

BUREAU OF BUSINESS AND ECONOMIC RESEARCH
CENTER FOR ECONOMIC DEVELOPMENT
SCHOOL OF BUSINESS AND ECONOMICS
UNIVERSITY OF MINNESOTA, DULUTH

Working Paper No. 90-10

DULUTH
RESIDENTIAL
GARBAGE COLLECTION
INDUSTRY: A CASE
STUDY OF PRICE
REGULATION

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April 1990

Duluth Residential Garbage Collection Industry: A Case Study of Price Regulation

Introduction

Of all public services, refuse collection has the broadest array of organization structures from purely privately owned and operated to purely municipally owned and operated. In some major metropolitan areas free competition is the regulating force by which efficiency, quality, and stability of service is determined. In other parts of the country various amounts of interventions such as exclusive franchise contracts and licensing with the imposition of price and service regulations are often imposed. In the extreme, local government may provide the service and finance them by general taxation or user's fees.

In the mid 1960's, cities of 50,000 to 100,000 population exhibited the following composition of collection arrangements:¹

1)	municipal (public)	35%
2)	contract	13%
3)	private	12%
4)	municipal and private	23%
5)	other combinations	16%

The trend however, is as cities increase in size, single arrangements--municipal (public), contract, or private collection--declined while combinations of public and private operations increased.² Duluth, by being a larger city in that size category and by moving toward publicly regulated and privately owned industry, fits this trend very closely. This paper will examine the price setting procedures adopted by the City of Duluth as part of their public regulation of the residential garbage collection industry.

Basis for Regulation

The most evident characteristic of this industry is that significant externalities

¹ Dennis Young, How Shall We Collect the Garbage (Urban Institute; Washington, D.C.: 1972), p. 9.

² *Ibid.*, p. 7.

exist for the service. A market externality refers to benefits or costs which are received or imposed on a population outside of the voluntary exchange of the service. In the case of solid waste disposal, if some households have uniformly efficient trash collection while other households are remiss in having their solid waste removed, a substantial pest infestation and accompanying health hazard may be passed on from the household with inadequate service to those households with satisfactory trash removal. Thus, a substantial health hazard has been involuntarily passed from one group of households to another. For this reason, some municipalities may require that all households in their boundaries subscribe to an acknowledged garbage removal service. Duluth has such a requirement.

In addition to the externalities of this industry, the industry may also be a source of significant economies of scale. These economies of scale further reduce the ability of competitive markets to allocate resources efficiently. In Duluth, the economies of scale are significant because of sparse population spread over a large geographic area. Duluth's population estimated in 1987 is 87,000 people down from 92,811 in 1980. This population is spread over 67 square miles of land. The city has 522.37 miles of street with a mean number of stops of 67.70 stops per mile. Based on national averages, the city generates 2.5 tons of garbage per mile per week. The economies of scale, as well as geography, favor a geographic route monopoly as opposed to city wide competitive industry. By increasing their collection density, firms are able to reduce both labor costs and truck operating costs per ton of garbage collected.³ In Duluth, the industry has formed a route cartel where informal arrangements have allocated coherent routes and connected route to individual firms.

The route cartel has reduced labor costs and travel time on the route as well as time to the WLSSD land fill and now its tipping area. Individual firms reported in 1985 survey that truck operating time has been reduced as the result of the

³Ibid., p. 9-40.

consolidation of routes. While the survey did not provide data to support this contention, Table 5 shows estimates that Duluth's cost per ton of residential garbage collection were \$27.13 compared to a national average of \$28.79.

Other economies of scale based on firm size identified on a national basis do not appear significant for Duluth. While Duluth has established an informal cartelized industry through consolidation of routes the industry contains a large number of firms with 21 firms identified in 1985 (See Table 4). A cursory review of Table 4 suggests that the industry has a broad range of small to very small firms. Beyond the consolidation of routes, economies of firm scale have not yet played a significant role in Duluth's industry. The largest firm in the industry employs only six people and uses four trucks representing 12 percent of the industry. The top seven firms in the industry provide 25 percent of the employment and roughly the same percentage of trucks. Economies of route density, however, suggest that the more densely populated areas of the city have lower costs than routes comprised of the more sparsely settled areas of the city.

