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Evaluating the long term impacts of transport policy: An initial assessment of bus deregulation

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ABSTRACT

Local buses in Britain, outside London, were 'deregulated' as a result of the 1985 Transport Act, with most of the organisational changes implemented in 1986 but many of the ownership changes occurring over a longer period. By contrast, in London, the 1984 London Regional Transport Act introduced a system of comprehensive tendering – but it took 10 years for the organisational and ownership changes to be fully implemented. This paper examines the long term impacts of these changes. A key issue when examining long term changes is that of the counterfactual – what would have happened if the changes had not occurred? An econometric model of the demand for local bus services in Britain is outlined and used in conjunction with extrapolative methods for key variables such as fares and bus kms to determine demand-side counterfactuals. Some analyses of subsidy and of costs will also be outlined. This will then permit the examination of welfare change by estimating changes in consumer and producer surpluses, updating earlier studies. It is found that outside London, bus demand declined strongly, at least up to the year 2000 and some of this reduction can be ascribed to deregulation. By contrast in London, demand has generally been increasing. However, in both areas operating costs also declined strongly, again up to 2000, but since then there have been strong increases in costs and subsidy. Our initial finding is that there are net welfare increases both outside and inside London, but with welfare increases per capita being five times greater in London than elsewhere. However, sensitivity analysis shows that our results are sensitive to the specification of the modelling system and assumptions made concerning the counterfactual, particularly for the results for London.

1. Introduction

Transport, as in many other sectors, exhibits a relative paucity of policy evaluation and where such evaluation does occur it tends to focus on short run effects. Bus deregulation in Great Britain is no exception. There was a slew of studies of the early effects (e.g. Mackie, Preston, & Nash, 1995; Romilly, 2001; White, 1990) but there have been no studies in recent years. There are good reasons for this – 'evaluation research is tortured by time constraints' (Pawson, 2002). The effects of a policy change are distorted by exogenous variables such as changes in population and income and are overtaken by other policy initiatives. Undeterred, this paper draws on the recent work of Almutairi (2011, 2012) and attempts to evaluate the long terms impacts of the deregulation of bus services in Great Britain.

In the next section, we briefly review the history of bus deregulation in Great Britain. Then, in section 3, we outline some of the key trends in the bus market in Great Britain. In section 4, we outline the development of a demand model of the bus market in Great Britain. In section 5, we undertake an initial evaluation. In section 6, we draw some preliminary conclusions, undertake some sensitivity analysis and make recommendations for further research.

2. A brief history of bus deregulation

The local bus deregulation story is documented in detail elsewhere (see, for example, Mackie & Preston, 1996). It originates with the neo-liberal reform agenda of the Thatcher Conservative Governments (1979–90). The 1980 Transport Act deregulated local bus fares and set up some trial areas (most notably in Hereford). These early reforms are documented in Savage (1985). They were followed by the 'Buses' White Paper in 1984, which stimulated a huge amount of debate (Banister, 1985; Beesley & Glaister, 1985a, 1985b; Gwilliam, Nash, & Mackie, 1985a, 1985b). Beesley and Glaister (1985a) put forward four key propositions. They argued

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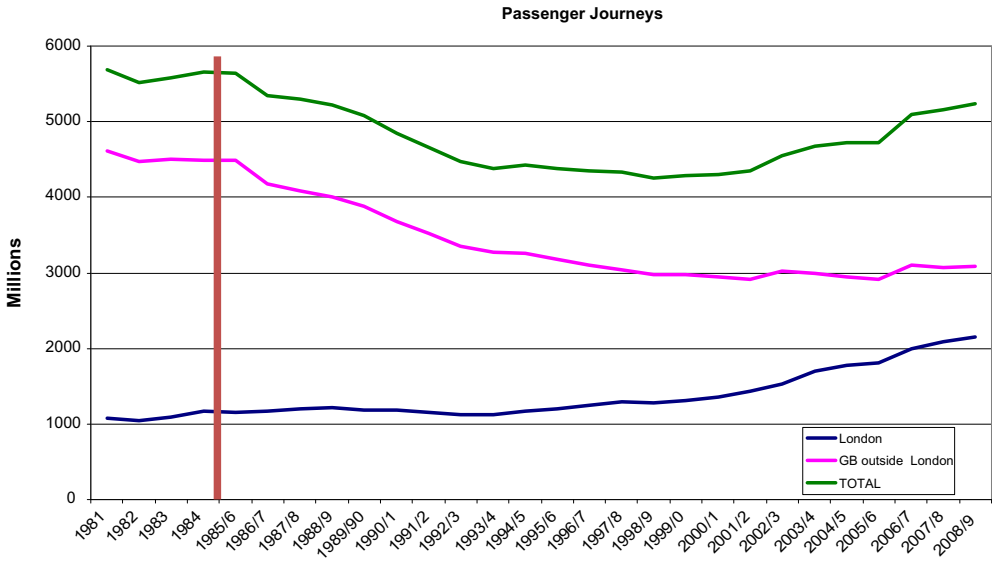

