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# PRIVATE MARKETS, CONTRACTS, AND GOVERNMENT PROVISION

## What Explains the Organization of Local Waste and Recycling Markets?

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The authors study determinants of market organization of local public services by an examination of one of the most visible services, residential waste management. Using a multinomial logit model and data for 1,000 U.S. communities, the authors explore the effects of political influence, voter ideology, environmental constraints, production costs, and contracting transaction costs on a community's choice of service delivery options. They find that costs are significant in explaining communities' choices. In contrast, few of the political variables are statistically significant. These results hold for both waste and recycling, providing further evidence that local governments emphasize costs when choosing between private and public provision.

*Keywords:* market organization; solid waste; recycling; local public goods

**In this study, we investigate the determinants of market organization of local public services by an empirical examination of one of the most visible of such services, residential waste management. Our objective is to determine to what extent cost factors versus political influences and interest group**

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pressure play a role in local governments' decisions to use public or private provision of services.

Since Adam Smith, economists have recognized that private markets are generally efficient at producing goods and providing services because competition among firms tends to reduce production costs. If, however, scale economies are significant, a single producer may be the most efficient outcome. By competitively bidding a contract to a single private firm, Demsetz (1968) and others have argued that the government can reap the combined benefits of competition during the bidding process with the cost savings from scale economies in production. The early literature on the costs of providing waste collection services emphasized the importance of scale economies and economies of density—that is, average costs that fall as population density rises—and found that contracts were the least-cost approach to collecting residential waste (Kemper and Quigley 1976; Savas 1977; Edwards and Stevens 1978).

Contracts can have costs of their own, however, because of the transaction costs associated with their writing, monitoring, and enforcement. When contracts are incomplete, “hold-up” problems can arise if the contractor owns key assets that are specific to the relationship (Williamson 1979; Hart 1995; Edlin and Hermalin 2000). Holdup problems are exacerbated in situations in which quality concerns or social goals are part of an efficient outcome and thus part of a welfare-maximizing local government's objective function (Hart, Shleifer, and Vishny 1997; Williamson 1999). In the case of waste and recycling services, as environmental objectives have become more and more important, it may have become more difficult for local governments to write and enforce a contract to achieve all of their objectives. Government provision may be the preferred arrangement in these circumstances.

Other observers explain that government provision of many local services continues to exist because government is not concerned with cost-minimization and efficiency in the first place. They argue that satisfying the demands of particular interest groups and maximizing the probability of reelection are more likely to be the key objectives of local decision makers (Stigler 1971; Becker 1983; Boycko, Shleifer, and Vishny 1996).

Whether one believes that governments are concerned with efficiency but contracts are incomplete, or believes that regulatory “capture” and vote maximization more accurately characterize government objectives, a variety of market arrangements could exist in equilibrium. If governments care about costs and efficiency, but variations in transaction costs and population density exist across communities, we are likely to see the full public-private continuum of service delivery methods. Likewise, if some governments attempt to maximize votes or appeal to particular interest groups, but constraints exist

in some locations that limit the extent to which they can do this, a range of options will be chosen. In this study, we attempt to identify the factors—including both measures of costs and political concerns—that can explain local governments' decisions.

To our knowledge, only two studies empirically analyze the determinants of the organization of local waste collection markets (Dubin and Navarro 1988; Bel and Miralles 2003), and no study has looked at recycling.<sup>1</sup> Our findings also add to the general literature on local government service delivery choices and the relative importance of efficiency and cost concerns on one hand, and politics and patronage on the other (Ferris 1986; López-de-Silanes, Shleifer, and Vishny 1997; Nelson 1997). We follow previous research by incorporating measures of cost, voter ideology, and political influence as potential explanatory variables. But we also include a wider set of explanatory variables than earlier studies. For example, we include regulatory constraints facing local governments—environmental constraints, in our case. In addition, this is the first study comparing contracts and government provision that looks at transaction costs by including a measure of asset specificity.

Our results suggest that political factors play little role in the choice of market organization. Rather, the costs of providing waste collection and recycling services, and transaction costs in contracting, appear to be significantly more influential. We also find similarities across waste and recycling, suggesting that communities consider the same factors when making decisions about how to provide both services. The results across the services provide further evidence that costs matter when local governments make choices.

In the next section of the article, we describe patterns of organization of local waste and recycling markets among U.S. communities in 1995, the year of our survey data. The following section discusses results in previous empirical studies of local government choices related to privatization. The next two sections present the explanatory variables that we use in our model and the results of the estimation. The final section provides concluding remarks.

### **PATTERNS IN THE ORGANIZATION OF WASTE AND RECYCLING MARKETS**

The survey data we use in this article show that local governments provide waste collection and recycling services through a variety of market arrangements, ranging from pure public monopoly to a relatively *laissez-faire* approach using several competing private firms. Between these extremes are two types of private monopoly: a contract arrangement between the local

**TABLE 1: Residential Waste Collection, Recycling, and Disposal Service Delivery Methods in 1995 (Percentage of U.S. Communities Choosing Each Option)<sup>a</sup>**

	<i>Curbside Collection</i>			
	<i>Solid Waste</i>	<i>Recyclable Materials</i>	<i>Landfill Disposal</i>	<i>Recyclables Processing</i>
Arrangement				
Government provision	38	40	12	9
Contract	36	42	16	30
Franchise	11	9	3	5
Private	18	16	6	7

SOURCE: Compiled from ICMA survey data (ICMA 1995).

