



# Evaluating the long term impacts of transport policy: The case of bus deregulation revisited



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## ABSTRACT

In a previous paper in this journal, we suggested that the bus reforms that were implemented in Britain from the mid-1980s onwards were welfare positive for both London and for the rest of Great Britain outside London (Preston & Almutairi, 2013). However, we cautioned that this work was preliminary and likely to be sensitive to various assumptions made. In this paper, we have undertaken more detailed sensitivity analysis as follows. First, we have developed separate demand models for London and for the rest of Great Britain. Secondly, we have developed cost models to determine the extent to which costs are determined by external factors (such as fuel prices) or partially external factors (such as labour costs). Thirdly, we have developed fares models to assess the impact of changes in subsidy, in terms of both revenue support and concessionary fare reimbursements. We have also changed the measurements of consumer surplus so as to be more consistent with underlying economic theory. This work confirms the sensitivity of the long term evaluation of transport policy to assumptions concerning the counterfactual and trends in demand, supply and prices. Any policy lessons inferred from these long term evaluations need to take these sensitivities into account.

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## 1. Introduction and outline

The bus reforms that took place in Great Britain in the 1980s can be viewed as one of the greatest experiments in industrial re-organisation in the transport sector (see, for example, Mackie & Preston, 1996). As a result of the 1985 Transport Act, bus services outside London were deregulated and largely supplied commercially, whilst the industry was commercialised and subsequently privatised. Additional socially necessary services were provided by competitive tender (Banister, 1985). As a result of the 1984 London Regional Transport Act, control of bus services in London was transferred from local to central Government (this was subsequently reversed in 2000) and the services were gradually subjected to comprehensive competitive tendering (completed in 1994), whilst the industry was also privatised (Kennedy, 1995). These reforms attracted a lot of initial interest and there was a

flurry of initial studies that undertook welfare analyses of various forms and with varying results (e.g., Kennedy, 1995; Mackie, Preston, & Nash, 1995; Romilly, 2001; White, 1990) but there have been few studies in recent years. This is surprising as a feature of the bus reforms in Britain has been their longevity, with their main features broadly intact.

In order to fill this gap, in a previous paper in this journal, we presented a long run evaluation of the impact of bus reforms in Britain (Preston & Almutairi, 2013). However, we noted that such long run evaluations are plagued by difficulties and we address these by drawing on the recent doctoral thesis of one of the authors (Almutairi, 2013). In particular, we noted that a key issue was whether our models sufficiently differentiated between London and the rest of Great Britain. We address this by developing separate demand models in Section 2. We also proposed to develop forecasting models for operating costs and fares, in order to carry out more detailed counterfactual analysis – the determination of what would have happened in the absence of the reforms. These models are presented in Sections 3 and 4 respectively. A description of our more detailed treatment of the counterfactual is given in Section 5. We suggested that our consumer surplus measures could be refined and this is done in Section 6. As a result, our welfare

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**Table 1**  
Dynamic time-series model for bus demand in London, Prais–Winsten AR(1) regression.

Variable	Coeff	p-Values
Ln( $Q_{t-1}$ )	0.534	0.000
Ln(S)	0.316	0.055
Ln(I)	-0.448	0.088
Ln(F)	-0.434	0.001
Ln(Motoring costs)	0.472	0.020
Dummy for privatisation process <sup>a</sup>	-0.064	0.035
Time trend	0.020	0.010
Constant	2.667	0.323
R <sup>2</sup>	0.990	
R <sup>2</sup> (Adj.)	0.987	
Number of obs.	30	
Durbin–Watson d-statistic (transformed)	1.838	
Rho	0.165	

<sup>a</sup> Starts from 1991 onwards.

findings are now different in a number of respects to those presented previously. The implications of this are presented in Section 7, with some policy conclusions drawn in Section 8.

## 2. Demand models

Data on the performance of the local bus industry are available from a number of sources, most notably the Department for Transport's Transport Statistics Great Britain. Time series databases were created for five areas of Great Britain (English Metropolitan Counties,<sup>1</sup> English Shire Counties, London, Scotland and Wales) for the years 1981–2008/9. We calibrated a time series model for London, whilst for Great Britain outside London we developed a pooled model of the four areas (the English metropolitan counties, the English Shires, Scotland and Wales).

For London, a time series model was estimated using Generalised Least Squares, with the Prais–Winsten (1954) estimator used to correct for serial correlation. The results are shown by Table 1.

