

Understanding mixed forms of refuse collection, privatisation and its reverse in the Netherlands

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Abstract: Based on panel data for almost all Dutch municipalities, we analyse changes in the different modes of production for refuse collection between 1998 and 2010 such as private contracts, outsourcing to neighbouring municipalities, intermunicipal cooperation, public provision and in-house collection. Interestingly, the market share of public firms increased substantially from 5% in 1998 to 33% in 2010 and the share of municipalities collecting waste in public cooperation with neighbouring municipalities decreased from 18% in 1998 to 13% in 2010. In 1998, 43% of municipalities used private firms and 31% used in house collection, while these figures are respectively 34% and 17% in 2010. So, the number of mixed forms such as public firms or municipal cooperation increased in the Netherlands.

We investigate these shifts by constructing data for refuse delivery patterns over time. In approximately half of all Dutch municipalities, the mode of production was stable between 1998 and 2010. In the other municipalities, 421 shifts took place with 68% towards outside production and 32% towards more inside production. In addition, we model a shift from inside production towards outside production and it's reverse. Based on a logit model, we investigate the importance of economic concerns, political engagement of citizens and interest group variables.

1. Introduction

The debate about privatisation of refuse collection is shifting from an ideological debate to a more proper discussion of the political and economic factors that determine the mode of production (see also Hefetz and Warner, 2011). Two factors seem responsible for this shift. First, the economic gain of privatisation seems not to be sustainable over time. In the nineties, there was some evidence that private production of refuse collection implies an efficient provision of services. In an overview article, Domberger and Jensen (1997) showed that private production suggests for a number of government services cost savings of about 20% without sacrificing the quality of service provided. However, recent evidence for cost savings from private delivery is more mixed. Bel et al. (2010a) conducted a meta-regression analysis particularly on the refuse collection literature and showed that there is no unambiguous

evidence for significant cost savings from private production. For the Netherlands similar results occur. In a recent article, Dijkgraaf and Gradus (2011) showed that the cost advantage of privatisation decreases over time and is non-significant if municipal fixed effects are included. Interestingly, in Dijkgraaf and Gradus (2011) the cost advantage of intermunicipal cooperation is larger than that of privatisation.

Secondly, municipalities have other motives behind their decisions about the modes of production than only efficiency. For example, López-de-Silanes et al. (1997) tried to explain the reservations of local authorities towards privatisation with US-data. Based on county-data in 1987 and 1992 only 25% of the services in 1987 and 35% in 1992 had been placed out-house. Moreover, in this article an empirical investigation of the mode of providing government services is given, where three leading aspects based on public choice and transaction costs theory (namely efficiency, political patronage and ideology) are investigated. The evidence presented in this article indicates that clean government laws and state laws restricting county spending encourage privatisation, whereas strong public unions discourage it. This suggests an important role played by political patronage and taxpayer resistance to government spending in the privatisation decision. Dijkgraaf et al. (2003) examined for the Netherlands the determinants of the provision mode of refuse collection. They found evidence for political patronage and the wealth of the local government as a ground for contracting out and privatisation, but also the possible efficiency gain of contracting out plays a role. Wassenaar et al. (2012) described pragmatic and institutional motivations for contracting out, in addition to the efficiency motive.

Related to these motives in favour or against contracting out, the analysis of shifts over time shows that not only privatisation and contracting out are important phenomena, but also reverse privatisation and contracting in exist and become more important as well. Based on five yearly IMCA survey of US service delivery between 1992 and 1997, Hefetz and

Warner (2004) found that 18 percent are new contracts and 11 percent are contracted back-in. However, in the period 1997-2002, these proportions flip and reverse contracting is preferred (see Hefetz and Warner, 2007). Interestingly, the same concerns with efficiency, political patronage and ideology that motivate privatisation, may promote reverse privatisation or more inside production (see Hefetz and Warner, 2004, 2007).

Though studies – in particular on US data - are performed for shifts over time, a study for the Netherlands is missing. Furthermore, as we have a large dataset for (almost) all Dutch municipalities between 1998-2010, we can extend these studies and we are able to analyse the patterns over time more carefully than those studies based on for example five years survey. Moreover, we can distinguish between five different modes of production. We show that our results have some similarities with this literature. In approximately half of Dutch municipalities the mode of production was stable between 1998 and 2010. In the other municipalities, 421 shifts took place from which 68% more towards outside production and 32% towards more inside production.