a. Numbers do not add up to 100 because (1) communities may have more than one option, (2) communities may not have the service at all, or (3) communities may have an intergovernmental agreement with a neighboring jurisdiction. For example, 32% of communities have no arrangement for landfill disposal and 19% have an intergovernmental agreement; 30% of communities have no arrangement for recyclables processing and 14% have an intergovernmental agreement.

government and a private firm, and a franchise arrangement whereby the local government awards a single firm the right, usually through a franchise fee, to provide a service in a given area. Conceptually, a franchise and contract are quite similar.<sup>2</sup>

Table 1 shows the percentage of communities that had each of these four types of service provision for residential waste and recyclables collection, waste disposal, and recyclables processing in 1995.<sup>3</sup> The table shows that the most common service delivery methods for collection of either waste or recyclables are government provision and contracts; relatively few communities use franchises or fully private markets. Government collection of waste takes place in 38% of communities in the sample, and government collection of recyclables in 40%. And, according to the survey data, of the 38% of communities that use government employees for residential waste collection, 90% of these same communities also use government employees in recycling. These facts suggest that there are likely to be similarities in collection services for waste and recyclables and perhaps, economies of scope in collection.

The percentage of communities choosing the other three market options are similar for waste and recyclables collection, with the biggest difference showing up in contracts: 42% of communities use contracts for curbside collection of recyclables, but a slightly lower percentage, 36%, use contracts for waste collection.

The processing of recyclable materials looks somewhat different from collection. Table 1 shows that 30% of communities have a contract with a private company to provide processing. Franchise arrangements, government employees, and private provision exist in only a small percentage of communities. As the footnote to Table 1 states, 30% of communities in the sample have no formal processing agreement at all. If the government contracts with a private firm for the collection of recyclables, it may leave the actual processing and sale of the recyclables to that firm without a prescribed arrangement between the government and the firm for those services. The firm, in turn, may either have an arrangement with a third party or process and sell the materials itself. The survey suggests that this may be relatively common across the United States.

The percentages for landfill disposal of waste show a somewhat similar outcome. As the footnote highlights, 32% of communities have no formal arrangement for disposal but rather leave it to the collection contractor to arrange for disposal.

### PREVIOUS EMPIRICAL RESEARCH

The existing literature on local government service delivery methods covers a variety of government-provided services ranging from operation of airports and nursing homes to electricity supply and waste collection and disposal services. The studies have slightly different conceptual views on government behavior. Ferris (1986) argues that contracting is always less costly than public provision because a contractor operating in more than one community can exploit economies of scale in the provision of a service and because competition in private markets lowers costs. He argues that the public provision of some services in some communities is observed because there are interest groups that stand to gain when services are provided with public employees, and these interest groups exert political pressure on elected officials.

Nelson (1997) allows that political forces—what he refers to as “bureaucratic and institutional considerations”—may play a role in governments’ decisions but argues that the transaction costs associated with contracting can be a key reason why governments produce in-house. Cost-minimizing government officials will weigh the costs of bureaucracy against the costs associated with writing, monitoring, and enforcing a contract.<sup>4</sup> Thus, provision of services using government employees can occur when the transaction costs of contracting outweigh the bureaucratic costs of public provision.

López-de-Silanes, Shleifer, and Vishny (1997) also consider transaction costs and highlight the quality and social concerns that may make writing contracts especially difficult. They emphasize, however, the possibility of political patronage and the political ideology of citizenry in government decisions. Under the political patronage theory, local officials are more inclined to use government employees to provide services as a way to earn political favors. Evaluating this theory is the primary focus of López-de-Silanes, Shleifer, and Vishny's empirical analysis.

Dubin and Navarro's (1988) study was the first to focus specifically on waste collection services, and it is also the only study that includes the pure private market as an option along with contracting, franchises, and public provision. Dubin and Navarro assume that cost minimization is a partial objective of local government, but rent-seeking interest group preferences and "public interest" ideological preferences are also factors. They explore the extent to which these factors affect communities' choices of residential waste collection methods. They include some of the explanatory variables included in the three studies noted above, but they ignore the transaction costs and social goals arguments that Nelson (1997) and López-de-Silanes, Shleifer, and Vishny (1997) highlight. Because Dubin and Navarro's data are from 1978, well before the proliferation of curbside recycling programs in the United States, they do not address recycling issues.<sup>5</sup> Bel and Miralles's study (2003) is a more recent study that looks at the choice between public provision and contracting for 90 communities in Catalonia, Spain. The private option and franchises are not included in the study, and the sample size is quite small.

In general, the studies include variables related to the local government workforce, such as information on unionization and salaries; variables describing fiscal constraints imposed by state governments such as limits on intergovernmental contracting, debt limits, and balanced budget requirements; and, in some cases, ideological variables such as voting behavior. Technological cost information is captured in the studies by including population to proxy the extent of scale economies; Dubin and Navarro include population density, expecting waste collection to exhibit economies of density—that is, a decline in average cost with increases in the amount of material collected for a given geographic area (Edwards and Stevens 1978).

