

**Theses of doctoral (PhD) dissertation**

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**INVESTIGATION OF OPERABILITY OF MUNICIPAL COMPANIES  
IN HUNGARY USING MULTIPLE VARIABLE STATISTICAL  
METHODS**

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# 1. INTRODUCTION

## 1.1 SIGNIFICANCE OF THE TOPIC

Financial crisis did not only affect traditional profit-oriented companies but also authorities providing services and companies under their ownerships. After the world economic crisis that broke out in 2007 and arrived to Hungary in 2008, municipal companies faced the risk of indebtedness and inoperability, besides the fact that the number of companies significantly increased during the crisis.

The consolidation of the debt of Hungarian local governments accumulated between 2002 and 2008 was performed by the state between 2011 and 2014, in contrast, the debt consolidation of the companies under their ownership did not happen. However, these firms became regulated by budgetary rules, especially debt regulations from 2015, so, as a consequence borrowing became subject to authorization for municipal companies.

More than a thousand municipal companies operate in our country, so monitoring their management is highly important as they perform public tasks and during their operation they manage municipal property, which belongs to the national property. This is laid down in the Fundamental Law of Hungary, as the property of the state and local governments is national property. Municipal companies form the essential part of the national property and they are partly managed by public funds, therefore it is important to determine their operability, and the analysis of the going concern principle which has appreciated as a result of the economic crisis.

The significance of the topic is further enhanced by the fact that former audits of State Audit Office (2012) also highlighted the significantly increasing indebtedness of municipal firms, and that the local authorities did not pay enough attention to the increasing total debt of the organizations and the presentation of financial risks to the representative bodies. State Audit Office found that liabilities in the balance sheet of contractual relationships between companies and their owners, off-balance sheet liabilities and liabilities to third parties are not directly and fully available.

## 1.2 OBJECTIVES OF MY RESEARCH

Main subjective of my treatise is the analysis of municipal companies' operability. Early recognition of bankrupt, financially unsustainable status is very important for these companies as they perform public tasks during their activities, affecting the value of national property and the operability of owners.

Objectives of my research are the following:

**O1: I investigate the profitability, capital structure, and liquidity status indicators of the companies to make a comparison between municipal and traditional, privately owned, market-based companies. My goal is to analyse and evaluate the effect of ownership background on management of the companies.**

Municipal business organizations does not only need to conform to the market conditions, but their operation is also highly affected by the legal and political environment and its potential changes. Nevertheless, keeping municipal companies operable is important for the entire society.

**O2: I analyse the debt trends of municipal business organizations with respect to the period after the municipal debt consolidation.**

Government of Hungary took over all the debt of the local governments and based on the Law of Stability (Act CXCV of 2011), municipal borrowing became subject to authorization. My goal is to analyse whether the local governments transferred their debts to the companies under their ownerships as a result of the stronger legal control. (By transferring, I do not mean transferring the actual, concrete debt, but to entrust the public service provider business organizations with such services/additional tasks that they had no capacity to fulfil, so that they needed to apply for loan.)

**O3: My third objective is to create such an Early Warning System (EWS) model that can indicate the inoperability of municipal business organizations.**

In my previous researches, I analysed the operability of municipal firms using bankruptcy forecasting models well known from literature. However, as these models are not designed for the Hungarian utility companies, the indicators of the companies and the models did not match in several cases.

**O4: In my treatise, beyond the domestic practice, I also take an international perspective on the management characteristics of municipal business organizations.**

Providing public services through companies is typical in Hungary. In Romania and Slovakia, the number of municipal companies is lower than in Hungary, and their management parameters are also different as a result of the distinct legal environment. Hungary has 0.5 municipal companies per local government, which is high compared to 0.17 and 0.07 of Romania and Slovakia respectively.

### **1.3 HYPHOTHESES OF MY RESEARCH**

**H1: Ownership background (municipal or private) affects the management indicators of companies. Domestic municipal firms have less favourable indicator values than the market-based private companies in terms of liquidity and profitability. Significant deviation can be detected between the equity ratio, liquidity and return on assets of the companies with different backgrounds.**

According to Krénusz (2017), capital structure of the companies is affected by corporate governance and characteristics of the institutional system.

**H2: Debt of municipal companies increased after the debt consolidation.**

According to the research of Homolya and Szigel (2008), although in case of municipal companies we cannot speak about such a “loan boom” as it happened for their owners, however, in the researches, they found that the overall amount of credit at the municipal companies has reached 25-30 percent of the full debt of the local governments. According to Aczél and his co-author (2012), debt of municipal companies had exceeded 200 billion forints by 2011. Research of Hegedűs (2016) states that, similarly to the owner local governments, debt of municipal companies increased between 2006 and 2013.

**H3: More than 40% of the domestic municipal business organizations are inoperable.**

I phrased this hypothesis based on the results of my former researches (see Annex 2). Financial, wealth and profitability situation was unfavourable at 40 percent of the analysed companies, while this status was not fully confirmed by bankruptcy forecasting models of different countries. Thus I confirm my hypotheses with the support of my self-created early warning system model. I create the model based on data from the reports of Hungarian municipal business organizations.

