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Econometric Model for the Financial Performance of Romanian Companies Operating in the Water Supply and Sewerage Field

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Abstract: This research aims to measure the financial performance of companies in the water and sewerage sector by creating a sustainable econometric model for making long-term strategic decisions for managers and stakeholders. The research methodology consisted of the use and statistical processing of the data included in the summary financial statements of 40 regional operators in the field from 2014 to 2020. Multiple linear regression has been created with which stakeholders and water and sewerage specialists can shape changes in value-added variation, the average cost per employee, labor productivity, and energy expenditure on the net profit of water operators and sewerage. The results indicated that the independent variables used, such as value-added, labor productivity, or intangible assets have a direct influence on increasing the net profit of water and sewerage companies. Other independent variables such as the average cost per employee or the expenditure on electricity and water negatively influence the increase in the net profit of companies in the water and sewerage sector. The conclusions indicated that the average net profit is influenced by independent variables and the model created, and it can be successfully applied to other international companies in the field.

Keywords: financial performance; water and sewage; economic efficiency; public/private partnerships

1. Introduction

Water and sanitation sector management is a significant issue for every country. However, how effective are these services, and how can they be measured? In the current context where companies face difficulties in managing resources and looking for other ways to increase profits, identifying new indicators to measure performance or creating econometric models to establish the sustainability of companies' decisions in the field of sewerage and water becomes essential. In this sense, it is essential to know the evolution of the concept of efficiency and its way of measuring, starting from the narrower or broader approaches brought by specialists in the specialized literature.

Several specialist studies indicate that the services provided by public entities with private capital are much more efficient than public entities, but this is not reflected in all

countries [1]. A narrower approach to the concept of efficiency shows the profitability and productivity of the water operator, while a broader approach to the concept of efficiency indicates some technical, social, and economic aspects.

By measuring the technical efficiency of public water and sewerage utilities, the entities ensure the quality of the services provided, while by measuring the social efficiency, the entities aim at the affordability of the tariffs applied to ensure quality services. From an economic point of view, water and sewerage operators have a regulated monopoly situation. On the one hand, this situation leads to the blocking of consumers or users within specific distribution networks, not being able to intervene in the choice of other water and sewerage suppliers. On the other hand, the absence of competition determines the lack of stimulation of operators towards efficiency and innovation [2]. In this sense, the regulation in the field can intervene, together with the pursuit of efficiency and productivity, by implementing a benchmarking system and comparing the operating parameters [3].

General indicators (profitability, productivity) or specific indicators (according to the regulatory bodies) can be used to analyze the performance. From the point of view of economic sustainability, the most used indicators for measuring performance are the efficiency of the water produced and sold, the efficiency of the use of water resources, the rate of coverage of operational expenses [4] or non-revenue water (NRW), i.e., the difference between the volume of water introduced into a water distribution system and the volume billed to customers [5,6]. Starting from the indicators presented, we focused our attention on a broader category of indicators of the financial performance of water and sewerage companies in the public and private domain, as significant differences were found between the results obtained by specialists. By using the academic databases used by specialists (Web of Science, SCOPUS, EBSCO) and conducting queries by keywords such as "profitability indicators", "efficiency of public and private utilities", and "water and sewerage sector", we noticed a focus of studies on identifying performance indicators and less on creating econometric models applicable to several water and sewerage companies in various economies worldwide. We noticed important contributions in this regard to the evaluation of collective water and sewerage systems [7] and the implementation of wastewater reuse systems for their resilience and sustainability [8] and made comparisons related to the sustainability of the financial performance of various water and sewerage companies located in different countries [9] to assess the current and economic prices of water [10] and the influence of water companies and sanitation in the development of society [11].

The main objective of the research is to measure the financial performance of companies in the water and sewerage sector in Romania. Compared to other studies in the field, this research brings an element of novelty: creating an econometric model that will help specialists in the field and stakeholders in their long-term strategic decisions. The outlined econometric model is necessary for efficient resource management and decision support for managers working in sewerage and water companies. This study consists mainly of four parts. The second part analyzes the main factors that determine the financial performance of companies in the water and sewerage sector, the impact of public/private partnerships (PPPs) in this field, and the sustainable development in Romania. The third part presents the research methodology and the proposed econometric model, accompanied by the analysis and interpretation of the results obtained. Finally, the fourth part presents the conclusions and directions of future research.

