VALUE FOR MONEY IN A CHANGING ECONOMY

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Abstract

Nine areas of spending are compared for value for money, using an innovative method allowing for declining marginal benefits as expenditure increases. The comparison includes allowance for radically new expectations of traffic growth, changes in the treatment of taxation, and the increasing importance of benefits other than classical time savings. Quantitative results suggest that local safety measures, smarter choices and cycling schemes offer the best value for money, then some local bus improvements and new light rail schemes. Highways Agency and Local Roads schemes perform very poorly after updating their results for the new circumstances. A greater total transport benefit can be produced even in the context of substantial public expenditure cuts, though that may require changes to the rules for distinguishing capital and revenue spending.. This version of the written paper reports the method and results, and will be updated at the conference with a discussion of the changing political context within which such research can be accommodated or rejected, because of the challenge and support it gives to different vested interests, and its salience for public and political attitudes and expectations.

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Introduction

The last report of the Commission for Integrated Transport (2010), whose delayed publication was almost immediately followed by the announcement of its abolition, concluded that

> 'Even with reduced spending limits, a good deal more net benefit could be generated by re-balancing the residual spend away from road capacity, to be focused instead on lower cost, high return schemes. These include road safety, and travel behaviour change through "smarter choices" measures, like school and workplace travel plans, car clubs, cycling, teleworking and internet shopping'.

The work was informed by a series of 'think-pieces' commissioned from academics and specialists, included with CfIT (2010), by James Laird, Greg Marsden, Peter Mackie, Lucy Budd, Abigail Bristow, Alan McKinnon, Sue Flack, and the author, whose initial paper for CfIT was followed by subsequent successively amended and extended versions (Goodwin 2010a, b, c). which give more details of the results below. My part of the work built on the Eddington (2006) study, and has been noted by a variety of organisations, including the House of Commons Transport Committee, and a response from the DfT is awaited.

The Eddington Report: reminding ourselves what the analysis really showed

The Eddington Report Eddington (2006) focussed on reducing congestion in urban areas, key inter-urban corridors, and key international gateways. It is remembered as having advocated infrastructure improvements for those areas, but in fact its conclusions were more nuanced, as is shown in its important Volume 3, HM Treasury (2006), and a technical annex with modelling results, Department for Transport (2006).

The Benefit-Cost Ratio (BCR) of a project is an estimate of its value made by comparing its real resource costs with a wide range of economically-valued benefits including effects on some or all of congestion, accidents, carbon, health, local environment, travel time, consumer satisfaction and wider effects on the economy which might be generated by these benefits. It is not a perfect measure, not coping well with strategic interactions of policies and projects or considerations of fairness and political acceptability, and in practice very many

assumptions are built in which can have the effect of giving answers which are biased for or against certain types of projects.

Having made this caveat, a good summary of the key results of the Eddington Report, expressed in terms of Benefit-Cost Ratios (BCRs), is provided by Dodgson (2009) as shown in Table 2.

Table 2 Dodgson's (2009) Summary of Eddington Results

Sector	No. of projects	Ave BCR
Highways Agency Schemes	93	4.66
Local Road Schemes	48	4.23
Local Public Transport Schemes	25	1.71
Rail Schemes	11	2.83
Light Rail Schemes	5	2.14
Walking and Cycling	2	13.55
Total	**184**	

At face value the results seemed to suggest that walking and cycling schemes gave the best value for money, then highway schemes, then public transport schemes. Policies such as smarter choices were not included as there was insufficient data available (or at least, known to the Eddington team) at that time.

These showed that expanding infrastructure investment, but without road pricing, would not in fact lead to an improvement in congestion, but steadily worsening travel conditions. This is seen in Table 1, (table 5.1 in the modelling annex).

