

# Chapter 7

## How to Get Increasing Competition in the Dutch Refuse Collection Market?

E. Dijkgraaf and R.H.J.M. Gradus

**Abstract** For the refuse collection market, it is well-known that concentration increases prices and offsets the advantage of contracting out. The presence of competing public firms might be essential to ensure fair competition. In this chapter we show that increasing competition by public firms decreases prices and can be essential for low prices.

**Keywords** Collection · dynamics · concentration · prices · Netherlands

### 7.1 Introduction

In the nineties, contracting out public services has become an important measure to improve efficiency within the public sector (see for example Savas, 1987). There seems much empirical evidence that especially contracting out refuse collection reduces costs. Domberger and Jensen (1997) conclude that contracting out suggests cost savings of twenty percent. Given these costs advantages the use of private collectors seems scarce. For example, in the Netherlands 38% of the contracts for municipal refuse collection is placed privately (see Table 7.1). For the UK, Netherlands, Sweden and Ireland similar pictures can be given (see Dijkgraaf, Gradus, & Melenberg, 2003).

Therefore, political economy papers have empirically studied the privatization factors of especially refuse collection (see for example López-de-Silanes, Shleifer, and Vishny for the United States, Bel and Miralles (2003) for Spain, Dijkgraaf, Gradus & Melenberg, 2003) for the Netherlands, Ohlsson (2003) for Sweden and

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**Table 7.1** Waste collection in the Netherlands in 2002 and 2006

Collection by:	Observations in 2002		Observations in 2006	
	Number	% of municipalities	Number	% of municipalities
– private firm	183	37	174	38
– public firm	88	18	115	25
– municipal <sup>1</sup>	95	19	64	14
– municipal services <sup>2</sup>	130	26	105	23
Total	496	100	458	100

<sup>1</sup>Cooperation with neighbor.

<sup>2</sup>Only own municipality.

Christoffersen and Paldam (2003) for Denmark). The overall conclusion of this literature is that the privatization decision of the municipality is pragmatic and not ideological. Therefore, other explanations are investigated as well. Another explanation is that the market for refuse collection is monopolized. A high degree of market concentration may weaken competition and, therefore, makes it difficult for some local governments to obtain benefits from contracting out. Recently, two empirical papers try to investigate this issue. Based on calculation of the Herfindahl-index for Catalonia, Bel and Warner (2006) argues that a tendency toward concentration may diminish the advantage of contracting out. In Dijkgraaf & Gradus (2007) it is shown that there is a correlation between regional concentration and prices. In highly concentrated provinces competition is weak, which results in higher prices. Moreover, in low concentrated provinces where public firms are active competition is strengthened. Therefore, the paper shows that involving public firms competing for tendering can be a proper tool for reducing costs in potentially concentrated markets. However, one of the disadvantages of this study was that data for the private side of the market was only available for 2002. This not only resulted in estimation results which were not significant at a high level, but also in a lack of information on the price effects of changes in concentration. Therefore, we stressed that an important topic for future research should be contracting out dynamics. There are some indications in the literature that the effects of a special mode of production will change over time. Szymanski (1996) and Bel and Warner (2006) stress out that the advantage of privatization of refuse collection disappears due to a tendency toward monopoly, while Hefetz and Warner (2004) show that there is a reverse privatization trend in the USA.

Therefore, in this chapter we investigate these topics by using observations for two years. By comparing the Herfindahl index for 2002 and 2006 we can describe market dynamics over time and try to investigate the relation between (changes in) market concentration and prices. This chapter is organized as follows. In the second paragraph we calculate the 2002 and 2006 Herfindahl index for the Dutch refuse collection market. It is shown that public firms increased their market shares. In the third paragraph we discuss the methodology of estimating a cost function and the available data. In the fourth paragraph estimations are discussed. Interestingly, the positive relation between concentration and prices is now highly significant. Moreover, we show empirically that the presence of enough competing public firms

might be essential to offset the disadvantage of high concentration. Finally, in the fifth paragraph some conclusions are drawn.

## 7.2 Development of the Dutch Refuse Collection Market Over Time

Dutch municipalities have a legal obligation to provide a waste collection infrastructure for municipal waste. They are free to choose whether to provide this task themselves or to contract out waste collection to outside firms. In the 1990s contracting out occurred only to private firms. As an alternative, municipalities cooperated to vest new public firms. At the start these firms only collected waste for the municipalities that owned the firm. During the last years, however, public firms began to compete with private firms for contracts by other municipalities. Nowadays contracting out to outside firms involves both private and public firms.

In 2002 183 municipalities (i.e. 37% of the municipalities and 26% of the inhabitants) have contracted out waste collection to a private firm and 85 to a public firm (see Table 7.1). A third group of municipalities (95) collects the waste by a municipal service in cooperation with neighboring municipalities. The other municipalities (133) collect the waste themselves (i.e. 26% of the municipalities and 38% of the inhabitants).

