Snežana Radukić[1]
Dušan Perović[2]
Dejan Vučetić[3]

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Economic and Environmental Effects from Liberalizing Utility Service Prices in the Republic of Serbia[4]

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Abstract: *The aim of research is to determine what kind of effects would price liberalization in public utility sector produce on inflation, standard of living and air quality in the Republic of Serbia. For the purpose of analysis financial reports of public utility companies were used including population number of 14 Serbian cities that were part of research, share of utility prices in consumption price index (CPI) and air quality statistics for analysed cities. The analysis covers period of 2008 – 2016 when significant changes in the operations of Serbian public utility companies occurred. Since all public utility companies receive the subsides from state and local authorities and most of them achieve loss in their reports, analysis will show economic and environmental effects from possible switch of public utility companies to market – based surroundings. This will help in determining the role of public utility companies in achieving sustainable development concept, which is important for creating future sustainable activities of public utility companies in the Republic of Serbia.*

Keywords: *utility, price liberalization, inflation, standard of living, air quality, sustainability.*

[1] University of Niš, Faculty of Economics Niš, Serbia
[2] University of Niš, Faculty of Economics Niš, Serbia, dulep89@gmail.com
[3] University of Niš, Faculty of Law Niš, Serbia
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Ekonomski i ekološki efekti liberalizacije cena komunalnih usluga u Republici Srbiji

Apstrakt: *Cilj istraživanja je da utvrdi kako bi liberalizacija cena komunalnih usluga uticala na inflaciju, životni standard i kvalitet vazduha u Republici Srbiji. Za potrebe istraživanja korišćeni su finansijski izveštaji komunalnih preduzeća, broj stanovnika 14 najvećih gradova Republike Srbije, učešće cene komunalnih usluga u indeksu potrošačkih cena, kao i statistika u vezi sa kvalitetom vazduha u analiziranim gradovima Republike Srbije. Analizom je obuhvaćen period 2008 – 2016, u kome je došlo do značajnih promena u poslovanju javnih komunalnih preduzeća Republike Srbije. Kako sva javna komunalna preduzeća u Republici Srbiji primaju subvencije od strane države i lokalnih samouprava, a većina njih posluje sa gubicima ističe se posebna potreba za analizom ekonomskih i ekoloških efekata od prelaska ovih preduzeća na tržišno orijentisani model poslovanja. Ovakav tip istraživanja će pre svega doprineti utvrđivanju uloge javnih komunalnih preduzeća u realizaciji koncepta održivog razvoja, što je od velike važnosti za koncipiranje budućih održivih poduhvata javnih komunalnih preduzeća u Republici Srbiji.*

Ključne reči: *komunalne usluge, liberalizacija cena, inflacija, životni standard, kvalitet vazduha, održivost.*

1. Introduction

Public utility companies in the area of water supply, heating and waste management represent a unique kind of monopoly called “pure monopoly”. This kind of structure provides services at reduced costs, which is impossible in situation with several market participants when costs of providing services are much higher. In a situation with “pure monopoly” fixed costs per unit are decreasing with the increase of utility service users and this goes in favour of public utility companies that can in the end achieve maximum production efficiency. All companies from public sector have an obligation to provide services to local users based on social aspect, which can sometimes collide with the economic aspect of business (Hefetz & Werner, 2012).

Nevertheless, the role of public utility companies is defined by the law and all companies organize their activities in accordance with the legislation. Contrary to the widespread public opinion, the prices of utility services in the Republic of Serbia are not regulated at the central state level. Prices are determined by the units of local self-government. The central state control of established costs is carried out indirectly through the mechanisms envisaged by the Public Enterprises Act (2016), the Utility Services Act (2011), the Budget System Act and the numerous so-called sector acts that further