Fig. 1. Trends in local bus demand (passenger journeys, millions).

that deregulation would, firstly, produce a competitive market. Secondly, it would substantially reduce costs. Thirdly, it would improve resource allocation (through more service and lower fares). Fourthly, it would have no undesirable spin-offs. Counter arguments were provided by Gwilliam et al. (1985a) who favoured competition for the market (competition for the road) rather than competition in the market (competition on the road).

The White Paper was followed by the Transport Act in 1985. The Transport Act introduced a raft of measures of which four should be highlighted. The first of these was the abolition of the system of Road Service Licenses which meant that the quantity supplied of bus service outside London was deregulated with effect from October 1986. This ended a regulatory system of quantity control that had been in existence since the 1930 Road Traffic Act. The second was it was recognised that some services (e.g. those in rural areas) could not be provided commercially and therefore provisions were made for the competitive tendering of socially necessary services by Local Authorities. These tendered services have constituted a relatively small, but growing, part of the market (now up to 20% of bus miles). The third was the commercialisation and eventual privatisation of the industry. In 1985 around 75% of the industry was in public ownership with four big groups – namely the National Bus Company (with 70 subsidiaries and 28% of the industry), the metropolitan and municipal PTCs (around 60 companies and 28% of the industry), London Transport (with 13% of the industry) and the Scottish Bus Group (9 subsidiaries and 6% of the industry). By 1999, the public sector's share of the market had reduced to 6%, with the big five stock exchange listed companies[1] controlling 68% of the industry (Cole, 1998; TAS, 1999). The fourth was the tightening of regulations concerning safety (by strengthening the powers of the Traffic Commissioners) and competitive behaviour (by giving the Office of Fair Trading powers over the bus industry).

One of the interesting features of the bus industry outside London is the relative stability of the policy environment. The 1998 New Deal for Transport White Paper had ambitious plans to convert local buses from workhorses to thoroughbreds but the practice saw little substantive change (Preston, 2003). The 2000 Transport Act brought in provision for Statutory Quality Bus Partnerships (with just a couple of take ups) and Quality Contracts (with no take ups), whilst the Local Transport Act 2008 enhanced the legislative provision for Quality Contracts and created Integrated Transport Authorities with very little effect. Arguably the most important change to the bus industry outside London has been to the concessionary fares regime. Since April 2006 a free fare concession for bus use has existed in England 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 and originally covered travel within a Travel Concessions Authority (TCA). In April 2008, a national scheme was introduced which extended free travel for concessionaires to any journey on a local bus in England.[2]

Another feature of bus deregulation was that the provisions did not apply to London, which as a result became a form of experimental control. The 1984 London Regional Transport Act took control of bus services away from local Government (and the soon to be abolished Greater London Council) and into central Government control. Competitive tendering for bus services was gradually introduced, with the process completed in 1994, whilst London Buses Limited was also privatised (see Kennedy, 1995). Again the broad policy has remained relatively unchanged, although the 1999 Greater London Authority Act meant that buses in the capital came once again under the control of local government, in the form of the elected Mayor and Greater London Assembly, and a new executive agency, Transport for London (established in 2000).