Price Behavior

The City of Duluth has informally granted a waiver to the industry from geographic competition; however, the city retained the right to directly intervene into the price and service conduct of the industry, since competition is no longer an effective regulating force. In competitive markets, the free interaction of buyers and sellers leads to a full cost price for the service, that is, a price which reflects all of the costs of providing the service, plus a competitive return on capital. In the City of Duluth, the city council sets the maximum price allowed for the service by city ordinance (See Table 15 for a copy of 1984 ordinance). While the ordinance sets the maximum price for the service, in effect, the ordinance provides the exchange the price for the service since all firms in the industry use this ordinance as their base price.

In the past, the city council has felt that it is poorly qualified to act as a public utility regulatory commission and act on requests for industry rate increases. The industry spokesman would often request rate increases based on visible increases in their cost of production such as gasoline price changes, tipping fees from the sanitary land fill or WLSSD or wage increases from unionized labor. The city council would be inundated with data and often conflicting testimony about the impact of cost changes on the fee structure to be imposed on the local citizens. As a result of this confusion, the city council requested that a procedure be established to estimate changes in the garbage fee structure due to changing costs to the industry.

Procedures for Estimate of Garbage Fee from Cost Approach

The process of estimating future garbage fee increases from changes in costs is developed from Table 1. Table 1 breaks out the major cost items of garbage collection. In column one of Table 1 the basic costs of garbage collection are broken out for 1985 in dollars.

As can be seen in this table, vehicle depreciation, for example, is shown in row one column one and is given as \$.778 per month from the total monthly change of \$7.75 maximum curb side fee. Repair and maintenance on average will amount to \$.323 per can. Consumables which include gas, oil, and grease will be \$.692. Total vehicle costs are \$1.793.

Personnel costs are broken into two major costs, wages and salaries and fringe. Wages and salaries are \$3.146 and fringe totals \$.564. Administration costs total 1.00 and include management, insurance, licenses and other.

The total costs of doing business are shown as \$6.544 and have been developed from a complex procedure shown in the appendix. This procedure uses national statistics adjusted for Duluth labor and WLSSD fees as well as the survey of Duluth garbage industry and Duluth customers. In addition, the gross industry

profit and investment have been used to estimate the industries average profits before taxes shown in row 13 column 1. The basic fee for Duluth residential customers with curb side service is currently \$7.75 in 1985.

To estimate the 1986 curb side fee the process begins with the 1985 current fee broken out for each major expense shown in Table 1 column 1, rows 1-17 (See Table 13). The process proceeds by providing the percentage increase in major cost items experienced during the year (see column 2). To determine the dollar increase, column 2 figures are reduced to their decimal equivalent and multiplied by column 1 (for the results see column 3). Finally, the 1986 fee structure is calculated by adding column 1 and column 3 row by row shown as column 4. Column 4 is then used as the base for calculating 1987 fee structure and is reproduced as column 1, Table 2.

The process is illustrated in Table 13 for a hypothetical industry request for fee change based on cost increases occurring in fuel, wage and salaries and WLSSD fees. In this illustration it is presumed that the industry has experienced a 20 percent increase in fuel costs (ie., an energy crises). The industry has been forced to raise wages by 10 percent and WLSSD has increased its fee by 40 percent. Each of these percentages increases are converted to their decimal equivalent and displayed in column 2 of exhibit 1. All other costs and profits are presumed to remain constant.

The dollar increase in the one can curb side fee is illustrated in column 3 by multiplying column 1 by column 2. For example, the 20 percent increase in fuel costs is shown as a \$.1384 increase in consumables, see row 3 column 3. The 10 percent increase in wages is calculated to increase the curb side fee by \$.3145 in wage and salary (row 5) and \$.0564 in fringe benefits. Finally, the 40 percent increase in WLSSD fee would result in a \$.0296 increase in curb side fee.

The 1986 curb side fee is calculated by summing columns 1 and 3 and is shown in column 4. If this calculation were used to establish the fee in 1986, the

curb side fee for one can would be \$3.555. Obviously, this calculation would be rounded to some figure between say \$8.50 and \$8.60. To determine the fee for a second can curb side the cost must at least cover the WLSSD fee. The single can fee plus WLSSD fee would be added. If \$8.50 were the single can fee than \$1.036 or rounding to say \$1.00, the two can fee would be \$9.50.

Summary

These fee estimation procedures have been in effect for five years now. At present, the procedures are undergoing an extensive review with a goal of modifying them to allow for an incentive for recycling. Since the establishment of the system, the fee structure has been modified four times with a minimum of controversy.

