



**MASARYK UNIVERSITY  
FACULTY OF ECONOMICS AND ADMINISTRATION**

**Municipal expenditures efficiency  
with emphasis on the competitiveness  
and type of company:  
Case study on waste management  
expenditures in the South Moravian Region**

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Working paper WP KVE – 03/2013

# **Municipal waste management expenditures efficiency with emphasis on the competitiveness and type of company – Case study in the South Moravian Region**

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### **Abstract**

This paper, based on the analysis of current municipal expenditures on waste management, compares expenditure per capita and examines the impacts of competitive environment and type of waste management company (character of ownership) on the expenditure efficiency. Expenditures are compared by the number of competing companies in neighbouring municipalities by the districts and municipality size groups. First part of the paper briefly describes current situation around environmental protection municipal expenditure in Czech Republic and explains reason why the area of current municipal waste management expenditure has been chosen for the efficiency evaluation. Second part is dedicated to the idea of the efficiency evaluation methodology which is based on Cost-efficiency Analysis (CEA) and assessing the impact of a competitiveness and type of company to the efficiency. Evaluation and comparison is performed on the all 673 South Moravian municipalities for each of the years in the five-year period ended 2011.

**Key words:** competitiveness; efficiency; current municipal expenditure; the South Moravian Region

JEL classification H59

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## 1. Introduction

Defining and measuring the efficiency, or in other words a process of using resources and their transformation into outputs and outcomes, seems to be one of the biggest issues of contemporary economic theory. Already in 1957 Farrell asked the question how to measure efficiency and pointed out its importance for economic policy makers: „it is important to know how far a given industry can be expected to increase its output by simply increasing its efficiency, without absorbing further resources”(Farrell, 1957). Throughout several decades' efficiency evaluation and its technology are greatly improved and advanced. However it still remains conceptual challenge in relation to public expenditures. This issue is also complicated by the fact that outcomes of public sector are often off-market, lacking relevant data and thus making it cannot be quantified, as stated by collective of authors at the European Commission (Mandl et al., 2008).

Apart from such methodological complications, it is quite reasonable to assume, competition and some other institutional features (e.g. corporate governance, ownership) affect somehow both quantity and quality of outputs as well as costs of production not only in the marketplace but within the Public Sector too. It could turn up to be correct mainly in cases, when cross-price elasticity of demand for one product can play its theoretical role – to encourage customers to switch their demand to the most competitively priced products available. We believe it is clearly a case of waste management. Municipalities, either as the customers of private companies offering services or directly services providers, declare quite often their “cost-sensitivity”.

There have been published quite a few studies dealing with this topic in economic journals<sup>1</sup>. According to Bel and Warner's complex review (2008) Hirsch conducted the first econometric study of waste collection in 1965. Using data from 24 municipalities in St. Louis County, Missouri, he found no difference in cost due to public or private contract arrangement.

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<sup>1</sup> For possibly the most recent review see Simões and Marques (2012)

Sustainable municipal waste management (MWM) has been accepted and practiced by city managers for some time. However, with different social and economic realities, consumption patterns, and technological development levels, municipalities in different countries have adopted varying approaches.

MWM is charged with an enormous task: get the waste out from underfoot and do so in the most economically, socially, and environmentally optimal manner possible. Solid waste management is almost always the responsibility of local governments and is often their single largest budget item. In the Czech Republic expenditure on solid waste management accounts on average for 4% of total current municipal expenditure, while in case of municipalities with population below 5000 is this share often more than 6%.

Furthermore it is obvious that, together with the increasing demand on the waste handling quality (related to the legislation requirements and the technical development in the field), the scale of these services and the related expenditures are growing as well. That is the reason why is the monitoring and regular evaluation of economic indicators of MWM a necessary condition for long-term development of MWM systems that would be environmentally, but also socially and economically bearable for citizens, municipalities and other subjects in the system.

