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BIG GUYS EAT BIG CAKES: FIRM SIZE AND CONTRACTING IN URBAN AND RURAL AREAS

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ABSTRACT: *A great deal of attention has been devoted to the analysis of different levels of privatization in urban and rural areas. However, until now no empirical study has been conducted on what types of firms are present in different geographical environments. We find that large firms that operate on a national basis dominate the contracts in the most populated and urban municipalities, and these firms seem to have closer relationships with nation-wide political parties. On the contrary, small firms that operate at a local level usually have the contracts in the less populated and isolated municipalities. This market structure may be harmful for competition in both types of municipalities, damaging the likelihood of obtaining cost savings from privatization.*

INTRODUCTION

Local service privatization has been an important policy trend around the world. Private delivery of solid waste collection is now common in many Anglo-Saxon and European countries. Several empirical studies have examined the motivations and consequences of local services privatization.¹ A major motivation for local privatization is service delivery costs savings, although the literature has not consistently shown that privatization lowers costs,² with several studies suggesting that insufficient market competition and market structures prone to concentration hinder privatizing's cost savings.³ Indeed, insufficient supplier competition can be especially problematic in small and rural municipalities, as they usually have fewer numbers of private contractors available.

In markets with structures more prone to competition, that is to say, where conditions for competition are strong and costs of entry are small, the number of competitors actually competing in the market is not a key issue, because potential competitors can enter the market whenever extraordinary profits emerge (Baumol 1982). However, the story is different in quasi-markets such as local public services (Lowery 1998). Where competition *in* the market is not economically efficient, competition *for* the market emerges as a potential source of efficiency improvement in cost reductions (Chadwick 1859; Demsetz 1968). In these markets, the number of actual competitors is important because a low number of bidders for a contract is associated with higher bids and greater probabilities of collusive behavior among suppliers.

Competitive market problems have been prominent in debates about local government services privatization. Previous policy analysis has stressed that weakly competitive markets may fail to deliver expected costs savings and public managers may need to manage their markets to ensure competition (Brown and Potoski 2003; 2004; 2005; Hefetz and Warner 2004; Lamothe, Lamothe, and Feiock 2008; Warner and Hefetz 2008). We contribute to this literature by examining what types of firms are present in refuse (solid waste) collection markets across different geographical environments. Our empirical analysis takes advantage of data from a survey of Spanish municipalities to examine the dynamics of competition in the market of solid waste, which is one of the most important and widespread among local government services. Indeed, solid waste is among the services with the largest impact on local government expenditures, and it has received extensive attention in the literature. Our analyses reveal differences in the type of firms that operate in different geographical environments. Large firms that operate on a national level dominate the market for contracts with highly populated municipalities and municipalities within the same metropolitan area. Conversely, smaller firms that operate at a regional or local level dominate the market for contracts in less populated municipalities and municipalities from rural areas isolated from big cities. Additionally, in these small municipalities and rural areas, the number of firms that bid for the contracts is particularly low so that the scope of competition for the market appears very modest. Overall, results of the empirical analysis suggest both large and small municipalities have insufficiently competitive refuse collection markets, with a large firm dominating the market in each of the large municipalities and smaller firms dominating the markets in smaller municipalities.

Important policy implications emerge from our analysis: public managers may need policy tools to stimulate competition in the market. Managers might segment their jurisdiction into multiple districts (when the dimension of the jurisdiction is large enough so that scale economies are not lost), thereby introducing some yardstick competition within a jurisdiction. Public managers might also recruit new bidders that operate in other geographic areas beyond this jurisdiction to promote spillover effects. Additionally, publicly owned units can be encouraged to compete for contracts outside their own jurisdiction, so that the number of available external vendors increases.

The rest of the article is organized as follows. Next, we provide some background on market structure, concentration, and competition problems in municipal service

delivery, and then we review studies related to our object of study and our empirical analysis. We then explain the characteristics of the survey from which data are obtained and examine results of the survey concerning the production form and market structure indicators. In the subsequent section, we develop an empirical model to identify local government choices of contract holders and then discuss the results. Finally, we draw our main conclusions.

MARKET STRUCTURE AND CONCENTRATION

There are several reasons why markets differ in their degree of competitiveness: the characteristics of the industry, the conduct of firms (such as collusion among them), and the particular point in time the analysis is carried out (Belleflamme and Peitz 2010). Uncompetitive markets tend to result in a higher degree of market power for firms, which can be defined as the ability to raise prices above the perfectly competitive level. As pointed out by Belleflamme and Peitz (2010), there exist two ways to measure market power. One is to look at the differences between prices and marginal cost. However, marginal costs are often not directly observable and—sometimes—even prices are obscure (as is the case with our empirical analysis below). Another way to measure firms' market power is through indexes that reflect the level of concentration in the market. One type of concentration index is the m -firm concentration ratio. Another, more sophisticated measure is the Herfindahl-Hirschman index, which replaced four-firm concentration ratios in the U.S. merger guidelines since the 1980s. Both types of measures are used in the empirical analysis below.

Seller concentration in a market is likely to be larger in cases where firm-level economies of scale are of stronger size (Martin 2010). Certainly, a larger number of firms in an industry means less firm market power, though maximizing the number of firms does not always increase welfare (Motta 2004). This is particularly so when scale economies are present because of relevant fixed costs. In such a case, a monopoly can be more efficient and welfare-enhancing than a large number of firms, because it allows avoiding the duplication of fixed costs. Nonetheless, the observed levels of industry concentration, particularly in manufacturing, tend to be much larger than required to fully exploit economies of scale (Scherer 1974; 1979). Hence, scale economies alone do not explain observed concentration levels.

