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COMPULSORY COMPETITIVE TENDERING FOR PUBLIC SERVICES IN THE UK: THE CASE OF REFUSE COLLECTION

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INTRODUCTION

The 1988 Local Government Act represented a fundamental change in the method of provision of local government services in the UK. The Act introduced Compulsory Competitive Tendering (CCT) for blue collar services provided by local authorities, including refuse collection, building maintenance, street cleaning, school and welfare catering and sports and leisure management.[1] Prior to 1979 virtually all local government services were provided through direct employment. After 1979 a small proportion of local authorities experimented voluntarily with competitive tendering of services such as refuse collection and street cleaning, but by 1988 around 90% of services across the UK were still provided by Direct Service Organisations (DSOs, as they are now known) and only about 10% of authorities had ever held a competitive tender for local services[2]. Following the Act DSOs were required to operate on an arms-length basis (with no cross subsidies from the local authority), to bid against private contractors at regular intervals for the provision of service, and to earn a minimum 5% return on their assets.

It is now well known that in most cases expenditure on services has fallen following the introduction of CCT (e.g. Walsh, 1991; and Walsh and Davies, 1993) but controversy remains about the extent and causes of those cost reductions. Critics have argued that the savings have been small and that lower costs have been achieved at the expense of service quality and the terms and conditions of the workforce rather than greater efficiency e.g. PSPRU (1992). The alternative is that lower costs have been achieved through higher productivity. Problems arise in empirically estimating the impact of CCT. Firstly, in most cases comparable measures of expenditure on specific services (e.g. sports and leisure management) were not recorded prior to CCT. Secondly, data on the characteristics of each service which might form the basis of a quality assessment is generally not available.

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However, refuse collection is the exception. Data on annual refuse collection expenditure by English local authorities can be obtained from the Department of the Environment. Data on service characteristics (e.g. the point from which refuse is collected, frequency of collection, provision of recycling services) prior to CCT was collected by CIPFA and used extensively in previous research on this subject (in particular Domberger, Meadowcroft and Thompson, 1986; and Szymanski and Wilkins, 1993). Since 1988 this data has not been available, but a survey of all refuse collection client managers in England carried out by Bello (1994) produced a set of comparable data for the post-CCT era. This study reports the changes in cost and service characteristics associated with CCT. The main findings are:

(i) On average refuse collection costs have fallen by 22% comparing the last full year before a competitive tender was held and the first full year afterwards. After controlling for variations in the characteristics of service provision, the size of cost savings directly attributable to the event of the competitive tender are actually greater.
(ii) Whilst there have been changes in a significant proportion of local authorities, the basic characteristics of collection have not changed in the majority of authorities since the introduction of competitive tendering.
(iii) Where contracts have been let to the DSO as opposed to an outside contractor, CCT has led to a significantly smaller drop in costs. On average contracts which are won by the DSO are about 10% more expensive than contracts won by private sector firms.

The paper is presented in six sections. The introductory section is followed by a section which provides a brief review of the existing literature on refuse collection. The third section looks closely at the organisation of the refuse collection service. The fourth section describes the refuse collection model, the estimation procedure and the data used in the analysis. The fifth section presents summary statistics and the results of the regression analysis. The final section contains the concluding remarks.

LITERATURE REVIEW

There have been quite a number of studies on the effect of competition on the provision of public services around the world, Domberger and Rimmer (1994) provide a useful review. Because domestic solid waste collection is a relatively simple service to analyse and about which data is readily available there have been a number of studies on this subject, particularly in North America e.g. Savas (1977 and 1978), Stevens (1978), Collins and Downes (1977), and McDavid (1985).

In an important study Domberger, Meadowcroft and Thompson (DMT)

(1986) showed that in a large cross section of UK local authorities voluntarily competitive tendering of refuse collection resulted in about a 20% fall in cost. This finding was supported by Data-Envelope Analysis carried out by Cubbin, Domberger and Meadowcroft (1987) and a time series/cross section analysis by Szymanski and Wilkins (1993).[3]

All of these studies were based on the Chartered Institute of Public Finance and Accountancy (CIPFA) data on service characteristics and costs. The specification of the service has a major impact on the cost of delivery and these studies estimated coefficients for a cost function based on the type of service delivered. For example, one of the key determinants of cost is the point from which household refuse is collected. The studies cited above, as well as an Audit Commission study from 1984 found that authorities can reduce cost by about 25% if they change their method of collection from back door to kerbside collection.

So far there have been surprisingly few studies on the impact of CCT. Walsh (1991) carried out an in depth survey of 40 local authorities during the early stages of CCT. He found that refuse collection costs fell by about 12.7% with the introduction of CCT: but this figure was based on only seven refuse collection contracts. The study by Walsh (1991) found little or no evidence to suggest that the cost savings are due to a lower quality of service.

Szymanski (1993) based on contract cost (data published in the Contracts Handbook, CDC Publishing) in 217 authorities found that refuse collection costs have fallen by about 20% (after allowing for the cost of contract administration) between 1988 and 1992. In a study based on the Department of Environment (DoE) data, Szymanski (1994) compared net expense on refuse collection for the last full financial year before the start of the contract and the first full year after the start of the contract. The study suggests that costs have fallen by about 18% on average. A regression of net expenditure against the household units and service provider (ie., DSO or private contractor) suggests that DSOs are about 12% more expensive. The main weakness of these papers is that the regression models did not include service characteristics variables to control for possible service quality differential.

This paper is based on the survey of contract characteristics carried out by Bello (1994). By combining cost and service characteristic data, as well as data on local authority characteristics it is possible to analyse whether CCT brought about significant changes in the way services were provided, and whether large cost reductions were associated with changes in service characteristics.

THE ORGANISATION OF REFUSE COLLECTION SERVICES

Local authorities have a statutory duty to ensure that household waste is collected and disposed of. In providing this service they must decide on the

level of service to provide given constraints such as cost and local conditions. These decisions include frequency of collection, the point where householders must deposit their waste for collection, the type of containers to be used and who is to provide them, the provision of facilities for recycling, and occasional services such as the collection of non-standard items (e.g., concrete debris).