regulate the performance of specific utility activities (Water Act, Waste Management Act, Energy Act, etc.). All utility services are divided into two broad groups (according to the provisions of Article 24 of the Utility Services Act): those in which the end user can be precisely determined and for which the price of utility services is paid by the user, and second, utility services in which the end user cannot be determined - so these are financed through the fees for their use or through the budget of local self-government units. Pursuant to Article 2 of the Utility Services Act, they are very heterogeneous and can be divided into as many as 14 types: 1) supply of drinking water; 2) purification and removal of atmospheric and wastewater; 3) production, distribution, and supply of heat energy; 4) municipal waste management; 5) urban and suburban passenger transport; 6) management of cemeteries and burial; 6a) funeral activities; 7) management of public parks; 8) providing public lighting; 9) management of markets; 10) maintenance of streets and roads; 11) maintenance of cleanliness on public surfaces; 12) maintenance of open green spaces; 13) chimney services; 14) the activity of zoo - hygiene. According to the provision of the same Article, certain types of utility services are distinguished as services of general economic interest (from 1) to 7) and from 11) to 13)) in accordance with the consumer protection regulations. These activities are related to the entire population of the local self-government unit and have the most significant impact on the standard of living, inflation and the regular functioning of the local self-government unit.

According to Article 25 of the 2016 Utility Services Act, the prices of utility services in the Republic of Serbia are determined by applying five basic principles: consumer pays, polluter pays, price sufficiency for covering operating costs, utility services price compliance with the accessibility principle, non-discrimination of consumers through different categories of expenditures (Dimitrijević, Vučetić & Vučković 2018.). The exception concerns the heating prices according to the Energy Act and the exclusive Government Decree. These principles should be sufficiently strengthened by unified procedure for their implementation and price setting throughout the state according to guidelines made by the competent ministry. In 2013, the Standing Conference of Towns and Municipalities of Serbia (SCTM) prepared a trial Draft of the Unified Methodology for Determining the Prices of Utility Services (Filipović & Krnjeta: 2013), which can serve as a useful guide to the legislation in this regard. Finally, before we continue with our analysis, we will point out a few shortcomings in the existing legal framework for the functioning of public utility companies. First, the Public Enterprises Act imposed many additional obligations that put them in an unequal position with private utility services corporations. Second, the Budget System Act classifies them into the category of "public funds users". Thus, they have become subject to restrictions and prohibitions applied to all users of budget funds. Such legal solutions constitute an obstacle for public utility companies

functioning based on market principles, corporate governance, professional management and sustainable management.

Some countries have laws that approve the existence of only public utility companies, while some approve private public partnership (PPP) or only private initiative in utility area. Although Serbian legislation approves private initiative in utility area, there are only few private companies that provide utility services for garbage collection. In water supply or heating area, it is not possible due to enormous initial costs, untypical structure of industry costs, low technical possibilities of improving current utility structure and unwillingness of local authorities to work on sustainable solutions for improving utility services and infrastructure. Additionally, as a result of a competition, private utility companies are under the pressure to take advantages of the potential economies of scale and avoid uneconomic solution, which is not the obligation for public utility companies (Czako et al., 2014). Bearing in mind that public utility companies receive funds from state through subsidies, one of their obligation should be justifying the amount of received subsidy. Most of the public utility companies in the Republic of Serbia report financial losses, which indicate the lack of quality management in these companies.

Social efficiency is area that all public or private utility companies should pay more attention. Every utility company should work on modernization and reconstruction of current service facilities in order to provide more quality services to users. With the improvement of production, the cost of provided services will decrease with further reduction in rates or prices, which will in the end lead to improved public services. Public utility companies need to carry out a comprehensive analysis of social efficiency and take into account all elements of service delivery, if they want to improve overall social efficiency (Kudryavtseva & Kuporov, 2015). Furthermore, public utility companies are facing restrictive municipal and state budget for utility services and consequently there are no additional investments in utility area. Another problem for public utility companies is environmental issue of their activities. Many public utility companies in the Republic of Serbia implement old technology and processes that have negative impact on the environment, while on the other hand they do not invest enough efforts in solving environmental problems (for some of them utility companies are directly responsible). By including environmental issue in their business strategies, utility companies will be on the path of achieving corporate social responsibility (CSR), which is great commitment for improving the reputation of utility companies in the Republic of Serbia (Čibukčić, 2017.). Therefore, CSR must become imperative for those companies that pollute the environment and force them to think more sustainably in order to attract more users and achieve higher success.