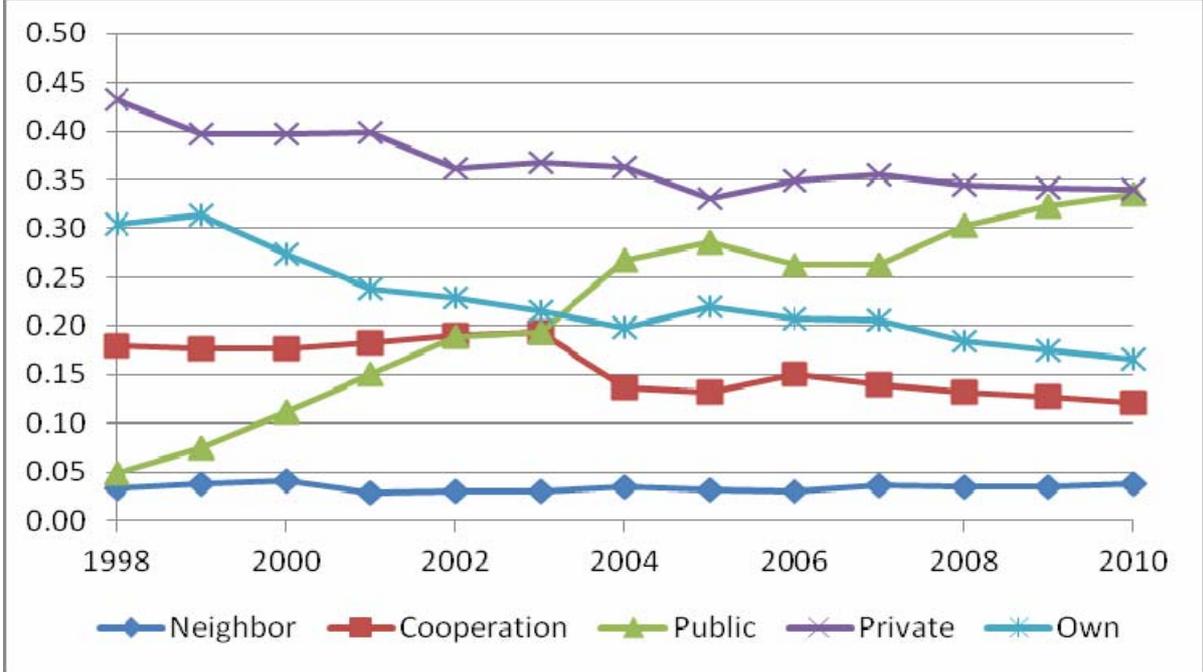
The paper is structured as follows. Section 2 describes the shifts over time and the data. A logit analysis based on three leading theories is presented in Section 3. In section 4, the results of additional estimations including tax variables for the period 2005-2010 are presented. Section 5 offers some concluding remarks.

2. Shifts in service management and data

Dutch municipalities have a legal obligation to provide a waste-collection infrastructure for municipal waste, but they are free to choose whether to carry out this task themselves or to contract out waste collection to outside contractors (public or private). Of all observations, 37% represents contracting out waste collection to a private firm and 21% to a public firm. It should be noticed that a public firm operates under commercial law, whereas the shares are

publicly owned by municipalities. A third group of observations (15%) represents collection via a municipal service in cooperation with neighbouring municipalities and they are organised as a public WGR (Law on the Common Arrangements) entity, where the executive board is directed by mayors and aldermen of participating municipalities (see Bel et al., 2010b).ⁱ A fourth group of observations (4%) execute this task also in cooperation with a neighbour, but not as a WGR public entity. So, in these cases a central municipality is running the services publicly. The remaining observations (23%) represent collection by municipalities themselves. In figure 1 these five modes of Dutch refuse collection are illustrated over time.