2. Literature Review

Based on the information gathered by accessing the aforementioned academic databases, a selection was made that considered highlighting aspects related to measuring the performance of companies in the water and sewerage field. The literature research was carried out by analyzing the information obtained from the search in academic databases by keywords such as influencing factors of financial performance, the impact of public/private partnerships, economic performance, and sustainable development of water and sewer-

age companies in the world. This research was the starting point for further studies to measure the performance of water and sewage companies. The results obtained led us to mention the most significant contributions made by specialists in this field, which are presented below.

2.1. Analysis of the Main Factors That Determine the Financial Performance of Companies in the Water and Sewerage Sector

The specialists analyzed the financial performance of the companies in the water and sewerage sector and the factors that determined their achievement. Exogenous factors (political arrangements, economic development, social equity, cultural beliefs, demographic factors, etc.) and endogenous (institutional components) highlight the links between the components of water institutions and their impact on financial performance [12]. As determinants of financial performance in the water sector, institutional links (within and between institutional components) are as strong as the institutional structure in the water sector [13]. The financial performance of institutions in the water sector is also influenced by the degree of integration between the various components of the institutional structure, such as the links between legislative factors, political factors, and water administration. This was achieved through a study conducted using the exploratory factor analysis (EFA) statistical method [14]. Other factors that influence the financial performance of institutions in the water sector include the coverage of operating and operating costs and the lack of existing connections between customers [15–17]. Some authors use a multifactorial market model to assess changes in electricity and agricultural prices on the performance of water and sewage companies. The authors' findings suggested some variability in the shares of water and sewerage companies but concerning the variations in the prices of electricity and agriculture [18]. Other authors analyze the relationship between the privatization of water and sewerage companies in Spain and their financial performance. The study's authors suggest that privatization allows water companies to perform better in managing labor, while public companies are less efficient in operating costs [19].

A 20-year analysis of changes in net income and financial performance of water companies in Wales and England indicated a negative impact due to input prices and scale effects [20]. The assessment of how environmental and quality factors influence the financial performance of Portuguese water companies has shown a positive impact due to private participation, water sources, and savings [21]. When regulations are based on performance, water and sewerage companies in Nigeria increase their efficiency and productivity [22]. The same findings of increased services, efficiency, productivity, and financial performance through private equity investments were also highlighted in a study of Chinese water companies from 1998 to 2006 [23]. The increase in infrastructure investment was also due to the increase in the technical quality of the services provided by water and sewerage companies [24] or the reforms they have made over time to increase performance with a positive impact on financial sustainability [25].

2.2. The Impact of Public/Private Partnerships (PPPs) on the Water and Sanitation Sector

Due to poor infrastructure, strict regulations in current legislation, and underfunding of the water and sewerage sector, many public sector water suppliers have partnered with the private sector to finance infrastructure projects. This has been facilitated by policy changes and legal regulations that have made these partnerships possible. A public/private partnership in water and sanitation includes several arrangements between public and private entities and can take the form of contractual operations or disposal agreements. In the case of contractual transactions, depending on the contract terms, the private partner will receive a fixed fee or a fee depending on the revenue generated by the transactions they carry out for the public partner. In the case of disposal agreements or privatization agreements, when a private entity invests in a public entity, the issue of the transfer of part or all the public utility title or other interests should be clarified. As a rule, the private entity invests in the public utility by paying the amounts of non-operating income and

recovers its investment and interest through service fees. Some partnerships between public entities in the water and sewerage sector and private entities may also involve long-term facilities leasing. In this case, the public company will be responsible for the operation and maintenance of the water system, but all payments will be borne and received by the private entity. The advantages of these PPPs are the following: (1) providing technical expertise; (2) improving efficiency; (3) increasing management flexibility; (4) ensuring access to financial sources. The disadvantages of these public/private partnerships are the following: (1) waiving of tax exemptions and staff [26]; (2) the existence of economic and financial risks [27].