Public utility companies provide services at price, which is lower than market price due to company's role in achieving social goals. This price level is not optimal from economic aspect, but should be enough for providing services to users without having significant impact on their standard of living. The actual question is what would happen if public utility companies decide to start with the liberalization of prices and what effects this decision will have on certain economic and environmental indicators? In order to answer this question, an appropriate analysis will be provided. The structure of paper, beside the introduction and conclusion, has three more chapters. First chapter brings brief literature review about public utility services, their structure and impact on economic indicators. In second chapter price liberalization effects in public utility sector of the Republic of Serbia will be analysed. Intention is to see how changes in prices affect inflation and standard of living, and draw some conclusions for the social effects. Third chapter represents the extension of the second chapter with the emphasis on the environmental effects from liberalization of prices in public utility sector of the Republic of Serbia. Due to data restriction, analysis is limited on the impact of liberalized price of heating on air quality in the Republic of Serbia.

2. Literature review

Since utility services represent public area of interest, they were also a part of many researches. A group of authors have provided an empirical study about the relation between heating costs and budget constraints in Romania (Miron et al, 2013). The goal of this study was to emphasize the requirements that were induced by budget constraints of households, while ensuring the universality of the access to the essential heating service. The research is based on the analysis of 55 households in sector 2 of Bucharest that have access to the gas heating systems, while they all have different equipment and revenues. Study showed that 59% of households, that have less than 400 lei per person, have problems in covering heating costs and 12% of these households have inadequate heating units. Due to budget constraints and high heating costs, 59% of households receive heating benefits, while only 0.2% of households can count on the increase of their standard of living, since their heating costs are smaller than heating benefits. Another group of authors quantified the most important aspects of sustainable management of water supply and sanitation companies in the Czech Republic through the comparison of household expenditures on water services (Hajek & Petružela, 2016). Authors have discovered that activities of water supply and sanitation companies are decreasing consumption, which has negative and social impact on domestic households. Results also showed that short-term income elasticity of demand is higher than medium-term elasticity. Problems are arising on the long-term when the elasticity is less dependent on conditions,

so further increase of water supply price can also bring the households closer to the poverty line.

In many public utility companies sustainable management is related to a complex set of specific economic, social and environmental constraints, which determine cost and revenues not just of utility companies, but also of the users of their services (Del Borghi et al., 2013; Cabrera et al., 2013). Most of the utility companies that have any kind of difficulties try to direct them to users, so in the end, users face either less quality service or increased price of services. This is mainly the case with private utility companies, since they pay more attention to profit than to other sustainable indicators. A system dynamic approach is important for enhancing all aspects of water supply business (Sahin et al, 2014). Innovative and progressive water supply companies are continuously working on the dynamics of their system in order to provide improved services to their users. Although water supply companies increase the price of their services after huge investments in their systems, on many occasions that increase is far above real price which only creates new pressure for household expenditures. The effects of privatization in water supply and waste management sectors also had a significant impact on the price of water supply for domestic users (Bakker, 2005; Gradus et al, 2014; Gassner & Pushak, 2014). In England and Wales, the conversion of water into an economic good required the introduction of true competition and cost – reflective pricing, which was an obligation of all companies that provide water supply services. Most of the users in England and Wales were struck with the enormous increase of water supply prices, so in one moment regulatory institutions had to react and stop non-principle behaviour of water supply companies. In the Netherlands, the privatization of utility companies in waste management area initially increased cost of garbage collection by 12%, which raised expenditures of many households.

A households' decision to acquire price information about utility service is endogenous, so it may affect price elasticity and consumption levels (Carter & Milon, 2005). Results showed that well informed households were more responsive to average and marginal price signals, which indicated better planning of household expenditures. This supported the argument that the lack of observed responsiveness to marginal price signals for public utility services is due to imperfect information about prices. The same case is with electricity services, where users also have responsive answer to average prices (Ito, 2014). Public utility companies, in waste management area, should pay more attention to cost efficiency analysis and practical solutions of separated waste collection, if they want to avoid frequent changes in costs and price of their services (D'Ónza et al., 2016). Garbage collection cost could be reduced by 10-15% with appropriate system of separated waste collection, which leaves utility companies without possibility to increase price of their services. In the short-term, households would face a slight increase of costs

due to new rules about waste separation, but in the long-term, all costs would be reduced.

