,566
2029	85,165	109,238	0.520	56,821
2030	85,165	110,876	0.503	55,723
2031	85,165	112,562	0.486	54,657
2032	85,165	114,284	0.469	53,616
2033	85,165	116,135	0.453	52,642
2034	85,165	118,133	0.438	51,737
2035	85,165	120,165	0.423	50,847
2036	85,165	122,232	0.409	49,973
2037	85,165	124,261	0.395	49,084
2038	85,165	126,323	0.382	48,212
2039	85,165	128,420	0.369	47,355
2040	85,165	130,655	0.356	46,550
2041	85,165	132,928	0.344	45,758
2042	85,165	135,268	0.333	44,989
2043	85,165	137,757	0.323	44,482
2044	85,165	140,291	0.313	43,981
2045	85,165	142,761	0.304	43,452
2046	85,165	145,273	0.296	42,928
2047	85,165	147,757	0.287	42,391
2048	85,165	150,284	0.279	41,860
2049	85,165	152,854	0.270	41,336
2050	85,165	155,468	0.263	40,818
2051	85,165	158,002	0.255	40,275
2052	85,165	160,609	0.247	39,747
2053	85,165	163,259	0.240	39,226
2054	85,165	165,953	0.233	38,712
2055	85,165	168,691	0.226	38,205
2056	85,165	171,474	0.220	37,704

Year	Column D Benefit (£, 2010 prices and values)	Column E Benefit (£, 2010 prices, future year values)	Column F Discount factor	Column G Discounted benefit (£, 2010 prices)
2057	85,165	174,321	0.213	37,213
2058	85,165	177,214	0.207	36,729
2059	85,165	180,174	0.201	36,255
2060	85,165	183,183	0.195	35,787
2061	85,165	186,352	0.190	35,346
2062	85,165	189,576	0.184	34,910
2063	85,165	192,855	0.179	34,479
2064	85,165	196,192	0.174	34,054
2065	85,165	199,586	0.169	33,634
2066	85,165	203,039	0.164	33,220
2067	85,165	206,551	0.159	32,810
2068	85,165	210,125	0.154	32,405
2069	85,165	213,760	0.150	32,006
2070	85,165	217,458	0.145	31,611
2071	85,165	221,220	0.141	31,221
2072	85,165	225,047	0.137	30,837
2073	85,165	228,940	0.133	30,456
2074	85,165	232,901	0.129	30,081
Total				**2,640,452**

6. Reporting the value for the social benefit

As discussed earlier, the value for the social benefit calculated using the above method cannot be considered additional to the user benefits that are estimated using the rule of a half, as set out in WebTAG.

However, the social benefit value provides more detail on the breakdown of benefits that can be used to inform the development of the transport business case.

DfT's current guidance on the transport business case identifies five separate cases: strategic, economic, commercial, financial and management[4]. The value for the social benefit can be used to inform the strategic and economic cases.

Strategic Case

Detailed guidance on the strategic case can be found on the DfT website[5]. Amongst other things, it sets out the objectives of the transport scheme and the problems that it is trying to solve. All scheme options need to be assessed against these objectives.

The inclusion of social benefits (calculated using the above method) in the strategic case can be used to inform that assessment. It will be particularly relevant where the scheme objectives are related to improving accessibility and reducing social exclusion.

Economic Case

The economic case is where the detailed WebTAG scheme appraisal is reported. It includes the full range of impacts set out in the Appraisal Summary Table (AST)[6] under the headings of Economy, Environmental and Social.

Typically, bus-related transport schemes affect fares and/or the generalised journey time (comprising access and egress times, waiting and transfer times and in-vehicle time). The associated user benefits will be reported in the "Economy>Business Users and Transport Providers" and "Social>Commuting and Other Users" rows of the AST, depending on the purpose of the trips.

Consider a person who, as a result of the transport scheme, makes a bus trip, but would not make the trip at all without the scheme (i.e. they would stay at home and not use an alternative mode). The impact of the scheme on that individual has two components:

(A) They get the social benefit of the activity they are now able to undertake at their trip destination.

(B) They incur a cost because of the travel time required to make the trips and the cost of the fare (if applicable).

For that individual the benefit (A) must outweigh the costs (B) otherwise they would not travel. We refer to the net impact as (C), where:

[4] https://www.gov.uk/government/publications/transport-business-case

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4468/strategic-case-guidance.pdf

[6] http://www.dft.gov.uk/webtag/documents/project-manager/xls/U2_7_2-appraisal-summary-table110418.xls

(C) = (A) + (B)

Calculation of user benefits using the rule of a half, as set out in WebTAG, gives us the net impact (C). Application of the new values for the social benefit, as described in Chapters 2 to 5, gives us the value of (A).