Using various investigative techniques, according to specialists, the most critical factors that influence the type of property and/or public/private management on performance [28] in the water and sewerage sector can be explained by the following aspects: (1) political and economic goals associated with the interest of privatization and shareholders monitoring the management efforts in order to increase profits [29]; (2) dissatisfaction due to poor quality services of public entities and governmental difficulties have led to the involvement of private entities in the water and sewerage sector but also to increased tariffs [30]; (3) focus on PPP as a result of the inability of the public system to improve the quality of services provided through the water and sewerage system [31]; (4) the inability to achieve efficiency targets even on the part of private investors [32,33]. There are studies conducted by specialists that indicate a positive impact on performance in the case of PPPs in the water and sewerage sector as follows: (1) value of production, economies of scale, regulatory regime in the water and sewerage sector [34–36]; (2) private entities in the water and sewerage sector are more efficient than public entities [35,37,38]; (3) private entities with corporate status in Brazil ensure high efficiency compared to public entities with the status of non-profit organizations [39]; (4) both public and private water operators achieve comparable results in terms of efficiency rates in Asia, the Pacific, the Philippines, Africa [40,41], private operators being more efficient than public ones in Africa [42]; (5) privatization has a positive effect on the efficiency rate of the industry in the United Kingdom and Italy [43,44]. Some studies show the negative impact on PPP's performance in the water and sanitation sector: (1) privatization has led to increased tariffs for water and sanitation services and decreased social efficiency for users [31]; (2) the introduction of private entities in the water and sewerage sector in Argentina harms the overall performance of the economy [45]; (3) the involvement of the private sector in the provision of water and sanitation services has only contributed to the cancellation of certain services or the increase of water tariffs for specific categories of consumers [46] with a negative effect on performance [47]; (4) the utility costs of private entities were higher than the utility costs of public entities [48], and public water and sanitation providers are more efficient than private ones [49–51]; (5) the property does not affect increasing the efficiency of public services even if after privatization the private entities have moved towards efficiency [52]; (6) privatization does not lead to low costs and over time the benefits diminish in the absence of optimal systematic choices between the public and private systems [53].

As noted, experts have various opinions, but some studies show that there are no significant differences in the impact of public and private entities in the water and sewerage sector, as follows: (1) there are no visible differences in cost and efficiency with a significant impact on the performance of public and private entities in the water and sanitation sector [54,55]; (2) there are no significant differences between public and private operators in terms of productivity and efficiency in England, Wales, the United Kingdom, France, Spain, and Portugal [56–60].

2.3. Sustainable Development and Economic Performance of the Water and Sewerage System in Romania

Through the Treaty of Accession to the European Union, Romania has made significant commitments in the water and wastewater sector for the transposition of the directives on drinking water quality [61,62]. All the provisions of the Romanian normative acts regarding

the water sector have been aligned with the acquis Communautaire. In Romania, the public water supply and sewerage service is part of the sphere of community services of public utilities. The public water supply and sewerage service include water supply, sewerage, and wastewater treatment, rainwater collection, sewerage and drainage, and activities that ensure the satisfaction of the needs of utility and the general public interest of local authorities. After more than four decades of centralized administration, Romania decided to return to the principle of local autonomy by achieving decentralization, thus transferring primary and concrete responsibilities to local public administrations, a principle also reflected in the Romanian Constitution. One of these specific responsibilities refers to the obligation of local public administrations to organize efficiently and adequately their functioning to provide public services. In addition, local public administrations have the right to associate to efficiently develop public services of joint/regional interest.

In Romania, the following sets of operational indicators related to the connection to the drinking water system/the connection to the sewage treatment system can be used to monitor the operational performance of the regional operators; contracting the supply of drinking water and taking over the wastewater; water consumption measurement and water service management; reading, invoicing, and collection of the value of the water provided and the sewerage services provided; interruptions of any kind to the water supply and wastewater collection service; the quality of the services provided; operation of water and sewerage services [63]. Currently, in Romania, several forms of PPP are used for two purposes: (1) developing access to services and covering the water and sewerage system (joint venture) in which a private investor holds a minority stake in a water company with full management responsibility invested in a private partner, the concession (for 20–30 years), based on which the private operator is responsible for the management of the entire system. The investment is largely or entirely financed and carried out by the private operator). (2) The improvement of the economic efficiency (the management contract (for 4–7 years), under which the private operator is only responsible for running the system, in exchange for a fee is to some extent performance-related: the lease (for 10–15 years), under which the assets are leased to the private operator receiving part of the revenue) [64].