Financial aspects of MWM are influenced by various factors of technological or institutional nature. First works about optimizing the current municipal expenditure on solid waste treatment emerge in 1960s and 1970s. In those days was the waste management seen mainly through the terms of collection, transport and landfilling. Since 1970s the research turned also to the relationship of expenditure and the parameters that influence it. According to Lombranno (2009), the first authors to examine the relationship between current municipal expenditure, size of the population and character of waste management company (public or private character) were Savas (1977) and Stevens (1977). Following studies (McDavid, 1985, Domberger et al, 1995, Szymanski, 1996, Gomez Lobo and Szymanski, 2001) focused primarily on the economies of scale the contraction process.

In the Czech Republic and Slovakia the works dealing with the issue of contracting in the field of waste management services are, for instance, Nemeč (2002), Pavel (2007), Ochrana et al. (2007) or Šauer et al. (2008).

Conducting the study of the South Moravian Region municipalities we examine whether the type of ownership (public, private) of waste management company play significant role in providing waste management services and how does the competitive environment contribute the waste handling price levels.

We assume, that the influence of the competition is greater among the municipalities, which have around (neighbouring municipalities) different waste management companies and there exists assumption of lower marginal costs for the competing company when considering expansion and overtaking of a new client (municipality).

Our research follows mainly on results of Soukopová and Bakoš (2010) examining the relationship between current municipal expenditure and size of the population, amount of waste, price of equipment and distance on the data of municipality with extended powers in the Czech Republic.

## **2. Results and discussion**

### *2.1 Methodology and data*

Data about municipal expenditure on waste management from Ministry of Finance of the Czech Republic (MF CR) automated budget systems ARIS<sup>2</sup> and ÚFIS<sup>3</sup> and data about population from Czech Statistical Office were used for the analysis of municipal waste management expenditures efficiency with emphasis on the competitiveness and type of company. Czech statistical office (CZSO) also monitors data about municipal expenditure on municipal solid waste management (MSWM) indeed, however based on the analysis and comparison of various environmental expenditure data (data from CZSO a MF CR)

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<sup>2</sup> <http://wwwinfo.mfcr.cz/aris/>

<sup>3</sup> <http://wwwinfo.mfcr.cz/ufis/>

performed by Bakoš, Soukopová a Kaplanová (2009) we consider data from Ministry of Finance of the Czech Republic to be more relevant.

Further information were acquired from waste management companies SITA, a. s., RESPONO, a. s. and van Gansewinkel, a. s. Mayors from municipalities provided further information regarding the contraction process, etc.

Municipal waste management expenditures are, according to the sector budget classification, reported under items listed in Table 1.



**Table I. Items of budget structure and their share on MWM expenditure 2005 – 2010**

Name of items of Budget structure	Number of item	Ratio of item's expenditure on total MSW expenditure
Collection and processing of secondary raw materials	2122	0.17%
Collection and transport of hazardous waste	3721	1.79%
Collection and transport of municipal waste	3722	75.79%
Collection and transport of other waste	3723	4.54%
Treatment and disposal of hazardous waste	3724	0.29%
Treatment and disposal of municipal waste	3725	10.66%
Treatment and disposal of other waste	3726	0.25%
Waste prevention	3727	4.10%
Monitoring of waste treatment	3728	0.08%
Other waste treatment	3729	2.33%

*Source: Authors according to Ministry of Finance, Czech Republic*

From the table 1 it is clear that the highest share on total MWM expenditure have item 3722 – Collection and transport of municipal waste (more than 75%) and item 3725 – Treatment and disposal of municipal waste (more than 10%). Due to this fact the analysis and the comparison of expenditure and price relationships and competitiveness environment were performed using only with these two expenditure items.

For this analysis it was necessary to find out what activities and services are included in these paragraphs and what indicators correlate with them.

To item 3722 can include collection and transport of municipal waste, transport of municipal waste from public roads, open spaces and the collection point and disposal of municipal waste. To item 3725 should be included only non-profit municipal waste management with the intention of replacing the production and

storage of waste (landfill disposal) reintegration process waste products into the economic cycle (in the form of raw materials or energy) and the recovery process (a process integrated with appropriate activities ), thus the use of waste.