**H3a: Deterioration of solvency and profitability was not in every case the root cause of permanent cessation of business activities of municipal companies.**

According to Lentner's study (2014), operability of municipal companies is highly affected by change in ownership background, and also potential change of government or different political decisions.

**H4: Performing public tasks through municipal companies is typical in Hungary, while less companies operate in this form in the neighbouring countries and there is a significant difference between the indicators of the different countries.**

Krénsz (2005) states that differences in the capital structures of companies are mainly caused by deviations of regions and countries.

Utility companies played more and more significant role in Hungary from the second half of 19<sup>th</sup> century as they were responsible for carrying out public tasks and for providing public services. After the Austro-Hungarian Compromise of 1867, construction of a modern national railways system happened through acquisition of state shares in private railway companies, and the influencing role of the state increased in other market sectors as well.

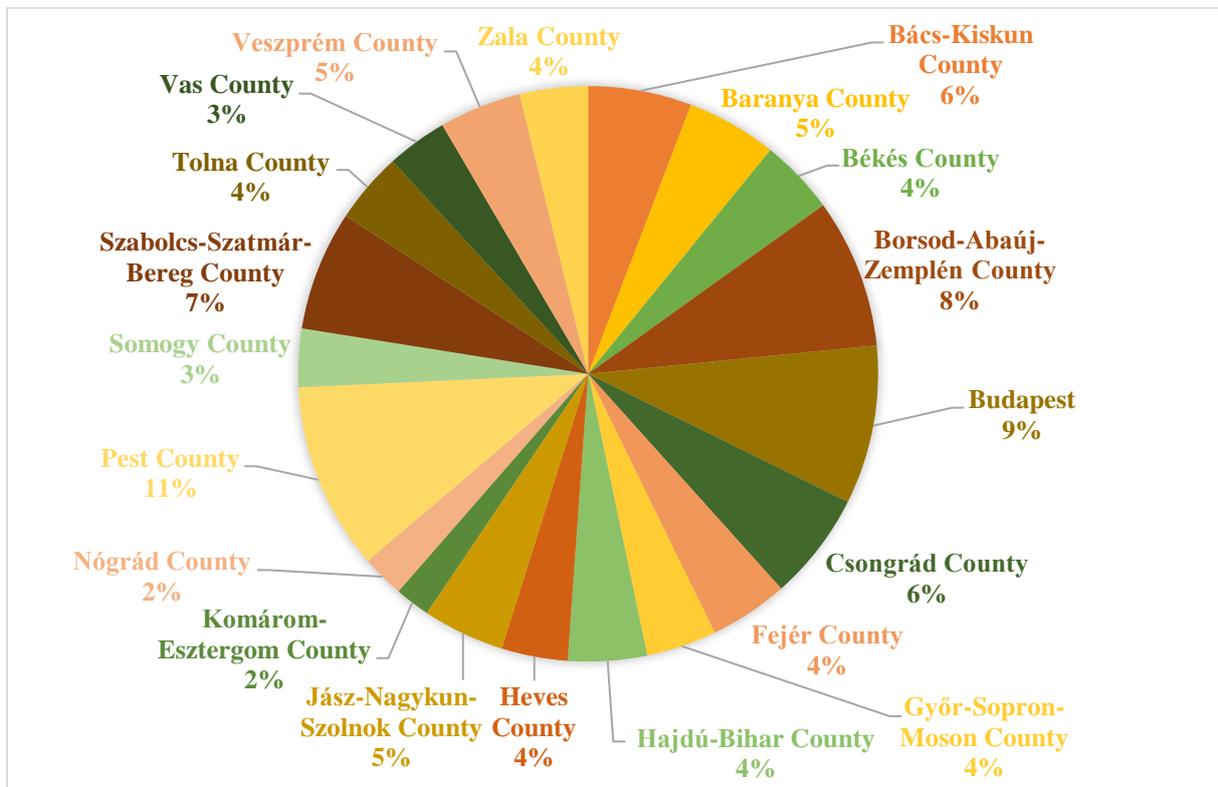
Nationalization processes after World War II made collective property typical for the entire Hungarian economy, however, beginning with the New Economic Mechanism of 1968, market considerations emerged for the utility companies, even if only to a minimal extent. However, planned economy of socialism did not make formation of real market structure possible, due to its basic philosophy (Lentner, 2020).

Until the beginning of 1990s, the bigger, country-wide public service provider systems were in state hands. Then, privatization took place, and making profit became the primary goal of the new owners, which negatively affected the financial conditions of the population. After the democratic transformation, leaders of economic policy organized an up-to-date municipal public service system. Local authorities were the responsible for performing public tasks, more and more supported by privatized utility companies with supplying capacity in their location, while the influence of the utility companies which remained under local governmental ownership decreased. An extensive public finance reform took place after 2010 with the main goal of improving public financial stability and the life quality of the population. As a result, the New Public Management and its economic philosophy, which was "constructed" from the 1970s in Anglo-Saxon areas, and was established in Hungary since the democratic transformation, was replaced by such a utility service practice which meant official regulation of public service prices, continuous centralization of assets included in the services, repurchasing utility companies as national property, and through these processes, wider realization of the common good became a higher priority, besides and beyond making profit (Lentner, 2017).