Some local services are subject to scale economies; such is the case of solid waste collection, and because of this efficient waste collection tends towards some degree of monopoly, as pointed out in works such as Antonioli and Filippini (2002) and Willner and Parker (2007). This being said, scale economies in this service may be of relatively limited relevance and become fully exploited as population grows (Stevens 1978; Bel and Costas 2006). More important, even if competition *in* the market is inefficient, competition *for* the market can contribute to improve welfare by limiting monopolistic profits when a monopolistic contract is awarded for a time period. In such markets, the number of actual competitors is a relevant issue, because a low number of bidders for the contract is sometimes associated with a lower likelihood of low-cost bids and a higher likelihood of collusive behavior among firms.

CITY DIMENSION, MARKET SIZE FOR PRIVATE VENDORS, AND PRIVATIZATION

While little research examines the relationships among service privatization, competition, and costs,⁴ beginning with Ferris (1986), several studies examine whether local governments would use contracting more often if the potential number of vendors is higher.⁵ More recent studies using more robust techniques and wider samples of U.S. municipalities have also tested service delivery choices of local governments distinguishing between rural and urban municipalities (Warner and Hefetz 2002; 2003; Brown and Potoski 2003; Walls, Macauley, and Anderson 2005; Warner 2007; Levin and Tadelis 2010). Warner and Hefetz (2002) and Warner (2007) develop a discriminant analysis for several local services to show that privatization of for-profit firms is highest among suburbs of metropolitan areas, while public production is more common in core metropolitan cities and rural areas. Warner and Hefetz (2003) obtain similar results by estimating probit multivariate regressions.

Brown and Potoski (2003) argue that transaction costs from contracting may be higher in less competitive markets since local governments may not have the information on prices and quality provided by different firms in the successive bids for the contract. In this regard, they consider that local markets should be more competitive in more populated and metropolitan areas with a larger number of potential contract partners. Their empirical analysis shows that, within metropolitan areas, contracting is more likely in smaller municipalities. Indeed, the largest governments contract less often, perhaps because the governments themselves can exploit scale economies. Regarding non-metropolitan areas, they find that contracting is more likely in larger municipalities since they are not large enough to exploit economies of scale and they have more potential vendors than smaller rural areas.

Walls, Macauley, and Anderson (2005) estimate a multinomial logit to identify the determinants of organizational forms in residential waste management and find that suburbs are more prone to contract with for-profit private firms than rural areas and there is a prevalence of internal production in central cities. They suggest that historical facts may explain that result. Levin and Tadelis (2010) develop a theoretical model with an empirical application to explain the determinants of privatization controlling for several service and city characteristics. They show that large and urban municipalities do more contracting since they face fewer contract difficulties than small and rural municipalities face. Their analysis indicates that contract difficulties in small and rural areas are due to the fact that these municipalities face a thin market of external providers.

In a recent paper, Lamothe, Lamothe, and Feiock (2008) check as well the hypothesis that delivery contracts should be more likely in areas where markets are more competitive. To test their hypothesis they use—as other studies do—a dummy variable indicating whether the city is located in a metropolitan area. Interestingly, they also use a variable indicating the total number of private service firms in the county where the city is located. While the metro variable shows no significance, the number of total private firms is positively and significantly associated with contracting out,

although the effect is not particularly strong. Lamothe, Lamothe, and Feiock (2008) emphasize that the small effect they find could be attributed to the fact that they consider the total number of private service firms, rather than the actual number of potential vendors for each service.

To sum up, a great deal of attention has been devoted to the varying intensity in the use of contracts by governments for service delivery in central cities, suburbs, and rural areas. However, previous works do not examine what types of firms are present in different geographical environments, although this issue has important implications for the available options for local governments when deciding whether to contract out. Next, we test a new hypothesis that relates to a different (but equally distressing) competition scenario in large and urban municipalities in comparison to small and rural areas. We expect that the major firms control the largest and more profitable contracts, while the typical market structure for small municipalities is a local monopoly with very few players in the successive bids for contracts.

DATA AND SOURCES

Most data used in our analysis was obtained from a survey on local services production, conducted by the University of Barcelona and the Catalanian Competition Commission in the Spanish Region of Catalonia through late 2006 and 2007. The questionnaire asked about different organizational aspects, such as production form (i.e., public internal-bureaucracy, publicly owned firm, mixed public-private firm, or private firm),⁶ the name of the firm holding the contract, and the number of firms in the bids for contracts.

The survey produced sufficient information for the year 2006 for 255 municipalities (all data obtained in the survey are available upon request). The sample includes 56% of municipalities from Catalonia that have a population above 1,000 inhabitants. As the percentage of answers to the questionnaire is higher for large cities, the population included in the sample represents 82.4% of the total population of municipalities above 1,000 inhabitants, and 80.1% of the total population of Catalonia.⁷ The information obtained from a previous survey for municipalities in Catalonia⁷ at 2000 also allows comparing the dynamics of privatization and concentration in the period 2000–2006.

The urban structure of Catalonia is quite representative of Spain as a whole. The average population of Catalanian cities was 7,542 inhabitants in 2006, whereas average population of the Spanish municipalities was 5,513. These figures are relatively close to those of other southern European countries such as Italy and France, but significantly smaller than that of most countries in central and northern Europe. Private delivery of solid waste is hegemonic in Catalonia, as it is in Spain. The three major firms in the Catalan market for solid waste (Fomento de Construcciones y Contratas–FCC, Ferrovial-Cespa, and ACS-Urbaser) are the three largest in the Spanish market as well (Bel 2006a). Overall, we believe that the solid waste market in Catalonia is representative of that in the rest of Spain.