It would appear that both the industry and city council are at least somewhat satisfied with the process and results. However, since the original study in 1984 little is known about the level of satisfaction of the customer. Hopefully, this review process will reveal the customers feeling about the garbage collection service, pricing and concerns with future changes.

Table 1Duluth Garbage Collection
Per 20 Gallon Can
At Individual Site
1985

	<u>% of Cost</u>	<u>% Revenue</u>	<u>Individual Revenue</u>
Equipment			
Vehicle Depreciation	11.89		\$.778
Repair	4.94		.323
Consumables Gas & Oil	<u>10.57</u>		<u>.692</u>
Total Vehicle Cost	27.40	23.14	1.793
Personnel			
Wage & Salary	48.08		3.146
Fringe	<u>8.62</u>		<u>.564</u>
Total Personnel	56.69	47.87	3.710
Administration			
Management	6.32		.414
Insurance	2.70		.177
Licenses	1.67		.109
Other	<u>5.22</u>		<u>.341</u>
Total Administration	15.91	13.43	1.041
Total Costs	100.00	84.44	6.544
WLSSD Charge		9.55	.740
Total Cost plus WLSSD Charge		93.99	7.284
Gross Profit		<u>6.01</u>	<u>.466</u>
Total Revenue		100.00	7.750

Source: See Table 2

Table 2

Duluth Garbage Industry
Cost for Residential
Collections

	\$	%
VEHICLE		
Vehicle Depreciation	207,000	11.89
Repair	86,000	4.94
Consumables	<u>184,000</u>	<u>10.57</u>
1. Total Vehicle	477,000	27.40
PERSONNEL		
Wage and Salary	837,000	48.08
Fringe	<u>150,000</u>	<u>8.62</u>
2. Total Personnel	987,000	56.70
ADMINISTRATION		
Management	110,000	6.32
Insurance	47,000	2.70
Licenses	29,000	1.67
Other	<u>91,000</u>	<u>5.22</u>
3. Total Administration	277,000	15.91
Total Costs	1,741,000	100.00
4. Est. WLSSD Charge	<u>682,000</u>	
Total 1+2+3+4	2,423,000	

Note: 26 total vehicles employ 48 people, used 68.75% for residential garbage collection or 17.875 vehicles and 33 persons. Wages = 33 x \$25,362. Equipment costs include vehicle depreciation - amortization for five years at 15 percent interest. Maintenance and repair at 10% of actual vehicle costs and 13 cents per mile for 40,000 miles per year. Vehicle consumable items: tires; one set per year per vehicle at \$350 per set. fuel; \$1.50/gallon assuming 20,000 miles per vehicle and 5 miles per gallon. oil; 150 quarts at \$7.50 per quart.

Table 3

Industry Revenue

<u>Type</u>	<u>Amount</u>	<u>% Return on Investment</u>
Fee for Collection	\$1,916,000	
Fee for WLSSD	<u>682,000</u>	
Total Fees	2,578,000	
Total Costs	2,423,000	
Profits before Tax	155,000	24.88
Est. Tax	75,500	14.84
Profits After Tax	75,500	
Vehicle Investment	508,875	

Source: Total revenue \$7 x 12 x 22,816
Single family residence. Duluth Census
WLSSD Charge, see table
Vehicle investment \$48,915, new price
Average age 5.829 years.
17.875 vehicles or 508,875 tax set. at 50%

Table 4
Duluth Industry

<u>Type</u>	<u>Total¹ Employees</u>	<u>Number² of Trucks</u>	<u>Total Number³ of Customers</u>
Largest Firm	6	4	2,200
Next Largest Two Firms	8	6	2,300
Next Largest Four Firms	12	8	3,800
Remaining	<u>22</u>	<u>15</u>	<u>17,520</u>
Total	48	33	22,820

Source: Survey of Duluth Garbage Collectors, J.P. Consulting, Inc., 1985.