3. Materials and Methods

This research develops an econometric model for analyzing performance in the water and sewerage sector to improve the use of financial information in decision-making by managers and other stakeholders. The econometric model was based on the data found in the annual financial statements of 40 regional operators in the period 2014–2020. The sample is nationally representative, as the study includes 40 of the 45 regional operators. Out of all the regional operators, three did not provide data (Bucharest, Ilfov, and Voluntari). Two regional operators, one from Cluj and one from Constanța, were excluded from the analysis because they have a turnover well above the average per branch, and data represent outliers and distort the results of the model. The operator from Ploiești did not provide data for the period 2019–2020. For easy statistical processing of time series, the values in lei for each year were converted into euros, based on the average exchange rate valid for that year. We can say that the model is valid for regional operators with a turnover of fewer than EUR 35 million per year. The realized econometric model is a multiple linear regression, which can make predictions regarding the dependent variable, also called endogenous, with the help of independent variables, called exogenous or predictive. When developing a multiple linear regression model, there is also the possibility that the variables do not correlate, and there is no viable econometric model. With the help of the data extracted from the financial statements of the water and sewerage operators and of the SPSS modeling and statistical analysis program, we proceeded to analyze the indicators from the created database. By combining 33 indicators and professional reasoning, we concluded that the dependent variable that reasonably reflects the entity's performance is the net profit. The model developed aims to provide a tool for forecasting net profit based on the indicators included in the annual financial statements. Possible synthetic indicators were used as predictors

and calculated based on the balance sheet, profit and loss account, and information in Form 30. With the help of the linear regression model [65], stakeholders can predict and analyze the results obtained by a water and sewerage operator. The management can optimize the obtained results and ensure an increased added value to the investors (ATUs).

The linear regression formula is:

$$Y_t = a_0 + a_{1\times 1t} + a_{2\times 2t} + \ldots + a_{k\times kt} + e_t,\ t = 1, 2, \ldots, n \quad (1)$$

where Y_t = net profit, dependent (endogenous) variable; a_0 = constant parameter (intercept); a_k = independent variable coefficient; X_{kt} = independent variable (exogenous, predictor); e_t = error variable (residual error), which explains the variation of Y determined by the missing factors in the model.

During the elaboration of the econometric model, the SPSS statistical analysis and modeling program was used. The model introduced as a dependent variable the net profit and as independent variables the turnover; material expenses; energy and water expenses; external services; expenses with staff; added value; financial expenses; intangible assets; property, plant, and equipment; total fixed assets; inventories; receivables; total current assets; total assets; equity; long-term debt; short-term debt; employees number; labor productivity; net commercial rate of return (RCn-ROS); rate of return on consumed resources (RRc); rate of economic return (Re-ROA); rate of return (economic) of invested capital (Rei-ROI); cost of employee turnover; duration of inventory turnover; duration of receivables turnover; financial result; and financial expenses. The research hypotheses that the econometric model will evaluate were the following:

H1. *There is a significant relationship between net profit; added value; average expenditure per employee; labor productivity; electricity and water; and the value of property, plant, and equipment;*

H2. *Economic entities in the water and sewerage sector that increase added value and labor productivity will significantly increase net profit. Those that increase average spending per employee, energy and water spending, and the value of property, plant, and equipment will significantly decrease net profit.*

4. Results

Of the possible independent variables, only those variables that significantly correlate with the dependent variable will be retained in the initial model. The significant correlation consists of a significant correlation coefficient and in the degree of significance $p < 0.05\%$. Possible independent variables and their correlation with the dependent variable can be found in Table 1.

Table 1. Matrix of correlations between the dependent variable net profit and the possible independent variables in the research.

Indicators	Pearson Correlation	Sig. (2-Tailed)	N
Fiscal value	0.654 **	0.000	278
Material expenses	0.579 **	0.000	278
Energy and water costs	0.460 **	0.000	278
Expenses with external benefits	0.556 **	0.000	278
Staff costs	0.444 **	0.000	278
Added value	0.662 **	0.000	278
Financial expenses	0.237 **	0.000	278
Intangible assets	−0.216 **	0.000	278
Tangible fixed assets	0.164 **	0.006	278
Total fixed assets	0.174 **	0.004	278

Table 1. *Cont.*

Indicators	Pearson Correlation	Sig. (2-Tailed)	N
Inventories	0.336 **	0.000	278
Customer receivables	0.474 **	0.000	278
Total current assets	0.262 **	0.000	278
Total assets	0.174 **	0.004	278
Own capital	0.550 **	0.000	278
Nr. staff	0.463 **	0.000	278
Work productivity	0.533 **	0.000	278
Rate of Return on Consumed Resources (RRC)	0.589 **	0.000	278
Economic rate of return (ROA)	0.493 **	0.000	278
Return on (economic) return on capital (ROI)	0.379 **	0.000	278
Average cost per employee	0.158 **	0.008	278
Inventory turnover	0.103	0.087	278
Duration of receivables rotation	−0.199 **	0.001	278
Financial result	0.047	0.440	278
Financial expenses	−0.074	0.283	278
Expenditure on depreciation, adjustments, and provisions	−0.075	0.276	278
Other operating income and provisions	0.000	0.995	278

Note: ** The correlation is significant at $p < 0.01\%$, meaning an estimation error of less than 1%. The correlation is significant at $p < 0.05\%$, meaning an estimation error of less than 5%.