THE MARKET STRUCTURE

The proportion of Catalonian municipalities contracting out to a private firm for solid waste services has been high and stable at 81.2% in 2006 and 81.7% in 2000 (Bel 2006b). Concerning the analysis of competition in the market of solid waste collection, we focus on the municipalities where a private firm delivers the service. Municipalities in Spain do not generally participate in the bids for contracts, contrary to other countries like the Netherlands or Norway. In our sample, information on concentration measures refer to 200 municipalities, while data for the number of firms that participate in the bids for the last contract are just available for 154 municipalities.⁸ Note also that the dynamic analysis is done only for 103 municipalities that filled out the questionnaire both in 2000 and in 2006,⁹ so that we can have a homogeneous sample that allows a sound comparison.

The largest firm in the Catalonian market, Fomento de Construcciones y Contratas–FCC, has almost 27% of all contracts, representing more than 47% of the population served by private firms. There are two other major players with market shares higher than 10% both in terms of contracts and in terms of total population: Ferrovial-Cespa with 13% of the contracts and serving almost 15% of the population, and ACS-Urbaser with almost 11% of the contracts and serving 18% of the population. Note that these three firms belong to multinational companies operating across several industries, especially construction activities, and all are prominent in national and even international solid waste service markets.¹⁰ The rest of the firms that operate in this market have very small market shares (lower than 3% of contracts and lower than 1% of population) with their operations confined to only the regional or local levels.

Table 1 reports commonly used measures of industry concentration applied to the Catalonian municipal solid waste market in 2006. To analyze the degree of competitiveness in the solid waste market in Catalonia we can draw on official competition guidelines used in the United States and in Europe. According to the Federal Trade

TABLE 1
Concentration Index for Solid Waste Collection in Catalonia, 2006 ($N = 203$)

<i>Year 2006 (N = 203)</i>	<i>CRI (%)</i>	<i>CR4 (%)</i>	<i>HHI</i>
Contracts	26.6	53.8	0.107
Population	47.4	82.8	0.281
<i>Year 2000–2006 (N = 106) Population</i>	<i>CRI (%)</i>	<i>CR4 (%)</i>	<i>HHI</i>
2000	46.8	78.4	0.268
2006	49.4	84.9	0.308

Source: Authors' from Survey on Local Services.

Note: CR1 is the market share of the leading firm in the market. CR4 is the aggregated market shared of the four leading firms in the market.

Commission and the U.S. Department of Justice, markets can be categorized as unconcentrated (HHI below 0.10), moderately concentrated (HHI between 0.10 and 0.18), and highly concentrated (HHI above 0.18). The European Commission establishes that competition may be considered tough enough in markets with a HHI below 0.20. Table 1 indicates that the considered market is highly concentrated in terms of population in 2006, which is the relevant measure for solid waste collection. In addition to this, Table 1 shows that concentration has increased by about four or five points in the period 2000–2006, regardless of the measure used.

Table 2 provides market concentration measures separately for metropolitan and non-metropolitan areas in Catalonia. As expected, metropolitan areas have a much higher number of inhabitants. The concentration index is also much higher for these types of municipalities, which can be likely explained by the high proportion of contracts that are won by one of the three largest firms in the market. The low levels of concentration that we find in non-metropolitan areas may be related to the fact that many different firms are winning the contracts in this type of municipalities. Finally, the mean number of firms that have participated in the bids for the contracts is higher in metropolitan areas, although not by a large amount.

Insufficient competition may threaten cost savings from privatization. Market concentration is high in Catalan municipalities with the number of firms in many municipalities bidding for the contracts as low as one or two. In about one-third of the municipalities less than three firms have participated in the bid for the contract. The major firms in this market operate in large municipalities and/or municipalities within metropolitan areas, and these are the municipalities with more competitive solid waste collection markets.

Concentration and dominance of the largest firms in highly populated municipalities, and monopolization of contracts by local firms in small towns likely create a disturbing scenario in terms of competition. In the next section, we examine empirical differences in the competitive scenario in large and metropolitan municipalities in comparison to small and rural municipalities by estimating the factors explaining local government's choices of the winner in the bid for the last contract.

TABLE 2
Data for Urban and Rural Municipalities (Mean Values)

	<i>Metropolitan areas</i> (<i>N</i> = 28)	<i>Non-metropolitan areas</i> (<i>N</i> = 175)
Population	83,412	16,104
Herfindalh-Hirschman (contracts)	0.477	0.080
Herfindalh-Hirschman (population)	0.439	0.179
Number of firms that have participated in the bid in the last contract	3.75	3.12

Note: Data for number of firms refer only to 157 observations (141 observations refer to metropolitan areas, and 16 observations refer to non-metropolitan areas).