Table 1: DfT Modelling Results Showing Congestion Getting Worse, in the absence of road pricing, even with a very large road building programme

Table 5.1: Road build in Intervention Scenarios

England, Road Lane Km	2015	2025		
Scenario	'Baseline' Scenario	'Baseline' Scenario	Economically Justified, No Road Pricing	Economically Justified, With Road Pricing
HA Road Lane kms - additional to 2003	1,590	3,500	4,850	2,300
HA Road Lane kms - change from 2015 Baseline		1,900	3,250	700
HA Road Lane kms - change from 2025 Baseline	-	-	1,350	-1,200
Traffic (Change from 2003)	22%	31%	32%	22%
Average Delay per vehicle km (Change from 2003)	25%	30%	28%	-37%

In the last row there is the preferred measure of the severity of congestion. It is seen that with road pricing (and with the substantially reduced road programme that would then be implied) the forecast is of a significant net *improvement* in the level of congestion, measured as a 37% fall in the average delay: most of this effect is due to the pricing itself. However, in the without road pricing case, even with the very much larger road construction programme

that would then, under the assumptions, be warranted, congestion actually gets worse, giving an increase of 28% in average delay.

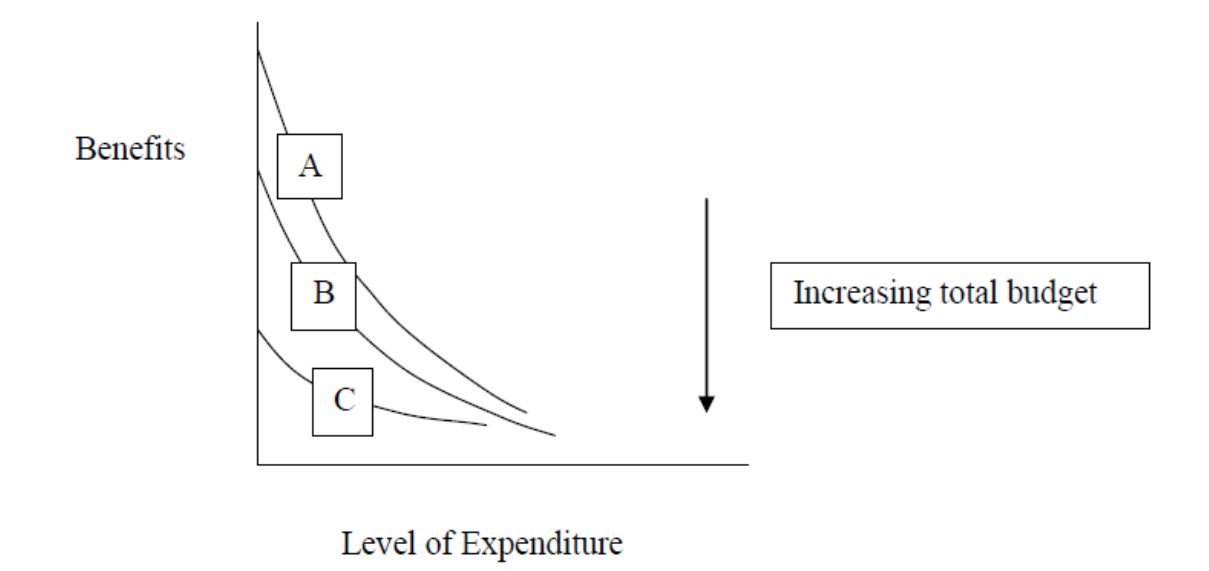
This reinforces a widely observed phenomenon, namely that most or all road proposals, appraised assuming no road pricing, provide their benefits in the form of 'slowing down the pace at which congestion gets worse', as measured not against an observable starting point, or any actual experience of road user, but against a 60 year forecast sometimes called the 'do-nothing' option. Thus the appraisal will interpret this difference between the two forecasts as a benefit, but the road user will *experience* a progressive worsening of travel conditions. It is not sensible to expect that this will lead to wider economic benefits, except in a peculiarly negative sense.

Revising and updating the Eddington analysis

The approach I use is similar in underpinning to Eddington's, but with a somewhat different presentation. It is based on the idea that for each area of expenditure (road building, public transport improvements, smarter choices, etc) the benefits of properly judged spending increase as spending increases, but usually at a declining rate, so that that the best projects at the top of the list will have a bigger benefit and higher value for money than the marginal projects at the bottom of the list. This can be depicted as in figure 5, for the expenditure classes A, B, C etc.

It follows generally that the more is spent on a particular area, the lower the benefits. Although there is no presumption that decisions already made in the past will have been optimised, in general it is likely that the more mature the field of application, the more of the very best projects will already have been identified and carried out, so a mature class of expenditure may well have lower BCRs than it used to have, and lower also than new emerging fields. This does not mean that the new is always better than the old, but does mean that it is more likely to have unexplored potential.