## 2. MATERIALS AND METHODOLOGY

### 2.1 THE GROUP OF ANALYSED COMPANIES

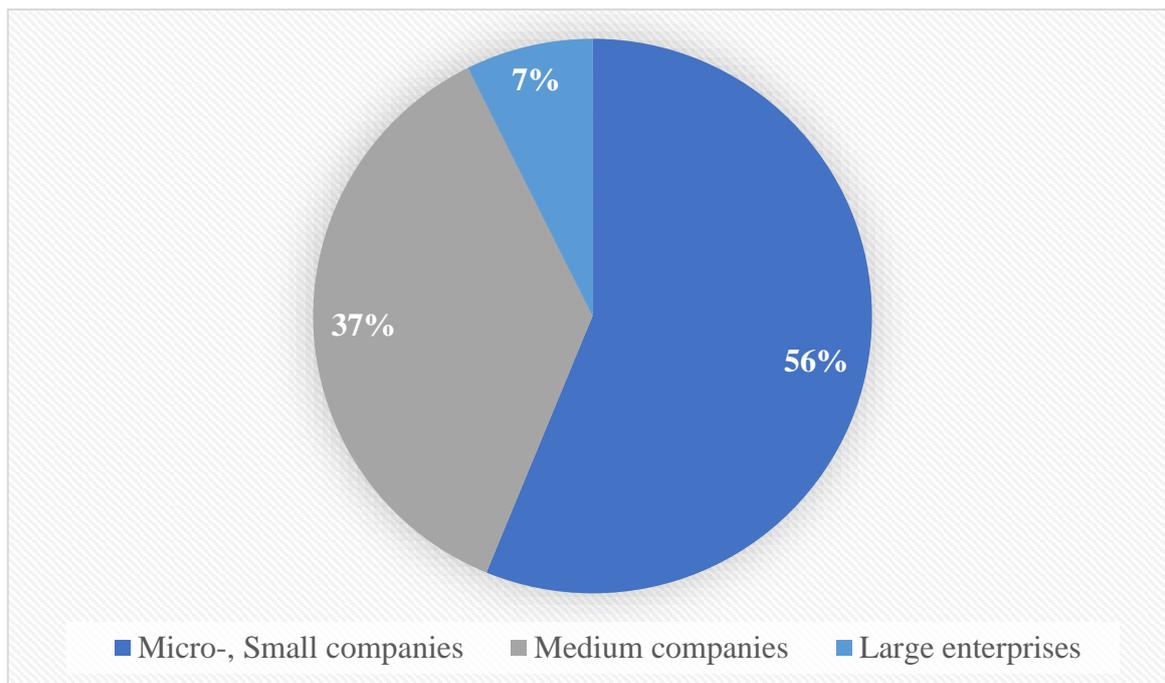
Hungarian municipal business organizations where at least 50 percent is under the ownership of a local government were in the focus of my research. According to the database of Amadeus, this group counted 1699 business organizations in 2017. When it comes to distribution of municipal firms within the country, this form of enterprises is typical in Pest county and Budapest. The number of municipal companies is also high (more than a hundred) in Borsod-Abaúj-Zemplén, Bács-Kiskun, Csongrád, and Szabolcs-Szatmár-Bereg counties, which means the municipal companies in the different counties make up 5% of the total number (Figure 1).



**Figure 1: Distribution of Hungarian municipal corporations in different counties (n=1699)**

*Source: Own editing based on the Amadeus database*

Size classification based on “KKV-law” is not applicable for municipal companies (Act XXXIV of 2004), however, considering their number of employees, they would most likely be in the category of micro, small or medium companies (see Figure 2). The number of employees in each company was less than 150 people, and their sales revenue did not reach 50 million forints (the company with the highest income realized 9 million forints of price income in 2017).