The indicators in Table 1 that have a corresponding correlation and significance coefficient are introduced one by one in the linear regression model to test the correlation between the dependent variable net profit and the possible predictors. The confidence threshold of the econometric model is 99% because $p > 0.001$. The data processing was performed in the SPSS statistical analysis and modeling program for the 278 positions in the sample. After many iterations and processing of the initial model, we identified a multiple linear regression model, which explains the behavior of the dependent variable net profit in a statistically correct and conclusive way. A vast number of tests and models were performed until the final model was obtained, but this paper does not present all the combinations of predictors, only the final model, which is statistically valid and follows the research hypotheses. In addition to the dependent variable, net profit was included in the econometric model of multiple linear regression predictors of added value, average cost per employee, labor productivity, energy and water costs, and intangible assets. Table 2 presents the descriptive statistics of the variables in the final model.

Following the realization of the model by processing with the help of SPSS software, we have in Table 3 the correlations between the dependent variable net profit and the independent variables.

Table 2. Descriptive statistics for the sample population.

Indicators	Average	Standard Deviation	N
Net profit	1,098,637.2282	1,101,033.41678	278
Added value	8,232,192.2447	4,330,689.79620	278
Average cost per employee	9722.6797	2117.42117	278
Labor productivity	20,042.6680	6712.07539	278
Energy and water costs	1,585,786.9254	1,091,550.39908	278
Intangible assets	4,428,628.8027	15,351,593.68308	278

Table 3. Correlation matrix for the final indicators of the econometric model.

	Indicators	Net Profit	Added Value	Average Cost Per Employee	Labor Productivity	Energy and Water Costs	Intangible Assets
Pearson Correlation	Net profit	1.000	0.662	0.158	0.533	0.460	−0.216
	Added value	0.662	1.000	0.512	0.563	0.771	−0.096
	Average cost per employee	0.158	0.512	1.000	0.753	0.406	0.030
	Labor productivity	0.533	0.563	0.753	1.000	0.525	−0.028
	Energy and water costs	0.460	0.771	0.406	0.525	1.000	0.019
	Intangible assets	−0.216	−0.096	0.030	−0.028	0.019	1.000
Sig. (1-tailed)	Net profit		0.000	0.004	0.000	0.000	0.000
	Added value	0.000		0.000	0.000	0.000	0.055
	Average cost per employee	0.004	0.000		0.000	0.000	0.312
	Labor productivity	0.000	0.000	0.000		0.000	0.319
	Energy and water costs	0.000	0.000	0.000	0.000		0.376
	Intangible assets	0.000	0.055	0.312	0.319	0.376	
N	Net profit	278	278	278	278	278	278
	Added value	278	278	278	278	278	278
	Average cost per employee	278	278	278	278	278	278
	Labor productivity	278	278	278	278	278	278
	Energy and water costs	278	278	278	278	278	278
	Intangible assets	278	278	278	278	278	278

The research results show a significant relationship between net profit, added value, average expenses per employee, labor productivity, energy, and water costs, respectively, the value of property, plant, and equipment, so the H1 hypothesis is confirmed. The summary of the resulting final econometric model is presented in Table 4.

Analyzing the summary of the resulting model, we can conclude that the value of R (the value of the Pearson correlation between the predicted value of the model and the actual data) can take values between 0 and 1; in the case of our model, it takes the value of 0.845 and shows us that there is a direct and intensive link between the dependent variable and the independent variables. To interpret the model's results, R2 is calculated, called the coefficient of determination. The determination coefficient shows how the predictors included in the model explain the dependent variable variation. In the case of the econometric model created by us, R2 has the value of 0.714, i.e., 71.4% of the variation of the dependent variable is explained by the variables included in the model. Therefore, it has good values and R2 adjusted, which is adjusted according to the number of independent variables in the equation. A result of over 70% of the coefficient of determination is a very good one, which means that the model is excellent and relevant. Since the difference between R2 and R2 adjusted is very small, we can be sure that the econometric model obtained is one of quality. Based on the correlation coefficient of 0.845, we can say that the predictors explain the dependent variable on net profit: added value, average cost per

employee, labor productivity, energy and water costs, and intangible assets in 71.4%. The results are significant in the water and sewerage sector. Much of the net profit of the entities in the sector can be explained by the predictors in the model. The model's validity is also strengthened by the ANOVA test (Table 5).