3. Key trends in the bus industry

Data on the performance of the local bus industry is available from a number of sources, most notably Transport Statistics Great Britain, and the key trends are relatively well known, including presentations to the International Conferences on Competition and Ownership in Land Passenger Transport (see, for example, Matthews, Bristow, & Nash, 2001; Preston, 1999). Figs. 1–5 illustrate the key trends between 1981/2 and 2008/9 with respect to demand (as measured by number of passengers), supply (as measured by

[1] Arriva, First Group, Go-Ahead, National Express and Stagecoach. Arriva was taken over by Deutsche Bahn in 2010.

[2] A national free scheme (including peak travel) has existed in Wales since April 2002 and in Scotland since April 2006.

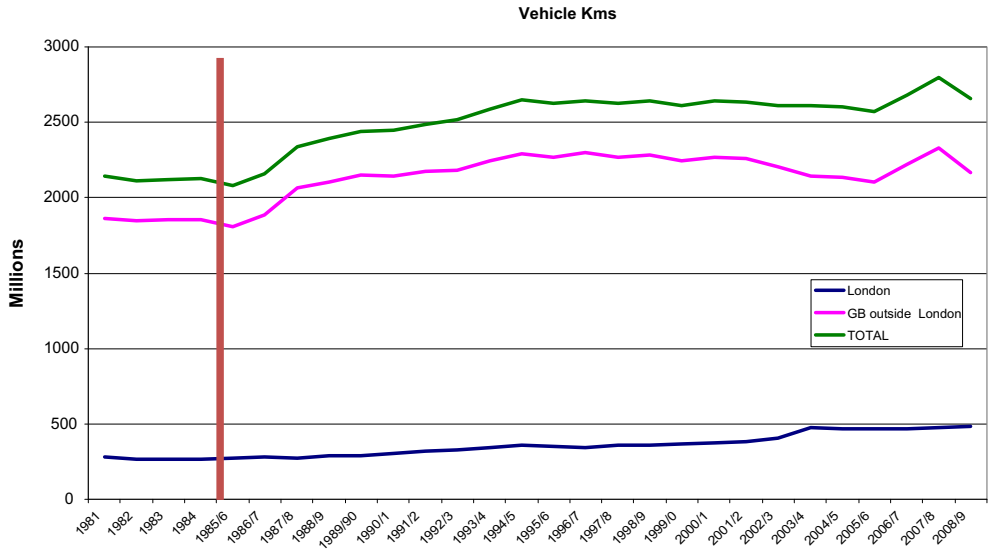

Fig. 2. Trends in local bus supply (vehicle kilometres, millions).

vehicle kms), fares (as measured by receipts per passenger in 2005/6 prices), operating costs and subsidy respectively. The key trends since deregulation in 1985/6 are summarised by Table 1.

The difference between London and the rest of the country is striking. Since deregulation the number of bus passengers in London has increased by 87%, whereas in the rest of the country there has been a 31% decline, although demand has stabilised in the last 10 years, with some recent growth due to the concessionary fares policy discussed above. Real fares in London have only increased by 15%, whereas outside London the increase has been 55%. Services in London have increased by 87%, whereas outside London the increase has only been 20%. Trends in operating costs have been broadly similar (albeit with London having much higher costs than elsewhere). Real costs in London have come down by 28%, outside London they have come down by 20%. For both, costs have been increasing strongly since 2000. Subsidy (in terms of revenue support and concessionary fares reimbursement – see also Preston, 2008) has increased by 84% in London but by only 5% outside London. For both, subsidy was minimised around 2000. A key issue is the extent to which subsidy reductions are part of the policy package, with Glaister (1991) arguing that subsidy reduction was the main motivation.

4. Determining the counterfactual

A key component to determining the counterfactual is the development of a demand forecasting model. A pooled time series cross section data base was created for five areas of Great Britain (English Metropolitan Counties, English Shire Counties, London, Scotland and Wales) for the years 1981–2008/9. Some key descriptive statistics for London and Outside London are provided by Table 2 and highlight the higher levels of demand and lower fares in London than the rest of the country.