It can be seen that this model has excellent goodness of fit, with an adjusted R squared of 0.987, with all parameter values statistically significantly at the 5% level, with the exception of the constant. The transformed Durbin–Watson statistic indicates that serial correlation has been dealt with. Demand in London appears to be relatively sensitive to service levels, with a short run elasticity of 0.32, rising to 0.68 in the long run, and to fares, with a short run elasticity of -0.43, rising to -0.93 in the long run. An important cross elasticity with respect to motoring costs is detected of 0.47 in the short run, rising to 1.01 in the long run. Bus travel is shown to be an inferior good, with a short run income elasticity of -0.45, rising to -0.96 in the long run, although this is offset by secular growth of 2.0% per annum. Adjustment appears to take a relatively long period, with 99% of change occurring in 7.3 years. It was found that an impact on demand was associated with the privatisation of London Buses Limited from 1991 onwards, leading to a decline in demand of 6.2% in the short run, rising to 12.8% in the long run, with this effect having been substantially completed by 1999.

Outside London, after extensive testing of alternative functional forms and estimation methods, we found that a Partial Adjustment Model, estimated with Fixed Effects using the Panel Corrected Standard Error (PCSE-AR(1)) method (Beck & Katz, 1995; Reed & Ye, 2007, 2011), provided the best model in terms of goodness of fit and plausibility of the parameter estimates. The estimated model is shown by Table 2.

<sup>1</sup> Greater Manchester, Merseyside, South Yorkshire, Tyne and Wear, West Midlands and West Yorkshire.

**Table 2**  
Dynamic panel model of bus demand outside London 1980–2008/9.

Variables	Coeff.	p-Value	LR elasticity
Ln( $Q_{t-1}$ )	0.630	0.000	
Ln(S)	0.133	0.039	0.36
Ln(I)	-0.629	0.000	-1.70
Ln(F)	-0.124	0.001	-0.34
Deregulation dummy	-0.048	0.002	
Time trend	0.011	0.000	
Mets DV	0.247	0.000	
Scot DV	0.190	0.004	
Wales DV	-0.026	0.046	
R <sup>2</sup>	0.998		
Number of obs.	101		
Number of groups	4		
Rho ( $\rho$ )	0.140		

Dependent variable: Ln( $Q_t$ ) where  $Q_t$  = number of bus passenger trips per capita in year  $t$ . Independent variables:  $F$  = receipts (excluding Concessionary Fares Reimbursement) per passenger in year  $t$ ,  $S$  = bus service (vehicle kilometres) in year  $t$ ,  $I$  = personal disposable income in year  $t$ ,  $Q_{t-1}$  = Number of bus passengers per capita in year  $t - 1$ , DV = dummy variable.

It can be seen that this model has excellent goodness of fit, with all parameters significant at the 5% level. This model implies an elasticity with respect to Vehicle Kilometres of 0.13 in the Short Run, rising to 0.36 in the Long Run and a Fares Elasticity of -0.12 in the Short Run rising to -0.34 in the Long Run. These are lower than in London and may seem low in comparison to other studies (e.g. Balcombe et al., 2004). However, the impact of national free concessionary fares in Wales from 2002, Scotland from 2006 and England from 2008 needs to be borne in mind.<sup>2</sup> Surveys by Passengerfocus (2013) suggest that only 50% of bus users are paying fares in the English metropolitan counties, reducing to 41% in the English shires. By contrast, the income elasticity is relatively high (in absolute terms), particularly compared to London, at -0.63 in the short run and -1.70 in the long run, however it is again offset by a secular time trend, although in this case of only around 1.1% growth per annum. The lagged dependent variable indicates that 99% of change will occur within 10 years, which is slightly longer than for London. The deregulation dummy variable indicates a 4.7% reduction in demand in the short run and 12.2% reduction in the long run, with this likely to have been completed by 1996. The dummy variables indicate that, compared to the reference case of the English shires and based on the exponential of the estimated parameter value, bus journeys per capita are 28% higher in the English Mets, 21% higher in Scotland but 3% lower in Wales.

## 3. Cost models

In our earlier work, we had focussed purely on assessing the impact of the regulatory reforms on demand. However, the reforms had important impacts on operating costs and on subsidy levels, whilst the counterfactual assumptions concerning these two variables are crucially important. As a result we develop a recursive modelling system in order to take these factors into account (see also Fig. 1). We first estimate total costs (described in this section) and then estimate fares as a function of costs and subsidy (see Section 4) and then feed the estimates of fares into the demand

<sup>2</sup> This involves free fare concession for bus use for the over 60s and eligible disabled people. This statutory concession operates between 9:30 am and 11:00 pm Monday to Friday and all day on Saturdays and Sundays. In England, it originally covered travel within a Travel Concessions Authority (TCA) but in April 2008, a national scheme was introduced which extended free travel for concessionaires to any journey on a local bus in England, so as to be consistent with the earlier national schemes in Scotland and Wales.

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