It is normal for authorities to ask residents to place their rubbish at a designated pick-up point on the designated collection day(s). Authorities are usually restricted to three options regarding designated pick-up points: kerbside, front of property and point of storage (backdoor). Kerbside collection requires the least effort of all by the waste collectors but from the residents' view point, this is arguably a lower quality of service because they have to physically transfer their rubbish to the kerbside. The second method requires residents to place refuse on the front of property on designated collection days and the waste collectors take the rubbish from the front of property and return the container to the front of property. This method is only different from kerbside collection where there is an appreciable distance between the kerbside and the front of the property. The third option is for the operatives to collect rubbish from the residents normal storage point and return the container back to the storage point. This is usually referred to point of storage collection or back door collection. This is arguably a higher level of service as the residents play little or no part in the collection process.

Apart from the three main options, some variations are also possible. The 'collect and return' method is arguably a hybrid of the traditional front of property collection and the backdoor collection. In this method, the operative collects bins from the backdoor or the front of property but only returns the bins to the front of property. Skeps can also be used to modify the traditional backdoor or front of property collection method. A skep is a dustbin-sized container carried by the operative. In this method, the operative empties the contents of the resident's bin into the skep, and uses the skep to transport the waste to the collection vehicle. The main advantage of skep collection is the reduction in collection time as the operative would not have to return a container back to the storage point.

Authorities also have to decide whether to provide residents with storage containers and the type of container to be provided. The common containers are bins, wheel bins, and sacks. Free provision of containers obviously raises the standard of service. Most authorities apply a charge to the collection of all or some categories of non-standard rubbish (e.g., concrete debris, freezers, etc). Authorities that collect all categories of such waste free of charge are also providing a higher level of service.

Collection of recyclable waste has received additional attention from the local authorities with the enactment of the Environmental Act of 1990. The Act requires authorities to recycle at least a quarter of their waste by the year 2000. Two arrangements are most popular for collecting such waste: collection of such waste from individual properties or ask residents to place

such waste in free standing facilities like bottlebanks, paperbanks, etc. The free-standing collection units are usually referred to as Municipal Recycling Facilities (MRFs). It is not unusual to have authorities use a combination of both methods. Collecting from individual properties is arguably a higher level of service as residents do not have to transport their waste to the MRFs.

With regards to the frequency of collection, it is normal for authorities to collect waste from most households once a week. However, they might collect commercial waste more than once a week.

THEORY AND DATA

The focus of this study is the cost of refuse collection. In order to simultaneously control for the effects of different variables on cost, the present work is based on regression analysis. This paper follows the existing literature by adopting the model proposed by Stevens (1978). The model is based on the assumption that the production function for refuse collection can be represented by a Cobb-Douglas technology with labour and capital as inputs. Authority production functions may vary according to intrinsic characteristics such as the density of the population, whether the population is urban or rural and so on. They may also vary according to the standard of service selected by the authority. Authorities are assumed to minimise costs subject to their production function. Under this assumption a log linear cost function can be estimated by ordinary least squares:

$$\ln(C_i) = \Sigma\gamma A_i + a_0 + a_1 \ln(Q_i) + u_i \qquad (1)$$

where C is the cost of refuse collection, A_i is a vector of authority specific and service characteristics, a_0 is a constant term. Q_i is a measure of output in the service and the value assumed by a_1 is an indicator of the presence of economies of scale. u_i is an *iid* normal error term.

The analysis of refuse collection cost in the present study for both the pre-CCT and post-CCT era is based on equation (1). However, its application requires a more precise definition of variables with specific reference to the variables contained in the authority specific vector, A. While the majority of the variables are common to both analysis eras (ie., pre-CCT and post-CCT), a few are specific to a particular period. In the detailed explanation of variables that follow, attention will be drawn to such variables.

C is measured as the local authority's net expenditure on refuse collection. That is, total expenditure less any income generated by these services. The net expenditure on refuse collection is preferred to the gross expenditure as the dependent variable. While there are no direct charges for household collection, authorities obtain additional income by collecting commercial waste. Obviously they also incur additional costs which add to gross expenditure. Subtracting income from the gross expenditure yields the net

expenditure which effectively equals the cost of domestic collection, if the profit from commercial collection is assumed to be sufficiently close to zero. The assumption of zero profit from commercial collection is justified considering the intense competition for the collection of commercial waste. As indicated by equation (1), the cost of refuse collection should increase with output, Q, (i.e., volume of waste collected). However, data on the volume of waste collected is not readily available and where available is not reliable. The output level is measured by the number of collection units (domestic and non-domestic) in an authority (designated as UNITS). This is the relationship estimated in the previous literature. However, since the dependent variable is expenditure on domestic collection it might be argued that only domestic units should be counted on the right hand side of the equation. There are two issues here. Firstly, because there may be economies of scale it is sensible to include non-domestic units in the cost function for domestic units. Secondly, on the average a domestic unit produces less waste than the other types of units and consequently, for two authorities with the same number of units, the collection cost should be lower for that which has a higher percentage of domestic units. Thus in the main text scale effects are captured through the UNITS term while the variable HOUS represents the percentage of domestic properties in an authority. In the Appendix, the regression in Table 7 (comparing the cost of refuse collection before and after CCT) is estimated using alternative specifications.

The variables contained in the authority specific characteristic vector, A, (equation 1) can be broadly divided into three categories: local factors, service characteristics, and market conditions.

Local Factors

A rural authority is distinctly different from a metropolitan authority in a number of ways. For example, there is a greater distance between pick up points (ie., household units) in rural authorities. The dummy variables RURAL and MET (metropolitan) were introduced to control for this. An additional variable LONDON was introduced to capture the fact that London authorities represent a special type of metropolitan authority. For example, for London authorities the distance to disposal sites is much greater than for other authorities.

The density of units, DENS (UNITS per hectare), in the local authority is included as an explanatory variable as a complement to the defined RURAL and MET variables. For two similar authorities (e.g., two rural authorities), the density variable is necessary to capture the difference in sparsity. The lower the density of units, the longer the distances that crew men have to travel and consequently, the higher the cost. All the variables described above are common to both pre-CCT and post-CCT regression cost analyses.

Service Characteristics

Pre-CCT service characteristic indicators are based on the Chartered Institute of Public Finance and Accountancy (CIPFA) annual surveys, while post-CCT indicators are based on the survey carried out by Bello (1994). The difference in the format of the two data sets calls for careful definition.