Figure 1. Market shares 1998–2010, measured by number of municipalities

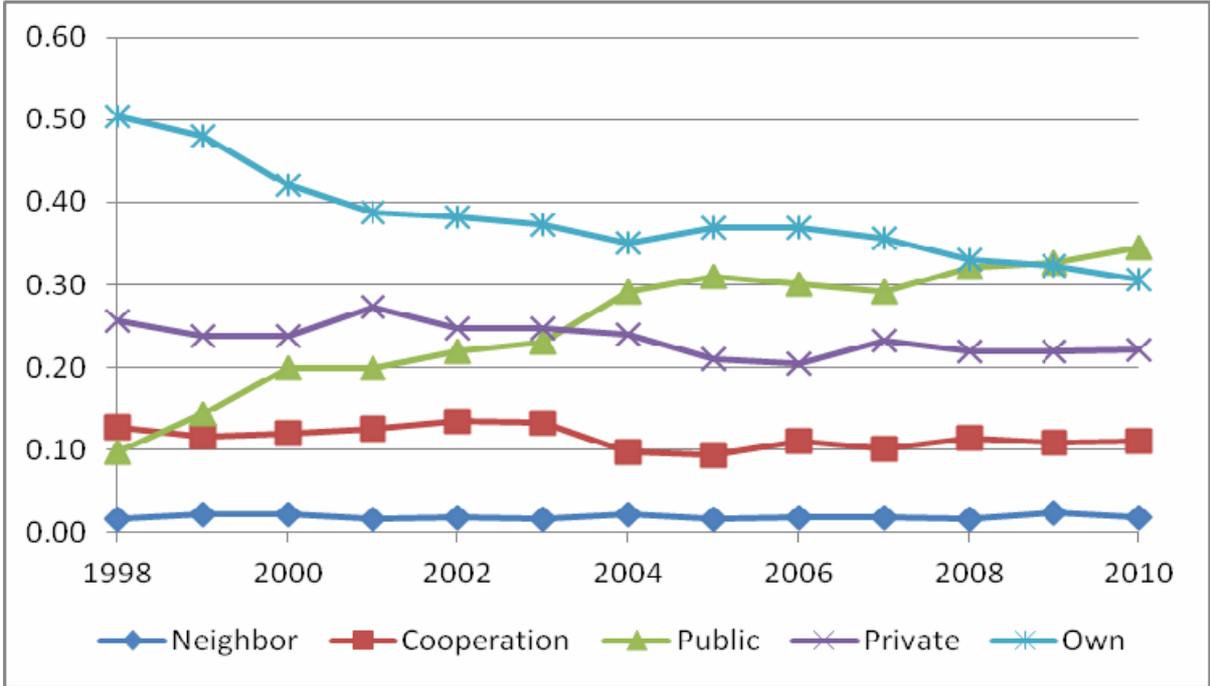


Interestingly, the market share of public firms increased substantially from 5% in 1998 to 33% in 2010 (see figure 1). The share of municipalities collecting waste themselves decreased from 31% in 1998 to 17% in 2010. In 1998, 43% of municipalities used private firms, while this percentage is 34% in 2010. This is at least partly the result of the merging of small villages, as private collectors were especially active in these villages. Municipal cooperation

in a WGR cooperation slightly decreased from 18% in 1998 to 13% in 2010. Finally, collection by a neighbouring municipality is rather small with less than 5% in all years.

Figure 2 shows market shares weighted by the number of inhabitants for 1998–2010. The share is much smaller for private contractors and much larger for own collection than the shares in figure 1. This implies that own collection is applied more in large cities and private collectors are used more in small municipalities. Public companies are more active in large cities as well and municipal cooperation is more usual in small municipalities, but the differences are less pronounced.

Figure 2. Market shares 1998–2010, measured by number of municipalities weighted by inhabitants



These large longitudinal data make it possible also to measure shifts over time. The alternatives to in house delivery of the own municipality are contracting out to a neighbouring municipality, an intermunicipal cooperation, or public or private companies. To determine

shifts, we need a method to track changes in forms of service delivery as shown in table 1. We constructed a transition matrix where the mode of production is ordered towards more outside production (see also Hefetz and Warner, 2004).ⁱⁱ All shifts are included in this matrix even if a municipality shifts several times in the period 1998-2010.ⁱⁱⁱ This method enables us to compare stability in forms of service delivery and to assess shifts towards more outside production or towards more inside production.