It is not the purpose of this paper to go in to detail concerning the econometrics underpinning this work – this is detailed elsewhere (Almutairi, 2012). Suffice to say that a number of static and

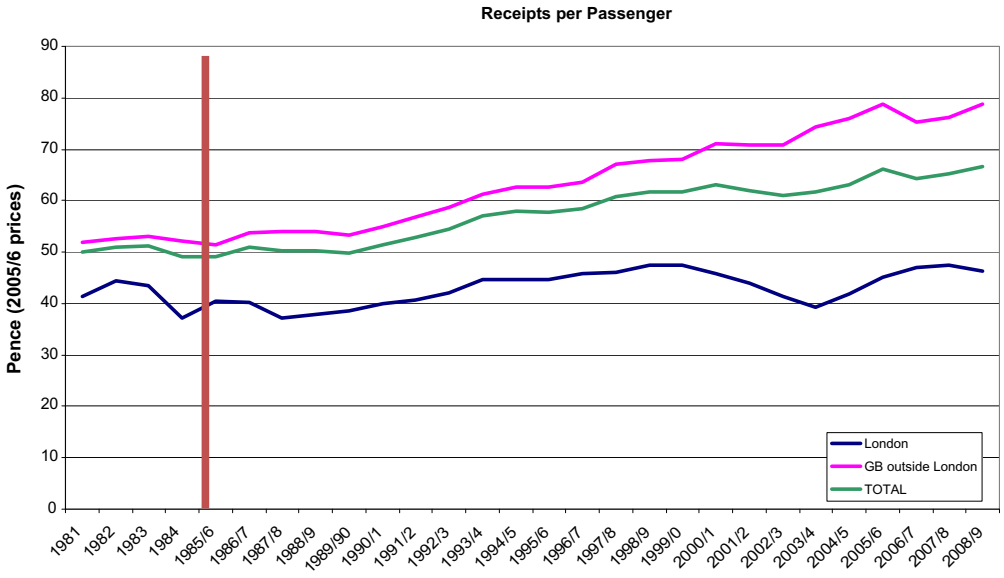

Fig. 3. Trends in fares (receipts per passenger, excluding concessionary fares reimbursement) pence, 2005/6 prices.

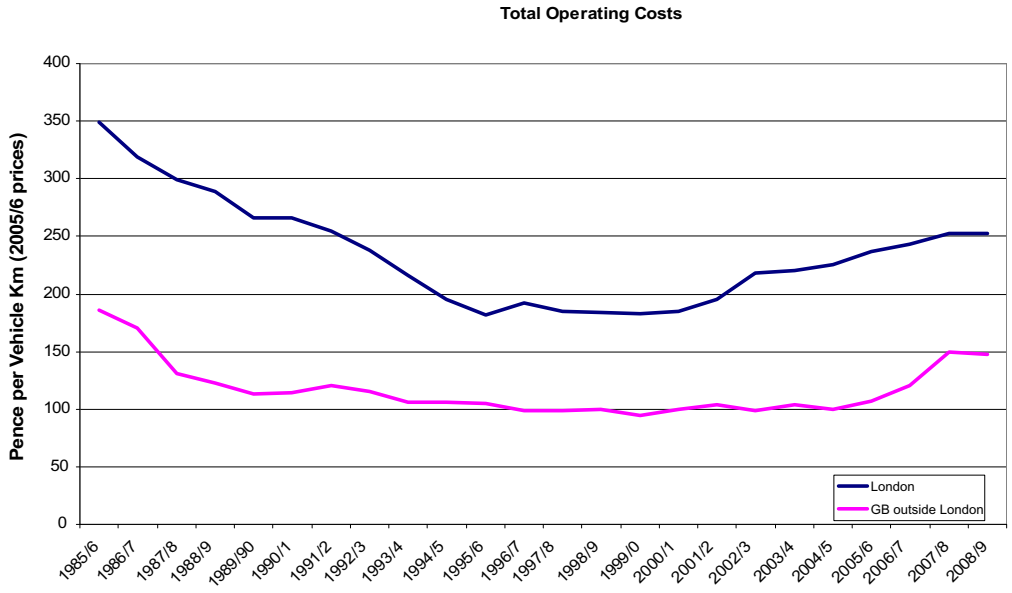

Fig. 4. Trends in vehicle operating costs: pence per km, 2005/6 prices.