The CIPFA data was based on a detailed questionnaire sent to all authorities with 80 questions covering all aspects of refuse collection. Given CIPFA's status and the presumed confidentiality of the data, local authorities were prepared to complete the survey. However, once local authorities discovered that this commercially sensitive data was for sale and was actually being supplied to researchers they started refusing to complete the questionnnaire. By the time of the 1988 Act CIPFA were getting virtually no responses. The CIPFA questionnaire asked authorities to provide various indicators of service quality which were used in previous studies. These can be broken down into three categories:

1. Collection methods: BACK (backdoor collection), KERB (kerbside collection), CR (collect and return collection), SKEPS (collection by the use of skeps), SP (special collection of non-standard items) and OTHERM (collection by any other method). The CIPFA surveys provided the percentage of waste that an authority collected by each of the methods.
2. Collection frequency: The variables, FREQL1, FREQ1 and FREQ2 indicate the percentage of waste collected less than once a week, once a week, and more than once a week.
3. Recycling: RVEH (number of vehicles collected in a year), BBANKS (number of bottle banks owned and operated by the authority), and RPAPER (tonnes of paper collected in a year).

In addition this study includes a variable not used in previous studies, FREECONT, which assumes a value of unity if an authority provided containers free of charge.

A detailed survey of the type carried out by CIPFA is no longer feasible, given the commercial sensitivity of the data. However, client managers (these are the individuals within the local authority responsible for administering the contract on behalf of the authority) are prepared to respond to a limited range of questions. Bello (1994) designed a survey as a one page questionnaire sent to all client managers, and asked eight separate questions, each requiring only a tick in a box so as to minimise the effort required by the client manager. These questions covered

1. Collection methods: It was believed that asking for specific percentages of households serviced using a particular method would be unlikely to elicit a response in a significant number of cases.[4] Therefore, authorities were asked to supply the refuse pick-up point from which

the majority of waste was collected. The three most common pick up points were represented by three dummy variables: KERB (kerbside collection), FRONT (front of property collection), BACK (backdoor collection).

2. Collection frequency: In the CIPFA survey there was significant variation in the frequency of collection, since in most cases a small proportion of households were more than or less than once a week. However, given that the post-CCT survey asked only about the frequency for the majority of households, there turned out to be no variation in this variable at all since in all authorities household waste collection takes place once a week for the majority of households.
3. Recycling: The organisation of collection for recycling is represented by three dummy variables. The variable REMRF assumes a value of unity if an authority collects the majority of its recyclable waste through Municipal Recycling Facilities (MRFs; e.g., bottle banks). REIND represents a case in which the majority of materials for recycling is collected from individual properties. REBOTH assumes a value of unity if an authority collects equally from MRFs and individual properties.
4. Customer payments and the provision of containers: The free provision of containers to households is represented by four dummy variables: FREEWBIN (free provision of Wheel bins), FREEBIN (free provision of bins), FREESACK (free provision of containers) and NOCONT (no provision of containers). The dummy variable, FREESP, was introduced to model the effect of free collection of non-standard items on cost.

Market Conditions

In the pre-CCT era, the majority of authorities provided refuse collection service by direct employment, while a relatively few authorities had introduced competitive tendering since 1979. Not all tendering authorities awarded contracts to private contractors: some of the contracts were won by the in-house team. The dummy variables TEND was introduced to model the effect of competition on cost. The variable TEND assumes a unit value if an authority held a tender and awarded the contract to the in-house team. The variable, CONT, was introduced to model the effect of privatisation on cost: the variable is zero except when an authority contracts out more than 10% of its collection service in which case it takes a value of unity.

The 1988 Act made competitive tendering compulsory. However, not all authorities held the competitive tender at the same date. The Act introduced a timetable which in the main has been followed by authorities, and the CDC Contracts Handbook provides information on the start date of all contracts let under CCT. In the regressions a dummy variable DSO assumes a value of

unity if the contract is awarded to the DSO and a value of zero if the service was contracted out to a private sector company. As in earlier studies (e.g., Szymanski, 1993), the issuance of section 13 or 14 notices is used as proxy for the lack of competition. Authorities that are suspected of anticompetitive behaviour by the regulatory authority, the Department of the Environment, (e.g. favouritism toward the DSO when awarding contracts) are issued a section 13 notice which is a formal request for an explanation of the allegedly anticompetieve practice.[5] If the Department considers that the practice was anticompetitive, a section 14 notice is issued requiring the authority to re-tender the service and/or shut down the DSO. The issuance of a section 13 or 14 notice is represented by the dummy variable, ANTICOMP.

In order to allow for the experience of authorities that had voluntarily held tenders before CCT, the dummy variable, CONATEN is introduced. This dummy variable assumes a value of unity for authorities with previous tendering experience. Street cleaning and refuse collection have been combined into a single contract by some authorities. The dummy variable RASC was introduced to allow for the fact that such an authority might report a comparatively higher expenditure figure (although in all cases the net expenditure data refers only to refuse collection). A definition of variables is presented in the Appendix.

ESTIMATION PROCEDURE AND RESULTS

Three sets of regression were run: (i) pre-CCT, (ii) post-CCT and (iii) a combined regression using both pre- and post-CCT data.

Pre-CCT

The 365 English local authorities responsible for refuse collection constitute the population for this study. The CIPFA annual surveys provided most of the data for cost, service level indicators, local conditions and market condition. Data on authorities that had previous tendering experience was that used in Szymanski and Wilkins (1993). The pre-CCT regression was based on the last year for which an authority's data was available because by 1988, only a few authorities were willing to participate in the CIPFA surveys. Over 86% of the data came from either the 1988 or 1987 data set. Year dummy variables were introduced to account for the fact that the data are for different financial years.

Post-CCT

Two sets of post-CCT regression were undertaken. The first set consists of a regression of net expenditure against the independent variables for the

financial year before the contract was signed (year T-1; based on 161 observations), the year in which it started (year T0; based on 156 observations), the first full year (year T1; based on 156 observations) and the second full year (year T2; based on 132 observations) after the start of the contract. The main interest here is to see the year to year changes in coefficients of the variables as the life of the contract advances. Dummy year variables were used to allow for the fact that the data in each of these regressions might belong to different financial years. The maximum number of observations possible in this analysis is restricted to 161 because of the absence of one or more of the following: cost data, service characteristics data, units served data, and contract start date. The decline in the number of observations from 161 in the year prior to the contract to 132 in the second year of the contract is because of the fact that authorities differ in terms of contract start date. For example, the data set for the second year of the contract would only contain authorities that started the contract before April 1991 since the last available cost figure is for the 1993 financial year.