Figure 5. Incremental benefits from successive increases in spending



The most important departures from the Eddington assumptions that I would now suggest relate to (a) new interpretations of changing trends that were already happening, especially in relation to trends in traffic growth; (b) new appraisal rules adopted by the DfT especially in relation to indirect tax; and (c) the need for closer attention to those expenditures which appeared to score well, but for which the report had little data. All of these have a substantial effect on the Eddington conclusions.

(a) **Traffic growth**.

The Eddington work followed the then DfT official assumptions about long term traffic growth which in some respects now seem implausible. This especially relates to a flattening (and some signs of reduction) in car use *preceding* the recession, perhaps going back as far as the early 1990s when there was an important shift, not noticed at the time, in the relationship between traffic growth and economic growth. Sometimes called 'decoupling', this meant that increasing incomes were associated with a declining, less than proportional growth in traffic, rather than the increasing, more than proportional relationship which had applied previously.

The consequence of the then Eddington assumptions (which are thought still to be the view of DfT officials) was that the long term trend in congestion was inexorably expected to be getting worse, even if an unaffordably large and politically untenable road construction programme were initiated. Only road pricing would bring about an actual improvement, but this itself was also deemed politically unacceptable. If these trends are softer, or go into reverse, then it is possible to make improvements in transport efficiency with less drastic and divisive policies, which in turn gives a more optimistic prospect. The research is not yet definitive, but recent discussions among researchers show this interpretation must be taken seriously, not dismissed out of hand.

All the infrastructure schemes appraised in the last two decades have been on the basis of assumptions about future traffic using, or based on, Department for Transport forecasts. These have typically been based on high and continuing rates of growth of car use, which increases expected future congestion and hence raises the estimated benefits of expanding road infrastructure, as well as putting downward pressure on the demand for non-car transport. However, since 1989 the actual growth in traffic has been very much less than forecast, and currently is actually reducing. (The latest year of data will reflect recessionary pressures, but the change in trend clearly started well before that). Figure 1 shows the long term trend in car traffic compared with the former and current DfT forecasts, and Figure 2 shows more detail on the recent period of car trips and distance travelled.

Nobody has yet fully explained this shift in trend, but it is obvious that the shift has predated the current recession by a considerable period. One very important indicator is 'transport intensity', which measures the association between traffic growth and economic growth. Generally speaking they tend to rise and fall together, to some extent (which does not of itself prove a cause-and-effect relationship) but it is notable that this relationship has changed substantially over the last twenty years, as shown in figure 3 (1.2b in the original).