Some research showed that developing countries are facing many challenges and difficulties in order to improve the overall efficiency and effectiveness of their public utility companies (Škafar & Mulej, 2008; Nevondwe et al, 2014; Shulepina et al., 2016). Developing countries have lack of investments in utility services, and on the other hand the price of these services puts a big pressure on budget of households.

3. Effects from transition to full cost policy in public utility sector in the Republic of Serbia

Utility services prices in the Republic of Serbia are formed with the approval of state or local authorities and with full respect of appropriate legislation. Prices are usually formed at lower level, mainly due to protecting the purchasing parity of service users. This kind of policy is looking for a balance of economic and social goals, where social goals usually take priority. Bearing in mind that utility service prices are formed at the level which is lower than economic level, profitability of public utility companies is lower. Public utility companies have various possibilities to improve their profitability. They can increase the price of their services, reduce costs, improve organizational aspect of overall business or implement more efficient way of governance. The Republic of Serbia adopted the Law of Utility Services that regulates all activities of public utility services and helps them to organize their businesses in a best manner.

Full cost policy is another solution for public utility companies to improve their performances, but due to many restrictions public utility companies are avoiding this solution. Full cost policy should be considered as a consequence of price liberalization, where public companies adjust their activities with accepting reduced average rates of return. This kind of behaviour would lead to the increase of general level of prices and it would also reduce the income of low-income households. This would also increase the poverty rate and force many households to seek social aid.

Price of public utility services depends on type, size and quality of the service, but also on the costs that are needed for providing certain services. Operating revenues are important for every utility service, because they include revenues from provided services that are basis for all activities of utility companies. Price policy is important for every public utility company, but change in prices depends on business expenses of companies, expenses for building and reconstructing of facilities and purchased equipment and net profit of companies. Before any change in prices, public utility companies should consult state or local authorities and get approval for changing the

price of utility services. Although the Law of Utility Services exists for a more than a decade, most of the public utility companies have losses in their financial reports, which indicates that full cost policy is not being implemented appropriately. Cumulating losses of local utility services and authorities threaten to become a serious problem for state, and therefore state must react effectively to solve this problem. For the purpose of the research, following hypothesis will be tested:

H1: The implementation of full cost policy causes significant increase in inflation rate and reduction of household's standard of living.

Covering overall costs of public utility companies requires the increase in price of provided services, which can ultimately lead to higher inflation rate. For the purpose of the research, data for 2008-2016 periods are used. All data can be found in financial reports of public utility companies. At the beginning, financial result of public utility companies is being analysed. If the result is positive, required increase of prices is equal to zero. If public utility companies have losses in their reports, then they should calculate needed increase of revenues. After determining net losses, their share in operating revenues is being calculated. The model is assuming the existence of very low price elasticity of demand, since all public utility services are part of pure monopoly where substitution is impossible.

For further analysis, average increase in prices of utility services must be included, since these prices have different share in CPI. The average increase in prices of utility services in the Republic of Serbia is calculated by multiplying the share of population in total population with required increase in prices in cities covered by the analysis. Cities included in the analysis are: Belgrade, Subotica, Zrenjanin, Kragujevac, Užice, Šabac, Smederevo, Kraljevo, Leskovac, Pančevo, Novi Sad, Sremska Mitrovica, Valjevo and Niš. By multiplying the sum of values for every utility service in analysed cities with the share of particular utility service in CPI, there is an inflation effect of transition to the model of full cost policy within every utility service. Sum of these products would give overall inflation effects, if all public utility services would lead their businesses at the edge of profitability (0% net profit). Similar access will be implemented for net profits of 5%, 7.5%, 10%, 12.5%, 15% in order to see possible inflation effects at these rates. Since net losses in public utility company's reports reduces population standard of living, this analysis will help in overcoming this obstacle. Also, analysis will help in finding more sustainable way of running business for public utility companies in the Republic of Serbia.