Economies of scale in the Nelson (1997) study and economies of density in Dubin and Navarro (1988) are found to be significant determinants of privatization and contracting. Bel and Miralles (2003) also find economies of scale, but these economies are exhausted when population reaches a particular level. These results suggest that technological cost considerations matter to local governments. Ferris (1986), however, does not find any economies of

scale. Nelson uses constructed variables of citizen heterogeneity to capture transaction costs associated with contracting and finds that these variables are significant.<sup>6</sup> Voter ideology is significant in Dubin and Navarro but not in Bel and Miralles or López-de-Silanes, Shleifer, and Vishny (1997). Ferris, Nelson, and López-de-Silanes, Shleifer, and Vishny all find that higher local government salaries make contracting more likely. Fiscal constraints are found to be significant in the Ferris and López-de-Silanes, Shleifer, and Vishny studies—for the most part, tax limits, state government-imposed debt limits, balanced budget requirements, and so forth increase the likelihood of contracting compared with in-house service provision. López-de-Silanes, Shleifer, and Vishny claim that this suggests political patronage forces at work—that is, in the absence of the constraints, local governments would be inclined toward public provision, all else being equal. Bel and Miralles also include a fiscal constraint variable but find that it is not significant. Overall, these econometric studies find some evidence that non-cost-related factors help determine local governments' choices of service delivery methods.

### **AN ECONOMETRIC MODEL OF COMMUNITY WASTE AND RECYCLABLES COLLECTION METHODS**

We use a multinomial logit procedure to estimate the likelihood that a community chooses pure private provision, a contract or franchise, or provision using government employees. We group contract and franchise arrangements together because franchises are used infrequently and are conceptually similar to a contract, and because preliminary results suggested that the results from grouping were not statistically different from treating the two as separate categories. We estimate models for both waste collection and recyclables collection. We use the same explanatory variables in each model and compare the results of the models. If political patronage, interest group pressure, and voter ideology are important, we expect the same variables to affect waste collection decisions as those that affect recycling decisions. Similarly, economies of density in collection affect the collection of both waste and recyclables. It is possible that our environmental constraints and asset specificity variables will affect the two services differently, but we include the same variables in each model and allow the empirical results to determine if that is the case.

Some communities in the sample report more than one service delivery method—for example, 96 communities report collection of residential waste using government employees as well as a contract. We estimate the model



with these dual choices included but focus here on the results for the single choices of private, contract/franchise, and public. Results from the full model are available in our discussion paper (Walls, Macauley, and Anderson 2003).<sup>7</sup>

Some communities report that they do not provide either of the services at all. We originally estimated the multinomial logit model with the *no-service* option included. A Hausman test for systematic differences in coefficients between models that included and excluded the no-service option was insignificant, suggesting that inclusion of the option does not violate the independence of irrelevant alternatives (IIA) assumption associated with the multinomial logit model (Greene 2000). Because we are focusing on the factors that determine the *method* of service delivery, however, and not on the factors that explain whether the service is provided at all, we report results for the model without the no-service option.<sup>8</sup>

The explanatory variables can be grouped into categories, which we discuss below.

#### TECHNOLOGICAL COST VARIABLES

As explained above, it is likely that the collection of both waste and recyclables exhibits economies of density. We include population density as an explanatory variable and expect that higher density will make the private option less attractive relative to the government or a contract/franchise if governments are concerned with cost minimization. Density should not, however, affect a community's choice of government provision versus a contract or franchise.<sup>9</sup>

#### TRANSACTION COST/ASSET SPECIFICITY CONCERNS

When there are key assets that have more value within a relationship than outside it, the party with residual control rights to the asset can potentially exert leverage on the other party (Grossman and Hart 1986). This fact can increase the transaction costs associated with writing, monitoring, and enforcing a contract between the two parties. In our context, key assets include disposal facilities such as landfills and incinerators, as well as recyclables-processing facilities commonly referred to as material recovery facilities (MRFs). Once investments in such facilities have been made, one party or the other—the owner of the facility or the contracted firm hauling materials to the facility—might be able to exert leverage on the other party in the relationship. The fact that this can happen may deter parties from making

the investments in the first place. In the transaction cost economics literature, it is this fact that suggests a need for vertical integration—that is, having a single firm perform the function that, in a world with complete contracts, could be done by two separate firms (Williamson 1979, 1999; Klein, Crawford, and Alchian 1978). An analogous story holds for government provision. If the potential holdup problem is big enough, a government may prefer to perform both functions itself—in this case, waste collection and disposal and/or recyclables collection and processing.

We include two asset specificity variables in the model: a dummy variable that equals 1 if the local government owns and operates a landfill or waste-to-energy incinerator that has been in place more than 5 years and a similar dummy variable to indicate whether the local government owns and operates a MRF. We only include facilities in place more than 5 years to minimize any endogeneity problems with these variables. The survey data show that 54% of communities that have either a government-owned landfill or incinerator, sited more than 5 years ago, use government employees for residential waste collection, and 56% of communities with a government-owned MRF use government employees to collect recyclables. Thus, we expect the probability that a community chooses the public provision option to be higher in communities with such facilities.

#### **FISCAL CONSTRAINTS**

In many states, the state government imposes tax and budgetary limits on local governments. The existence of these limits, in general, hardens city and county budget constraints; López-de-Silanes, Shleifer, and Vishny (1997) argue that this makes contracting of services more likely than public provision. In our model, this effect may make pure private markets more likely than either contracts or government provision. To reflect state-imposed budgetary limits, we include a dummy variable that equals 1 if the state allows local governments to issue short-term debt. The lack of a constraint on government borrowing of this type should make private markets and contracts less likely as a service provision choice than government employees.<sup>10</sup>

#### **ENVIRONMENTAL REGULATORY CONSTRAINTS**

We include two measures of environmental regulatory pressures facing local governments: a dummy variable that equals 1 if the state bans yard waste in landfills and a dummy variable that equals 1 if the state mandates that communities have recycling programs.<sup>11</sup> Although these environmental

regulations are likely to affect government behavior, we do not have strong a priori beliefs about the *direction* of the effects of these two variables on service delivery choice.