Figure 1. Trend in car traffic since 1950, and DfT 1989 and 2007 forecasts

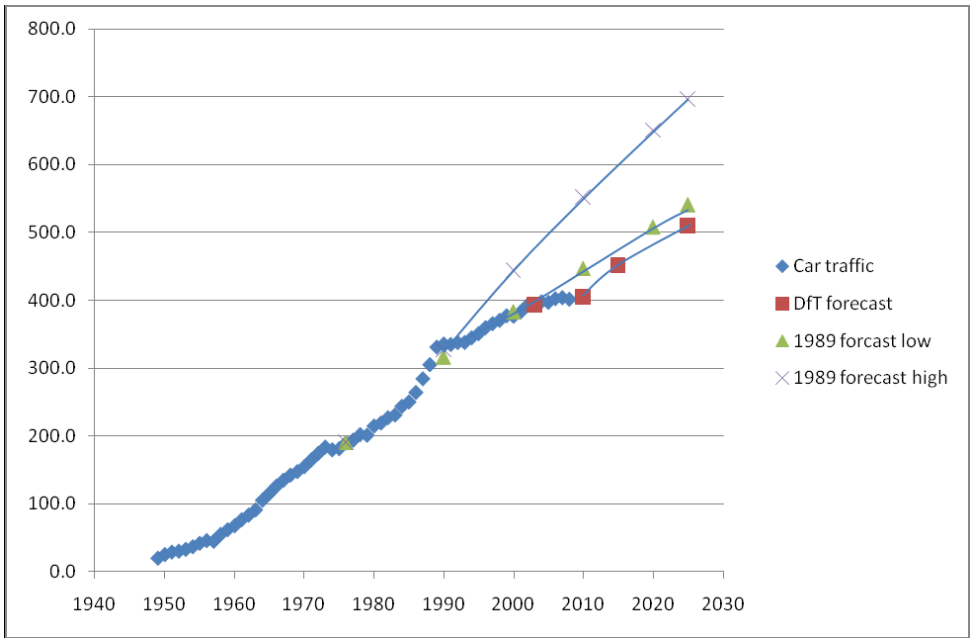
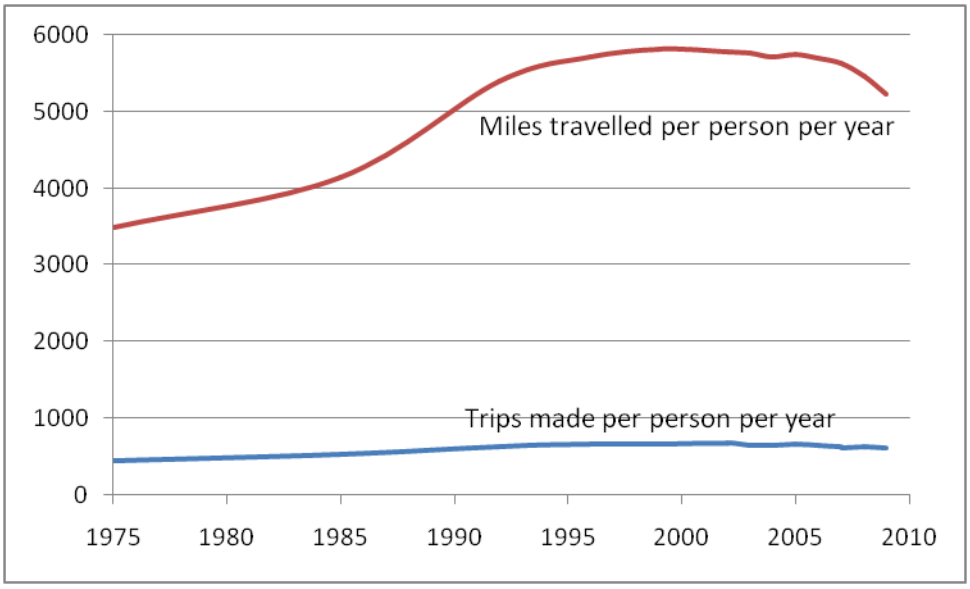
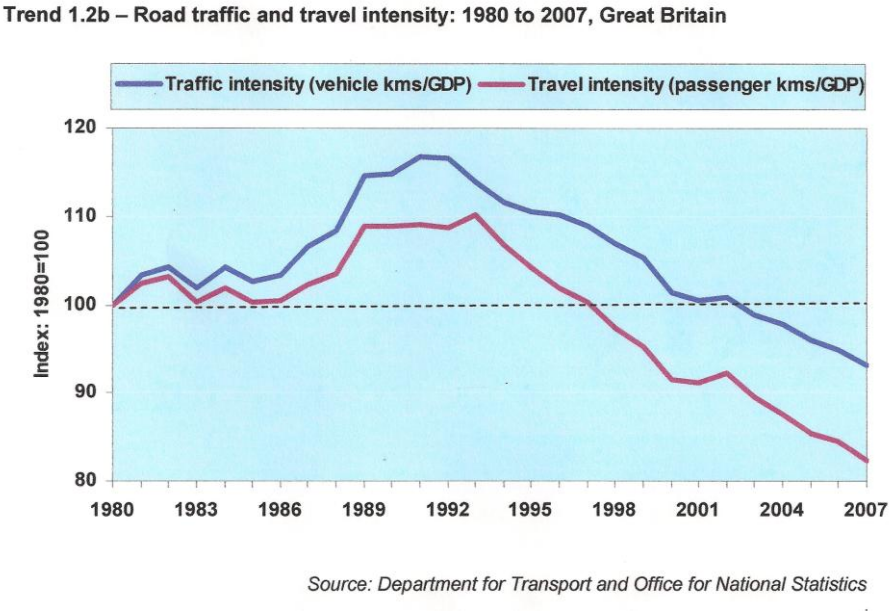


Figure 2. Car Trips and Car Distance Travelled, per person, 1975-2009



Source: Chained from DfT National Travel Surveys, 2010, 2004 and 2001

Figure 3: 'Decoupling': A shift in the relationship between traffic and economic growth