¹Total employees used both residential and commercial collection

²Number of trucks used both residential and commercial collection

³Number of potential customers - number of single family occupied housing in Duluth 1980 Census

Table 5

Duluth Garbage Industry Parameters 1980 Data

Land Area	67.292 sq. miles
Population	92,811
Occupied Housing	35,363
Mean Persons per Occupied Housing	2.6245
Mean Stops per Square Mile	525.52
Mean Stops per Mile of Street	67.70
Mean Number of Persons per Mile	177.68
Garbage per Mile of Stops in lbs. per Week	4975 lbs.
Garbage per Mile In Tons per Week	2.4875
Estimate of National Cost per Ton to Haul in 1985	\$28.79 per ton
Estimate of Duluth Cost per Ton to Haul in 1985	\$27.13 per ton

Source: Duluth 1980 Census; Duluth 1983 Park Report. How Shall We Collect the Garbage? (Using 4 lbs. per day seven days a week per person). (Duluth Total Cost = \$1,723,000, est. total Duluth garbage = 67,752 tons)

Table 6

WLSSD Cost of
Dumping One 20 Gal. Can
Per Week for Average Month

<u>Cost Per Cubic Yard</u>		<u>Volume of Garbage in Can</u>		<u>Average Number of Weeks in Month</u>		<u>Average Cost per 20 Gal. Can</u>
\$5.20	x	.0330 cu yds	x	4.3452	=	\$.7456

Table 7

Estimate of the
Number of Trucks
Needed to Collect
Residential Garbage
in Duluth

<u>Truck Trips Weekly</u>	<u>Trucks Average 2 Trips to WLSSD per Day 6 Days a Week</u>	<u>Three Person Crew or Employment</u>
175.82	14.65 trucks	43.96

Source: Tables

Table 8

Volume of Vehicle
and Garbage Cans

<u>Volume of Vehicle</u>	<u>Estimate Carrying Capacity of Material of Density of (1)¹</u>	<u>Actual Load of Average Vehicle²</u>
18 cu yd	15.17 tons	4.25 tons
20 cu yd	16.86 tons	5.00 tons
25 cu yd	21.00 tons	7.00 tons
one 20 gal can ³	166.87 lbs	55.62 lbs

¹Weight of Water at density of 1 is 62.426 pounds per cubic foot or 1685.50 pounds per cubic yard. See Mark Standard Handbook for Mechanical Engineers

²See Exhibit 5.4
Estimated Average Payloads for Selected Refuse Collection Vehicles, 1974.

³4620 cubic inches or 2.6736 cubic feet or .0990 cubic yards compacted to .0330 cubic yards.

Table 9

Number of Truck
Trips Required to Dispose
of Duluth Garbage Weekly

<u>Estimate Weekly Garbage Tons</u>	<u>Average Pay Load of 25 cu Truck</u>	<u>Truck Trips Weekly</u>
1230.74	7 tons	175.82

Source: Solid Waste Generation: WLSSD

Table 10

Duluth Garbage
Industry Estimate

<u>Estimate of Population</u>	<u>Per Capita Garbage per Day</u>	<u>Total Garbage per Day</u>
87,000	4.04 pounds	351,625 lbs/day 175.82 tons/day

Source: Solid Waste Generation Exhibit 4.5
Average of 24 Waste Shed Districts, applied to Duluth

Table 11

**Estimated Costs for Alternative
Crew-Size and Vehicle-Size Operations**

All Costs in 1974 dollars

Cost Category	Truck Size and Crew Size					
	18 cubic yard		20 cubic yard		25 cubic yard	
	2-man	3-man	2-man	3-man	2-man	3-man
EQUIPMENT¹ Total	10,500	10,500	11,692	11,692	13,150	13,150
Vehicle Depreciation	5,450	5,450	6,292	6,292	6,900	6,900
Maintenance and Repair	2,250	2,250	2,600	2,600	2,850	2,850
Consumable Items	2,800	2,800	2,800	2,800	3,400	3,400
LABOR² Total	25,667	38,278	25,667	38,278	25,667	38,278
Salaries and Wages	19,015	28,355	19,015	28,355	19,015	28,355
Fringe Benefits	3,800	5,670	3,800	5,670	3,800	5,670
Overtime	2,852	4,253	2,852	4,253	2,852	4,253
ADMINISTRATION & OTHER³ Total	7,200	8,600	7,200	8,600	7,200	8,600
Supervision & Management	2,850	4,250	2,850	4,250	2,850	4,250
Insurance & Legal	1,200	1,200	1,200	1,200	1,200	1,200
Licenses & Fees	750	750	750	750	750	750
Other Fixed Overhead	2,400	2,400	2,400	2,400	2,400	2,400
TOTAL ANNUAL COST	43,367	57,378	44,562	58,570	46,017	60,028
COST PER MINUTE	0.36	0.48	0.37	0.49	0.38	0.50
COST PER TON/PER MINUTE	0.84	.113	.074	.098	.054	.071

Source: The source of these data is the Middlesex County Solid Waste Program.