#### BUREAUCRATIC CONSTRAINTS AND CONSIDERATIONS

Some states impose a number of constraints on the local government workforce. We include three such variables: a dummy variable that equals 1 if state law requires that a merit system be used for hiring local government employees, a dummy variable that equals 1 if state law forbids political activity by local government employees, and a dummy variable that equals 1 if the state sets a purchasing standard for local governments.<sup>12</sup>

The first two variables could measure the extent of political patronage in local government decision making. Merit-based hiring constrains the kinds of employees that can be hired in local government, and forbidding political activity by local government employees constrains employees' behavior once they are hired. Thus, if patronage explains decision making, government provision of waste and recycling services would be less likely than private or contract/franchise arrangements in communities subject to these constraints, all else equal.

A state-mandated local purchasing standard generally means that communities must use competitive bidding for certain types of services or for purchases of more than a particular dollar amount. If the presence of local purchasing standards is found to lead to more privatization, this could also suggest political patronage forces at work. The possible effect of this variable is less clear than the other two, however, because a purchasing standard constraint could potentially push communities toward a contract even when government provision is the least-cost approach (as could be the case, for example, if the transaction costs of contracts outweighed the bureaucracy costs of government provision).

We include two other variables that relate to local bureaucracy concerns: the percentage of the local government workforce that is unionized and a dummy variable that equals 1 if the local government has a city manager form of government rather than an elected mayor or city council. Like the three dummy variables described above, the city manager variable could also capture political patronage effects. Because managers are not elected officials, they may be less likely to make decisions on a political basis and more likely to make decisions based on costs (Ferris 1986). Thus, under the political patronage hypothesis, communities with managers are less likely to have government provision of waste and recycling services.

If a political influence model explains government behavior, then communities with a higher percentage of government workers that are unionized could be more likely to have government provision. On one hand, unionized workers may exert more influence on local decisions than nonunionized workers. On the other hand, unionized workers tend to be higher paid, so communities that are interested in minimizing costs may be less likely to choose government provision when a high percentage of the government workforce is unionized.

#### **VOTER IDEOLOGY**

We attempt to reflect ideological factors by including a variable that measures the fraction of the population in the surrounding county that voted for the Democrat, Bill Clinton, in the 1996 presidential election.<sup>13</sup> We expect that in communities where a higher percentage of the population voted for Clinton, private market provision of waste and recycling services will be relatively less likely, because Democrats, in general, would be expected to favor various government interventions more than Republicans. We also include per capita income, and this variable may also measure ideological factors. Dubin and Navarro (1988) argue that higher income communities would tend toward private markets because of a reluctance to subsidize through their tax dollars the services of others in the community. We include income in our model but do not have strong a priori beliefs about the sign on this variable.

#### **CONTROL VARIABLES**

Our earlier analysis of the International City/County Management Association (ICMA) data showed that service delivery methods differ among cities, suburbs, and rural areas (Walls, Macauley, and Anderson 2003). In particular, the ICMA data show that fully 71% of central-city communities in metropolitan statistical areas (MSAs) used government provision for waste collection, and 58% of suburban communities used contracts or franchises. Therefore, we include two dummy variables, one to indicate whether the community is in a central city and another to indicate whether the community is in a suburb. The data also suggest regional differences; thus, we include three dummy variables to indicate the census region of the community.

The appendix lists the sources of the data used in the estimation. Table A1 in the appendix shows summary statistics for the explanatory variables.

## ESTIMATION RESULTS

Table 2 shows the results of the estimation. These results suggest that cost factors play a major role in local government decisions. Population density is significant for the private option in both the waste and recycling equations. Communities with higher population densities are less likely to choose pure private market provision relative to either a contract/franchise or public provision. Local government decision makers apparently recognize that as density increases, all else being equal, a single provider is less costly than multiple private firms. We find no significant effect of density on the choice between a contract/franchise and government provision, however. These results are consistent with those of Dubin and Navarro (1988).

The choice of a contractor or franchisee versus government employees is determined, in part, by a different kind of cost: transaction costs. This effect is picked up by the asset specificity variables *landwte* (i.e., landfill or waste-to-energy incinerator) and *MRF*. The greater the extent of these sunk costs by government, the greater the transaction costs associated with contracting, and—if the government is concerned with costs when making these decisions—the more likely is government provision. Our results uphold the theory: we find that the existence of a government-owned and -operated landfill or waste-to-energy incinerator in a community makes government provision of waste and recyclables collection services more likely than either a contract/franchise or private markets. We also find that the existence of a government-owned and -operated MRF makes it more likely that there will be government provision of recyclables collection services.

Table 3 provides some information about the magnitude of the effects of these cost variables. The table shows the marginal effects of changes in *density*, *landwte*, and *MRF* on the probability of each of the service delivery outcomes. Increasing population density by 1,000 persons/square mile, from the mean density of approximately 2,800 persons/square mile, reduces the likelihood of private markets by approximately 2% and increases the probability of either the contract/franchise option or public provision by about 1%. In a given metropolitan area, population densities can vary widely—in Cuyahoga County, Ohio, for example, densities range from around 100 people/mi<sup>2</sup> to 10,000 people/mi<sup>2</sup>.<sup>14</sup> Our results suggest that service provision options are likely to vary with density. Having a government-owned landfill, waste-to-energy incinerator, or MRF in an area reduces the likelihood of using contracts or franchises for the collection of waste and recyclables by 16% to 30%, and correspondingly increases the likelihood of government provision by about the same percentage figures.