Interestingly, the market share of especially public firms increases substantially from 88 municipalities (i.e. 18%) in 2002 to 115 municipalities (i.e. 25%) in 2006 (see also Dijkgraaf and Gradus (2008)). There seems a pattern that public collectors are increasingly a preferred choice for Dutch municipalities. The number of municipalities using a private firm is more or less the same. In 2002, 37% of all municipalities uses private firms and in 2006 38%. The other two institutional forms decrease over time. The share of municipalities collecting the waste themselves decreases from 130 municipalities (i.e. 26%) in 2002 to 105 municipalities (i.e. 23%) in 2006 and municipal cooperation decreases with 31 municipalities (i.e. 5%) from 95 municipalities (i.e. 19%) in 2002 to 64 municipalities (i.e. 14%) in 2006.

In Dijkgraaf and Gradus (2007) we show that the Dutch waste collection market was highly concentrated with respect to competition between private firms in 2002 (see also Table 7.2). For the national market the 2002-Herfindahl index is 0.27. If the relevant market is the province, concentration is even higher. The concentration is not evenly spread over the country. Some provinces do not have private collection firms at all (Flevoland and Friesland), while others have a high incidence of private collection. However, public firms behave more and more as competitors for private firms. On a national scale the 2002-Herfindahl index is now only 11% suggesting a competitive market. Still concentration might be available at a provincial level as for a number of provinces the Herfindahl index is still very high.

In this contribution we want to focus on the development of the Herfindahl index over time. An interesting question is whether private firms have strengthened their market position and whether the role of public firms has changed. Therefore, in

**Table 7.2** Overview Herfindahl index 2002 and 2006

	Observations in 2002		Observations in 2006	
	Private competitors	Private and Public competitors	Private competitors	Private and Public competitors
Drenthe	1.00	1.00	1.00	0.56
Friesland	n.a.	1.00	n.a.	1.00
Flevoland	n.a.	0.85	n.a.	0.80
Groningen	0.72	0.71	0.65	0.45
Limburg	0.53	0.50	0.63	0.63
Zuid-Holland	0.43	0.35	0.57	0.26
Zeeland	0.58	0.34	0.55	0.61
Utrecht	0.57	0.32	0.43	0.30
Noord-Holland	0.46	0.32	0.45	0.22
Overijssel	0.23	0.31	0.25	0.34
Noord-Brabant	0.28	0.20	0.22	0.16
Gelderland	0.28	0.16	0.43	0.18
Netherlands	0.27	0.11	0.23	0.08

Table 7.2 the Herfindahl index in 2006 is included at a national and provincial level. In most provinces, the difference between 2006 and 2002 in the Herfindahl index for private firms is small. In other provinces, where a change is visible, institutional developments are important. For example, in Zuid-Holland a large public company, i.e. AVR, has become private. The decrease in Utrecht is due to the mergers of municipalities. So, the 2006-situation on the private side of the market is more or less comparable to 2002. There are two dominant firms in both years, where SITA serves 87 and Van Gansewinkel 39 municipalities.

Compared with the relatively stable private market, the number of public firms has increasing substantially between 2002 and 2006. As a result the Herfindahl index is decreasing in most cases. In some provinces municipal cooperation has changed into a public firm. In Noord-Holland, Holland Collect is a new public firm, which was based on municipal cooperation in the area of West-Friesland. In other provinces public firms were municipal services before. In Drenthe, the public NV Area Reiniging consists of a merger of the municipal services of Coevorden, Emmen and Hoozeveeën at January 1 2006. In the province of Groningen, the public firm Omrin has entered the market, while they were only active in Friesland in 2002. In Zeeland, however, an increase is visible due to fact that an existing public firm now collects waste in five municipalities.

### 7.3 Methodology and Data

We test whether concentration influences refuse collection costs by an OLS estimation of a standard log linear total cost function. This function includes as production variable the number of collection vehicle stops (measured by the number of households) and a number of exogenous factors like the travel time to the pick-up points,

the time needed to collect the waste, the waste composition and waste treatment costs (see Dijkgraaf & Gradus, 2007).<sup>1,2</sup> Furthermore, three dummies are included that measure whether the waste collection firm is public, private or an intermunicipal cooperation. Municipalities that collect the waste themselves are the benchmark for these variables. Finally, variables are included that measure regional concentration and competition by public firms. We test four alternatives:

- First, we include Herfindahl indices in the cost function and multiply the Herfindahl indices by the private ownership dummy. As public companies compete with private companies both are included in this variable. We multiply the Herfindahl indices by the private ownership dummy to test the effects of concentrated markets on the behavior of private firms.
- Second, we also include the Herfindahl indices multiplied by the public ownership dummy to test the effects of concentrated markets on the behavior of public firms.
- Third, we capture the dynamics between 2002 and 2006 by taking as an dependent variable the increase (or decrease) of prices between 2002 and 2006 and include the Herfindahl indices multiplied by the private and public ownership dummy as independent variable.
- Fourth, we include the dynamics in Herfindahl indices as well. Hereby, we take again as an dependent variable the increase of prices between 2002 and 2006, but now include the change in Herfindahl indices between 2006 and 2002 both multiplied by the private and public ownership dummy as independent variable.