According to the character of the above-mentioned public services, they are the function of the following variables<sup>4</sup>:

$$E_{WM} = f(w, p, d, t, c, WMC) \quad (1)$$

where

$E_{WM}$	municipal expenditures on waste management (CZK),
$w$	waste (t),
$p$	price of equipment <sup>5</sup> ,
$d$	distance,
$t$	transport costs,
$WMC$	waste management company <sup>6</sup> ,

For the sake of simplicity, we are going to deal with just variable “WMC”, which is a function of factors affecting business policy of the waste management company and its margin (character of ownership, character of competition, method of contracting services, etc.), ∴

$$WMC = f(Com, O, Contr) \quad (2)$$

where

$Com$	character of competition as market structure (number of WM companies),
$O$	character of ownership of WM company (public, private),

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<sup>4</sup> Taking the limited size of the Working Paper into an account, we intentionally leave apart some other variables reflecting Public Choice approaches (political cycle, the strength of a local government, e.t.c.) here. We plan to examine these aspects in a future research.

<sup>5</sup> Facility for recovery or disposal of municipal waste i.e. landfill, incinerator, mechanical-biological waste treatment plant, biogas, composting, etc. The price of the device is the final price of the input.

<sup>6</sup> It includes factors affecting business policy of the waste management company and its margin (character of ownership. character of competition, method of contracting services, etc.).

Cont method of contracting services,

Examining the influence of environment competitiveness, the map of waste management companies' coverage was used. Following hypotheses offers itself: *The influence of the competition is greater among the municipalities that have neighbors with different contract partner, s there exists assumption of lower marginal costs for the competing company when considering expansion and overtaking of a new client (municipality).*

## *2.2 Case study in the South Moravia Region*

For comparison of individual municipalities were used expenditures per capita. Acquired data are from 2007 to 2011 and represent the expenditure of all 673 South-Moravian municipalities.

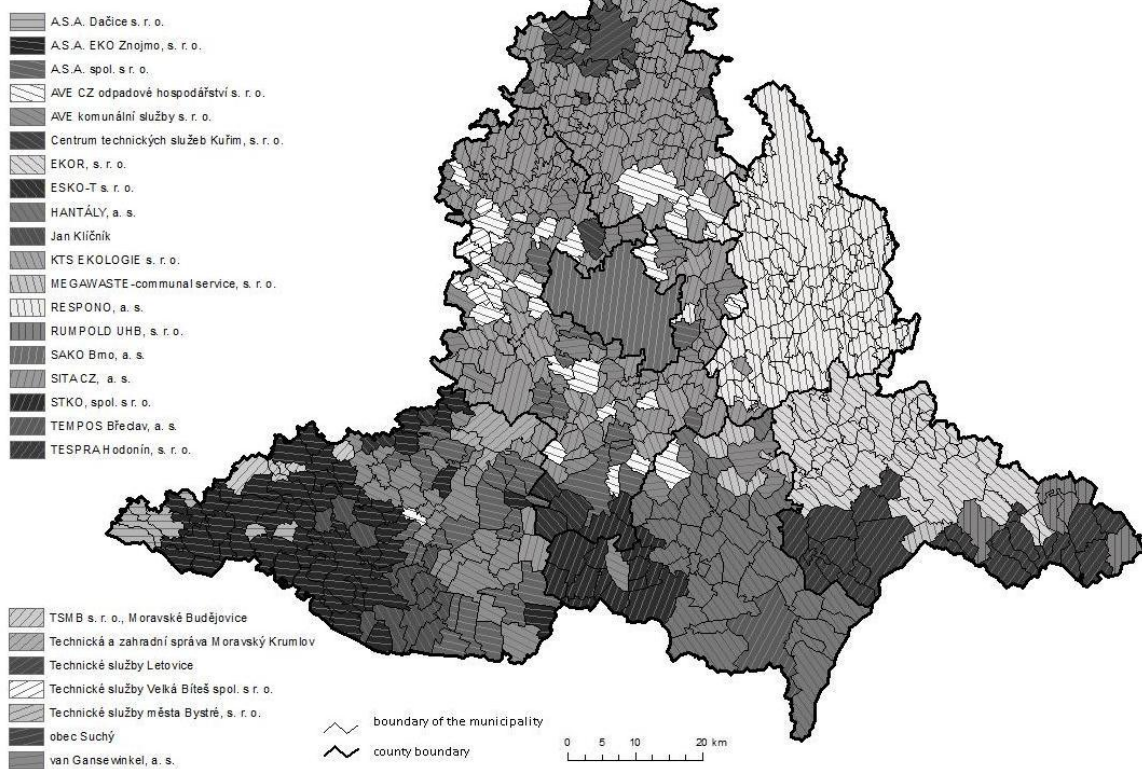
Individual municipalities were sorted according to whether they have a neighbor municipality with different waste management company contracted than the municipality itself. After creating seven groups of municipalities we have compared the data about the average expenditure per capita, mean value of expenditure per capita and the standard deviation of expenditure per capita with the data from whole South Moravian Region. The power of environment competitiveness was examined also within each district.