**TABLE 2: Multinomial Logit Results for Choice of Market Organization Alternative: Curbside Recycling and Residential Solid Waste Collection**

Variable	Alternative	Waste		Recycling	
		Coefficient	Z statistic	Coefficient	Z statistic
Technological costs					
Density	Private	-0.3483***	-3.97	-0.3534***	-3.60
	Contract/franchise	-0.0153	-0.36	-0.0226	-0.52
Transaction costs					
Landwte	Private	-0.3831	-1.07	-0.0393	-0.09
	Contract/franchise	-0.7021***	-2.64	-0.5167*	-1.70
MRF	Private	-0.3148	-0.42	-0.3944	-0.45
	Contract/franchise	-0.7152	-1.25	-1.7493***	-2.39
Fiscal constraints					
Borrow	Private	-1.2429***	-3.76	-0.7393**	-1.97
	Contract/franchise	0.1303	0.52	0.0445	0.16
Environmental regulations					
Yrdban	Private	0.8630**	2.06	0.5555	1.21
	Contract/franchise	0.3307	1.29	0.5041*	1.77
Stateman	Private	-0.1868	-0.57	-0.4906	-1.28
	Contract/franchise	-0.0234	-0.10	-0.2157	-0.86
Bureaucratic factors					
Polact	Private	0.1386	0.55	-0.2742	-0.95
	Contract/franchise	0.0220	0.12	-0.0869	-0.43
Merit	Private	-0.3956	-1.45	-0.1606	-0.53
	Contract/franchise	0.2275	1.10	0.2321	1.02
Purch	Private	0.3007	1.00	0.3345	1.01
	Contract/franchise	0.3106	1.48	0.5095**	2.16
Manager	Private	0.1534	0.63	0.3095	1.12
	Contract/franchise	0.1138	0.61	0.0522	0.26
Union	Private	-0.0009	-0.24	-0.0006	-0.13
	Contract/franchise	-0.0020	-0.76	0.0008	0.26
Voter ideology					
Election	Private	-0.0276*	-1.79	-0.0286*	-1.68
	Contract/franchise	0.0137	1.41	0.0197*	1.79
Income	Private	0.0062	0.37	0.0068	0.32
	Contract/franchise	-0.0160	-1.18	0.0099	0.62
Control variables					
City	Private	-0.7126	-1.52	0.2439	0.52
	Contract/franchise	-.3863	-1.39	-0.5705*	-1.87
Suburb	Private	0.7740***	2.54	1.5778***	4.43
	Contract/franchise	1.3483***	6.13	1.4237***	5.84
Northeast	Private	0.0891	0.22	-0.7984*	-1.68
	Contract/franchise	-0.6392**	-2.11	-1.2394***	-3.70
South	Private	-4.2939***	-5.56	-4.1312***	-5.17
	Contract/franchise	-0.9894***	-3.66	-0.9469***	-3.17

(continued)

TABLE 2 (continued)

Variable	Alternative	Waste		Recycling	
		Coefficient	Z statistic	Coefficient	Z statistic
West	Private	-0.6402	-1.03	-0.3687	-0.54
	Contract/franchise	0.7626**	1.90	0.8948**	2.01
Constant	Private	1.6535**	1.91	1.0987	1.13
	Contract/franchise	-1.2207**	-1.96	-1.8384***	-2.65
		Number of obs = 980		Number of obs = 912	
		LR statistic = 469.1		LR statistic = 413.6	

NOTE: Coefficient estimates are relative to the public provision alternative.

\* $p < .1$ . \*\* $p < .05$ . \*\*\* $p < .01$ .

TABLE 3: Marginal Effects of Key Independent Variables on Probability of Each Market Organization Option

	Private		Contract/Franchise		Public	
	Waste	Recycling	Waste	Recycling	Waste	Recycling
Density	-0.022	-0.021	0.007	0.005	0.012	0.011
Landwte	-0.003	0.003	-0.157	-0.171	0.156	0.028
MRF	0.002	0.021	-0.155	-0.308	0.160	0.314

NOTE: For the dummy variables, *landwte* and *MRF*, the numbers in the table represent the discrete change in probability of each option as the dummy variable changes from 0 to 1; for the continuous variable, *density*, the numbers in the table represent the marginal change in probability for a marginal change in density (density is measured in 1,000 persons/square mile). All marginal effects are numerically calculated at the means of the independent variables.

Political patronage does not appear to be a factor in local waste and recycling decisions. None of the three variables that are most likely to pick up patronage effects—*polact*, *merit*, and *manager*—is statistically significant. It appears that restricting the political activity of government employees, mandating a merit system for hiring government employees, and the presence of a city manager have no effect on the extent to which communities privatize waste and recycling.