Data for the type of collection (by the municipality itself, by public firm, by private firm or by an intermunicipal cooperation), waste composition and total costs come from the Dutch Waste Management Council. Total costs are calculated by multiplying the average municipal tariff per household with the number of households per municipality. If actual tariffs do not cover total costs, we use the coverage factors to calculate cost covering tariffs.<sup>3</sup> Other data for exogenous variables come from the Dutch Bureau of Statistics. The same source is used for the number of inhabitants per municipality, the basis for the calculation of the Herfindahl indices. All data are for nearly all Dutch municipalities in 2002 (496) and 2006 (458). In total we have 866 observations as for 43 municipalities in 2002 and 45 in 2006 data are missing. Table 7.3 gives the descriptive statistics for the variables described above.

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<sup>1</sup> Note that factor prices are not included as no reason is present why they should differ between municipalities.

<sup>2</sup> In the Netherlands waste treatment costs depend on the waste incineration plant. There are 10 plants in the Netherlands, so we include 9 dummies (with the plant of HVC (the plant serving the largest number of municipalities) as a benchmark). Note that in 2002 and 2006 in the Netherlands none of the municipalities use another form of treatment, like landfilling. Furthermore, we have no information that the situation in 2006 is different from the situation in 2002.

<sup>3</sup> As only companies have to pay VAT, we use tariffs excluding VAT for these firms (see Wassenaar & Gradus, 2004).

**Table 7.3** Descriptive statistics

	Mean	Max.	Min.	Std. Dev.
Municipal collection costs (million euro)	3.52	114.24	0.11	7.54
Pickup-points (households)	15,115	410,201	490	30,248
Inhabitants per point	2.49	3.65	1.76	0.21
Density (hectares per household)	0.0119	0.4063	0.0004	0.0251
Unsorted waste (kg per household)	221	529	71	59
Glass (kg per household)	23	116	5	8
Paper (kg per household)	73	158	16	16
Vegetable, fruit and garden waste (kg/hh)	109	301	2	44
Collection with neighboring municipalities	0.17	1	0	0.38
Collection by public firm	0.21	1	0	0.41
Collection by private firm	0.37	1	0	0.49
Herfindahl (private and public)	0.37	100	0.16	0.23

## 7.4 Results

According to the first estimation, private collection is 20% cheaper than collection by municipalities (see Table 7.4).<sup>4</sup> This result is consistent with the literature. Collection by a public firm is 18% cheaper than collection by municipalities. Although the coefficient for private firm collection is somewhat higher than for public firms, a Wald test does not reject the hypothesis that they have the same size. Apparently, the most important factor influencing collection costs is not ownership but contracting out. Moreover, the difference between collection by an intermunicipal cooperation and collection by the own municipality is insignificant.

**Table 7.4** Estimation results: effect on total cost waste collection

Independent variable	Model 1	Model 2	Model 3
Effect for municipalities with collection by:			
– intermunicipal cooperation	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)
– public firm	–0.08*** (0.02)	–0.08*** (0.02)	–0.09*** (0.03)
– private firm: all	–0.08*** (0.02)	–0.14*** (0.03)	–0.14*** (0.03)
– private firm: effect of Herfindahl		0.16*** (0.06)	0.17*** (0.06)
– public firm: effect of Herfindahl			0.03 (0.05)
R <sup>2</sup> -adjusted	0.97	0.97	0.97

Notes: Standard errors beneath coefficients. Coefficients with \* /\*\* /\*\*\* significant at 90/95/99%.

<sup>4</sup> As the estimations are in logs the effect can be calculated using  $e^x - 1$ . Note that this effect has to be multiplied by 2.5 as collection costs are on average 40% of total costs. We only present results for production mode and concentration variables. Results for other variables are available upon request.

The second estimation shows that the coefficient of the Herfindahl index is significant at 99%. Interestingly, the positive relation between concentration and prices is now highly significant compared with Dijkgraaf & Gradus (2007)<sup>5</sup>, which strengthen our case that the costs of private provision are increasingly dependent on regional concentration. At the average value of the Herfindahl index the net effect of private provision on collection costs is -16%. With a Herfindahl index of 1 (monopoly) total costs even increase with 9%. At the other hand, cost advantages of private collection are much higher if enough competition is present. A Herfindahl index of zero (maximal competition), results in an estimated cost decrease of 32%. This stresses that the competitiveness of the market is extremely important when waste collection is contracted out.