The second set of post-CCT regressions was based on the pooled data for the first three years after the start of the contract (i.e., years T1, T2 and T3). The aim of this pooled regression is to establish the general influence of the different cost variables after the start of the contract. This consists of 366 observations. The first, second and third year after the contract respectively contributing 156, 132, and 78 observations. Financial year dummy variables and dummy variables representing years into the contract were introduced.

A Combined Regression Using Both Pre- and Post-CCT Data

Given the differences in the data on characteristics pre- and post-CCT a full comparison is not easy. However, two service characteristic elements can be obtained for both eras: firstly, whether collection is from the kerbside, the backdoor or from the front of the property, secondly, whether free sacks are provided. In addition to local authority characteristics the combined regressions included time dummies and dummy variables for the number of years since a compulsory competitive tender was held.

All cost figures for both pre-CCT and post-CCT analyses have been inflated using the RPI to December 1994 prices. All the regressions were estimated using ordinary least squares. The results are presented in the next section.

SUMMARY STATISTICS

Table 1 presents the summary statistics of the data by year for income and expenditure, local characteristics and service characteristics. As indicated above most of the data is drawn from the years 1988 and 1987 for the pre-CCT data and 1991, 1992 and 1993 for the post-CCT data. There is some

Table 1

Summary Statistics

	1984	*1985*	*1986*	*1987*	*1988*	*1990*	*1991*	*1992*	*1993*	*All**	*Pop.**
Observations	7	4	34	101	185	12	79	133	142	697	365
Units (000)	73.6	47.9	68.2	54.8	49.4	40.6	51.6	50.7	52.6	52.3	56.6
Total expend**	2470	1561	2547	1772	1678	1120	1505	1401	1522	1628	
Total income**	295	191	346	216	242	210	306	271	312	270	
Net expend**	2175	1370	2201	1556	1436	910	1199	1130	1210	1358	–
London (%)	0	0	12	9	7	8	4	5	6	7	9
Met (%)	43	0	29	16	12	8	10	11	13	13	19
Kerb (%)	27	25	14	18	23	25	24	20	18	20	–
Front (%)	29	0	5	5	7	17	19	20	23	13	–
Freecont (%)	29	25	32	18	25	58	66	65	65	43	–
DSO (%)	–	–	–	–	–	42	68	73	75	–	–

Notes:

* *All* refers to all observations in the sample and *Pop.* refers to the population of 365 English local authorities.

** £000 (1994).

evidence that the sample over-represents the smaller, rural authorities but there is still a significant proportion of urban councils included. Where pre-CCT data for 1987 and 1988 was not available earlier years were used. In the regressions a separate estimate excluding the earlier years was carried out and not found to produce significantly different results. The data also indicates the trend in collection point (kerbside collection, collection from the front of property and backdoor collection) and the free provision of containers. The former is discussed in more detail below. The data indicates a significant increase in the provision of free containers. Before CCT around 25% of all authorities issued free containers to households. Since the introduction of CCT this figure has risen to about 70%.

Table 2 gives the profile of collection costs from the last year before its introduction to the second year after. The table indicates that there was a steep decline in average net collection costs following the introduction of CCT, and although the panel is unbalanced there is no evidence of any systematic difference in the reporting authorities. Net expenditure fell by about 22% between year T-1 and year T1. This fall was accounted for by a fall in gross expenditure, rather than by increased income, which in fact remained static. The results clearly indicate that there has been a significant fall in costs in the year following the holding of a competitive tender under the 1988 Act. The change in cost between year T1 and year T2 is negligible (about 1.6%).

Table 3 illustrates the change in collection methods over the last decade. Pre-CCT the secular trend away from backdoor toward kerbside collection was clear, and is not surprising given the support for this change from bodies such as the Audit Commission. The 1994 survey indicates that the trend away from backdoor had continued, but that CCT had not produced a dramatic

Table 2

Costs and the Introduction of CCT

Year	*T-1*	*T0*	*T1*	*T2*
Average total expenditure (£000)	1719	1676	1363	1479
Average total income (£000)	238	244	240	303
Average net expenditure (£000)	1481	1432	1123	1176
Average units (000)	50.7	51.0	49.8	50.9
Average net Cost per unit £	28.79	27.96	22.76	23.12
Number of Authorities	170	168	148	85

Table 3

Refuse Collection Methods by Local Authority (%)

Year	*1984*	*1985*	*1986*	*1987*	*1988*	*1994*
Backdoor	77	73	71	69	65	54
Kerbside	19	22	24	25	30	25
Front of property	4	4	4	4	5	21
Other	0	1	1	1	1	–
Observations	299	339	324	295	200	264

change in the proportion using that method (over a six year period the drop was 11 percentage points, compared to a 12 percentage point drop over the previous five years). However, the 1994 survey did indicate that there was a general shift: toward front of property, as opposed to kerbside in terms of method. It is difficult to decide the significance of this change, since in many cases there may be little practical difference between the two options.

Table 4 is a matrix illustrating the changes that have occurred in specific authorities. It illustrates that in the majority of authorities (74%) there was no change comparing 1988 with 1994. However, the greatest number of changes reflected the shifts from backdoor to either kerbside or front of property.