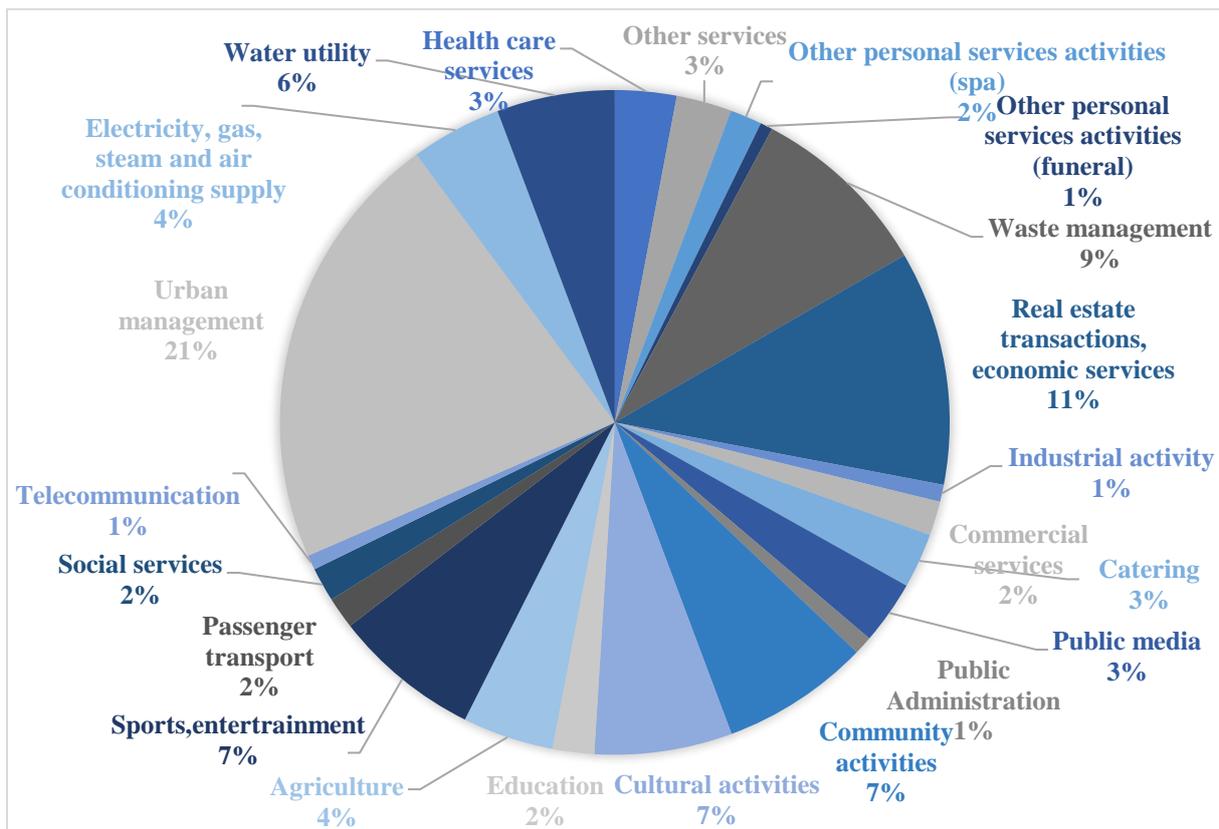


**Figure 2: Classification of Hungarian municipal corporations by size categories (n=1699)**

*Source: Own editing based on the Amadeus database*

Municipal business organizations in Hungary typically operate in micro or small business form. 7 percent of the municipal firms would count as large enterprise. Sales revenues of these companies were around 1 million and 390 million euros, while their number of employees exceeded 100 people. Holdings, water utility companies, and even companies providing passenger transport and education services can be found in the group of large enterprises. 22 percent of the larger enterprises operate in Budapest, 10 percent in Borsod-Abaúj-Zemplén County. With the exception of Nógrád, there is at least one larger company in each county.

Figure 3 shows the classification of municipal companies based on their base activities.



**Figure 3: Classification of Hungarian municipally owned companies according to their field of activity (n=1699)**

*Source: Own editing based on the Amadeus database*

In terms of the performed tasks, activities of municipal companies are quite diverse. The activities of 21 percent of these companies are related to settlement management, which includes the activities in connection with urban management. 11 percent deals with wealth management, and 9 percent of them is involved in waste management. 6 percent of the municipal organizations provide water utility services, while 4 percent of them provide electricity and district-heating services. Both cultural and community activities are performed by 7-7 percent, similarly to sports, entertainment and free time activities, which are done by 7 percent too. Only 3 percent of the companies provide health care services, while social care services are provided by 2 percent of them. Education, passenger transport, commercial and spa operation activities are performed by 2 percent of the companies, while only 1 percent of them deal with telecommunication, funeral, industrial and public administration.

## 2.2. METHODS USED DURING THE RESEARCH

During my research, I analyse the operability of municipal business organizations supported by the data from reports available for public use.

*Table 1* contains the methodology used to prove the hypotheses.

**Table 1: Methodology of doctoral dissertation**

Premises	Objectives, Hypotheses	Methodology	Variables, indicators
<b>Molnár – Hegedűs (2019)</b>	O1 » H1	Descriptive statistics, Chi-Square Test, Two-Sample t-Test, Mann-Whitney U Test	Liquidity rate, equity ratio, ROA indicator
<b>State Audit Office (2017)</b>	O2 » H2	Parametric and non-parametric test	Long-term and short-term liabilities
<b>Molnár - Hegedűs (2018a, 2018b), Molnár (2018), Nagy et al. (2018), Molnár (2019), Lentner (2014)</b>	O3 » H3	Logistic regression	Indicators of capital structure, liquidity, indebtedness, efficiency, profitability
<b>Nagy et al. (2018), Molnár et al. (2018), Molnár – Hegedűs (2018b)</b>	O4 » H4	Descriptive statistics, Chi-Square Test, Two-Sample t-Test, Mann-Whitney U Test	Wealth, financial, income indicators

*Source: Self-edited, based on Hegedűs-Molnár, 2019; Zéman – Béhm, 2016 és 2019; Bán et al., 2017*

### ***Material and methodology for Hypothesis 1***

My first hypothesis states that wealth, financial and income indicators of the municipal companies show less favourable picture than the indicators of market-based companies. In our former study (Molnár – Hegedűs, 2019), we analysed 34 private and 34 municipal business organizations. The research highlighted that the ratio of loss-making companies was higher between the municipal companies than between the analysed privately owned business organizations.