Table 1. Number of municipalities' switches and municipalities that do not change in dataset per mode

		To					
		Own collection	Neighbour	Cooperation	Public	Private	Total
From	Own collection	73	<i>16</i>	25	69	<i>51</i>	234
	Neighbour	4	5	8	3	<i>14</i>	34
	Cooperation	12	7	34	<i>47</i>	<i>15</i>	115
	Public	4	0	3	24	<i>37</i>	68
	Private	15	9	29	53	129	235
	Total	108	37	99	196	246	686

In 265 municipalities the mode of production is unchanged over time (i.e. the sum of the diagonal). So, the mode of production is stable during this period in approximately the half of the Dutch municipalities.^{iv} Especially, the mode of own collection and private collection are stable over time. In other Dutch municipalities one or more switches took place during the period 1998-2010.^v In total there are 421 switches, from which 285 switches (*italic in the table*) were towards more outside production or to market and 136 (**bold in the table**) were towards more inside production or from the market. Thus, approximately two third was to the market and one third from the market. Interestingly, shifts towards outside production are

dominant in the Netherlands, but reverse shifts are important as well. As the table shows shifts from own production towards production by a public or private firm are the most dominant.

Let us focus into more detail on privatisation and reverse privatisation as well (see fifth column and row of table 1). Remarkably, there were 117 shifts towards privatisation, but there were 106 shifts towards reverse privatisation as well. So, privatisation is preferred almost equally towards reverse privatisation. Thereby, the shifts towards a public firm or intermunicipal cooperation were the most important shifts (see table 2). This is line with the literature, where intermunicipal cooperation and a public firm are found to be a good alternative to privatisation (see Bel and Costas, 2006; Dijkgraaf and Gradus, 2011).

Data

Let us describe the data. Data for the elections, inhabitants, household size and other municipal characteristics come from Statistics Netherlands (CBS). Institutional data on waste collection come from the Dutch Waste Management Council (AOC). We have data for the years 1998 – 2010 (see table 2 for descriptive statistics). To test theories about changing ownership, a dataset is constructed with variables representing several aspects of public choice theory. Similar to Dijkgraaf et al. (2003) we include as independent variables output, wealth, interest group and political variables.

Output variables

To test for the output arguments the number of inhabitants and population density (number of inhabitants per hectare) are included in the empirical setting. On average, a Dutch municipality has 26 thousand inhabitants, while the largest city (Amsterdam) has 767 thousand inhabitants and the smallest municipality only 1 thousand. For reasons of scale

economy, the number of inhabitants squared is included as well. Moreover, the population density shows a high variation between municipalities, indicating that the transport distance between individual pick-up points varies.

Wealth variables

Dutch municipalities finance their spending through specific (37 percent) and general grants (30 percent) from the central government, municipal levies (14 percent) and income from property and market activities (19 percent) (see Allers and Elhorst, 2010). Specific grants are in general earmarked to finance local government tasks imposed by the central government, whereas general grants are used to finance the autonomous tasks of local governments.

Municipal levies consist of user charges (mainly for sewerage and refuse collection) and local taxes (57 percent). Local tax revenue is dominated by the property tax (83 percent of tax revenue). The second local tax of any importance is the parking tax. Since user charges are not allowed to exceed (budgeted) costs and municipal budgets must be balanced, higher service levels can in general only be funded by raising taxes, that is, by setting higher property tax rates. This property tax consists out of two elements: a user tax, based on the value of dwellings and a tax levied on both the owners and users of non-residential real estate. A poor local government with a high level of these taxes might be more willing to change ownership. Also, total tax revenues per inhabitant are included in the estimation. We include the average personal income in a municipality as a wealth variable as well. The hypothesis is that a municipality is more willing to change ownership if the inhabitants are poor. However, we have only data for 2005-2010 for these tax variables and therefore in section 4 we include a separate regression based on the 2005-2010 subset of data.

Interest group variables

Data available for the number of public employee unions in a municipality are not available. Similar to López-de-Silanes et al. (1997), it is possible to include labour-market conditions as an approximation of interest-group variables. In general, we should expect that a government is less willing to change ownership if unemployment in a municipality is high. Therefore, the municipal unemployment level is included in our estimations.

Political variables

We include as political variables the fractions of the following parties, based on the local elections of 1998, 2002 and 2006^{vi}: Green Left/Socialist party, social democrats, progressive liberals, Christian democrats, orthodox Protestants and conservative liberals.^{vii,viii} In the estimations the local parties are excluded. We expect that conservative liberals are more willing to change ownership towards outside or private collection in contrast with social democrats and Green Left / Socialist party.