THE EMPIRICAL MODEL

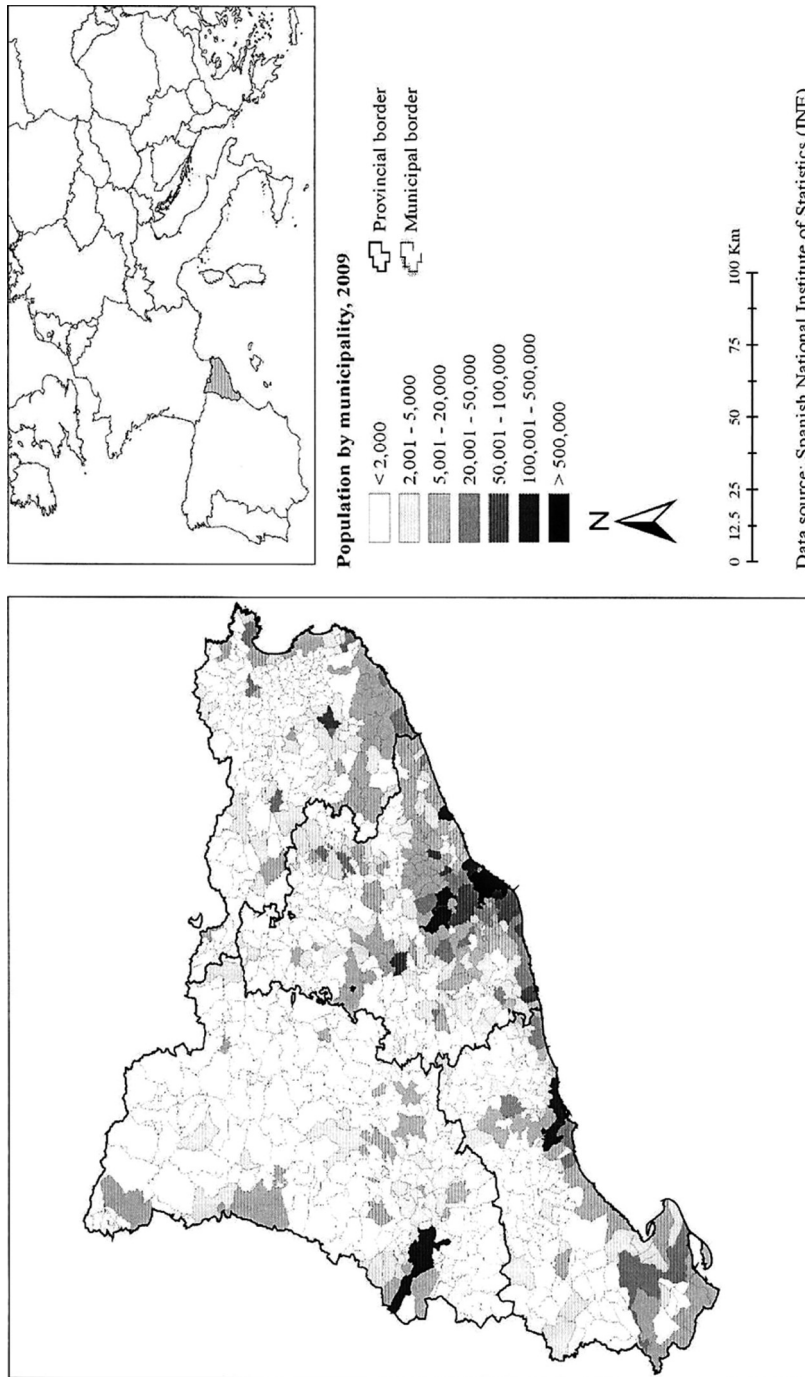
We look to identify the characteristics of municipalities where the firm that won the last contract to deliver solid waste collection is one of the major firms in the market. In our context, it is clear that the major firms are those three firms with a market share much higher than the rest of small private firms that deliver solid waste in Catalonia (as well as in Spain): FCC, Cespa, and Urbaser. We estimate the following equation for the municipalities ($m = 1, \dots, M$) where the delivery of solid waste is undertaken by a private firm:

$$\begin{aligned}
 D_m^{major} = & \alpha + \beta_1 \text{Log}(\text{Population})_m + \beta_2 D^{metropolitan-areas} \\
 & + \beta_3 \text{Number_firms}_m + \beta_4 \% \text{Major_region}_c \\
 & + \beta_5 \text{Economic_activity}_m + D_m^{national-party} + \varepsilon
 \end{aligned} \tag{1}$$

The dependent variable (D^{major}) is a dummy variable that takes value “1” in those municipalities where the last contract to deliver solid waste was won by one of the three major firms of the market, and it takes value “0” in other case.

We include two different variables to capture the effects of city size and the metropolitan status. Note that city size and metropolitan status are both related to the attractiveness of the local market for large firms. First, we include the logged population of the municipality (*Population*). Second, we include a dummy variable that takes the value “1” for those municipalities within a metropolitan area ($D^{metropolitan-areas}$). Note that Europe, in contrast to the U.S., lacks a common statistical definition of metropolitan area. The statistical definition used by Eurostat to define regions, NUTS, divides the economic territory of the countries of the European Union in a harmonized way. A NUTS 2 area has a range of population between 800,000 and 3,000,000 inhabitants, while NUTS 3 areas have a range of population between 150,000 and 800,000 inhabitants. In practice, the statistical territorial units are defined in terms of the existing administrative units in the Member States and do not necessarily meet that population range. In Spain, NUTS 2 are “Comunidades Autónomas” and NUTS 3 are “provincias.” Catalonia meets the NUTS 2 definition and within Catalonia there are four provinces that meet the NUTS 3 definition (Barcelona, Girona, Lleida, Tarragona). Catalonia is also divided into 41 counties. In this context, we consider municipalities within metropolitan areas to be those cities that are part of the county of the capital of each of the Catalanian provinces, that is to say, the province capital cities and their surroundings. Figure 1 clearly identifies the metropolitan areas of Catalonia. In this regard, it shows that municipalities located in urban areas have a relatively high number of inhabitants. We obtain this information from the Spanish Statistics Institute.

We expect that major firms are more interested in winning the contracts for delivering local services in large cities and in cities within metropolitan areas where size of potential contract revenues is higher. Smaller firms that operate at a regional or local level will tend to operate in small towns and municipalities isolated from big cities. Thus, we expect the sign of the coefficient associated with these variables to be positive.



Data source: Spanish National Institute of Statistics (INE)

Figure 1. Population of Municipalities in Catalonia.

The analyses also include a variable for the number of firms that have participated in the bid for the last contract, *Number_firms*. The expected sign of the coefficient for this variable is a priori ambiguous. It may be positive because large firms may be more prone to compete for the contracts involving large amounts of revenues where a major number of players will be involved in the bids. On the contrary, that coefficient may be negative because major firms may have more probabilities to lose the contract the higher is the number of firms involved in the bid.