Using the indicators, besides descriptive statistics, I chose to prove my hypothesis as a function of normality using Chi-Square Test, Two-Sample t-Test, and Mann-Whitney U Test. Chi-Square Test by Pearson shows the correlation between two categorical variables. Null hypothesis of the test means that the two variables are independent. Rejecting the null hypothesis means that the two variables are not independent, in this case, the value of significance level is below 0.05.

Two-Sample t-Test points out whether there is significant difference between the averages of two random variables from two different samples. However, a precondition of applying this test

is that the two random variables shall be normally distributed. I perform Kolmogorov-Smirnov Test to check the normality. Mann-Whitney U Test is the non-parametric version of Two-Sample t-Test, which can be applied in case of non-normally distributed random variables (Szűcs, 2004). Null-hypothesis of Two-Sample t-Test is that the expected values of the random variables are equal, meaning the test does not show significant difference between the averages of random variables in the two samples. In case of Two-Sample t-Test, rejecting the null-hypothesis, the expected values of the random variables are not equal, so they differ significantly. Null-hypothesis of Mann-Whitney test is that the two samples are coming from normal distribution. In case the significance level is higher than 0.05, then the two samples are not different, while when it is lower than 0.05, then the two analysed groups significantly differ.

### ***Material and methodology for Hypothesis 2***

In its reports, State Audit Office (2012, 2017) highlighted the fact that after the debt consolidation of local governments, debt of the companies under their ownership was not taken over. Several researches, studies emerged in the topic of municipal debt consolidation, however, the development of municipal companies' debt has not yet been analysed.

The second assumption of my dissertation is that the full debt of municipal business organizations increased after the debt consolidation. The variables under analysis are liability and indebtedness indicators, and I apply parametric and non-parametric tests in terms of methodology, depending on the distribution.

Assuming a normal distribution, I perform an analysis of variance based on the data from years 2008, 2012, 2015, 2016, 2017. Analysis of variance shows whether there was a significant difference between the data of the different years. In case the population is not normally distributed, I perform Kruskal-Wallis Test. Analysing the data from 2008 is important because this was the year when the World Economic Crisis started, 2012 was the starting year of debt consolidation, and then, by 2015, all debt of local governments had been taken over by the state.

Analysis of variance is capable of comparing the averages of several normally distributed groups with equal standard deviations. According to the null-hypothesis of the analysis, there is no difference between the averages, the average of the target variables is equal in each group. If the level of significance is lower than 0.05, we reject null hypothesis, meaning the averages are not equal, and significant difference can be found between the averages of the groups. Kruskal-Wallis Test is a non-parametric statistical procedure that can be used to decide whether the given samples can be derived from the same exact distribution. As per the null hypothesis of the statistical test, medians are equal in each group.

### ***Material and methodology for Hypothesis 3***

My former researches (Molnár- Hegedűs 2018b, 2018c; Nagy et al., 2018, Molnár, 2019b) proved that the bankruptcy models known from literature are not necessarily capable for forecasting the risk of bankruptcy in case of Hungarian municipal companies. While indicators were showing the actual wealth, financial and income problems, the bankruptcy models did not lead to the same results as the indicators.

This is why I consider it important to create a model that can warn about the risk of bankruptcy for municipal companies, and also the problems of inoperability and solvency. Statistical

methods most commonly used for bankruptcy models are discriminant analysis, regression models (logistical and probit regression), decision trees and neural networks.

In the end I chose logistic regression as it does not have such limitations to the normality of the variables as the discriminant analysis. The only assumption of the logit method is that the logarithm of the odds ratio depends linearly on the dependent variables. Logistic regression estimates the probability the occurrence of a specific event (dependent variable). Knowing the value of conditional probability, the decision maker is able to create a decision rule about which of the pre-defined, result-based categories the observation unit is part of (Hajdu et al., 2001). If the number of the outputs of the result variables is two, that means it is a binomial logistic regression, if more than two, then it is polynomial or multinomial regression (Szűcs, 2004).

When it comes to bankruptcy forecasting, binomial logistic regression is the relevant type as the model's two possible results are bankruptcy or survival.

Assumption of binary logistic regression is that the dependent variables explain one of the possible outcomes. Logistic regression models the ratio of probability, so the odds value of two, mutually exclusive categories knowing the values of  $x$  dependent variables. Odds value can be defined with the following formula, which is the ratio probabilities depending on  $x$ :

$$\text{odds} = \frac{p}{1-p}$$

Based on the assumption of logistic regression, linear function of the dependent variables is the logarithm of odds:

$$\ln(\text{odds}) = \ln \frac{p}{1-p} = \log \text{it}(p) = b_0 + b_1 x_1 + \dots + b_p x_p$$

B parameter of the model can be estimated using maximum likelihood method. The main objective of the maximum likelihood principle is to provide an estimation for the unknown parameters of a measurement under which the given value most likely occurs.