dynamic demand models have been estimated, considering both fixed and random effects, and using a variety of estimation methods including the Ordinary Least Squares First Order Autoregressive (OLS-AR(1)) procedure developed by Baltagi and Wu (1999), the equivalent Feasible Generalised Least Squares procedure (FGLS-AR(1)) and the Panel Corrected Standard Error (PCSE-AR(1)) method (Beck & Katz, 1995; Reed & Ye, 2007). In addition, several Error Correction Models (ECM) were developed, including those based on the Engle-Granger two step procedure (Engle & Granger, 1987) and those based on the system based test of Johansen (1988). Various lag structures were examined using the Akaike Information Criteria, with the use of the dependent variable with a single period lag strongly supported. The model took the general form:

$$\mathrm{Ln}Q_{it} = \alpha - \beta_F \mathrm{Ln}F_{it} + \beta_V \mathrm{LnVKM}_{it} - \beta_Y \mathrm{Ln}Y_{it} + \beta_{Q-1}\mathrm{Ln}Q_{it-1} - \beta_{\mathrm{DD}}\mathrm{DD} + \beta_t t + \sum_{i}^{i-1} \beta_i \mathrm{RDV}_i$$

where Q_{it} = Number of bus passenger trips per capita in region i in year t, F_{it} = Receipts (excluding Concessionary Fares Reimbursement) per passenger in region i in year t, VKM_{it} = Vehicle Kilometres per capita in region i in year t, Y_{it} = Personal Disposable Income in region i in year t, Q_{it-1} = Number of bus passengers per capita in region i in year $t-1$, DD = Deregulation Dummy Variable, t = time trend and RDV = Regional Dummy Variables.

The model was estimated using the PCSE(AR)(1) method. A Wooldridge statistical test confirmed the presence of first order

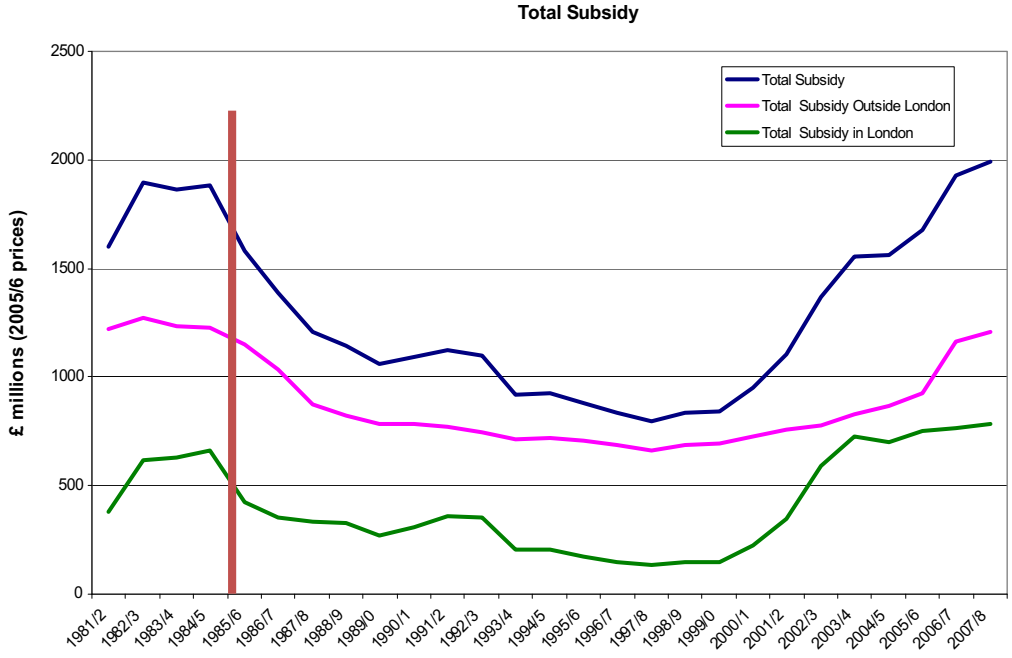

Fig. 5. Trends in subsidy. £ million, 2005/6 prices. Note: does not include bus service operators grant (previously fuel duty rebate) – £414 million in 2007/8.