Having a state-mandated local purchasing standard (*purch*) makes it more likely that a community will choose a contract or franchise over public provision of recyclables collection services. It also makes a contract/franchise more likely for waste collection services, although the effect is only significant at the 14% level. A purchasing standard has no statistically significant effect on the choice of pure private markets over government provision. The purchasing standard coefficients could indicate that political patronage

forces are at work—that is, in the absence of the standard, local decision makers would hire government workers to garner political support—but a statistically significant coefficient could just as easily be consistent with cost-minimizing behavior on the part of government. If one accepts that there are transaction costs associated with contracts and franchises and thus that these options are not *always* the least-cost approach, the positive coefficient on the purchasing standard variable could reinforce the view that governments minimize costs. In other words, the state-imposed constraint could simply be pushing local governments away from a cost-minimizing (government) choice and toward the choice dictated by the constraint (a contract or franchise). In any case, we find that the effect holds only in the recycling model.

We also find no support for the “regulatory capture” theory, at least to the extent that our unionization variable can reflect such an effect. The results show that having a higher percentage of unionized workers in the government labor force has no statistically significant effect on a community’s choice of government, private, or contract/franchise provision of waste and recycling services. Thus, we find no evidence that unionized government workers wield their influence to push communities toward government provision.<sup>15</sup>

Voter ideology could be playing a role in local governments’ decisions to some extent. As expected, on one hand, we find that pure private market provision of waste and recyclables collection is less likely in communities in which a higher percentage of voters voted Democratic. On the other hand, we find that a greater percentage of Democrats in a community makes a contract or franchise *more* likely than government provision.

Of our two regulatory variables, only the presence of a ban on yard waste in landfills has a statistically significant effect on communities’ choices. A state mandate that all communities have recycling programs does not affect choices of how to provide either waste or recycling services. The presence of a yard waste ban makes private markets more likely than contract/franchise arrangements and contract/franchise more likely than government provision for both waste collection and recyclables collection. The ban constrains the behavior of the parties responsible for waste management, be they government or private firms. The results suggest that local decision makers would rather let private markets or private contractors address this restriction, all else being equal, rather than incur that extra cost in-house.

Allowing communities to incur short-term debt reduces the likelihood that private markets will be used to provide collection services but has no discernible effect on the choice between contract/franchise arrangements and government provision. This result suggests, then, that the more budgetary



flexibility that local governments have in providing services, the more likely they are to provide those services themselves or contract with a private firm to have them provided, rather than leave them to private markets.

Many of the location control variables are significant. We find that, even after controlling for other factors, suburbs are much more likely than rural areas to have private markets or contract/franchise arrangements for both waste collection and recycling, and the effects are strongly significant. Central city communities are less likely than rural areas to have private markets or contract/franchise provision of waste collection services and are less likely than rural areas to have contract/franchise provision of recycling, but the effects are not as large or statistically significant as those for the suburbs. The prevalence of government provision in central cities and private firms in suburbs appears in part to be a result of historical facts and the patterns of population growth in the United States in the 20th century. Cities in the 18th and 19th centuries used private markets for handling waste but changed over to government provision as concerns over public health grew. In the 20th century, metropolitan areas expanded in land area and grew in population primarily by adding more and larger suburbs. Government solid waste departments often found themselves without the resources to provide waste collection services to those outer areas and, as a result, relied on a ready and willing private sector to do the job (Savas 1981).<sup>16</sup>

All the census regions of the country are as likely to have pure private waste and recycling markets as they are to have public provision, with the exception of the South where private markets are much less likely than public (or contract/franchise) provision. Communities in the West are more likely to have contracts and franchises than are communities in other regions. The Northeast and South regions are less likely to have contracts or franchises than government provision when compared with the North-Central region (the omitted region in the model). We speculate that these regional differences are likely due to historical factors. For example, it is well-known that Western communities historically have relied on the use of contracts and franchises, and that government provision is relatively more common in northeastern states. We do not examine the reasons for these historical differences here.

We find similarities in the waste and recycling econometric results, suggesting that communities largely consider the same factors when making decisions about how to provide the two services. Economies of density, for example, have almost exactly the same effect on waste collection service delivery methods as they do on recyclables collection methods—that is, the coefficients are of almost identical magnitude. The transaction cost variables, *landwte* and *MRF*, also have similar effects in the two equations, with

the only difference being that, as would be expected, the *landwte* variable is more significant in the waste equation and the *MRF* variable more significant in the recycling equation. Likewise, *yrdban*, although significant in both equations, has a coefficient of slightly different magnitude (although the same sign); this is expected, because a landfill yard waste ban has a more direct effect on waste collection than on recyclables collection. The political patronage and political influence variables are similarly insignificant in both equations, whereas the voter ideology variable, *election*, is significant, and its coefficients are almost identical. The regional and city versus suburb dummies have similar effects and statistical significance across equations.

Waste collection and recyclables collection are services with several characteristics in common. Most importantly, the extent of the economies of density, which are probably the most important cost factor, should be roughly the same across the two services. It is reassuring that our results seem to bear this out. And the similarity in the results for the two services provides further evidence that communities consider costs when making service delivery decisions.<sup>17</sup>

The overall explanatory power of the models is relatively low, which is not that unusual for a cross-section study of this type. The pseudo  $R^2$  for the waste equation is 0.19 and for the recycling equation is 0.16; thus, other unobserved factors are important in determining how communities provide waste and recycling services.<sup>18</sup>

## CONCLUSIONS

We use a multinomial logit model to explore the effect of costs, political patronage and regulatory capture, voter ideology, and other variables on a community's choice of market arrangement for waste collection and recycling services. Our study builds on previous studies of the organization of markets for local services in three respects. We assess the importance of transaction costs associated with contracts by including variables that measure the degree of asset specificity. We also include two measures of environmental mandates facing local governments. And although one previous study has looked at waste collection, ours is the first study to examine the determinants of recycling market organization. This is a particularly timely topic for exploration, given the increase in the provision of recycling services throughout the past 20 years and the overlay of many federal and state regulations governing recycling.