Thus until the early 1990s, economic growth was associated with high and increasing traffic growth. Since then, it has been associated with lower and decreasing traffic growth. This is indeed what policy would have intended, giving very favourable possibilities of economic growth without excessive congestion or environmental damage, and declared policies of both Conservative and Labour administrations have sought to achieve this. Indeed it is interesting that the time of a policy shift in relation to road building, environmental impacts, and traffic growth occurred in the period 1990-1994 (notably associated with Gummer, Portillo and Mawhinney) with a consistent development in 1997-8 (notably associated with Prescott), though it is not usually thought that their policies could have been powerful enough to result in such a marked shift on their own. However, whatever the reason, I would argue that the scale of car traffic growth implied by the earlier DfT forecasts, and used by

Eddington, is no longer plausible. Given that assumed continuation of the earlier trends underpins all the road BCR calculations, it is necessary to reconsider this substantially. Whether the future is of continuing falls in car use, or a return to some stable or slightly increasing level, there is no evidence for such large growth as previously. The effect will unambiguously be to reduce the estimated value for money of road schemes compared with the Eddington calculations.

The problem is how big to make the adjustment, since this would require redoing all the modelling and forecasting with new assumptions. However, some indication may be given from a different, but related, issue, which in fact had been recalculated for the Eddington appendices. This concerns what would happen if there were road pricing at some point in the future during the 60 year appraisal period of road schemes. (In this case we are using the road pricing results not as part of an argument about road pricing itself, but as the best available evidence about what effect a more favourable pattern of traffic would have on the value for money of infrastructure spending).

This is seen in model results from the Department for Transport annex to the Eddington Report, which I have reformatted for comparability, as shown in table 3. The results show that the incremental benefit of extra road construction declines the more one builds, both with and without road pricing. The reduced overall traffic level, and its relocation in less congested conditions, resulting from road pricing substantially reduces the estimated benefits obtainable from road building: the modelling suggested there would be an economic case for building 3250 lane kilometres by 2025 if road pricing is *not* implemented, but only 700 lane kilometres if it is, a reduction in the warranted road programme of nearly 80%. Comparing like with like, road pricing reduces the BCR of road spending substantially, eg by 70% in the roughly overlapping category 1450-2250 lane kilometres in the table (from a good BCR of 3 to an unacceptable BCR of 0.9, a reduction of two thirds. The reason for this is mainly that the problems of congestion which the road building had been intended to solve, would be largely already solved by more rational pricing, so that the extra benefit of building the roads is small compared with their cost.

Table 3 Marginal Benefit-Cost Ratios for Road Building With and Without Road Pricing, according to the DfT's National Transport Model

Additional Lane Kilometres	Marginal BCR without road pricing	Additional Road Kilometres	Marginal BCR with road pricing
		350-550	1.5
		550-700	1.5
		700-850	1.1
		850-1150	1.0
		1150-1500	1.1
1450-2250	3.0	1500-2450	0.9
2250-2750	2.3	2450-3700	0.7
2750-3250	1.2		
3250-3350	0.7		
3350-4450	1.0	3700-4600	0.7
4450-5200	-0.1		
5200-6150	0.2		

Thus one of the indirect financial consequences of road pricing would be the saving of funds on unnecessary road building. (Since it also generates net revenue itself, there is a double

whammy effect on public finances, a feature which may lead to a re-growth in policy interest by Government in the future. Indeed it may be a triple whammy, since it would also be expected to reduce the need for at least some public transport revenue support, because of the more buoyant market conditions that would apply, and possibly increase the proportion of public transport infrastructure spending that would be profitably funded internally). For the time being however I assume that all the policy assessments are made on the assumption of **not** implementing road pricing, which is why the economic impacts can in some cases be perverse and unintended.