Table 1
Key changes in the local bus market since 1985/6.

	Outside London	London
Demand	−31%	+87%
Fares	+55%	+15%
Services	+20%	+78%
Costs	−20%	−28%
Subsidy	+5%	+84%

serial correlation in the data, although a modified Wald test confirmed homoscedasticity and a Breusch–Pagan (BP) Lagrange Multiplier (LM) test confirmed cross sectional independence, although VIF (Variance Inflation Factor) tests do suggest the presence of multicollinearity in the pooled data. The estimation method is based on a form of pseudo differencing and hence non stationarity is dealt with, whilst comparison of adjusted R^2 and information criteria measures suggested this approach was preferable to ECM procedures which in any event are not well developed for pooled data sets. Beck and Katz (2011) provide general support for the modelling approach adopted here.

The results of the estimated model are given by Table 3. It can be seen that all the key parameter estimates are significant at the 1% level, although only the regional dummies for London and Wales are statistically significant. The model R^2 is 0.997, indicating excellent goodness of fit. This model is a version of the Partial Adjustment Model (Dargay & Hanly, 2002). Short run elasticities for fares, vehicle kilometres and income are given by the coefficients estimated above (−0.11, 0.18 and −0.34 respectively). The long run elasticities are determined by dividing the coefficients by 1 − 0.842. This gives long run fare, vehicle km and income elasticities of −0.72, 1.14 and −2.18 respectively. The deregulation dummy variable indicates a 6.9% reduction in demand in the short run and a 36.2% reduction in the long run. The time trend variable indicated a yearly growth of 0.9% in the short run and 5.8% in the long run. The coefficient of the lagged dependent variable (0.842) suggests a relatively slow adjustment, with 90% of the adjustment occurring in 13.34 years (Ln(1 − 0.9)/Ln(0.842)) – suggesting relatively long adjustment periods.[3]

The PCSE-AR(1) model was used to make some comparisons of actual and counterfactual demand as illustrated by Table 4. For simplicity of analysis, it is assumed that fares and vehicle kms are held at 1984 levels and the first year of deregulation having an effect is assumed to be 1985/6, as many networks were adjusted in advance of D-day on 26 October 1986.

From Table 4 it can be seen that of the 87% actual growth local bus usage in London, 54% was predicted to have occurred anyway – which is around 62% of the actual growth. By contrast outside London, demand reduced by 31% but the counterfactual forecasts a 9% growth – principally due to increased population. Actual demand is thus 36% lower than the counterfactual demand – a finding that is remarkably consistent with the long run impact of the deregulation dummy variable.

5. Welfare analysis

Our principal measure of welfare change is:

$$\Delta W = \Delta CS + \Delta TR - \Delta TC$$

where W = Welfare, CS = Consumer Surplus, TR = Total Revenue, TC = Total Costs. All values are expressed in 2005/6 prices and Δ refers to the difference between the actual outcome and the counterfactual.

The changes in Consumer Surplus are estimated using the rule of half. Outside London, where counterfactual fares are lower and demand higher than actual outcomes, this is calculated for each year as:

$$\Delta CS = \frac{1}{2}(F_1 - F_2)(Q_1 + Q_2)$$

where F_1 = counterfactual fares, Q_1 = counterfactual demand, F_2 = actual fares and Q_2 = actual demand. For London, where both counterfactual fares and demand are lower than the actual, and hence an outward shift in the demand curve is assumed, the sign is reversed.

Our initial welfare results are presented in Table 5. These calculations are given as Present Values using the Treasury's 3.5% discount rate. It has been assumed that bus operating costs in the counterfactual were fixed at 1985/6 levels (the first year for which data are available).

This analysis suggests that in the long run both reforms have been welfare positive but in different ways. In London, both consumers and producers appear to have gained. Outside London, the situation is different – consumers have suffered losses but producers have had large gains in terms of reduced total costs, although in recent years these have petered out.

Our 2008/9 population estimates (derived from the Office of National Statistics) are 7.62 million for London and 52.18 million for

Table 2
Key descriptive statistics.