The analyses also include the variable *%Major_region* indicating the percentage of municipalities in the region in which a major firm is the holder of the contract.¹¹ This variable is intended to capture the influence of the geographical environment on the likelihood that a major firm has won the contract. In this sense, we expect that large firms will look to monopolize geographical areas composed of several municipalities contiguously located. Indeed, the monopolization of geographical areas allows a better exploitation of scale economies due to the aggregation of production of nearby municipalities. Thus, we expect the sign of the coefficient associated to this variable to be positive since large firms will more likely win the contracts in the municipalities of the regions in which they have a major presence.

A variable capturing the strength of economic activity is also considered, *economic_activity*. This variable reflects economic activity by measuring the dimension of economic activity in the city relative to country as a whole. The variable is an index based on the tax revenues' share of the city over the whole country. Here tax revenues refer to local taxes for economic activities. The expectations for this variable are similar to those of the variables of city size and urban status. Indeed, we expect that major firms are more interested in winning the contracts for delivering local services in municipalities with stronger economic activities where the amount of revenues that can be obtained is potentially higher. Data for this variable have been obtained from La Caixa, the largest Spanish savings bank.

Finally, we also consider as a control variable a dummy variable that takes value "1" when the mayor of the municipality belongs to a nation-wide party (*D^{national-party}*). National parties are those parties that have representatives in all regions in the country (the Social-Democrat Party–PSC-PSOE, and the Conservative Party–PP), while the other parties are region-wide with representatives just in the region of Catalonia, or other strictly local parties.¹² In this way, we expect that national parties will have closer relationships with large firms that operate at the national level, while regional and local parties will tend to have closer relationships with smaller firms that operate at a regional or local level.¹³ Hence, we expect a positive sign in the coefficient of the dummy variable associated to the national party. Indeed, the likelihood that a major firm is the contract holder should be higher when the mayor of the municipality belongs to the main national party and such likelihood should be lower when the mayor belongs to the main regional party.

Another aim of our research is to identify changes why some local governments changed who received solid waste contracts between 2000 and 2006. We estimate

the following equation:

$$\begin{aligned} \Delta D_m^{major} = & \alpha + \beta_1 \Delta Population_m + \beta_2 D^{metropolitan-areas} + \beta_3 Number_firms_m \\ & + \beta_4 \Delta \% Major_region_c + \beta_5 \Delta Economic_activity_m \\ & + D_m^{national-party} + \varepsilon \end{aligned} \quad (2)$$

Here we construct a discrete dependent variable with three possible values, ΔD^{major} . The variable takes value “1” if the contract holder has moved from a minor to a major firm in the considered period, value “0” if the contract holder is of the same type in the considered period (e.g., minor or major firm), and value “-1” if the contract holder has moved from a major to a minor firm. From the point of view of a competition analysis, we are more concerned with the move from a minor to a major firm.

Note that we have a sample of 103 municipalities (106 observations, since the city of Barcelona provides four observations) that filled the questionnaire both in 2000 and in 2006. Overall, 86 municipalities implemented a new bidding process (or a renegotiation) between 2000 and 2006. Hence, we estimate changes for these 86 municipalities, which provide 86 observations (since the city of Barcelona did not run a bid within that period). There is a high stability in the type of contract holder across the considered municipalities since only 17 of them have made a change from a minor to a major firm, and only three have made a change from a major to a minor firm.¹⁴ On the contrary, the bidding process in 66 municipalities did not result in a change of the type of firm size.

TABLE 3
Descriptive Statistics ($N = 203$, Year = 2006)

<i>Continuous Variables</i>				
	<i>Mean</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
Population	25,388.64	62,356.84	1,052	401,401
%Major_region	49.08	16.97	0	66.7
Number_firms	3.19	1.43	1	8
Industrial_activity	0.0036	0.0036	7.36e-06	0.023
<i>Discrete Variables</i>				
	<i>Total Observations</i>	<i>Number of Observations with Value 1</i>	<i>Number of Observations with Value 0</i>	
D^{major}	203	101	102	
$D^{national-party}$	203	83	120	
$D^{metropolitan-areas}$	203	28	175	

Note: Data for number of firms available only for 154 municipalities (157 observations).

Source: Authors' from Survey on Local Services.

TABLE 4
Correlation Matrix Between the Variables Used in the Empirical Analysis ($N = 203$)

	D^{major}	Population	%Major_ region	Number_ firms	$D^{national-party}$	$D^{metropolitan-areas}$	Industrial_ activity
D^{major}	1						
Population	0.220	1					
%Major_region	0.350	0.17	1				
Number_firms	0.280	0.22	0.26	1			
$D^{national-party}$	0.360	0.32	0.20	0.29	1		
$D^{metropolitan-areas}$	0.230	0.37	0.15	0.13	-0.01	1	
Industrial_activity	0.029	-0.16	0.11	0.03	0.03	-0.09	1

Note: Data for number of firms refer only to 157 observations.

Following equation (1), we use as explanatory variables of equation (2) the following variables: the change in population, changes in economic activity, change in the percentage of municipalities in the region with a major firm holding a contract in the period 2000–2006, a dummy variable for metropolitan areas, and the values for 2006 concerning the municipalities with a mayor who belongs to a national party. Note that we are not able to include the change in the number of firms that have participated in the bid in the last contract because we do not have this information for 2000.