Table 4. Summary of the resulting econometric model.

Model	R	R2	R2 Adjusted	Standard Estimation Error	Durbin–Watson Test Result
1	0.662 a	0.439	0.437	826,309.30193	
2	0.695 b	0.483	0.480	794,251.71411	
3	0.822 c	0.676	0.672	630,236.29001	
4	0.840 d	0.705	0.701	602,086.43683	
5	0.845 e	0.714	0.709	594,425.40767	2.080

a. Predictors: (constant), added value. b. Predictors: (constant), added value, average cost per employee. c. Predictors: (constant), added value, average cost per employee, labor productivity. d. Predictors: (constant), added value, average cost per employee, labor productivity, energy, and water costs. e. Predictors: (constant), added value, average cost per employee, labor productivity, energy and water costs, intangible assets.

Table 5. ANOVA test results.

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	147,350,830,769,283.000	1	147,350,830,769,283.000	215.808	0.000 b
	Residual	188,449,229,235,895.000	276	682,787,062,448.896		
	Total	335,800,060,005,178.000	277			
2	Regression	162,320,219,029,022.000	2	81,160,109,514,511.200	128.655	0.000 c
	Residual	173,479,840,976,156.000	275	630,835,785,367.839		
	Total	335,800,060,005,178.000	277			
3	Regression	226,967,867,942,777.000	3	75,655,955,980,925.500	190.474	0.000 d
	Residual	108,832,192,062,401.000	274	397,197,781,249.640		
	Total	335,800,060,005,178.000	277			
4	Regression	236,835,354,872,109.000	4	59,208,838,718,027.100	163.331	0.000 e
	Residual	98,964,705,133,069.400	273	362,508,077,410.511		
	Total	335,800,060,005,178.000	277			
5	Regression	239,691,154,248,625.000	5	47,938,230,849,725.100	135.671	0.000 f
	Residual	96,108,905,756,552.700	272	353,341,565,281.444		
	Total	335,800,060,005,178.000	277			

b. Predictors: (constant), added value. c. Predictors: (constant), added value, average cost per employee. d. Predictors: (constant), added value, average cost per employee, labor productivity. e. Predictors: (constant), added value, average cost per employee, labor productivity, energy, and water costs. f. Predictors: (constant), added value, average cost per employee, labor productivity, energy and water costs, intangible assets.

The ANOVA test determines whether the model results are due to hazards and whether the variables are of global significance. The ANOVA significance test compares the means and the equality between three or more means. On the Regression line, we find the average values calculated for the predictors in the model and their residual value in the Residual line. The ANOVA test for the proposed model is excellent, confirming the global significance of the selected predictors. The values recorded by the Fisher test (F) are sufficiently high compared to the values found in the Fisher table corresponding to the degree of freedom and the number of observations. The degree of significance is above the minimum accepted value of $p < 0.05$. In the case of our model, $p < 0.01$, i.e., the probability of model error is below 1%. The estimated parameters of the realized econometric model are found in Table 6.

Table 6. Parameters of the realized econometric model.

Model	Non-Standardized Coefficients		Standardized Coefficients	Test T	Sig.	Collinearity Statistics	
	B	Standard Error	Beta			Tolerance	VIF
(Constant)	982,309.213	170,153.153		5.773	0.000		
Added value	0.200	0.014	0.785	14.187	0.000	0.344	2.911
Average cost per employee	−366.417	26.351	−0.705	−13.905	0.000	0.410	2.441
Labor productivity	123.144	8.737	0.751	14.095	0.000	0.371	2.696
Energy and water costs	−0.254	0.053	−0.252	−4.773	0.000	0.378	2.643
Intangible assets	−0.007	0.002	−0.094	−2.843	0.005	0.957	1.045