Table 2. Descriptive statistics

	Mean	Maximum	Minimum	Std. Dev.	Obs
Ownership change total	0.54	1.00	0.00	0.50	5349
Ownership change from market	0.24	1.00	0.00	0.43	5349
Ownership change to market	0.48	1.00	0.00	0.50	5349
Ownership change from private	0.21	1.00	0.00	0.41	5349
Ownership change to private	0.20	1.00	0.00	0.40	5349
Population	34,630	767,457	942	58,033	5349
Population density ¹	0.69	5.35	0.00	0.84	5349
Income (euro per inhabitant)	32,070	59,600	17,500	4,977	5349
Unemployment (%)	0.01	0.20	0.00	0.01	5349
Conservative liberals (%)	0.16	0.52	0.00	0.08	5349
Social democrats (%)	0.17	0.63	0.00	0.10	5349
Progressive liberals (%)	0.03	0.29	0.00	0.04	5349
Christian democrats (%)	0.22	0.71	0.00	0.10	5349
Orthodox Protestants (%)	0.05	0.67	0.00	0.10	5349
Green Left + Socialist party (%)	0.06	0.41	0.00	0.08	5349
Real estate tax owners (1000 euro per inhabitant)	0.12	0.38	0.03	0.04	2315
Real estate tax users (1000 euro per inhabitant)	0.04	0.23	0.00	0.03	2315

¹Inhabitants per hectare.

3. Results

We apply our estimations with a logit analysis for five models. Our dependent values are (i) the level of changing ownership^{ix}, (ii) the level of change ownership from market (towards more inside production), (iii) the level of change to market (towards more outside production out), (iv) the level of change to privatisation and (v) the level of reverse privatisation. Table 3 shows the estimation results.

Table 3. Estimation results

	Change total	From market	To market	Privatisation	Reverse privatisation
Constant	1.02***	0.60*	0.23	-0.43	1.05***
Population	-0.03	-0.09***	-0.01	0.04	-0.13***
Population squared (*1000)	-0.10	0.98**	-0.44*	-2.48	1.49***
Population density	0.06	-0.29***	0.16***	-0.55***	-0.46***
Income	-2.65	3.36	-5.67	8.51	-1.40
Unemployment (%)	-0.05	-0.10*	-0.05	-0.21***	-0.21***
Conservative liberals	1.26***	-0.27	1.86***	1.62***	-1.00**
Social democrats	0.07	-3.67***	0.96***	-1.87***	-3.94***
Progressive liberals	-0.16	-0.94	0.34	0.43	-1.37
Christian democrats	-3.23***	-2.79***	-2.42***	-3.73***	-3.25***
Orthodox Protestants	-0.16	-0.43	1.13***	2.31***	-0.17
Green Left + Socialist	-1.83***	0.52	-2.04***	0.76	1.28**

Note: coefficients with */**/** are significant at 10%/5%/1% level.

If changing total is investigated, only a number of political variables (and the constant) are significant. The attitude of the conservative liberals towards changing the mode of production turns out to be positive and significant (compared to local parties, which is the reference group), whereas the attitude of the Christian democrats and Green Left (including Socialistic Party) turns out to be negative and significant. It seems that conservative liberals are in favour of change and especially the Christian democrats are against it. For other parties, significant results are not found.

Additional and more interesting results are obtained if we analyse the shifts from the market. The output variables are now significant. The bottom of the polynomial in terms of inhabitants is at more than 47 thousand inhabitants^x: thus, if the number of habitants increases (up to this minimum) then the probability of from the market decreases. For large municipalities, the probability of a change from the market increases. In addition, the effect of inhabitants per hectare and the number of unemployed persons (at 90%-level) becomes negative and significant. However, the income per inhabitant the effects are (still)

insignificant. In addition, the results for political variables are also here suggestive. The attitude of the social democrats and Christian democrats are all significant negative.

If we analyse the shifts to the market the attitude of the social democrats, conservative liberals and orthodox Protestants are all significant positive, and especially for social democrats this result is surprising. The attitude of the Green Left and Christian democrats are all significant and negative as expected. In addition, the effect of inhabitants per hectare becomes now positive and significant and for income negative and significant (only at 90% level). However, for the number of unemployed persons and population the effects are insignificant.