Following the previous analysis, the move from a minor to a major firm should be more likely in those municipalities that have had a higher increase in population ($\Delta Population$) and in those municipalities with an urban status ($D^{metropolitan-areas}$). These municipalities should be more attractive for the major firms in the market. In the same vein, this move should be more likely in municipalities with a higher level of economic activities ($\Delta Economic_activity$). We expect as well a positive sign for coefficients associated to the other two variables included as explanatory variables: the variation in the percentage of municipalities of the region c in which a major firm is the holder of the contract ($\Delta \%Major_region$), and the dummy variable that takes value “1” when the mayor of the municipality belongs to a nation-wide party ($D^{national-party}$).

Tables 3 and 4 provide descriptive statistics and the correlation matrix of the variables used in the empirical analysis. Note that half of the municipalities of our sample with private delivery have chosen a major firm. In addition to this, a high proportion of the municipalities have a mayor that belongs to a national party.

MODEL RESULTS

Equation (1) is estimated via logit due to the binary nature of the dependent variable. The standard errors are clustered by province (NUTS 3 following the statistical definition of Eurostat).¹⁵ We make two different estimations of the equation for factors explaining local government choices of the contract holder. First, we estimate equation (1) including all the variables. Note that data for the number of firms opting for the contract is not available for all the municipalities of our sample, so that we also estimate equation (1) a second time excluding the number of firms as explanatory variables.

Table 5 shows the results of the different estimations of equation (1). We report the coefficient estimated and the marginal effects that indicated the effect of a one unit change in each explanatory variable on the probability of scoring a one in the dependent variable. The overall explanatory power of the regressions is reasonably good,¹⁶ while all the variables have the expected signs although the variable for economic activity is not significant.

The results reported in Table 5 indicate that major firms are more likely to hold solid waste contracts in large and metropolitan municipalities, and in those municipalities in which more firms have participated in the bid for the last contract. Indeed, the sign of the variable for number of firms is positive and statistically significant,

TABLE 5
Estimates of the Equation (Logit). Period: 2006. $N = 203$

	<i>Specification (1)</i>		<i>Specification (2)</i>	
	<i>Coefficients</i>	<i>Marginal Effects</i>	<i>Coefficients</i>	<i>Marginal Effects</i>
Log(Population)	0.330 (0.130)**	0.820	0.28 (0.180) ⁺	0.070
D ^{metropolitan-areas}	0.600 (0.700)	0.140	1.64 (1.020)*	0.350
Number_firms	0.190 (0.100)*	0.040	—	—
%Major_region	0.022 (0.009)**	0.005	0.03 (0.009)***	0.008
Economic_activity	30.570 (34.730)	7.600	22.89 (26.060)	5.720
D ^{national-party}	1.180 (0.230)***	0.280	1.21 (0.180)***	0.290
Intercept	-5.280 (1.020)***	—	-5.07 (1.350)***	—
N	157		203	
Pseudo R^2	0.19		0.21	
χ^2 (joint sig.)	43.21***		57.91***	
Log pseudolikelihood	-87.16		-111.75	

Note: Standard errors in parentheses (robust to heteroscedasticity and clustered by province). Significance at 1% (***), 5% (**), 10% (*), 11% (⁺). Marginal effects are evaluated at sample means.

while the sign of the variables for population and metropolitan status are also positive and generally significant. The marginal effects obtained from the estimation show that the impact of the variable of population in the probability that major firms win the contract is relatively high when we consider the number of firms as explanatory variable, and the impact of the dummy variable for metropolitan areas is relatively high when we do not consider the number of firms as explanatory variables.

Note that the variables of city size and urban status are correlated and the joint estimation may provoke problems of multicollinearity, and hence it may distort the identification of the individual effects. Indeed, the variable of urban areas shows a higher statistical significance in analyses excluding the population variable while the population variable's coefficients tend to be similar when urban status is excluded. In any case, the analyses suggest that major firms focus their operations in large and urban municipalities. It seems that the variable of population captures better this effect when we include the number of firms as explanatory variable, and the dummy variable of urban status captures better this effect when we do not include the number of firms as explanatory variable. Although a higher number of firms participate in the bids for the most profitable contracts, the three major firms are usual bidders. Given that the average number of bidders is below four even in the largest municipalities, this suggests the existence of a highly oligopolistic sector in this segment of the market.

Smaller regional or local firms are more likely to be the contract holders in small municipalities that, in turn, do not receive many offers in the bids for the contracts.

Such smaller firms may work as a local monopoly as very few firms (if any other than the incumbent) may be participating in the successive bids for the contract.¹⁷

The results in Table 5 also show that the higher the percentage of municipalities in the region that have chosen a major firm the higher the probability that a major firm is the contract holder in the municipality. Hence, our evidence is consistent with the argument that large firms try to monopolize geographical areas to exploit better scale economies due to the aggregation of production of nearby municipalities. We also find that the coefficient of the dummy variable for a mayor that belongs to the main national party is positive and statistically significant. Thus, we find that the likelihood that a major firm is a contract holder will be higher in those municipalities where the mayor belongs to the main national parties.

Equation (2) is estimated using multinomial logit, with the results displayed in Table 6. As in the previous estimation, the standard errors are clustered by province. We also report the coefficient estimated and the marginal effects.¹⁸

The results in Table 6 show that moving from a minor to a major firm is more likely in those municipalities with higher increases in population, so that major firms are winning contracts in the most dynamic municipalities from a demographic point of view. The marginal effects obtained from the estimation show that the impact of the increases in population in the probability of a move from minor to major firms is relatively high. In a similar vein, this move is more likely in municipalities with higher increases in the levels of economic activity. Note also that variable of urban status is not statistically significant. The move from a minor to a major firm is also more likely when the percentage of municipalities in the corresponding region that has a major firm as a contract holder has also increased in the considered period. This is also the case when the mayor belongs to the main national party. From these