The Pre-CCT Regression

Table 5 reports the pre-CCT regression results. Diagnostic tests for the normality of the error term, the absence of heteroscedasticity, correct functional form, and the absence of autocorrelation were all passed at the 5% significance level Ten variables were significant at the 5% level but the main variables of interest are LONDON, TEND, CONT and KERB. Authorities that contracted out and those that tendered and retained the service in-house

Table 4

A Comparison of Methods: 1988 and 1994 (Number of Authorities)

		1994		
		Kerbside	*Front of Property*	*Backdoor*
1988	Kerbside	47	15	6
	Front of Property	2	8	1
	Backdoor	12	30	127

Table 5

Pre-CCT Regression Estimates

Dependent Variable: Log of Net Expenditure (pre-CCT)			
	Constant	4.21	(0.449)
Authority characteristics	log UNITS	0.92	(0.031)
	Log DENS	−0.02	(0.010)
	Log HOUS	0.03	(0.712)
	MET	0.08	(0.049)
	LONDON	0.14	(0.056)
	CONT	−0.21	(0.036)
	TEND	−0.17	(0.061)
Service characteristics	KERB	−0.0024	(0.00031)
	CR	−0.0003	(0.00056)
	SKEPS	−0.0004	(0.00037)
	SP	0.0038	(0.00281)
	OTHERM	0.0046	(0.00154)
	FREQ2	0.0036	(0.00073)
	FREQL1	−0.0061	(0.00227)
	BBANKS	0.0007	(0.00139)
	RPAPER	0.00003	(0.00002)
	RVEH	0.0004	(0.00013)
	FREECONT	0.09	(0.024)
Time dummies	Y85	−0.046	(0.116)
	Y86	−0.026	(0.077)
	Y87	−0.033	(0.073)
	Y88	−0.029	(0.717)
	R^2	0.917	
	Observations	331	

Note:
Heteroscedasticity consistent standard errors in parentheses.

enjoyed savings of 19% and 16% respectively. London authorities are about 15% more expensive than rural authorities. Authorities that collect from the kerbside side enjoyed a 22% savings pre-CCT. The results are in line with the earlier works of DMT(1986), Szymanski and Wilkins (1993) and Szymanski (1993).

The Post-CCT Regressions

Table 6 presents the post-CCT results. Table 6 indicates that seven variables are significant at the 5% level in the pooled regressions: UNITS, KERB, FRONT, REMRF, DSO, DENS, and FREEWBIN. The pooled regression results suggest that kerbside collection and front of property collection reduces cost by about 15% compared to backdoor collection. This is significantly different from the 25% achievable in the pre-CCT era. One possible interpretation is that the efficiency of backdoor collection has risen over the years while that of kerbside collection has not enjoyed a comparative rise in the same period. The scope for improvements in kerbside collection is rather limited because the operatives only need to pick up refuse that the residents have already placed on the kerbside. On the other hand, backdoor collection is more complex and consequently gives a larger room for improvement. For example, the use of wheel bins might reduce the collection time as operatives only need to wheel bins along to the truck instead of physically lifting them.

The pooled regression indicates that, in the first three years of contract, DSOs are on the average about 13% more expensive than private contractors. The result is perhaps surprising since local authorities are obliged to award tenders to the lowest bidder unless they have good reason based on the ability of the bidder to deliver an efficient service. Despite being more expensive on average, over 70% of contracts let in the post-CCT era have been awarded to DSOs. Since the regressions control for differences in service characteristics it cannot be argued that higher costs reflect higher service standards, at least in terms of service characteristics for which we have data. The implication of this finding is that there is still some room for further cost reductions. The regressions for the individual years suggest that DSOs were 16% and 15% more expensive in the years T1 and T2 respectively. This clearly confirms that the cost differential between DSOs and private contractors observed in the first year by earlier studies (e.g., Szymanski, 1994; and Bello, 1994) persist through the second year of contracts.

The pooled regression results also suggest that collecting recyclable materials from MRFs is about 13% more expensive than collecting from individual properties. Free provision of wheel bins adds about 9% to collection cost. While the units served and the density of units served remained important determinants of cost as in the pre-CCT era, the London variable is insignificant in the post-CCT era. This implies that there is little difference between London and rural authorities in the post-CCT era. This finding suggests that costs have fallen by higher levels in London authorities compared to rural authorities. This finding confirms the work of Szymanski (1993 and 1994) which suggests that the largest cost reductions have occurred in the largest authorities.

The contract year dummy variables, T1 and T2 are not significant at the 5% level which confirms the empirical results that the second year of contract

Table 6

Post-CCT Regression Estimates (Dependent Variable: Log of Net Expenditure (Post-CCT))

	Years	*Pooled (All Years)*	*T−1*	*T0*	*T1*	*T2*
Authority characteristics	CONSTANT	−3.381 (0.510)	−2.930 (0.832)	−3.14 (0.835)	−3.29 (0.810)	−3.42 (0.877)
	Log UNITS	0.969 (0.033)	0.996 (0.058)	0.967 (0.056)	0.937 (0.056)	0.956 (0.059)
	Log DENS	−0.030 (0.009)	−0.006 (0.017)	−0.003 (0.016)	−0.019 (0.016)	−0.032 (0.017)
	Log HOUS	0.036 (0.085)	−0.095 (0.137)	0.021 (0.132)	0.077 (0.130)	0.077 (0.139)
	MET	0.072 (0.054)	0.015 (0.093)	0.013 (0.089)	0.090 (0.088)	0.107 (0.096)
	LONDON	−0.016 (0.066)	0.222 (0.106)	0.252 (0.102)	−0.017 (0.101)	−0.063 (0.117)
	CONATEN	−0.044 (0.036)	−0.168 (0.060)	−0.114 (0.058)	−0.014 (0.058)	−0.028 (0.060)
	DSO	0.122 (0.025)	−0.032 (0.041)	−0.058 (0.040)	0.138 (0.040)	0.134 (0.044)
	RASC	0.007 (0.025)	0.040 (0.044)	0.060 (0.042)	0.003 (0.042)	0.008 (0.042)
	ANTICOMP	0.103 (0.071)	0.065 (0.112)	0.100 (0.107)	0.143 (0.106)	0.041 (0.148)
Service characteristics	KERB	−0.164 (0.029)	−0.184 (0.049)	−0.137 (0.048)	−0.137 (0.047)	−0.174 (0.049)
	FRONT	−0.148 (0.027)	−0.139 (0.041)	−0.169 (0.044)	−0.162 (0.043)	−0.132 (0.048)
	REMRF	−0.141 (0.038)	−0.049 (0.064)	−0.097 (0.064)	−0.138 (0.061)	−0.125 (0.066)
	REBOTH	−0.097 (0.053)	−0.159 (0.089)	−0.192 (0.087)	−0.083 (0.084)	−0.079 (0.089)
	FREESP	0.035 (0.021)	0.009 (0.037)	−0.011 (0.035)	0.025 (0.035)	0.026 (0.037)
	FREEWBIN	0.084 (0.026)	0.170 (0.044)	0.232 (0.043)	0.098 (0.042)	0.058 (0.045)
	FREESACK	−0.005 (0.025)	0.005 (0.042)	0.119 (0.041)	0.022 (0.041)	0.007 (0.043)
	FREEBIN	−0.015 (0.068)	0.136 (0.129)	0.080 (0.124)	−0.009 (0.122)	−0.006 (0.122)
Time dummies	Y88		−0.092 (0.168)			
	Y89		−0.057 (0.161)	−0.212 (0.162)		
	Y90	0.104 (0.063)	−0.021 (0.159)	−0.099 (0.156)	0.055 (0.075)	
	Y91	0.038 (0.033)	−0.097 (0.166)	−0.128 (0.157)	0.002 (0.051)	0.048 (0.068)
	Y92	−0.004 (0.025)	−0.007 (0.223)	−0.179 (0.159)	−0.072 (0.054)	0.045 (0.039)
Contract time dummies	T2	0.022 (0.025)				
	T3	0.063 (0.033)				
	R^2	0.844	0.851	0.856	0.828	0.853
	Observations	366	161	156	156	132