Finally, the cut-off point needs to be defined. A P value higher than the cut-off point indicates that the company survives, while a lower value means that we consider it as bankrupt (Hajdu, 2001; Kristóf, 2008a).

For modelling, I use two subsamples: municipal companies terminating their business and the operable organizations. To compose the model, I will use wealth, financial, income and efficiency indicators.

Asset and capital structure indicators are the most suitable for the analysis of wealth conditions. By the asset structure indicators, we can identify the most significant proportions of a company's assets and their changes.

Liquidity of the company can be determined using indicators evaluating financial situation. Liquidity means that a company fulfils its payment obligations within the prescribed time limit in any cases. Keeping the liquidity is an essential prerequisite of the company's activity and to meet the conditions of the going concern principle.

Profit and loss statement makes it possible to analyse the trends of profitability in the business organization. Profitability shows the ratio of income and expenditures. During the comprehensive analysis of profitability, we compare each different result category to some kind

of a base projection. This kind of analysis indicates the changes in ability of making profit regarding to the profitability level, provides possibility to analyse the trends of profitability, furthermore, by the analysis, the company becomes comparable to other companies or averages in the sector.

Efficiency and profitability has a high correlation, so besides the profitability, the quality of economic efficiency for the companies is also worth analysing. Main principle of cost-efficiency is to achieve the highest possible result with the lowest possible investments. Economic efficiency show the cost-efficiency, so the efficiency can be measured as performance per quantity unit (expenditure) of the used production resources (or the reciprocal).

The analysed sample of companies included 234 active organizations still operating in 2017, and 70 companies that terminated operations between 2011 and 2017. To create the model, I take wealth, financial, income and efficiency indicators from the company reports (for the still active companies, I take the report of 2016 as a basis, for those who ceased operations, I take the data from the reports of the years before the termination).

Table 2 below shows the indicators:

**Table 2: Building indicators of the model**

Wealth indicators	
$\frac{\text{Fixed assets}}{\text{Balance sheet total}}$	$\frac{\text{Equity}}{\text{Balance sheet total}}$
$\frac{\text{Current assets}}{\text{Balance sheet total}}$	$\frac{\text{Liabilities}}{\text{Balance sheet total}}$
$\frac{\text{Tangible assets}}{\text{Fixed assets}}$	$\frac{\text{Long term liabilities}}{\text{Balance sheet total}}$
$\frac{\text{Intangible assets}}{\text{Fixed assets}}$	$\frac{\text{Short term liabilities}}{\text{Balance sheet total}}$
$\frac{\text{Fixed financial assets}}{\text{Fixed assets}}$	$\frac{\text{Equity}}{\text{Capital stock}}$
$\frac{\text{Stocks}}{\text{Current assets}}$	$\frac{\text{Equity}}{\text{Liabilities}}$
$\frac{\text{Receivables}}{\text{Current assets}}$	Scale of capital stock: log capital stock
$\frac{\text{Financial assets}}{\text{Current assets}}$	Scale indicator of wealth: log tangible assets and log total
Company liquidity indicators	
$\frac{\text{Net working capital}}{\text{Liabilities}}$	$\frac{\text{Current assets} - \text{Stocks}}{\text{Short term liabilities}}$
$\frac{\text{Current assets}}{\text{Shortterm liabilities}}$	$\frac{\text{Financial assets}}{\text{Shortterm liabilities}}$
Profitability indicators	
$\frac{\text{Earnings before taxes} + \text{Costs on financial transactions}}{\text{Balance sheet total}}$	$\frac{\text{Earnings before interests and taxes}}{\text{Net sales}}$
$\frac{\text{Earnings after taxes}}{\text{Balance sheet total}}$	$\frac{\text{Earnings before taxes}}{\text{Net sales}}$
$\frac{\text{Earnings before interests and taxes}}{\text{Balance sheet total}}$	$\frac{\text{Cash flow}}{\text{Net sales}}$
$\frac{\text{Earnings after taxes}}{\text{Capital stock}}$	$\frac{\text{Earnings before interests and taxes}}{\text{Personnel costs}}$
Efficiency indicators	
$\frac{\text{Net sales}}{\text{Balance sheet total}}$	$\frac{\text{Net sales}}{\text{Net working capital}}$

Source: Self-edited

After creating the early warning system model, I use the model to evaluate the operability of the municipal companies going out of business with respect to the year before termination of their activities. Using the wealth, financial and profitability indicators I prove that the final termination of business activities was not necessarily caused by operability issues when it comes to municipal companies.

#### ***Material and methodology for Hypothesis 4***

My fourth objective is to analyse and perform comparison on the indicators of municipal companies in Hungary, Romania and Slovakia. The analysis is performed on wealth, financial, and income situation indicators. My goal is to prove that there is a significant difference between the indicator values of the municipal companies operating in the different countries. Beyond descriptive statistics, I would like to prove my hypothesis using Chi-Square Test, Paired-Sample T-test, and Mann-Whitney test, based on the indicators. I have already described the results of the statistic tests in more detail in subsection 1.