TABLE 6
Estimates of the Dynamic Equation (Multinomial Logit). Period: 2000–2006

	<i>1 (From Minor to Major)</i>	
	<i>Coefficients</i>	<i>Marginal Effects</i>
Δ Population	5.25 (1.80)***	0.62
$D^{\text{metropolitan-areas}}$	-0.46 (0.97)	-0.04
$\Delta\%$ Major_region	1.49 (0.40)**	0.17
Δ Economic_activity	0.54 (0.33)*	0.06
$D^{\text{national-party}}$	1.39 (0.26)***	0.16
Intercept	-3.41 (0.59)	—
<i>N</i>		86
Pseudo R^2		0.20
χ^2 (joint sig.)		18.82***
Log pseudolikelihood		-44.27

Note: Standard errors in parentheses (robust to heteroscedasticity and clustered by province). Significance at 1% (***), 5% (**), 10% (*). Changes from 0 to -1 (major to minor firm): 3 observations. Changes from 0 to 1 (minor to major firm): 17 observations. No change: 66 observations.

results, we can infer that the tendency towards the monopolization of geographical areas is increasing along time, and that relationships between major firms and national parties are becoming even stronger.

It is interesting to note that among the 66 municipalities that did retain the same type of firm size, 29 cities have a major firm delivering the service. However, in seven of these cases, even if the firm size type did not change, the actual firm changed. In this way, Urbaser won five new contracts, FCC lost two contracts overall (FCC won two cities and lost four), and Cespa lost three contracts. First, this shows that some room for competition exists between major firms. Second, we believe it is remarkable that Urbaser (which was not a major player until it won a contract for a district in Barcelona in 1999) seems to have been aggressively competing in the last years. This could be a good outcome of the change in the system of waste management in Barcelona, implemented beginning 2000 (see Bel and Warner 2009), since it helped create a new major player in the regional market. In the same way, it is worth mentioning that by December 2008 the city of Barcelona awarded the new contracts for 2009–2017 to one firm in each district, which means four firms in the city, instead of three (since FCC had the contract in two districts until now). Because of this, we can expect that the new firm in the city, Comsa/CLD, could also become a major player in the regional market, thus increasing competition within the city (yardstick competition) as well as outside the city (spillover effects).

CONCLUDING REMARKS

Empirical studies about the impact on costs of the private delivery of local services do not find a robust and systematically positive relationship between costs savings and privatization. One of the hypotheses put forward to explain this result is the lack of competition in the markets for local services; several studies show that competition rather than ownership is what leads to the efficient production of local services. We show that competition may be soft in solid waste collection both in urban and rural areas and different types of firms operate in different geographical environments. Large firms operating at a national level dominate the market for contracts concerning high-populated municipalities and municipalities that belong to the same metropolitan area. Although the number of firms that participate in the bids for the contracts is higher in these municipalities, major firms seem to win the award process very often. Smaller firms operating at regional and local levels dominate the market for contracts in low population municipalities and municipalities from areas isolated from big cities. In these cases, the number of firms that participate in the bids for the contracts may be particularly low so that the scope of competition for the market is very modest.

Important policy implications emerge from our analyses. Cost savings from privatization require strong competition and public managers need to know and use different tools available to stimulate competition in the market. Certainly, not enough is known about where private providers operate and why and some policies have been shown to foster competition. For example, service delivery can be segmented

into multiple districts, so that more competition can be introduced within a jurisdiction. In the same way, public managers can be active in looking after new bidders that operate in other geographic areas beyond a jurisdiction. Indeed, the case of Barcelona illustrates the opportunities for yardstick competition and spillover effects. In addition to this, publicly owned units can be encouraged to compete for contracts. Overall, more attention must be devoted to the award contracting procedures to have the maximum number of effective competitors. Only in such a case, tariffs charged by contract holders will be clearly related to the costs of delivering the service.

To conduct our research we have been able to obtain data on number of bids and winners for a sample of around 200 municipalities. Similarly, we have been able to track the bids over time for more than 100 municipalities. This has allowed us to analyze interesting issues related to firm size and contracting in urban and rural areas for the market of solid waste delivery. Extending the analysis to other services in the same region, as well as on the same service in other regions/countries, would enrich the results and improve our capability for generalization. Conducting this extension will require a huge effort since the data needed is not publicly available, and must be obtained by means of specific surveys. We leave this undertaking for future research.

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NOTES

1. A recent and comprehensive review of empirical evidence on motivations of privatization of local services can be found in Bel and Fageda (2007).
2. Recent surveys do not find a systematic superiority of private production (Hirsch 1995; Boyne 1998; Hodge 2000; Bel and Warner 2008; Bel, Fageda, and Warner 2010).
3. For some empirical evidence on that issue, see Bel and Costas (2006) and Dijkgraaf and Gradus (2007a).
4. Empirical evidence about the relationship between privatization, competition, and costs in the delivery of solid waste collection is scarce. However, some studies have found

empirical evidence of the effect of competition on costs for the United Kingdom (Domberger, Meadowcroft, and Thompson 1986; Szymanski and Wilkins 1993; Symanski 1996; Gómez-Lobo and Symanski 2001). Other studies for the Netherlands and Spain have examined how competition conditions influence local services costs. Dijkgraaf and Gradus (2007a; 2007b) show that high levels of concentration imply higher costs in the delivery of local services in the Dutch market. Finally, Bel and Costas (2006) show that contracting out in Spain is a process that converges to a bilateral monopoly to the extent that costs in cities with recent privatization are lower than costs under public delivery, but no significant differences in costs between cities with old privatization and those using public delivery are found.

5. This is so since markets for local services may be more competitive in those municipalities than in rural areas (Morgan, Hirlinger, and England 1988; Ferris and Graddy 1988; Stein 1990; Benton and Menzel 1992; Miranda 1994; Hirsch 1995; Greene 1996; Nelson 1997; Kodritzky 1998).