Note:
Heteroscedasticity consistent standard errors in parentheses.

is not sufficiently different from the first year of contract. The results of the yearly regressions are consistent with the results of the pooled regression.

The Combined Pre- and Post-regressions

The most striking aspect of this regression (shown in Table 7) is the large and significant negative coefficients on the post-CCT years, T1, T2 and T3. These figures are larger than the simple fall in net cost measured in Table 2 (22% comparing the last full year before CCT to T1). They imply a 34%, 31% and 27% fall in costs following CCT. These estimates are large compared to most of the earlier research. However, where contracts have been let to DSOs the regression indicates that costs are on average 11% higher, still indicating an overall saving due to CCT, but significantly smaller than in cases where they have been awarded to private contractors. The coefficients on the service characteristics are not out of line with the earlier regressions, with kerbside and front of property collection significantly less expensive than backdoor collection. Free containers appear more expensive but not significantly so. The year dummies indicate that there has been a downward trend in the cost of collection up until 1988, but some upward trend since. This may have to do with transition costs associated with CCT. However, even if the cost savings from CCT (T1, T2 and T3) were reduced to take account of the secular increase in cost, the overall saving would still be large and significant.

In regressions not reported here the authors experimented with interaction between the private contractors and the method of collection, to see if the lower cost levels achieved in these cases could be explained by cheaper methods but no significant results were found. However, given that the introduction of a private contractor usually involves a complete reorganisation of the service, this may be a rather crude test.

In the Appendix there are three sets of additional regressions reported. The first set examines changes in income. The average local authority income from refuse collection services (mainly charges to non-domestic properties) rose slightly in the sample (averaging £3.84 per unit before CCT and rising to £4.54 after CCT) but this change cannot account for the much larger change in collection costs and the regressions do not support the view that any great proportion of the cost reductions can be attributed to higher charges. The second set of regressions report the cost per household (rather than the cost per unit). This alternative specification makes little difference to the estimated impact of CCT. The third set uses total rather than net expenditure as the dependent variable. The coefficients are almost identical to those in Table 7.

CONCLUSION

Compulsory competitive tendering in the UK is an important policy experiment in the provision of local services. In the UK alone the market for

Table 7

The Combined Pre- and Post CCT Regression

Dependent Variable: Log of Net Expenditure			
	Constant	−3.01430	(0.34020)
Authority characteristics	Log UNITS	0.95923	(0.02198)
	Log HOUSE	0.01440	(0.06270)
	Log DENS	−0.01075	(0.00801)
	MET	0.07940	(0.03657)
	LONDON	0.13252	(0.05684)
	CONATEN	−0.13968	(0.02764)
	DSO	0.10413	(0.02666)
Service characteristics	KERB	−0.00170	(0.00022)
	FRONT	−0.00105	(0.00032)
	FREESACK	0.02478	(0.01802)
Time dummies	Y85	−0.06355	(0.07408)
	Y86	−0.04777	(0.07459)
	Y87	−0.10221	(0.06589)
	Y88	−0.00228	(0.06537)
	Y90	0.10402	(0.06474)
	Y91	0.05842	(0.03562)
	Y92	−0.00280	(0.02712)
Contract time dummies	T1	−0.40161	(0.07422)
	T2	−0.36047	(0.07194)
	T3	−0.29601	(0.07087)
	R^2	0.861	
	Observations	697	

Note:
Heteroscedasticity consistent standard errors in parentheses.

these services amounts to around £2.5bn per year. The extension of CCT in local government, the civil service and the National Health Service is an important issue in its own right, and could have a significant impact on policy within the European Union. Assessing carefully the gains and losses is an important issue.

This paper is the first to apply systematic data on variations in the characteristics in delivered services to an analysis of the impact of CCT on costs. The results show that there is no evidence that lower costs are due to changes in the specification of services, and indeed no evidence that CCT has brought about any radical shift in the characteristics of the services delivered to consumers. Despite this, costs appear to have fallen significantly. The raw data shows that comparing the last full year before CCT with the first full year after, costs fell on average by 22%. The regression estimates suggest that controlling for other factors such as service characteristics, costs after CCT are between 34% and 27% lower. However, where the service is provided by

the DSO, costs are 11% higher than when it is provided by private contractors. In this market, ownership (private or public) clearly matters.

Because the issues discussed have strong political overtones, we have tried to avoid any speculation as to possible causes of the cost reductions for which we have no data. We have also avoided more detailed interpretation of the difference between DSOs and private contractors. One referee suggested that it was easy to see why DSOs have higher costs, since private contractors cherry-pick attractive authorities, pay low wages, under-bid to gain market share and cut quality of service. This could be true, but on the other hand it could be the case that some authorities oppose the introduction of private sector competition and actively prevent potential bidders entering the market, preserving rents for the incumbents. It could also be that DSOs are failing to introduce efficient management techniques employed by private contractors. The fact is that there is little more than anecdotal evidence available on any of these assertions, and a more systematic study of private and public sector behaviour in services covered by CCT is called for to explain the striking variations which this paper has presented.