Variable	Area	Obs	Mean	Std. dev.	Min	Max
Demand (Journeys per capita)	Lon.	28	191.5	36.63	153.1	282.0
	Out.	28	70.8	13.76	56.6	95.9
Fare[a] (Pence per journey)	Lon.	28	42.9	3.27	37.2	47.6
	Out.	28	63.3	9.46	51.4	78.9
Service (Vehicle kms per capita)	Lon.	28	49.7	8.33	38.8	63.7
	Out.	28	42.9	2.79	37.3	46.4

[a] 2005/6 prices.

Table 3
Model results.

	Coefficient	Standard error	z	$p > \|z\|$
Constant (α)	3.067	1.081	2.84	0.005
Fare (β_F)	−0.114	0.037	−3.08	0.002
Service (β_v)	0.180	0.059	3.06	0.002
Income (β_Y)	−0.343	0.126	−2.73	0.006
Lag (β_{Q-1})	0.842	0.024	24.93	0.000
Dereg DV (β_{DD})	−0.071	0.014	−4.93	0.000
Time trend (β_t)	0.009	0.003	3.34	0.001
London DV	0.054	0.026	2.09	0.037
Mets DV	0.004	0.021	0.20	0.839
Scotland DV	−0.016	0.028	−0.55	0.582
Wales DV	−0.037	0.013	−2.84	0.005

R^2 0.997, Rho 0.142, Wooldridge test 9.162 (p 0.039), Modified Wald test 6.13 (p 0.294), BP LM test 10.057 (p 0.4335).

Table 4
Actual and counterfactual estimates of local bus demand in London and outside London (passengers, millions).

	London		Outside London	
	Actual	Counterfactual	Actual	Counterfactual
1985/6	1152	1223	4489	4462
2008/9	2149	1885	3084	4884
Change	+87%	+54%	−31%	+9%

[3] 99% of adjustment takes around 27 years (Ln(1 − 0.99)/Ln(0.842)).

Table 5
An initial cost-benefit analysis of bus reforms in Britain since 1985/6 (£ Million, 2008/9 prices).

	London	Outside London
ΔCS	+1505	−7320
ΔTR	+46	−4038
ΔTC	−1763	−15,751
Δ*W*	+3314	+4393

Uplifted from 2005/6 prices using a factor of 1.086 [Based on the GDP deflator at market prices – see http://www.hm-treasury.gov.uk/Economic_Data_and_Tools/GDP_Deflators/data_gdp_index.cfm].

Table 6
Sensitivity analysis (I) constant trend assumption concerning service levels and with more detailed modelling of fares and operating costs (£ million, 2008/9 prices).

	London	Outside London
ΔCS	+748	−1270
ΔTR	+1645	−10,578
ΔTC	−58	−14,811
Δ*W*	+2451	+2963

Table 7
Sensitivity analysis (II) variable trend assumption concerning service levels and with more detailed modelling of fares and operating costs (£ million).

	London	Outside London
ΔCS	+1196	+1927
ΔTR	+2775	+2598
ΔTC	+3389	−879
ΔW	+582	+5404

the rest of Great Britain. As a result, our results indicate that the mean benefit per person over this prolonged period was around £435 in London but only around £84 per person outside London, in other words over fivefold higher in London than outside London.

An important issue is the change in subsidy. Using a simple counterfactual in which subsidy is frozen at 1984/5 levels, we find that there have been reduced levels of subsidy (based on Concessionary Fares Reimbursements and Public Transport Support only – data is not readily available for Fuel Duty Rebate). Between 1985/6 and 2007/8 there has been a saving in subsidy of £5106 million in London and £6726 million outside London (2008/9 prices). This represents a transfer but if one assumes a shadow price of public funds of around 1.2 (after Dodgson & Topham, 1987) then there are deadweight efficiency gains from this reduced expenditure of around £1021 million in London and £1345 million outside London.