According to the information from the collection companies, only municipalities using landfill disposal method were considered. In 2008 was the incinerator in Brno under reconstruction and the collection companies were transporting the waste primarily to the landfills.

Figure 1 clearly shows that some municipalities are located within larger territories with common contract partner, while some are located on the border between two or more collection companies' areas.

**Figure I. Map of collection areas according to the collection companies for year 2011**

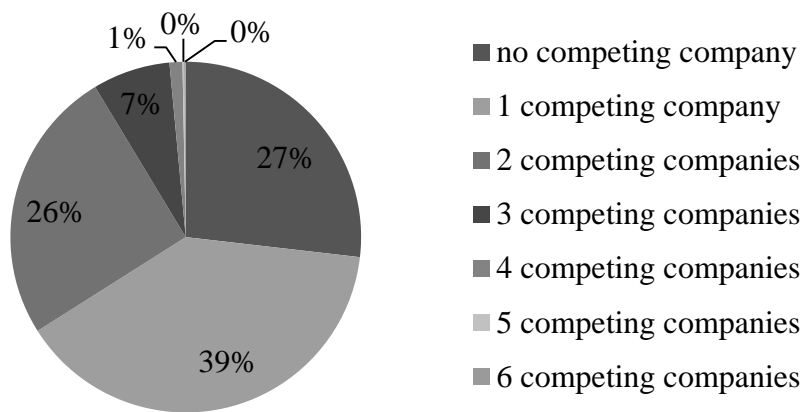
## Waste management companies



Source: Authors

Results of the analysis show that the power of environment competitiveness in the South Moravian Region (JMK) is average. More than 2/3 of examined municipalities are located in area with no more than one competing company and more than 90% of examined municipalities are located in area with no more than 2 competing companies, as depicted in the figure 2.

**Figure II. Character of competitive environment among municipalities in the South Moravian Region**



*Source: Authors*

When analysing average expenditure per capita adjusted from the distance to the facility factor according to relation (2), it was found out mean value, median value and standard deviation are lowest among municipalities with no competitive environment, as shown in following table.

**Table II. Results of the analysis of competitive environment influence on average expenditure per capita from 2007 to 2011**

Character of competition	Number of municipalities	Mean ( $\bar{x}$ )	Median ( $\mu$ )	Standard deviation ( $\sigma$ )
No competing WM company	182	481.54	450.52	49.21
1 competing WM company	263	584.54	528.12	64.87
2 competing WM companies	170	555.46	535.72	83.88
3 competing WM companies	48	1028.30	539.37	318.83
4 competing WM companies	8	564.73	616.84	61.60
5 competing WM companies	1	17.17		
6 competing WM companies	1	501.82		
South Moravian Region	673	578.98	507.80	83.22

Source: authors

This table shows extremely different mean values. The most extremely value is average standard deviation for a group of municipalities with 3 competing waste management companies and mean value for a municipality with 5 competing waste management companies. The municipalities with extremely different values were removed from the analysis.

The following table shows the analysis results are adjusted for extreme values (standard deviation of expenditure is higher than 100 CZK / capita)

Results of the analysis shown in table 3 completely reject the set hypothesis. Based on the analysis results it can be stated that the **examined territorial aspect of competitive environment does not have any significant influence** on the expenditure. Nevertheless, lower values arise also among municipalities with high level environment competitiveness (3 competing companies among neighbour municipalities). Due to that there cannot be any strong conclusion.