### 3. NEW AND NOVEL SCIENTIFIC RESULTS

**1. In my research I proved that structure of ownership background affects the operation of both municipal and private companies.**

The traditionally profit-oriented market-based companies has more favourable profitability, equity and liquidity values. However, we must note that the comparison was done between companies performing the same kind of tasks, which were real estate and property management. The operation of municipal companies is affected by a number of other factors which are not relevant for the activities of classically market-based companies. Changes in political environment, and the consequent replacement of professional leaders and defection of specialists risk the operability and effective management of municipal business organizations.

**2. In my research I proved that full debt of municipal business organizations increased after the debt consolidation of the local governments.** Monitoring authority of State Audit Office has been extended to management of municipal companies since 2011. Law of Stability regulates borrowing and inhibits realization of extreme indebtedness of local governments since the debt consolidation. Debt of municipal companies mostly consist of short-term liabilities, even after 2014, no intensive growth can be observed in the value of long-term liabilities. The liabilities of companies increased between 2014 and 2016, however, as a result of legal control, liabilities decreased in case of municipal companies by 2017.

**3. As a result of my research I developed a model specifically for Hungarian municipal business organizations which is able to forecast the risk of inoperability.** According to the model developed using binary logistic regression method, going concern accounting principle is risked in case of 24 percent of the still operating companies.

Formula of the model: 
$$Z = \frac{e^{-1.086 - 3.09 * x_1 - 6.656 * x_2 + 0.658 * x_3}}{1 + e^{-1.086 - 3.09 * x_1 - 6.656 * x_2 + 0.658 * x_3}}$$

where the variables equal to the following indicators:

$$x_1 = \frac{\text{Financial assets}}{\text{Current assets}}$$

$$x_2 = \frac{\text{Earnings before interests and taxes (EBIT)}}{\text{Balance sheet total}}$$

$$x_3 = \frac{\text{Liabilities}}{\text{Net sales}}$$

Critical value: 0.5

**4. I also proved the fact that providing public services through business organizations is mostly typical in Hungary, and that the way of management and effectiveness of utility companies is significantly different in each country.**

For my investigation, I took the data of two neighbouring companies as a basis. Considering the values of Slovakia and Romania, it is visible that Hungary has significantly more municipal companies than the two neighbouring countries. However, difference can not only be found in the count of the companies, but also in their management parameters. In terms of solvency, values of Slovakian utility companies were the weakest, while Romanian companies appeared to be the most effective.

## 4. CONCLUSIONS AND SUGGESTIONS

Table 3 shows the results of my hypotheses phrased in the beginning of the analysis.

**Table 3: Methods and results of hypothesis testing**

Hypothesis	Applied methodology	Result
Ownership background (municipal or private) affects the management indicators of the companies. Domestic municipal companies have less favourable indicator values than the market-based private companies, both in terms of liquidity and profitability. There is a significant difference between the equity, liquidity and return on assets of the companies with different ownership backgrounds.	Descriptive statistics, Chi-Square Test, Mann-Whitney U Test, Analysis of Variance	<b>PARTIALLY ACCEPTED</b>
Debt of municipal companies increased after the debt consolidation.	Descriptive statistics, Kruskal-Wallis Test	<b>ACCEPTED</b>
More than 40 percent of domestic municipal business organizations are inoperable. In case of municipal firms, deterioration of solvency and profitability is not always the root cause of final termination of operations.	Binary logistic regression	<b>PARTIALLY ACCEPTED</b>
Performing public tasks through municipal organizations is typical in Hungary, while in the neighbouring countries less companies operate in this form, and there is a significant difference between the indicators of the different countries.	Descriptive statistics, Chi-Square Test, Kruskal-Wallis Test	<b>ACCEPTED</b>

*Source: Self-edited*

I partially accepted my first hypothesis. In terms of effectiveness, Chi-Square Test and Mann-Whitney statistical tests confirmed that ownership background affects profitability, and it is clearly visible from the descriptive statistics that 35-40 percent of municipal companies realized negative results in the period under analysis, while we could see loss-making operation only at 20-30 percent of classically market-based companies. Based on the performed statistical tests, there was not always significant difference between the equity and liquidity ratios of the companies. Larger proportion of profit-oriented companies had adequate solvency based on the financial indicators, while utility companies did better in terms of equity.

I accepted my second hypothesis, which states that debt of municipal business organizations increased after the municipal debt consolidation. Hungarian government took over the debt of local governments between 2011 and 2014. Between 2014 and 2017, the aggregate and average value of short-term and long-term liabilities increased in case of municipal companies. Nevertheless, high value of short-term liabilities is more typical in case of municipal business

organizations. The increase in the average of liability values was not caused by the increasing value of a few companies with higher debt, as the median and the percentiles were also increasing between 2014 and 2017, and the short-term debt of the company with the highest value even decreased. By 2017, minimal improvement can be observed in the liability of the companies. Examining the total debt, values of 2014 show deviation. In that year, total liabilities were affected by location, and the growth of short-term liabilities was also the most significant in this year.