6. Conclusions and further work

This work is still at an initial stage and the findings should therefore be interpreted with caution. Nonetheless, we find some relatively strong evidence that bus deregulation suppressed demand in the long run by around 36%. As a result we find that consumers suffered substantial losses of benefit in Great Britain outside London, but these were more than offset by reductions in operating costs so that society seems to gain overall. However, in London both consumers and producers gain and the resultant welfare increase per capita is five times greater than that outside London. This would seem to support the view posited by Gwilliam et al. (1985a) that competition for the market is preferable to competition in the market. There appears to be limited competition for bus services outside London and the resultant configuration of higher fares and services is consistent with oligopolistic competition (Evans, 1990), although more recent studies suggest a degree of monopolisation (Competition Commission, 2011). However, Beesley and Glaister (1985a) were correct in their forecasts of substantial reductions in operating costs and of limited undesirable spin-offs.

It is interesting to note that, some 25 years on from the initial reforms, our analysis indicates that the impacts are nearing completion, whilst the year 2000 seems to have been a turning point for some key trends (i.e. demand, subsidy and operating costs). It is also worth comparing the big bang approach to the bus regime outside London (where the main reforms were introduced in less than two years) with the much more gradual approach in London (where the reforms took at least ten years). Research in the rail industry suggests that the gradual approach has advantages over a more instantaneous approach (Friebel, Ivaldi, & Vibes, 2003) and there are some suggestions here that this might also apply to the bus industry.

There is though more work to be done. A key issue is whether our models sufficiently differentiate between London and the rest of Great Britain. Our analysis was initially limited to variations to population and income. Initial attempts to include other variables, particularly car ownership and motoring costs, were unsuccessful. However, the introduction of the congestion charge in London in 2003 is likely to have provided a fillip to bus use that has not been picked up by our models (see also White (2010) for details of other factors that should be taken into consideration). As result, subsequent work has involved the development of separate demand models for outside London (based on pooled data) and for London (based on time series data) (Almutairi, 2012). The model for outside London has an income elasticity of −0.63 in the short run and of −1.70 in the long run, whilst the demand dampening effect of deregulation is reduced to 4.8% in the short run and 12.4% in the long run. The model for London has lower (in absolute terms) income elasticities (−0.45 in the short run, −0.96 in the long run) and includes a motoring cost term. We have also developed forecasting models of operating costs and fares that will permit more detailed counterfactual analysis of the impact of subsidy reductions. The cost modelling has also permitted analysis of the extent to which the operating cost reductions that have been observed may be attributed to reductions in input prices (particularly wages and fuel). Some sensitivity analysis using this subsequent approach is shown in Tables 6 and 7. In both cases the calculations have been extended to include data for 2009/10.

It can be seen that the finding that the reforms outside London are welfare positive is relatively robust and the range of welfare gains (from +£2963 to +£5404 million) bound our initial estimate (+£4393 million). In the variable trend assumption (Table 7), the counterfactual assumes that there would have been reductions in service levels and this dissipates the total cost savings (as the increase in vehicle kms as a result of deregulation is enhanced). The counterfactual fares assumed in Table 7 are lower than those in Table 6, resulting in enhanced gains in total revenue, whilst overall there are modest consumer surplus gains. The results for London are also welfare positive but seem less robust, given our initial estimate of a welfare gain of £3314 million is outside of the range of +£582 to +£2451 million in the subsequent analysis illustrated by Tables 6 and 7. In part, this is due to the fact that much more of the increase in demand since the reforms can be explained by external factors (such as rising motoring costs) but there is also a cost impact of operating more service than predicted by the counterfactual. The initial finding that the reforms in London had a greater net benefit per capita than the reforms outside London is supported by Table 6 (with the gains per capita again being over fivefold higher in London) but not by Table 7 (where the gains per capita outside London are over a third higher than those in London).

Our welfare analysis could be further refined. In future work we intend separate the impacts of subsidy changes from the regulatory reforms. We will investigate obtaining our estimates of consumer surplus from direct integration of the estimated demand functions, although given their dynamic nature this is not straightforward

(Dargay & Goodwin, 1995) and is particularly problematic in circumstances where the demand curve is believed to have shifted. We will also widen our welfare analysis to consider wider impacts, for example on employment, on safety and on the environment. We propose to report this work in a subsequent paper.

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