Finally, the shifts to privatisation and from privatisation are analysed. As this debate is more ideological we would expect that social democrats and Green Left/Socialistic party are in favour of reverse privatisation and conservative liberals, orthodox Protestants and Christian democrats are in favour of privatisation. These priors only partially fit with the results in table 3. The social democrats and Christian democrats are against privatisation and also reverse privatisation and the conservative liberals and orthodox Protestants are in favour of privatisation, but not (significantly) against reverse privatisation. In addition, the effect of inhabitants per hectare now becomes negative and significant. For unemployment the results are suggestive as well as for privatisation and for reverse privatisation the estimates are negative. The output variables are significant for reverse privatisation, but contrary. The bottom of the polynomial in terms of inhabitants is at around 44,000 inhabitants^{xi}: thus, if the number of inhabitants increases till this minimum then the probability of reverse privatisation decreases and after this minimum it increases.

4. Sensitive analysis

In this section, we apply a sensitive analysis. First, we investigate whether shifts differ between 1999-2004 and 2005-2010. Second, we apply our logit estimations for five models for 2005-2010 including tax variables.

In tables 4 and 5 the switches for the different periods are given.^{xii} In 1999-2004 218 switches did occur and in 2005-2010 203 switches did occur. However, the pattern differs between these periods as for example in the first period shifts towards production by a public firm are more important and in the second period reverse privatisation shifts are more important.

Table 4. Number of municipalities switches per mode 1999-2004

		To					
		Own collection	Neighbour	Cooperation	Public	Private	Total
From	Own collection	Na	9	18	49	32	108
	Neighbour	2	na	4	2	8	16
	Cooperation	3	7	na	32	2	44
	Public	0	0	0	na	7	7
	Private	5	3	10	25	na	43
	Total	10	19	32	108	49	218

Table 5. Number of municipalities switches per mode 2005-2010

		To					
		Own collection	Neighbour	Cooperation	Public	Private	Total
From	Own collection	na	7	7	20	19	53
	Neighbour	2	na	4	1	6	13
	Cooperation	9	0	na	15	13	37
	Public	4	0	3	na	30	37
	Private	10	6	19	28	na	63
	Total	25	13	33	64	68	203

Let us investigate by applying a Wilcoxon rank-sum test whether different distribution for five depending variables of section 3. For privatisation the distributions of both periods are equal. However, for changing total, from and to market and reverse privatisation the distribution of both periods are not equal.

Therefore, we apply logit estimations for 2005-2010 with including tax variables as we have only tax data for this period. Table 6 shows the estimation results.

Table 6. Estimation results for period 2005-2010 and including tax variables

	Change total	From market	To market	Privatisation	Reverse privatization
Constant	1.50***	1.07*	1.28***	0.74	1.43**
Population	-0.04*	-0.07**	-0.02	0.03	-0.13***
Population squared (*1000)	0.05	0.67	-0.73	-2.10	1.51**
Population density	0.12*	-0.21**	0.22***	-0.52***	-0.33***
Income	-22.06**	-15.46	-42.46***	-22.70	-21.46
Unemployment (%)	-0.06	-0.04	-0.10	-0.22*	-0.12
Conservative liberals	1.68**	0.48	2.40***	2.20***	-0.51
Social democrats	-0.40	-4.47***	0.79*	-2.34***	-4.91***
Progressive liberals	-0.07	-2.54*	1.21	1.71	-1.72
Christian democrats	-2.75***	-2.50***	-1.75***	-3.10***	-2.72***
Orthodox Protestants	-0.18	-0.54	0.99**	1.96***	-0.07
Green Left + Socialist	-2.27***	-0.30	-3.20***	0.03	0.65
Real estate tax owners	1.91	2.22	2.14	0.11	2.87*
Real estate tax users	-1.03	-4.69**	-0.01	-3.27	-4.01*

Note: coefficients with */**/** are significant at 10%/5%/1% level.

From this estimation we can get information how important these tax variables are and how robust the other estimates are for this sub period. There is no support for the hypothesis that a local government with a high level of taxes is more willing to change ownership. Only for from market the real estate tax for users is negative and significant (at 95%-level) and for reverse privatisation both tax variables are only weakly significant (at 90%-level).