(B) can then be inferred by simply subtracting (A) from (C):

(B) = (C) – (A)

Note that, as in the example above, (B) may represent a cost (or negative benefit), even if the overall impact is positive.

Having calculated (A), (B) and (C), there is the question of how best to report these results in the AST. In this note we offer two alternatives. Neither should be construed as formal guidance, but are offered for discussion. Both options result in the same Net Present Value (NPV) as the current guidance, but offer alternative ways of breaking down the net benefits to provide more information to decision makers.

For business users we can assume that the social impacts are negligible and no change is required to the way benefits are reported (i.e. the net impact (C) for business users continues to be reported in the "Economy>Business Users and Transport Providers" row, as per current guidance).

Option 1

The results of the above calculations for non-business users could be included in the AST as follows:

- Net impacts (C) from the rule of a half to be reported in the "Social>Commuting and Other Users" row, as per the current guidance.
- The value of the social impact (A) to be reported in the "Summary of key impacts" column in the "Social> Access to services" row. (To avoid double counting it should not be included in the Monetary column.)

This represents a relatively minor change from the existing reporting, with additional information in the "Summary of key impacts column."

Option 2

Rather than reporting the net impact (C) in the Monetary column of the "Social>Commuting and Other Users" row, the two components (A) and (B) could be reported separately for non-business users:

- The value of the social impact (A) to be included in the Monetary column of the "Social> Access to services" row.
- The value of the travel cost impact (B) to be included in the Monetary column of the "Social>Commuting and Other Users" row.

This is a more significant change from existing guidance. As noted above, even with schemes with a positive net impact, the travel cost impact (B) may well be negative. This may present problems with interpretation of the results for the non-expert.

7. References

Department for Transport (2012). TAG Unit 3.5.4 Cost Benefit Analysis.
http://www.dft.gov.uk/webtag/documents/expert/unit3.5.4.php

Department for Transport (2012). TAG Unit 3.5.6 Values of Time and Operating Costs.
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Mott MacDonald (2013). Valuing the social impacts of public transport: Final report. January 2013. Document reference: 302148/ITD/ITN/07A

TRL et al (2004). The demand for public transport: a practical guide. TRL Report 593
http://www.demandforpublictransport.co.uk/ [Accessed 2 October 2012]

Appendices

Appendix A. Model for predicting "not go" in the absence of bus

Section 3 of this note sets out the proportion of bus trips in each segment which would not travel at all if an acceptable bus service were not available. For shorthand we refer to these as the "not go" proportions. These proportions were obtained from applying a model. The detailed derivation of the model is described in Mott MacDonald (2013). This appendix provides a brief summary.

The model is a logit model which predicts the probability that "not go" is the best alternative in the absence of bus (as opposed to, for example, choosing to travel by a different mode).

Algebraically the form of the model is:

$$\textit{Proportion which would not travel} = \frac{\exp\left(U^{notgo}\right)}{\exp\left(U^{notgo}\right)+\exp\left(ASC2\right)}$$

ASC2 is a constant associated with travel by bus and is equal to 0.805.

U^{notgo} is the sum of constants relating to the particular trip segment. These are set out in the following table:

Segmentation variable	Constant
Household car ownership: 0 car	0
Household car ownership: 1 car	-0.438
Household car ownership: 2 or more cars	-0.907
Trip purpose: Shopping	0
Trip purpose: Commuting	-2.28
Trip purpose: EB	-13.2
Trip purpose: Education	-1.03
Trip purpose: Health	-1.80
Trip purpose: Pers Business	-0.883
Trip purpose: VFR	-0.428
Concessionary travel pass status: holder	0.286
Concessionary travel pass status: non-holder	0

The interpretation of these numbers is that the lower/more negative numbers indicate that a particular segment is less likely to have "not go" as the best alternative. For instance, people in a household with 1 car are less likely to have "not go" as the best alternative than people in a household with no car.

Only one value should be used from each of the three segmentation categories (car ownership, trip purpose, concessionary travel pass status)[7]. For example, for a personal business trip made by a non-

[7] It is a requirement of the model form that the constant for one segment within each category is set to zero; this is not a mis-print in the table.

concessionary travel pass holder who lives in a household with one car the sum of the segmentation constants would be:

U^{notgo} = -0.438-0.883+0 = -1.321

and therefore

$$\textit{Proportion which would not travel} = \frac{\exp(-1.321)}{\exp(-1.321)+\exp(0.805)} = 10.7\%$$