In the realized econometric model and the theoretical form of multiple linear regression, a constant is included on the first line of the table, which ensures the basic value of the intercept in order to adjust the predictions and predictors (exogenous variables) of the model. The following lines show the independent variables of the model. Additionally, in Table 6, we find the statistics regarding multicollinearity. The coefficients of the multilinear regression equation are found in column B of the non-standardized coefficients. The Standard Error column contains the standard deviations of the coefficients of the independent variables in the regression. The standard error shows us the range in which the coefficients in the model vary, a deviation that can be plus or minus. The deviation of the independent variable coefficient Average cost per employee is 26.351, i.e., the deviation can be EUR ±26 from one water and sewer operator to another. The column of standardized coefficients contains values independent of the unit of measurement of the predictors. The independent variables are expressed in EUR and EUR/employee so that the interpretation will be based on non-standardized coefficients. The T column shows the *t*-test values, with the help of which we check the probability that the parameters are zero in the model, based on the hypothesis H0: $\beta = 0$. Significance for predictors has a value of less than 0.05 in all cases, and, consequently, the null hypothesis (H0) is rejected. The value obtained for the *t*-test also shows us the importance of the predictor in the econometric model. The most critical variable is Added Value, and the least important is Intangible Assets. Collinearity statistics, such as tolerance index and variance inflation factor (VIF) (Table 6), show a low degree of collinearity, which does not affect the statistical correctness of the model. Theoretically, if the VIF has a value below 4, then the model is statistically correct, and if it is above 10, there are serious collinearity problems. From a homogeneity perspective, the variation of the errors is normal for the predictors of the model. In terms of significance, they are statistically significant with $p < 0.01$ (Figure 1).

The Durbin–Watson test was performed to verify the non-correlation hypothesis. The Durbin–Watson test checks for error correlation; corresponding values are those that are around 2. Depending on the number of independent variables and the sample size, concrete values can be extracted from the critical statistical tables. The disadvantage of the Durbin–Watson test is that it only detects first-order autocorrelation and only applies to intercept models. In the case of research, these problems do not arise because the phenomenon of seasonality is excluded, and the regression model has a free term. Regarding the correlation of errors, we formulate a null hypothesis (H0) and an alternative one (H1): H0: $p = 0$, the null hypothesis, which assumes that there is no autocorrelation; H1: $p \neq 0$, the alternative hypothesis, which assumes that there is autocorrelation. The critical values for dL and dU are extracted from the Durbin–Watson test tables. If the value returned by the test is greater than dL and less than 4 dU, then the null hypothesis (H0) is not rejected, i.e., there is no I-order autocorrelation. The value obtained for the econometric model performed by 2.080 (Table 4) is in the range of acceptance of the null hypothesis, i.e., 2.129 is part of the range (1.767; 2.233) set for $n = 300$ and k = 5, for d = 5, significance threshold $p < 0.01\%$.

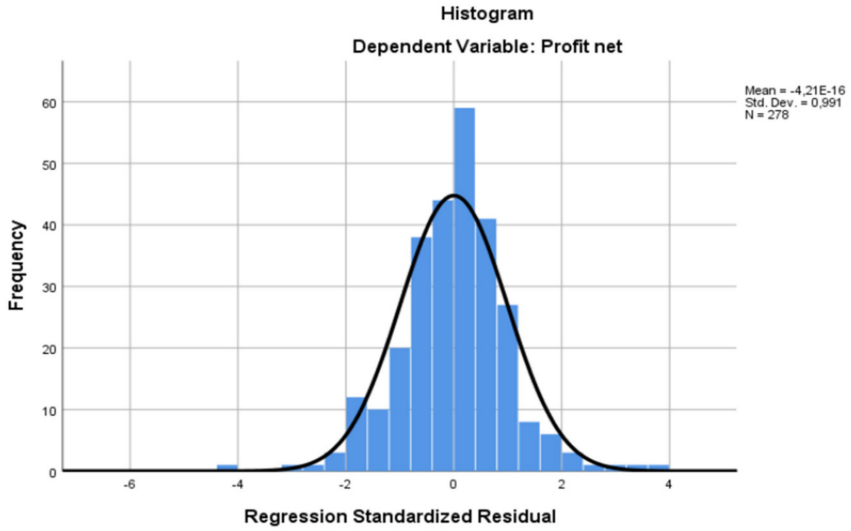

Figure 1. Graph of normality for error variation.

After validating the econometric model obtained, we can consider that it is a valid multiple linear regression, and the predictors indicate the increase or decrease in the net profit. These increases can be modeled under the condition ceteris paribus, i.e., under the condition that, when changing a predictor, the other elements remain unchanged. Given that the validation tests were verified for the estimated model, we can say that the result of our research is a valid multiple regression model. The value of the predictor parameters indicates the level of increase or decrease of the net profit, determined by the increase by one unit of each independent variable, provided that the other independent or predictive variables remain constant.