We find very little evidence to suggest that political influence and regulatory capture arguments explain government service delivery choices.

Virtually none of the variables we include to capture such effects is statistically significant. These results contrast with previous studies that look at a wider set of government services (Ferris 1986; López-de-Silanes, Shleifer, and Vishny 1997). Our results suggest that local governments are primarily motivated by costs—both the costs of providing the services, as measured by the extent of economies of density in the communities, as well as the transaction costs associated with writing contracts, as measured by the extent of sunk costs of specific assets in the community.

We believe that our results regarding local government decision making are encouraging in at least one dimension—the perspective of economic efficiency. They suggest that government officials consider costs when making choices between public and private options. The fact that managing waste has become a much more complicated exercise makes this finding even more heartening. In future work, study of the organization of the market for processing recyclable materials would be of interest, as would further research into the structure of the waste and recycling contracts that exist between local governments and private firms.

#### APPENDIX DATA SOURCES AND SUMMARY STATISTICS FOR EXPLANATORY VARIABLES

**TABLE A1: Variables, Definitions, and Summary Statistics**

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Income	Per capita income in \$1,000s	15.71	6.96	4.78	72.50
Density	Persons per square mile in 1,000s	2.75	2.19	0.04	19.58
Election	% voting for Clinton in 1996, by county	48.0	9.48	15.73	77.44
Union	% of city employees that are organized	31.30	33.56	0.00	100.0
Stateman	= 1 if state mandates that communities have recycling programs	0.36	0.48	0.00	1.00
Yardban	= 1 if state bans yard waste from landfills	0.59	0.49	0.00	1.00
Manager	= 1 if council-manager form of government	0.60	0.49	0.00	1.00
Borrow	= 1 if state allows local government to issue short-term debt	0.77	0.42	0.00	1.00
Polact	= 1 if state law prohibits political activity by local government employees	0.47	0.50	0.00	1.00
Merit	= 1 if state law requires a merit system for hiring local government employees	0.44	0.50	0.00	1.00
Purch	= 1 if state sets a purchasing standard for local government	0.80	0.40	0.00	1.00

*(continued)*

**TABLE A1 (continued)**

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Landwte	= 1 if local government owns or operates a landfill or waste-to-energy incinerator that has been in place for more than 5 years	0.12	0.33	0.00	1.00
MRF	= 1 if local government owns or operates a materials recovery facility that has been in place for more than 5 years	0.02	0.15	0.00	1.00
City	= 1 if central city of MSA	0.16	0.37	0.00	1.00
Suburb	= 1 if suburb of MSA	0.59	0.49	0.00	1.00
(Independent)	= 1 if independent (not in MSA)	0.25	0.43	0.00	1.00
(Northcentral)	= 1 if in north-central U.S. Census region	0.34	0.47	0.00	1.00
South	= 1 if in south U.S. Census region	0.25	0.44	0.00	1.00
Northeast	= 1 if in northeast U.S. Census region	0.21	0.40	0.00	1.00
West	= 1 if in west U.S. Census region	0.20	0.40	0.00	1.00

NOTE: Parentheses around a variable name indicate that it was the omitted dummy variable category in the models.

In the following paragraphs, we describe our data and the sources that we use. Because of some missing variables or problems with the International City/County Management Association (ICMA) data, the final number of observations for the estimation is slightly less than the full ICMA sample of 1,071 communities. As noted in Table 2, the number of observations for the waste equation is 980, whereas the number of observations for the recycling equation is 912.

The data on market arrangements for the 1,071 communities in our sample are from the ICMA Solid Waste Collection and Disposal survey (International City/County Management Association [ICMA] 1995).

Our 1995 population and density estimates are from the U.S. Census (U.S. Bureau of the Census 2000). We calculate density by dividing population by total land area (U.S. Bureau of the Census 1990).

We derived the variable measuring per capita income from 1990 U.S. Census data (U.S. Bureau of the Census 1992).

The election data measure the percentage voting for the Democratic candidate (Bill Clinton) in the 1996 presidential election by county (Leip 2001).

The union variable measures the percentage of 1987 full-time city workers that are organized (U.S. Bureau of the Census 1991; Inter-university Consortium for Political and Social Research 1993).

The yard waste variable equals 1 if the state bans yard waste (e.g., grass clippings) from landfills, and 0 otherwise; it comes from Steuteville (1995, table 2).

The state mandate variable equals 1 if the state requires that cities have a recycling program; these data come from Steuteville, Goldstein, and Grotz (1993, tables 2-3).

The bureaucratic variables *manager*, *polact*, *merit*, and *purch* are from the U.S. Advisory Commission on Intergovernmental Relations (1993), as is the information on whether the state allows local governments to do short-term borrowing.

The presence of a government-owned landfill, waste-to-energy incinerator, or MRF in the community that was not built in the past 5 years is from the ICMA survey (1995). The various control variables—that is, the city versus suburb and regional dummies—are also from the ICMA survey.

## NOTES

1. Carroll (1995) compares the costs of recycling programs in Wisconsin cities with different market arrangements; Callan and Thomas (2001) examine waste and recycling costs and the extent of economies of scale and scope in Massachusetts communities that use contracts and government provision. Neither study examines the determinants of service delivery choice.