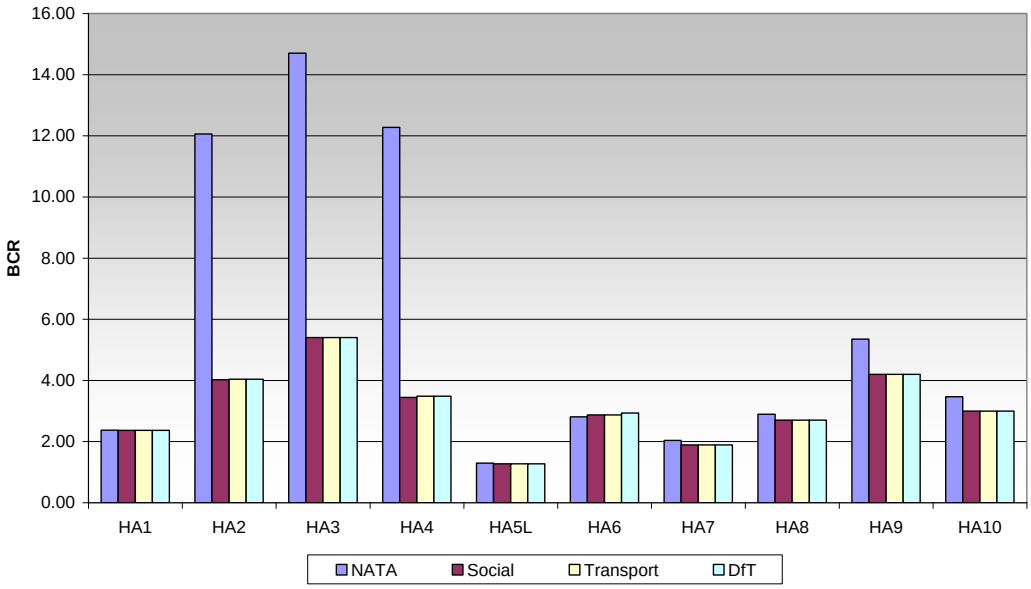
The mechanisms by which road pricing brings about a reduction in congestion are not the same as those by which a reduction in traffic growth for other reasons brings about a reduction in congestion, but the orders of magnitude of effect seem prima facie comparable. At the moment I assume that the scale of impact on benefits which would be available from road pricing is broadly similar to the scale that would be caused by other transport policies (eg a combination of smarter choices, public transport improvements, etc, though these would certainly be a more expensive way of achieving them), and that the scale of effects that would be brought about by spontaneous other changes in trend are capped at the same level, though in principle of course they could be greater. Thus the reduction in BCR on road schemes due to road pricing is used provisionally as a measure of the effect of other sources of reduced traffic growth.

(b) Indirect Tax

In the period 2003 to 2009 the DfT used a rather non-standard method of social cost benefit analysis, such that the indirect tax consequences of a project were included as benefits or costs. For example, if a road scheme induced traffic which generated more fuel tax revenue, the extra revenue was treated as a reduction of the cost of the scheme. This approach became increasingly criticised as it appeared to be biased towards roads schemes and against public transport and especially against those where traffic reduction was actually intended as a policy objective. It appeared to build in an incentive to public stakeholders to adopt policies which were in direct conflict with objectives of efficiency and environmental protection. In 2009 DfT decided (rightly, in my view) that this approach was not going to be continued, and from 2010 new schemes are being assessed using a different approach, in which tax effects – though clearly of course important in themselves – are not confused with the ratio of benefits to costs of the scheme itself.

The DfT retrospectively reworked 10 Highways Agency schemes, published in the form of a PowerPoint presentation by O'Sullivan and Smith (2009) as shown in Figure 4.

A chart illustrating the BCRs for a selection of road schemes



The now abandoned approach is violet in the figures, labelled 'NATA'. In 8 of the 10 cases the BCR given under the former NATA approach is higher than any other criterion, and in three of these cases the difference is very substantial indeed, a BCR of the order of 12-15 in cases where the three other methods all give BCRs of the order of 3-5. This result is reinforced by work by Buchan (2009), who carried out an analysis of a small number of specific schemes, including some whose BCR will be better under the new approach. His results are shown in Table 4, (numbered 1 in the original).