I reject my third hypothesis that going concern principle will not be met in the future in case of more than 40 percent of Hungarian municipal business organizations. For this hypothesis, I took the results of my earlier researches as basis, which I performed using bankruptcy forecasting models known from literature. However, it should be noted that these models are not designed for utility companies, furthermore, in many cases not for Hungarian companies. The model developed by me, the main variables of which are the proportion of financial assets within current assets, the quotient of EBIT and balance sheet total, and the quotient of liabilities and revenue, showed that only 24 percent of domestic municipal companies has a high risk of inoperability. I accept the part of my third hypothesis which states that ceasing business operations of municipal companies was not caused by drop in economic performance, but the changes in ownership and political background. According to the model designed for Hungarian utility companies and the wealth, financial, profitability indicators, going out of business was a reasonable step for 60 percent of the municipal companies based on the deterioration of operability.

I accepted my fourth hypothesis. 1600 municipal companies operate in Hungary, while, considering the neighbouring countries, the number of them in Romania is less than 600, and close to 200 in Slovakia. It was confirmed by the performed statistical tests that significant differences can be observed between the financial and wealth indicators of companies operating in the different countries. Examining the indicators, it can be said that Slovakian utility companies are the weakest in terms of operability, while wealth situation of Romanian companies was the most favourable, and there was only a minimal difference between the solvency of Romanian and Hungarian companies (taking the classification of the companies based on liquidity rate into account).

The results of my research can be useful for municipal company leaders and the owner local governments. The developed early warning system model helps the operation of companies, efficient management, and also the early identification of the potential risks. The topic also has potential for further research activity as it would be worth analysing whether the model can be applied for business organizations under state ownership, and also to investigate the operability of those companies. It shall be always taken care that in case of any change in the environment (e.g. world economic crisis or world pandemic), for each and every type of companies, including private and utility companies, going concern principle has to be met.

## 5. SUMMARY

In my research, I examined the operability of municipal business organizations. The importance of this topic is emphasized by the fact that local authorities are responsible for performing public services in the given settlements, however, they can entrust these activities to enterprises they own. Quality and continuity of public services affects the complete society, thus, having a utility company terminating its continuous activity affects the life of the population negatively. Municipal companies shall always keep an eye on cost-efficient, profitable operation as they are managed with public money so they use the money of the local government to perform their tasks. Unfortunately, as a result of the less rigorous regulatory environment, the debt of the local governments had significantly increased by 2008, there was no collateral for the borrowings from earlier. That's why debt consolidation had taken place in Hungary between 2011 and 2014, a more rigorous regulatory environment had been established, and since 2011, efficient management of national assets is required by a number of laws. State Audit Office monitors the compliance with the legislation by performing several audits in the past decade, and since 2011, its authority covers the municipal enterprises as well, also it may sanction in case of management irregularities.

Application of the going concern principle in the operation of municipal enterprises was the focus point of this research topic. In the conceptual phase of the study, I processed the topic of national budget through domestic and international literature, focusing on the example of Hungary. I covered the regulations established in the context of reforms implemented after 2010, principles of national budget management, general government costs and revenues, the operation, tasks, management and property of local governments, which is the relevant local subsystem to the topic. I shortly presented the process of municipal debt consolidation implemented in Hungary, then I put the emphasis on management of municipal companies. In the second part of the literature research, I presented the indicators, methods and models of evaluating operability of enterprises, that is, the ways of measuring the appliance of the accounting principle of going concern for the given companies. Investigation of this accounting principle can mainly be performed through bankruptcy forecasting models. As the closing of the literature overview, I presented the models used in different countries, including multiple models which are well-known from the literature (e.g. Altman, Springate models), and also lesser known models such as Czech IN models.

I started my empiric research with presenting the investigated group of companies. I evaluated them by their location, tasks, and after defining goals and hypotheses, I presented the results of my research. I proved that the ownership structure affects the operation of the companies, the debt of the municipal corporates increased after the municipal debt consolidation, and also the fact that there is a significant difference between the management of public service companies in the different countries. During my research, I developed a model for Hungarian municipal companies that can signal the application of going concern principle. According to this model, 24% of the municipal business organizations in Hungary has a high risk of inoperability, so the appliance of going concern principle is doubtful for the future.

As a summary, we can say that performing public tasks in the form of enterprises is a very common approach in Hungary, number of municipal companies is more than 1600, which is not typical in neighboring countries. However, for this corporate circle, the going concern principle should always prevail, and their efficient, profitable management is a priority as they perform public services and they manage national assets, and the termination of their operation leads to deterioration or even termination of providing public services. The operability of

corporates owned by the local governments is often affected by the sometimes frequently changing political environment, law changes, but despite the political and legal changes, it is highly recommended for them to maintain solvency. Establishing a specific controlling and monitoring system for municipal companies is recommended for these companies to manage proprietary (municipal) assets appropriately, profitably. Establishing these monitoring and supporting systems is important for efficiently performing public tasks, as it was proven by the extension of powers of State Audit Office. Since 2012, monitoring authority of State Audit Office covers corporates owned by local governments, as a result, investigations, analyses and reports of the main economical control body also supports compliance with laws, and the efficient and profitable management of municipal property.

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