The equation of the regression model obtained is given by the values of the non-standard coefficients and is of the form:

$$\text{Net profit} = 982{,}309.210 + 0.200 \times \text{VA} - 366.417 \times \text{CMS} + 123.144 \times \text{PM} - 0.254 \times \text{CHEA} - 0.007 \times \text{IMOBNE} \quad (2)$$

where VA = added value; CMS = average cost per employee; PM = labor productivity; CHEA = energy and water costs; IMOBNE = intangible assets.

5. Conclusions

The econometric model of multiple linear regression is interpreted following the research hypotheses formulated at the beginning of the analysis.

1. The added value is crucial in the ability of a water and sewer operator to make a profit. Through research Hypothesis H5, we assumed that the increase in added value to a water and sewerage operator leads to a significant increase in net profit. Therefore, the coefficient of added value would be 0.200, i.e., an increase by one unit of added value leads to an increase in net profit by 0.200 units, i.e., if added value increases by EUR 1, net profit increases by EUR 0.20.
2. The average cost per employee is the second predictor of the regression model created for which we hypothesized that an increase in the average cost per employee leads to a significant decrease in net profit. The value of −366.417 is found in the table of linear regression coefficients (Table 6). Therefore, it can be deduced that an increase in the average cost per employee by EUR 1 reduces net profit by EUR 366.417. This predictor is essential in terms of the annual increase in the minimum wage in the economy, which has a direct effect on this indicator, and with the help of the econometric model, can calculate its effect on net profit at the country level for regional water and sewerage operators.

3. Labor productivity is the third indicator in the developed econometric model, for which we hypothesized that an increase in labor productivity leads to a significant increase in net profit. In the table of linear regression coefficients for this predictor, we find the value 123.144. Increasing labor productivity by EUR 1 per employee leads to an increase in net profit by EUR 123.144.
4. The fourth predictor of the econometric model is energy and water costs. This is an essential element in water and sewerage operators (about 13–14% of operating costs). In connection with this non-dependent variable, we hypothesized that the increase in energy and water costs significantly decreases net profit. In the table of linear regression coefficients for this independent variable, we find the value 0.254. Therefore, the value can be interpreted as follows: an increase in energy and water costs of EUR 1 leads to a decrease of EUR 0.254 net profit.
5. The last indicator of the econometric model is intangible assets, a less critical element that affects the net profit of water and sewerage operators. Its effect manifests in the net profit through depreciation expenses. In connection with this predictor, we hypothesized that an increase in intangible assets decreases net profit. In the table of linear regression coefficients for this independent variable, we find the value 0.007, i.e., the increase in the value of intangible assets by 1 EUR leads to a decrease in profit by EUR 0.007. However, the result should be interpreted with caution, as new investments in intangible assets may reduce other expenses, including increased productivity, and as a result, an increase in profit may be made.

Given the results of the research, Hypothesis H2, according to which economic entities in the water and sewerage sector that increase added value and labor productivity will significantly increase net profit, it is confirmed that those that increase average spending per employee, energy and water costs, and the value of property, plant, and equipment net profit will be significantly reduced. As a result of the research, we created a multiple linear regression with which stakeholders, both specialists and non-specialists in the field of water and sanitation, can model the changes produced by the variation of added value, average cost per employee, labor productivity, and energy costs on the net profit of water and sewerage operators. It is an interesting fact that, compared to the initial expectations, when we were firmly convinced that the material expenses and the rotation of receivables will be correlated with the net profit, in the final model, these independent variables have no place. Based on the multiple linear regression, the average net profit starts at EUR 982,309, which is influenced by the independent variables: added value, average cost per employee, labor productivity, and energy and water costs. In the case of salary expenses, an increase by one unit of the average cost per employee leads to a decrease in net profit by 366 units.

Another limitation of the research is the non-inclusion of the independent variables of non-financial variables, such as population density, the county's political structure, and other similar elements that may affect the performance of a public entity. Further research will need to examine the effect of these potential independent variables to achieve an updated model. To extend this research, we can examine the effect of including in the econometric model-independent non-financial variables related to sustainable development and corporate governance, thus achieving an extended econometric model of financial performance. Additionally, the econometric model can be used in the future to model the non-financial performance of these entities. Additionally, the model created can be successfully applied to other international companies in the field.

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