Table 1: Summary of comparative results under different NATA assumptions

	Benefit Cost Ratio (BCR) under original appraisal model	BCR under revised appraisal model	BCR under appraisal model with further reforms
Tram Merseytram	1.97	2.07	2.85*
Cycle Grand Union Canal Cycle Path	38.4	75.0	75.0
Road Improving the A14 between Ellington and Fen Ditton	10.83	6.69	1.3 – 3.25**
Bus Guided busway Cambridge to St Ives	4.8	6.4	7.9**
Rail Freight Expansion of rail freight (Felixstowe – Nuneaton)	5.25	10.4	10.4***

* Based on moving to a 60 year appraisal. The Merseytram case study provides several examples of how small changes in the treatment of tax revenues has a strong impact on the benefits (see the main report, *Investing In Transport: Making the Change*)

** Based on limited data

*** The carbon benefit of the rail freight scheme was already factored into the original analysis hence there is no change

The direction and order of magnitude of change for road schemes is broadly consistent with the DfT schemes reported above. In some other cases the change is in the opposite direction, notably the busway, rail freight scheme, to a lesser extent Merseytram, and very substantially for the Cycle scheme where an already very large BCR (calculated by the DfT) is made substantially greater. This is entirely in accordance with what one would expect. The biggest class of schemes affected are those whose indirect effect is to increase tax revenue, primarily by inducing more traffic. These are mainly the bigger road schemes. The new rules will reduce their BCRs, compared with the 2003-2009 rules which produced the data used by Eddington.

Other schemes which would be affected in the opposite direction are those whose indirect effect is to reduce tax revenue, primarily by reducing traffic, but potentially also by increasing fuel efficiency. This would include smarter choices, cycling and public transport improvements. The new rules would *increase* their BCRs compared with the 2003-2009 rules.

An adjustment to take account of tax changes can be made unambiguously in the case of most road schemes, since nearly all the available BCR results in recent years will have been made according to the now abandoned method. By inspection of the DfT and Buchan results, a cautious adjustment would be to reduce the BCRs of the apparently best-performing schemes by half, the next best by 20% and the next tranche by 5%. However, without inspecting the detailed studies individually it is not clear how much to increase the results for the opposite effect, since some of them ignored the DfT recommended procedure during this period (eg smarter choices), and others require a more detailed study to assess on a case by case basis (especially public transport improvements). Therefore the results are not formally amended, though this is likely to result in some degree of underestimate of the benefits of the latter, especially where the studies were done by DfT, or according to its recommendations.

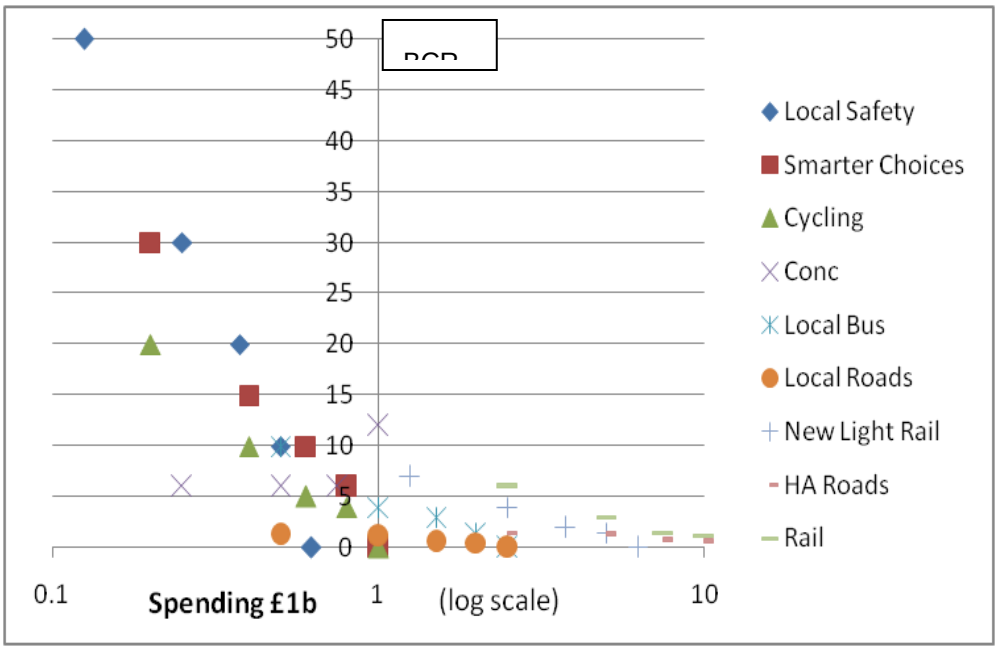
Table 5 and Figure 6 show the results: detailes of assumptions and calculations are given in Goodwin (2010a, b)