6. In publicly owned firms (public firms henceforth) the government has control over the organization of the service delivery. However, public firms are managed and organized under private commercial law rules, which means they have wide flexibility regarding crucial factors such as labor organization and inputs purchases. Hence, the autonomy of managers is much greater with a public firm than under bureaucratic delivery. Mixed public-private firms are firms where ownership is divided between the government and the private sector. Usually, the government retains a control stake in the firm, but the firm operates under private commercial law. The private partner tends to be a large firm with a solid position in the market for private production of the particular local service. Warner and Bel (2008) provide a detailed analysis of these organizational forms.

7. Data on the cities that contributed to the 2000 Survey was used in previous studies (Bel 2006b; Bel and Costas 2006).

8. From the 207 municipalities with private production that answered the questionnaire, seven (3%) did not include the name of the firm holding the contract. Hence, we have information on the private firm holding the contract for 200 municipalities. In addition, there are 46 municipalities with private production (22% of all municipalities with private production that responded the survey) that did not report information on the number of competitors in the bids for contracts. Non-respondent cities do not look systematically different from respondent cities in the rest of crucial variables, so we believe our survey does not have non-response bias. Overall, we have information on the name of the firm and on the number of firms participating in the last bid for the contract for 154 municipalities.

9. It is important to note that the number of observations used in the empirical analysis increases in three units since the largest municipality of the sample, Barcelona, has divided the delivery of the service in four districts. Because of this, 200 municipalities in 2006 generate 203 observations. Concerning the comparison between 2000 and 2006, 103 municipalities generate 106 observations.

10. Some of them are active players in foreign markets like the UK (Davies 2007).

11. In our analysis, we have used the seven regions used by the government of Catalonia for purposes of regional planning and policy implementation. Using counties as variable for geographical environment is not possible because Catalonia has 41 counties, and our sample is not large enough to be representative at the county level in all cases, especially in those cases where the county is formed mainly by very small cities and towns. Furthermore, using provinces (NUTS 3 according to the statistical definition of Eurostat) would not allow us to have enough variability for this variable since there are just four provinces in Catalonia.

12. These regional parties are: the regionalist—CiU, the pro-independence party—ERC, and the Eco-socialist party—ICV. Besides these region-wide parties, other municipalities in the sample have a mayor belonging to a strictly local political group.

13. Among other factors that could induce relationships of the type national firm—national party and regional firm—regional party, we can think of issues related to electoral campaign financing, party organization financing, or sharing information on firms by local politicians within the same party. Carr, LeRoux, and Shrestha (2009) emphasize the importance of communication networks created through institutional ties.

14. Some municipalities that were using a single major firm in 2000 are using a “temporary joint venture” (UTE) of firms in 2006. We have been careful to consider as “major” those UTEs led by a major firm in 2006.

15. Choices of one municipality concerning contracts may influence choices made by other municipalities in the same neighborhood, so that random shocks may affect in a similar way municipalities within the same province.

16. The explanatory power obtained in empirical studies on the determinants of local privatization (literature closely related to our work) typically lies between 0.10 and 0.15 as measured by the pseudo- R^2 (Bel 2006a). Recall that we are using the logit technique due to the binary nature of the dependent variable.

17. Note that Table A.1 in the Appendix shows the results of the estimates of an equation of these analyses in which the dependent variable is the number of firms that have participated in the bid for the contract, while the explanatory variables are the same explanatory variables considered in equation (1). Here the estimation is made using an ordered logit. Results of this estimate shows that the number of firms that participate in the bids is higher in municipalities of larger size and located in urban areas. This estimation is not aimed to fully account for all the determinants of the number of firms that opt to the contracts but just to show that the competition environment seems to be different in large and urban municipalities in relation to small and rural municipalities.

18. We present results of the move from major to minor firms in the Appendix since only three municipalities made that move in the considered period.

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APPENDIX: ADDITIONAL ESTIMATES

TABLE A.1

Estimates of the Equation of Number of Firms (Ordered Logit). Period: 2006. $N = 157$

	<i>Coefficients</i>	
Population	0.27	(0.110)***
D _{metropolitan-areas}	0.52	(0.270)**
Economic_activity	38.86	(12.40)***
%Major_region	0.01	(0.005)***
D _{national-party}	0.58	(0.180)***
Intercept	9.06	(1.190)
N	157	
R^2	0.05	
χ^2 (joint sig.)	164.89	***

Note: Standard errors in parentheses (robust to heteroscedasticity and clustered by province). Significance at 1% (***), 5% (**), 10% (*), 15% (+).

TABLE A.2
Estimates of the Dynamic Equation (Multinomial Logit). Period: 2000–2006

	<i>1 (From Major to Minor)</i>	
	<i>Coefficients</i>	<i>Marginal Effects</i>
Δ Population	1.80 (0.67)***	4.31e-12
D ^{metropolitan-areas}	-36.72 (2.08)***	-4.30e-10
$\Delta\%$ Major_Region	-4.92 (4.16)	-2.03e-11
Δ Economic_activity	-1.21 (4.95)	-5.12e-12
D ^{national-party}	-36.15 (0.89)***	-0.00045
Intercept	-1.95 (0.76)	—
<i>N</i>		86
Pseudo <i>R</i> ²		0.20
χ^2 (joint sig.)		18.82***
Log pseudolikelihood		-44.27

Note: Standard errors in parentheses (robust to heteroscedasticity and clustered by region). Significance at 1% (***), 5% (**), 10% (*). Changes from 0 to -1 (major to minor firm): 3 observations. Changes from 0 to 1 (minor to major firm): 17 observations. No change: 66 observations.