APPENDIX

List of Variables

C	Net expenditure. i.e. gross expenditure minus income. Gross expenditure basically covers all contractor costs, cost of employees on the client side, etc. Income comes from charges for the collection of commercial waste, charges for collecting non-standard items, etc. Net expenditure is measured in pounds.
KERB	pre-CCT: percentage of household waste collected from kerbside. post-CCT: dummy variable: = 1, if kerbside is the refuse pickup point for the majority of the households; 0, if otherwise.
FRONT**	dummy variable: = 1, if the majority of waste is picked up from the front of property; 0, if otherwise.
BACK	pre-CCT: percentage of household waste collected frombackdoor. post-CCT: represents the case in which the majority of waste is collected from the backdoor. The variable was used as a benchmark.
CR*	percentage of waste collected by the 'collect and return' method.
SKEPS*	percentage of waste collected by the use of skeps.
OTHERM*	percentage of waste collected by other normal methods; apart from skep kerbside, backdoor, and 'collect and return' collections.
SP*	percentage of special collection.
FREEWBIN**	dummy variable: =1, if free wheel bins are provided to household; 0, if otherwise.
FREEBIN**	dummy variable: = 1, if free bins are provided to household; 0, if otherwise.
FREESACK**	dummy variable: = 1, if free sacks are provided to households; 0, if otherwise.
NOCONT**	dummy variable: non-provision of free containers. This is a benchmark variable.
FREESP**	dummy variable: =1, if non-standard items are collected without a charge; 0, if otherwise.
REMRF**	dummy variable: =1, if an authority collects recyclable materials predominantly from MRFs; 0, if otherwise.

REIND**	dummy variable: =1, if an authority collects recyclable materials predominantly from individual properties; 0, if otherwise.
REBOTH**	dummy variable: represent a case in which an authority collects materials for recycling from MRFs as well as from individual properties. This is a benchmark variable.
MET	dummy variable: = 1, for metropolitan authorities; 0, if otherwise.
LONDON	dummy variable: = 1. for a London authority; 0, if otherwise.
UNITS	the total number of domestic and non-domestic property units in an authority.
DENS	units of household per hectare in a local authority.
HOUS	percentage of domestic units in a local authority.
DSO**	dummy variable: =1 if post-CCT contract was awarded to the Direct Service Organisation (DSO); 0, if otherwise.
ANTICOMP**	dummy variable: =1 if an authority has been served a section 13 and (or) a section 14 notice; 0, if otherwise.
CONATEN**	dummy variable: = 1 if an authority held a voluntarily tender pre-1988; 0, if otherwise.
RASC**	dummy variable: =1 for combined refuse collection and street cleaning contract; 0, if otherwise.
BBANKS**	number of bottle banks operated by authority.
RVEH*	number of abandoned vehicles collected.
RPAPER*	tonnes of paper collected.
FREQL1*	percentage of waste collected less than once a week.
FREQ1*	percentage of waste collected once a week; this is a benchmark variable.
FREQ2*	percentage of waste collected more than once a week.
CONT*	dummy variable: =1 if service was contracted out pre-CCT; 0, if otherwise.
TEND*	dummy variable: =1 if service was tendered and awarded to the in-house pre-CCT; 0, if otherwise.
Y84,..Y93	dummy variables for financial years between 1984 and 1993.
T1,...T3**	dummy variable for the first full year of contract to the third full year of contract.

** Used exclusively for post-CCT analysis.
* Used exclusively for pre-CCT analysis.

Some Alternative Specifications

Table 7a

Pre- and Post-CCT Regression with Net Income From Refuse Collection as the Dependent Variable

This regression examines whether there is any systematic relationship between CCT and income from refuse collection services. This is an important consideration since it is possible that falling local authority net expenditure could simply have been caused by raising charges. As mentioned in the text, income in the sample did increase by around 18% comparing the pre- and post-CCT data, but since income is small relative to total expenditure, this effect cannot account for the absolute falls in net expenditure. The regressions show that apart from the number of non-domestic units in the authority (Log COMM) and the total number of units there is almost no statistical relationship between income and the variables included in Table 7. In the first year after the introduction of CCT there is a fall in income which is statistically significant at the 5% level, but given that the *t*-statistic is on the borderline of significance and that there is no significant effect in subsequent years, this result should be interpreted with caution.

Dependent Variable: The Log of Real Local Authority Income From Refuse Collection

	COMM Specification		*Units Specification*	
Constant	0.06846	(0.72160)	−5.75740	(1.55500)
Log COMM	0.23306	(0.07995)		
Log UNITS			0.84124	(0.14540)
Log DENS	0.22167	(0.05071)	0.18897	(0.04865)
MET	1.21590	(0.24750)	0.70224	(0.27160)
LONDON	0.07945	(0.26720)	0.27275	(0.26680)
CONATEN	−0.52877	(0.18330)	−0.47737	(0.17890)
DSO	0.11086	(0.20410)	0.15559	(0.20240)
KERB	−0.00254	(0.00177)	−0.00317	(0.00174)
FRONT	0.00299	(0.00176)	0.00210	(0.00175)
FREESACK	0.12563	(0.11990)	0.10951	(0.11980)
Y85	−0.03652	(0.60050)	−0.07453	(0.51890)
Y86	0.02691	(0.22880)	0.06188	(0.19650)
Y87	−0.02681	(0.21930)	0.00651	(0.20080)
Y88	0.03626	(0.21130)	0.12368	(0.19290)
Y90	0.30996	(0.40350)	0.50368	(0.40130)
Y91	0.30636	(0.28650)	0.28916	(0.28580)
Y92	0.14289	(0.23140)	0.14600	(0.23010)
T1	−0.71005	(0.34580)	−0.68315	(0.33170)
T2	−0.63536	(0.33680)	−0.60491	(0.32210)
T3	−0.21968	(0.30470)	−0.21425	(0.29060)
R^2	0.274		0.265	
Observations	697		697	

Note:
Heteroscedasticity consistent standard errors in parentheses.

Table 7b

Pre- and Post-CCT Regression Using Households as Measure of Waste Volume

This table reports the alternative specification where net expenditure on domestic refuse collection is estimated as a function of domestic collection units (log DOM). The coefficient is significantly smaller than unity implying increasing returns to scale. When non-domestic units are included (log COMM) the sum of the coefficients is still smaller than unity. Comparing the estimated coefficients in Table 7, the alternative specification makes little difference to either the size or significance of the remaining variables.