In the third estimation the added coefficient for the Herfindahl indices multiplied by the public ownership dummy is not significant and, therefore, implies no effects of concentrated markets on the behavior of public firms. This is also an interesting result. According to this estimation, it seems that public companies can play an important role, if they compete with private companies. However, there price behavior seems not be influenced by market concentration.

In the fourth estimation (Table 7.5) we explore the market dynamics and investigate whether the increase of prices is related to the institutional dummy or the Herfindahl. For the institutional dummies we find a negative sign meaning that prices go up if self supply is chosen. However, the coefficient for cooperation and private firms are not significant at all. For public firms it is significant at 90%

**Table 7.5** Estimation results: effect on total cost waste collection change (2006/2002)

Independent variable	Model 4	Model 5
Effect for municipalities with collection by:		
- intermunicipal cooperation	-0.06 (0.04)	-0.07 (0.04)
- public firm	-0.09* (0.05)	-0.34*** (0.09)
- private firm: all	-0.06 (0.05)	-0.03 (0.08)
- private firm: effect of Herfindahl	0.08 (0.11)	
- public firm: effect of Herfindahl	0.17* (0.09)	
- private firm: effect of change in Herfindahl (2006/2002)		0.17 (8.44)
- public firm: effect of change in Herfindahl (2006/2002)		0.35*** (0.10)
R <sup>2</sup> -adjusted	0.02	0.05

Notes: Standard errors beneath coefficients. Coefficients with \*/\*\*/\*\* significant at 90/95/99%.

<sup>5</sup> For the Herfindahl-index significance at 90%-level is found and for C3-ratio we found significance at 95%-level (see Dijkgraaf & Gradus, 2007).

indicating some evidence. Interestingly, the decreasing effect of public firms on prices is smaller, if market concentration is higher. However, this effect is again only significant at 90%-level. At the average value of the Herfindahl index the effect of public firms leads to 6% lower prices. With a Herfindahl index of 1 (monopoly) the change in total costs is positive (22%). At the other hand, changes in cost of public collection are much higher if enough competition is present. A Herfindahl index of zero (maximal competition), results in 21% higher cost changes.

In the fifth estimation we explore the market dynamics further and investigate whether the increase of prices is related to the change in the Herfindahl index. Interestingly, the results are much stronger. For the public firm dummy we find a significant negative coefficient meaning that prices go down if a public firm is chosen. Similar, the effect of public firms on prices is smaller, if market concentration is higher. Interestingly, this effect is now significant at 99%-level and thus indicates the importance of the presence of enough firms also for public firms. Although the level of concentration does not influence the price of public firms, the change in concentration measured by the Herfindahl index does. At the average value of the change in the Herfindahl index (-9%) the effect is negative, implying a decrease in prices of 5%. If the Herfindahl index increases with 9%, the net effect is 10%. Thus, not only the level, but also the change in Herfindahl index determines price paths.

## 7.5 Conclusions

In this article we show that the Dutch market for private refuse collection is highly concentrated as the Herfindahl indices for 2002 and 2006 are high on a provincial level. Also if public firms are included the Herfindahl indices stay high. Moreover, it is shown that in highly concentrated provinces competition is weak, which results in barriers for local governments to effectively obtain benefits from contracting out. However, according to our estimates this is only the case for private firms. The price behavior of public firms seems not influenced by market concentration and in low concentrated provinces, where public firms are active, competition is strengthened. The importance of public firms is also put forward, if the increase of prices between 2002 and 2006 is related to the institutional dummy. For public firms we find a significant negative sign meaning that prices go down if a public firm is chosen in a market where competition increases. Thus, the level of concentration does not influence the cost of public firms, but the change in concentration does.

The involvement of public firms seems an effective way to organize day-to-day operations under private commercial law rules, whereas the government retains control over strategic decisions as will be done in a public firm. An important policy implication of this chapter is that local governments should be cautious with privatization of public firms. Although it raises some short run revenues, it can cause welfare losses in the long run.

There are several topics for future research. Although we have data for two years, it would be worthwhile to investigate the issue for a longer panel data set. In the



literature it is stressed that the advantage of privatization refuse collection disappears over time due to a tendency toward monopoly (e.g. Bel and Warner (2006)). Therefore, it is important to investigate whether a transformation of a local government division into public-owned private-law cooperation can offset the tendency toward a monopoly dynamically. Finally, an important topic for future research is the relevant market. There are some indications that the relevant market for refuse collection is the province and this assumption is used in the empirical part of this chapter. Till recently the market was regulated and organized on a provincial level. However, current legislation is more on a national scale and in some cases even on an international scale. This stimulates cooperation between regions in different provinces. It would be worthwhile in future research to analyze whether other relevant markets are feasible.

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