For the other variables the differences between table 3 and table 6 are rather small. Only in 'for market' the (squared) output effects disappears and in 'changing' and 'to market'

the income effects becomes significant (at least 95%-level). In reverse privatisation the effect of unemployment and for the conservative liberals and Green Left disappears. Nevertheless, in most estimates the results for the political variables are highly comparable, so that we can conclude that these results are not sensitive if we take another sub period (2005-2010).

5. Conclusions and discussion

Based on panel data for almost all Dutch municipalities between 1998 and 2010, we analyse the patterns over time of analyse different modes of production for refuse collection ranging from inside to outside production: in house collection, neighbours, intermunicipal cooperation, public firm and private firm. Interestingly, the number of mixed forms such as public firm increases in the Netherlands between 1998 and 2010 as other forms declines. In addition, municipal cooperation in a WGR cooperation only slightly decreases. These patterns underline the question of whether contracting out to private waste collectors is beneficial in the long term, as other forms are increasingly a preferred choice for municipalities in the Netherlands.

In approximately half of Dutch municipalities, the mode of production was stable between 1998 and 2010. In the other municipalities 421 shifts took place from which two third was more towards outside production and one third was more towards more inside production. Looking at the shifts towards privatisation is preferred almost equally towards reverse privatisation. If we distinguish between two periods (1998-2004, 2005-2010), reverse privatisation became more important in the later period and shifts towards production by a public firm became less important.

Based on a logit model, some evidence is found for an ideological motivation of changing the mode of production. Conservative liberals are in favour of changing especially towards the market and privatisation and for Christian democrats we found the reverse. Also

social democrats have a negative attitude against privatisation. However, for reverse privatisation we found some evidence that Christian democrats are against it and also find some evidence that a larger municipality is more likely to have reverse privatisation. Only very weak evidence is found for the hypothesis that a high level of taxes by the local government or income of the inhabitants (the wealth argument) or a high level of unemployment (the interest group argument) raises the probability of changing.

There are many avenues for future research. First, Dijkgraaf et al. (2003) found strong statistical evidence that the parametric specification of the logit estimations is too inflexible. Especially for the interpretation of the ideological variables it can be suitable using semi parametric models. Second, an other important topic for future research is the private side of the market and it's relation with (reverse) privatisation. Earlier work showed that in provinces with a high concentration of private firms, competition is less and public firms can be useful to stimulate competition (see Dijkgraaf and Gradus, 2007). However, such private data are not available yet. Third, we can extend our analysis to other tasks than refuse collection as well. Brown et al. (2003) showed that service characteristics are important to understand the nature of transactions costs and contracting out process.

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- ⁱ In the Netherlands intermunicipal cooperation (WGR) can be employed for refuse collection or other public task such as fire brigades (see Bel et al. , 2010). This WGR is regulated by Dutch law.
- ⁱⁱ We ordered the modes from inside to outside by inhouse collection, neighbour, intermunicipal cooperation, public firm and private firm.
- ⁱⁱⁱ If municipalities merge to a new municipality shifts are only included if they take place after the new municipality was installed.
- ^{iv} In 1998 there were 548 municipalities and in 2010 there were 431 municipalities.
- ^v For 524 Dutch municipalities, data between 1998 and 2010 are available and 259 Dutch municipalities shift towards a different mode of production once or more times (i.e. 49%). In most municipalities (.) there was one shift, in (.) municipalities two shifts did take place and in two municipalities four shifts did take place.
- ^{vi} There were local elections in May 1998, March 2002 and 2006. In almost all Dutch municipalities an election took place. For all political parties their votes divided by the total votes is included. For subsequent years without an election we take the results of the last elections.
- ^{vii} The so-called local parties are used as a benchmark and are excluded.
- ^{viii} Green left: Groen Links + SP, Social democrats: PvdA, Progressive liberals: D66, Christian democrats: CDA, Orthodox protestant: SGP + CU (in 1998 CU consisted of two parties RPF and GPV) and Conservative liberals: VVD.
- ^{ix} The dependent variables are one for each year if the municipality changes in one of the years.
- ^x The minimum of this polynomial is $0.09/(2*0.98)*1000*1000$.
- ^{xi} The minimum of this polynomial is $0.13/(2*1.49)*1000*1000$.

^{xii} We do not include stable municipalities in tables 4 and 5 as we have defined stable during the whole period 1998-2010.