**Table III. Results of the analysis of competitive environment influence on average expenditure per capita from 2007 to 2011 - data adjusted from extreme values**

Character of competition	Number of municipalities	Mean ( $\bar{x}$ )	Median ( $\mu$ )	Standard deviation
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				(σ)
No competing WM company	167	475.88	446.46	42.42
1 competing WM company	231	550.97	521.65	44.83
2 competing WM companies	143	532.28	517.15	45.30
3 competing WM companies	39	507.56	506.16	40.79
4 competing WM companies	7	517.67	516.84	53.58
South Moravian Region	587	522.97	494.94	44.72

*Source: authors*

To strengthen the relevance of the analysis results was performed the analysis of the influence of competitive environment in individual counties, where there have been assumptions of low impacts of other factors. Analysis was performed on the data adjusted from extreme values. Results of the analysis are shown in following tables 4 and 5.

**Table IV. Number of municipalities and competitive WM companies in districts of South Moravian Region**

District	Municipality count	WMC count <sup>7</sup>	Number of municipalities with given amount of competing WM companies among neighbour municipalities						
			0	1	2	3	4	5	6
Blansko	116	7	5 5	44	15	1	1	-	-
Brno-City	1	1	-	-	-	-	-	-	1
Brno-Country	187	11	3 1	32	79	39	6	-	-
Břeclav	62	7	1 4	30	15	3	-	-	-
Hodonín	82	5	2 7	38	11	5	1	-	-
Vyškov	79	2	4 6	25	8	-	-	-	-
Znojmo	144	11	7	94	40	2	-	1	-

Source: Authors

**Table IV. Number of municipalities and competing companies in individual districts of South Moravian Region**

District	District mean value	Mean values per capita from 2007 to 2011				
		0 WMC	1 WMC	2 WMC	3 WMC	4 WMC
Blansko	467.05	462.15	450.15	517.08	393.16	-
Brno-Country	506.81	457.63	474.47	528.48	436.18	591.81
Břeclav	539.35	526.55	568.11	490.03	508.21	-
Hodonín	467.70	434.29	480.00	523.19	447.20	-
Vyškov	460.96	446.08	498.93	428.58	-	-
Znojmo	643.11	829.89	654.72	580.60	540.84	-

Source: Authors

Results of the analysis can be interpreted in several ways:

<sup>7</sup> SS – Svozová společnost – určuje počet konkurenčních svozových společností v sousedících obcích



1. To examine the hypothesis that in areas where there is less competitive environment is the effect of competition on the prices greater for municipalities whose neighbour municipalities have several different contract partners (collection companies), as there exists an assumption of lower marginal costs for competing companies when considering expansion and overtaking a new client.
2. To examine the hypothesis that the effect of competition on the prices is greater for municipalities whose neighbour municipalities have several different contract partners
3. To examine hypothesis that in areas where there is more competitive environment is the effect of competition to the prices in municipalities lower.

The first hypothesis can be accepted for Vyškov District, which is specific by the fact that RESPONO waste management company operates on almost whole area of the district – only two municipalities have contracts with waste management company SITA CZ. The municipalities with two available competing waste management companies have the lowest expenditures per capita from whole district. Second hypothesis, however, has not been verified. Although it could be verified for Znojmo District, where it is clear that municipalities more competitive environment have lower expenditures per capita. Nevertheless, this does not hold for other counties. In Brno-Country District and Blansko District, where there is more competitive environment, have the lowest expenditure per capita municipalities with the least competitive environment, and there exist inverse relationship between environment competitiveness and expenditure. Third hypothesis was accepted for Blansko District, Brno-Country District and Hodonín District. Based on results of Brno-Country District this hypothesis could be verified. The competitive environment here is the strongest from whole South Moravian Region. But this hypothesis has been rejected for Znojmo District, where there is also strong competitive environment (11 waste management companies) and expenditures per capita are lower.