Table 1 shows how far public utility companies in the Republic of Serbia should go in order to eliminate losses in their reports and become more profitable. Weighted average for companies in water supply sector, shows that prices should be increased by 3.5130%, if companies decide to start with

the implementation of full cost policy. Utility companies in heating area should increase their price more significantly (8.5475%) due to huge losses during the analysed period. For reaching the break point of profitability, utility companies in waste management area should increase their prices by 1.6274%. This is much less than utility companies from another two analysed areas, which means that waste management companies did not have huge losses like other analysed companies. When it comes to the cities, prices in water supply sector should be significantly increased in Valjevo (7.8965%), Užice (7.7584%) and Belgrade (7.1325%). In the group of analysed cities in heating sector, prices should be significantly increased in Kragujevac (53.6104%), Smederevo (25.2917%) and Valjevo (11.3529%). Finally, utility companies from waste management sector should give greater effort in achieving break point of profitability in Smederevo (10.6356%), Kragujevac (3.6378%) and Novi Sad (2.8544%).

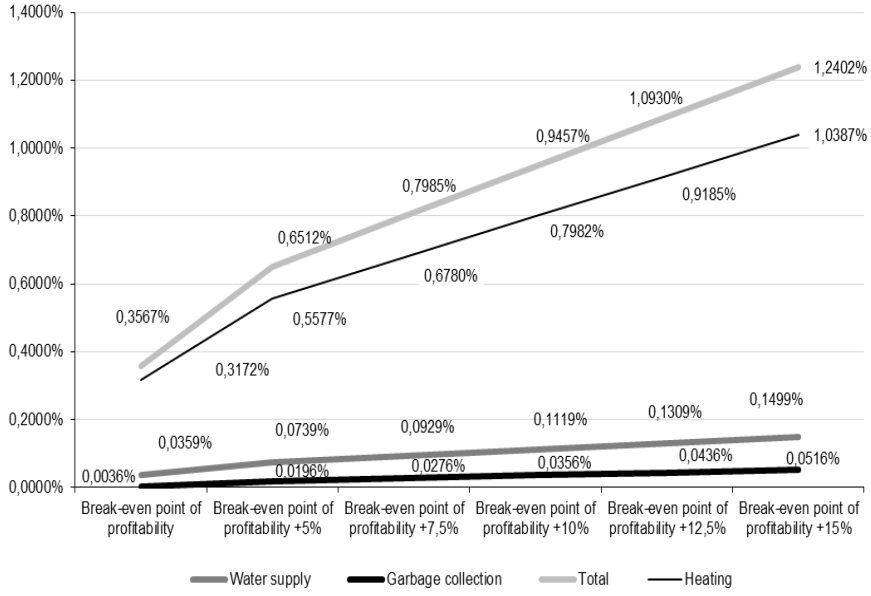
Table 1. Required increase of business revenues (prices) of public utility companies in order to reach break-even point of profitability in the Republic of Serbia for 2008 -2016

Cities	Percentage of revenue increase by the type of utility service		
	Water supply	Heating	Waste management
Belgrade	7,1325%	4,0348%	0,2756%
Subotica	6,4996%	2,2374%	1,2967%
Zrenjanin	3,2967%	5,9578%	0,2349%
Kragujevac	0,6926%	53,6104%	3,6378%
Užice	7,7584%	0,0000%	0,0000%
Šabac	3,3409%	2,5421%	0,5842%
Smederevo	0,1946%	25,2917%	10,6356%
Kraljevo	1,7085%	10,8709%	0,8862%
Leskovac	2,6331%	1,6794%	1,4513%
Pančevo	6,1114%	0,0000%	0,1302%
Novi Sad	0,0000%	0,8041%	2,8544%
Sremska Mitrovica	0,0000%	0,5169%	0,0000%
Valjevo	7,8965%	11,3529%	0,2641%
Niš	1,9174%	0,7664%	0,5327%
Weighted average for the Republic of Serbia	***3,5130%***	***8,5475%***	***1,6274%***

Source: Authors' calculations

By multiplying required percentage of utility service price increase with the share of utility services in CPI, inflation effects for every type of utility service will be shown. This will help in calculating how many percentage points the inflation rate will be increased. Sum of these weighted values represents overall (total) inflation effect of price changes in public utility sector (Figure 1). Furthermore, Table 2 shows by how many percentage points inflation rate will be increased at different desired levels of public utility prices net profits (0%, 5%, 7.5%, 10%, 12.5%, 15%).