2. They are differentiated from each other in practice in that under a franchise arrangement, the firm directly bills and collects payment from households and businesses. Under a contract, the government bills and collects payments from its citizens, and in turn reimburses the contractor.

3. These data are from the 1995 survey by the International City/County Management Association (ICMA) titled "Solid Waste Collection and Disposal." We note that the 1995 survey includes a disproportionate number of midsized cities and comparatively few small towns; it also overrepresents municipalities in the north-central part of the United States. The survey has not been conducted since 1995; therefore, these are the most recent data available. We focus on residential markets here. For statistics on the commercial sector, see our discussion paper (Walls, Macauley, and Anderson 2003).

4. The costs of bureaucracy include internal monitoring costs and added production costs that result because in-house employees are not residual claimants like outside contractors and thus have little incentive to keep costs down.

5. Dubin and Navarro's objective is to correct a shortcoming in earlier empirical studies of the cost of waste collection services (Stevens 1978; Kemper and Quigley 1976). These studies found government provision to be more costly than contracts but treated the choice of collection method as exogenous. Dubin and Navarro estimate both a model of market organization and a model of costs.

6. Nelson (1997) argues that the more heterogeneous a community's citizens are, the more difficult and costly it is to write a contract; he creates indexes of heterogeneity based on education and age.

7. It is difficult to interpret the coefficients on the explanatory variables for these dual choices. Furthermore, they are a relatively small proportion of the sample—only 7% of communities report two choices for waste, and 16% report two choices for recycling. We omit the very small number of communities that report more than two.

8. The omission of an alternative that does not violate the IIA assumption could potentially lead to inefficient estimates. Inclusion of the no-service option would add at least 18 additional

coefficient estimates to the model (the number of explanatory variables we currently include), however. Thus, it is unclear whether the potential gain in degrees of freedom would be worth the trouble; only 16 communities report having no residential waste collection, and 76 report having no curbside recycling. See Kinnaman and Fullerton (2000) for an analysis of a community's choice of whether to have a residential recycling program.

9. As found by Stevens (1978) and argued again in Dubin and Navarro (1988), economies of scale in waste collection are quickly exhausted in communities and are, therefore, not an important aspect of costs; it is economies of density that are important. Bel and Miralles (2003), using data from Spanish communities, find otherwise. We ran specifications of the model with population as an explanatory variable, however, and confirmed this finding of previous U.S. studies—that is, population was not significant.

10. We experimented with two other fiscal constraint variables: a dummy to indicate whether the state mandates that local governments have balanced budgets and a dummy to indicate whether the state imposes debt limits on local governments. Debt limits applied to nearly 94% of the communities in our sample, and there was not enough variation across communities by service provision type to include this variable. Moreover, debt limits typically apply to loans of more than 1 year, which are probably not a significant factor for waste and recyclables collection services. The balanced budget mandate variable was not statistically significant; our conclusions about the fiscal constraint variables are not sensitive to the inclusion of this variable.

11. Note that a state recycling mandate does not necessarily mean that communities must offer residential *curbside* recycling. The state requirement may be met by offering drop-off services. The exact language of these mandates can vary across states.

12. These variables are from the U.S. Advisory Committee on Intergovernmental Relations (1993) and are from 1993, two years prior to the ICMA survey data.

13. Voting in a presidential election is a somewhat crude measure of ideology, but it is difficult to get other variables that differ by locality.

14. Cleveland is in Cuyahoga County, and the population density of the city is 6,166 persons/mi<sup>2</sup>. These census figures are from Cuyahoga County Planning Commission (n.d.).

15. If unionized workers are more highly paid than nonunionized workers and government minimizes costs, we might expect the coefficients on this variable to be negative—that is, the greater the percentage of government workers who are unionized, the less likely is government provision of waste and recycling services, all else being equal. It is, thus, possible that the insignificant coefficient on this variable indicates that the cost-minimization hypothesis and the regulatory capture hypothesis are both at work, and, across the communities, the effects offset each other.

16. Interestingly, a 1975 survey of 2,052 American cities, discussed in Savas (1977), found results by size of community very similar to what we find in the 1995 ICMA data. In that year, 37% of all communities surveyed had government provision of residential waste collection services, but 73% of cities with populations greater than 250,000 had government provision. In the ICMA data, 38% of all communities (see Table 1) and 71% of central cities have government provision.

17. Without knowing when communities made their arrangements, we cannot say for sure that a community chose, say, a contract for recycling because it had previously chosen a contract for waste collection. Such an outcome is possible but unidentifiable with the ICMA (1995) data, which simply provides a snapshot of the arrangements in place in 1995. The one study that uses data on choices made by communities at the time those choices were made is Bel and Miralles (2003). Callan and Thomas (2001), using data from Massachusetts communities on total costs of waste management (waste collection, transport, and disposal) and total costs of recycling (

collection of recyclables, transport, and processing), find economies of scope across the two services.

18. López-de-Silanes, Shleifer, and Vishny (1997), in their probit and logit estimations of a wide range of government services, report pseudo  $R^2$ 's half this level. Dubin and Navarro (1986) report likelihood-ratio statistics for joint significance of the explanatory variables that are far lower than the levels that we obtain. The LR statistic for our waste collection model is 469 and for the recycling model is 414; both are greater than the chi-square critical value at the 1% level.

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