Based on these inconsistent results it can be stated that the extent of environment competitiveness does not play significant role as a factor of

efficiency when considering expenditure on MSWM. From the analysis it can be concluded that other factors have higher influence on the amount of expenditure per capita. In case of Czech Republic plays important role also the fact that waste management companies operate on small area and therefore have to cooperate, which notably deforms the competitive environment.

This is verified also by the research of Szymanski (1996), which shows that for the expenditure per capita level is more important the effect of waste management company ownership type.

Therefore other analysis was focused on types of ownership of waste management company (table 6).

It is evident that lower expenditures have municipalities with ownership in the waste management company. This contradicts the results of Szymanski (1996) research, which submit that can be achieved greater savings if contracting with private waste management company. From our perspective, this research did not analyse the behaviour of local companies in the competitive environment. These public waste management companies operate and behave like private companies. Especially if they have the character of public limited companies or join stock companies as is the case with the company RESPONO, in which municipalities have some of the lowest long-term expenditures. In addition, research of Szymanski (1996) is confirmed by results of companies SITA CZ and van Gansewinkel, that are the market strongest. Average expenditure of municipalities which cooperate with those waste management companies are among the lowest in the South Moravian Region.

**Table VI. Character of ownership of WMC and average municipal expenditures from 2007 to 2011**

Waste management company	Character of ownership	Number of municipalities	Average municipal expenditures
A.S.A. Dačice Ltd.	SS	7	760.58
A.S.A. EKO Znojmo. Ltd.	SS	57	642.40
A.S.A. spol. Ltd.	SS	39	562.91

AVE CZ odpadové hospodářství Ltd.	SS	32	506.44
AVE komunální služby Ltd.	SS	32	520.91
HANTÁLY. a. s.	SS	36	559.89
Jan Klíčník	SS	13	556.68
MEGAWASTE-communal service. Ltd.	SS	7	505.11
SITA CZ. a. s.	SS	190	477.91
TEMPOS Břeclav. a. s.	SS	1	755.01
van Gansewinkel. a. s.	SS	24	458.21
Centrum technických služeb Kuřim	VS	1	610.95
EKOR. Ltd.	VS	50	514.78
ESKO-T. Ltd.	VS	5	549.14
KTS EKOLOGIE Ltd.	VS	16	494.73
Obec Suchý	VS	1	0.93
RESPONO. a. s.	VS	80	469.61
RUMPOLD UHB. Ltd.	VS	6	565.48
SAKO Brno. a. s.	VS	1	998.11
STKO. spol. Ltd.	VS	15	594.90
Technická a zahradní správa Moravský Krumlov	VS	3	433.20
Technické služby Letovice	VS	17	558.81
Technické služby města Bystré. Ltd.	VS	1	274.79
Technické služby Velká Bíteš spol. Ltd.	VS	6	410.58
TESPRA Hodonín. Ltd.	VS	25	507.44
TSMB Ltd.. Moravské Budějovice	VS	6	516.72

Source: Authors

According to Ochrana et al. (2007), Nemeč (2002) or Pavel (2007) is in case of waste treatment the most important factor the way of contracting the service with open (or restrained) public competition being the most efficient. However,

the research of Ochrana et al. (2007), Nemeč (2002) or Pavel (2007) did not examine the behaviour of public trade companies as a part of competitive environment, where they behave as private companies (especially if they take form of stock companies).

### **3. Conclusion**

The paper contains results of performed analysis and evaluation of municipal expenditure on solid waste management per capita and evaluation of the influence of environment competitiveness on the efficiency of these expenditures.

Results of the analysis clearly show that within the analysed sample of municipalities one cannot identify any significant influence of the environment competitiveness on the efficiency of municipal solid waste expenditure.

The hypothesis *“The influence of the competition is greater among the municipalities that have neighbours with different contract partner, so there exists assumption of lower marginal costs for the competing company when considering expansion and overtaking of a new client (municipality)”* has been refuted.

It is obvious that the factors that influence the efficiency to a greater extent are price and trade policies of waste management companies, the way of service contraction and the character of waste management company ownership. Important role plays the rate of the waste treatment facility, which was examined in this analysis. That is the reason why the following research will be focused in this direction in order to accept or reject the results of this analysis. Also other mentioned factors would be subsequently examined.

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