Dependent	*Log of Real Net Expenditure*				*Log of Real Net Expenditure Per Household*			
	DOM Specification		*COMM Specification*		*COMM Specification*		*DOM Specification*	
Constant	−1.61460	(0.26090)	−2.00940	(0.23750)	−2.00940	(0.23750)	−1.61460	(0.26090)
Log DOM	0.81662	(0.02523)	0.79565	(0.02469)	−0.20435	(0.02469)	−0.18338	(0.02523)
Log COMM			0.09178	(0.02706)	0.09178	(0.02706)		
Log DENS	0.02855	(0.00900)	0.00669	(0.00991)	0.00669	(0.00991)	0.02855	(0.00900)
MET	0.20147	(0.03916)	0.13083	(0.03830)	0.13083	(0.03830)	0.20147	(0.03916)
LONDON	0.09808	(0.05960)	0.11770	(0.05787)	0.11770	(0.05787)	0.09808	(0.05960)
CONATEN	−0.09830	(0.02948)	−0.11225	(0.03014)	−0.11225	(0.03014)	−0.09830	(0.02948)
DSO	0.14668	(0.02793)	0.12325	(0.02856)	0.12325	(0.02856)	0.14668	(0.02793)
KERB	−0.00178	(0.00026)	−0.00165	(0.00024)	−0.00165	(0.00024)	−0.00178	(0.00026)
FRONT	−0.00109	(0.00035)	−0.00099	(0.00033)	−0.00099	(0.00033)	−0.00109	(0.00035)
FREESACK	0.04737	(0.02075)	0.03153	(0.01892)	0.03153	(0.01892)	0.04737	(0.02075)
Y85	−0.06350	(0.08597)	−0.06519	(0.07241)	−0.06519	(0.07241)	−0.06350	(0.08597)
Y86	−0.00101	(0.07610)	0.01138	(0.07926)	0.01138	(0.07926)	−0.00101	(0.07610)
Y87	−0.06979	(0.06761)	−0.07851	(0.06554)	−0.07851	(0.06554)	−0.06979	(0.06761)
Y88	0.03349	(0.06736)	0.02082	(0.06479)	0.02082	(0.06479)	0.03349	(0.06736)
Y90	0.07292	(0.06471)	0.06683	(0.06328)	0.06683	(0.06328)	0.07292	(0.06471)
Y91	0.04279	(0.03928)	0.04429	(0.03606)	0.04429	(0.03606)	0.04279	(0.03928)
Y92	−0.00981	(0.03003)	−0.00898	(0.02768)	−0.00898	(0.02768)	−0.00981	(0.03003)
T1	−0.39200	(0.07772)	−0.38773	(0.07401)	−0.38773	(0.07401)	−0.39200	(0.07772)
T2	−0.35691	(0.07433)	−0.35216	(0.07158)	−0.35216	(0.07158)	−0.35691	(0.07433)
T3	−0.30100	(0.07303)	−0.29553	(0.07051)	−0.29553	(0.07051)	−0.30100	(0.07303)
R^2	0.819		0.840		0.464		0.393	
Observations	697		697		697		697	

Note:
Heteroscedasticity consistent standard errors in parentheses.

Table 7c

Pre- and Post-CCT Regression with Total Expenditure on Refuse Collection as the Dependent Variable

Comparing with Table 7 there is almost no difference in the size of the estimated coefficients. Together with Table 7a, this can be taken to imply that most of the changes which occurred due to CCT were associated with the expenditure rather than the income side of refuse collection.

Dependent Variable: The Log of Real Local Authority Total Expenditure on Refuse Collection

	COMM Specification		*Units Specification*		*DOM Specification*	
Constant	−3.1133	(0.2544)	−3.1550	(0.2558)	−2.6177	(0.4162)
Log UNITS	0.9527	(0.0250)	0.9671	(0.0244)	0.9804	(0.0232)
Log COMM	0.0151	(0.0090)				
Log DOM					−0.1286	(0.0745)
Log DENS	0.0115	(0.0084)	0.0138	(0.0082)	0.0128	(0.0082)
MET	0.1643	(0.0442)	0.1664	(0.0441)	0.1658	(0.0447)
LONDON	0.1472	(0.0607)	0.1473	(0.0605)	0.1607	(0.0602)
CONATEN	−0.1814	(0.0278)	−0.1790	(0.0277)	−0.1827	(0.0285)
DSO	0.0972	(0.0284)	0.1007	(0.0283)	0.0955	(0.0288)
KERB	−0.0017	(0.0002)	−0.0017	(0.0002)	−0.0018	(0.0002)
FRONT	−0.0009	(0.0004)	−0.0009	(0.0004)	−0.0010	(0.0003)
FREESACK	0.0090	(0.0195)	0.0108	(0.0195)	0.0078	(0.0194)
Y85	−0.0112	(0.0785)	−0.0115	(0.0793)	−0.0093	(0.0770)
Y86	−0.0222	(0.0809)	−0.0235	(0.0803)	−0.0281	(0.0807)
Y87	−0.0653	(0.0741)	−0.0638	(0.0738)	−0.0685	(0.0738)
Y88	0.0380	(0.0745)	0.0407	(0.0743)	0.0338	(0.0740)
Y90	0.0812	(0.0733)	0.0847	(0.0730)	0.0861	(0.0743)
Y91	0.0652	(0.0436)	0.0648	(0.0436)	0.0653	(0.0440)
Y92	0.0045	(0.0325)	0.0044	(0.0325)	0.0044	(0.0328)
T1	−0.3069	(0.0856)	−0.3072	(0.0854)	−0.3076	(0.0854)
T2	−0.2714	(0.0817)	−0.2717	(0.0814)	−0.2724	(0.0814)
T3	−0.1934	(0.0807)	−0.1940	(0.0803)	−0.1942	(0.0803)
R^2	0.860		0.860		0.860	
Observations	697		697		697	

Note:
Heteroscedasticity consistent standard errors in parentheses.

NOTES

1 However, the Act did not extend to local authority services whose annual value is below the £100,000 threshold.
2 Apart from road maintenance services which had been subject to compulsory tendering since 1980.
3 A dissenting study by Ganley and Grahl (1988) highlights some of the difficulties in reaching conclusions on this subject.
4 This might not only be for reasons of commercial sensitivity. In many cases client managers may not believe that they need to know about service methods in such detail.
5 This normally follows a complaint from a disgruntled private sector bidder.

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