¹Equipment Costs. Vehicle depreciation-amortization for five years at 7 percent interest. Maintenance and repair: 10 percent of initial vehicle cost 5-7 cents per mile for 40,000 miles per year. Consumable Items: tires - one set per year at \$150 per tire; fuel - \$.40/gallon, assuming 20,000 miles per year and five miles per gallon; oil - \$300.00 (150 quarts at \$2.00 per quart).

²Labor Costs. Salaries and wages - average annual salary of \$9.675 for drivers and \$9.340 for loaders based on recent contracts in the region; Fringe benefits - 20 percent of salaries and wages; Overtime - 15 percent of salaries and wages.

³Administration and Other Expenses. Supervision and management - 15 percent of salaries and wages; Insurance - \$100.00 per month; Licenses and fees - \$750.00 per year.

Table 12Minnesota Motor Freight Transportation
and Warehouse Industry

	<u>Establishment</u>	<u>Revenue</u> (000's)	<u>Annual</u> <u>Pay</u> (000's)	<u>Payroll</u> <u>Numbers</u>	<u>Propriety</u>	<u>Park</u>
Industry	2,238	2,320,561	584,277	26,816	908	118
Garbage	241	99,531	23,841	1,398	112	19
per Establishment	1	412,992	per employ 71,195	annual pay 17,054	number 6	

Source: U.S. Department of Commerce, Bureau of Census, 1987 Census of Transportation,

Table 13

Estimate of Expense Impact
on Duluth Garbage
Basic Fee
1986

Column	1	2	3	4
Type of Expense	1985 \$	% of Increase Requested % decimal	\$ of Increase	1986 \$
1. Vehicle Depreciation	\$.778	N/C	\$ -	\$.7780
2. Repair	.323	N/C	-	.3230
3. Consumables	.692	.20	.1384	.8304
4. Total Cost	1.793			1.9314
PERSONNEL				
5. Wages & Salary	3.146	.10	.3145	3.4605
6. Fringe	.564	.10	.0564	.6204
7. Total Personnel	3.710			4.0809
ADMINISTRATION				
8. Management	.414	N/C	-	.4140
9. Insurance	.177	N/C	-	.1770
10. License	.109	N/C	-	.1090
11. Other	.341	N/C	-	.3410
12. Total Administration	1.041	N/C	-	1.0410
13. Total Costs	6.544			7.0533
14. WLSSD Charge	.740	.40	.296	1.0360
15. Total Cost & Charge	7.284			8.0893
16. Gross Profit	.466	N/C	-	.4660
17. Basic Fee	7.750			8.5553
		Approximate range		
		1 can curb	8.50	- 8.60
		Second can		
		2 can curb	8.50 + 1.00	= 9.50

Source: Table 1

Table 14

BY COUNCILOR RODNE:

RESOLVED, that pursuant to the provisions of Section 24-21 of the Duluth City Code, the City Council hereby revises the maximum monthly rates which may be charged for ordinary collection and removals of garbage and other solid waste by collectors licensed by the City based on once-a-week service:

- | | | |
|----|--|--|
| 1) | Up to 20 gallons per week
pick up at curb or alley -- | \$7.75 |
| 2) | Up to 40 gallons per week
pick up at curb or alley -- | 8.25 |
| 3) | Up to 40 gallons per week
pick up at other locations -- | 10.00 |
| 4) | Each additional 20 gallons or
portion thereof per week -- | |
| | a) at curb or alley | add \$.50 to the rate
set forth in 2 |
| | b) at other locations | add \$1.00 to the rate
set forth in 3 |

RESOLVED FURTHER, that collectors may charge a fee of \$.50 to accounts unpaid for a period of 45 days after the original billing date.

RESOLVED FURTHER, that if more than one pickup location is covered by a single billing account, the rates specified herein shall apply to each pickup location; and if more than one billing account covers a single pickup location, the rates charged shall apply to each billing account.

RESOLVED FURTHER, that this resolution shall be effective January 1, 1985, and Resolution 83-0017 is hereby rescinded as of such date.

Approved: December 3, 1984

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