Table 5: BCRs by Quartile of Expenditure in Nine Areas of Spending

Exp £b	Local Safety	Smarter Choices	Cycling	Conc Bus Fares	Local Bus	Local Roads	New Light Rail	HA Roads	Rail
0.125	50								
0.2		30	20						
0.25	30			6					
0.375	20								
0.4		15	10						
0.5	10			6	10	1.3			
0.6		10	5						
0.625	0								
0.75				6					
0.8		6	4						
1		0	0	12	4	1.1			
1.25							7		
1.5					3	0.6			
2					1.5	0.5			
2.5					0	0	4	1.5	6
3.75							2		
5							1.5	1.25	3
6.25							0		
7.5								0.7	1.5
10								0.6	1.2
12.5								0	0

(Results after adjustment for traffic growth, indirect tax, and omitted elements)

Figure 6 Value for Money Related to Expenditure



A strong pattern is now emerging of which types of transport expenditure have the greatest value for money in terms of speeds, travel times, safety, and other economic costs such as health. In summary, by far the best returns come from smarter choices, local safety schemes, cycling schemes, and the best of local bus and some rail quality and reliability

enhancements, together with new light rail systems in some places. Traditional road capacity schemes are now giving much lower estimated value for money than cited in Eddington, due (a) to a change (for the better) in the way that taxation is accounted for in the studies, and (b) the effects of lower traffic growth, whether due to road pricing, other policies, or to changing trends.

Therefore the best overall value for money will be gained from *increasing* the expenditure on the first group of best performing projects, *protecting* the best projects in a second group of medium performance projects, and *making savings* mostly from the worst projects in this group, and all except the very best in a third group which would only crowd out better expenditures.

Although carbon considerations have played only a very small part in the calculations, the resulting pattern of recommended expenditures is very supportive of carbon objectives.

Road pricing is not itself included in the analysis: since it produces both revenue and net social benefit, it will inevitably count better as 'value for money' than any of the spending policies included. However, it is allowed for in testing the robustness of other policies: road pricing would (like reduced traffic growth for other reasons) reduce the value for money of road building. It could also increase the ability for public transport to fund its own improvements.

Concessionary fares spending similarly is not quite comparable, but it does seem to produce a good level of social and economic benefits.

Road maintenance, pedestrianisation of town centres, traffic calming (other than safety schemes) and traffic management are not yet included in the analysis. I believe it would be very worthwhile to do so.

The results are provisional, to test the feasibility of the method, availability of data, and robustness of the conclusions. Qualitatively they seem in line with common sense and strategic priorities, but the exact numbers would be influenced by detailed data which could be published by the DfT, and further more substantial analysis and remodelling.

How should the balance between capital and revenue be altered?

The main problem is an artificially strict imposition of the distinction between capital and revenue spending especially in the case where well-judged revenue spending (such as on smarter choices) actually makes it possible to make larger savings in capital. In these cases, it is sometimes necessary to forego thesaving, making less efficient use of funds, because of the implicitly 'higher' importance of capital. The problem would be solved by suitably ingenious redefinition, giving local authorities some flexibility, which they would like and which would give better value for money.

Many of the best expenditures traditionally are classed as 'revenue' expenditure rather than 'capital'. To get maximum benefit it is essential to have some form of interchangeability or trade-off such that (for example) revenue spending which saves a greater amount of capital spending can be counted under the rules for capital expenditure. Otherwise there is a serious danger that the best value projects will be wiped out while inferior spending is protected.

What Effect has this approach had on the public debate and DfT priorities?

A recent brief review article by Silke (2010) identifies a number of agencies who have come to similar conclusions, partly in response to this study, and partly as a result of their own independent work. This includes the PTE's Technical Advisers Group (TAG), the Campaign for Better Transport, and in part the senior local government officers' body ADEPT, although they also favour some highway schemes, as does the RAC Foundation. CfIT's support has been noted, and responses from the House of Commons Transport Committee and the DfT itself are expected shortly. Separately, a recent report by the industry lobby group London First (2010) suggested that the wider economic benefit was the highest proportion of total

benefit for urban public transport schemes, with interurban road schemes having a very much smaller effect.

(This section of the paper will be expanded at the Conference by which time it may be clearer whether there is any reflection of the results shown in Government spending plans. At the time of writing the answer seems to be a little, but less than the author would have favoured).

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