Figure 1. Inflation effects in model of full cost policy for public utility companies in the Republic of Serbia for 2008 – 2016 period



Source: Authors calculation

If public utility companies with net losses want to cover total costs and continue with their activities close to break-even point of profitability, the increase of their services prices will cause the increase of inflation rate by 0.3567% (Figure 1). Significant impact on inflation rate will also have the increase of prices in heating sector (0.3172%), then increase of prices in water supply sector (0.0359%) and in the end the increase of prices in waste management sector (0.0036%). Figure 1 also shows how inflation rate affects public utility companies in situation when they gain profits. For example, public utility companies with profit rate of 10% would cause the increase in inflation rate by 0.9457%. In this kind of situation, companies from heating

sector would increase the inflation by 0.7982%, companies from water supply sector would increase the inflation rate by 0.1119%, while companies from waste management sector would increase the inflation by 0.0356% if they gain profit at rate of 10%.

Changes in the price of utility service can also have impact on population standard of living, especially of those households with low incomes. Since low-income households do not have possibilities to change the provider of utility services they must face reduction of their incomes. The increase in inflation rate by 0.3567 percentage points will reduce households incomes by 0.3567%. Assume that low-income households have monthly income of about 20,000 dinars. In addition, we can assume that household on monthly basis pays 1,000 dinars for water supply (5%), 5,000 dinars for heating (25%) and 400 dinars for garbage collection (2%). The increase of prices for water supply (3.5130%), heating (8.5475%) and waste management (1.6274%) will force households to pay additional 434 dinars for provided services, which represents the reduction by 2.17% of their monthly incomes. This is why low-income households should be provided with special treatment in order to overcome possible difficulties that can appear from significant change in prices that are part of CPI.

4. Environmental effects in price liberalized heating sector of the Republic of Serbia

The implementation of full cost policy brings changes in prices of provided services, but also in the expenditures of households. Although price liberalization in public utility sector affects inflation rate and standard of living, question is can it also produce some environmental effects on water, air or soil? Price liberalization causes significant changes in behaviour of all subjects that are involved in the process of providing or using utility services. By changing costs for provided services many economic subjects change their own habits, but sometimes changes do not have just economic or social effects.

Many studies have shown that beside industry, district thermal power plants have huge responsibility for causing air pollution (He, Ye & Zhao, 2013; Wissner, 2014; Zanobetti & Petres, 2015; Nikolić, 2015; Petrović et al, 2016). In fact, almost all of the district thermal power plants use fossil fuels that produce high concentration of hazardous gases due to oil combustion during the production process. Air quality in many areas near district thermal power plants is reduced with increased possibility of additional environmental problems for local communities. Some district thermal power plants have started to use other raw materials such as biomass in order to reduce

pollution, but share of these resources is still at very low level and they also face many barriers for faster implementation of biomass as a primary source for heating in the Republic of Serbia (Filipović & Miljković, 2011; Mikulandrić et al., 2012). Use of biomass will help in improving energy intensity in the Republic of Serbia, since intensive use of fossil fuels in district heating system caused significant increase of domestic energy intensity (Perović & Radukić, 2017).

Price liberalization in district heating sector should offer possibilities for switching to more sustainable technologies and improving the environmental performances of thermal power plants. Thermal power plants must also do serous cost benefit analysis, where they will find a right combination of inputs and assets that will help in achieving sustainable goals (Alexander, 2014). This also implies more investments in facilities, human resources, but also taking part in some regional projects that will bring benefits to all thermal plants and their users (Perović & Radukić, 2017). Price liberalization is good start for those thermal plants that intend to change their inputs and cut costs, which in the end should transform thermal power plants into better providers of heating services.

5. Research methodology and data

For the purpose of environmental analysis, fixed effects model is being used. Analysis involves several cities in the Republic of Serbia from the previous chapter and during the same period (2008 – 2016). Fixed effects model will help in estimating how some polluting particles affect liberalized heat prices. Required increase in business revenues (prices) for heating public utility companies is used as a dependent variable, while medium level values (emissions) for SO_2 and NO_2 are used as independent variables. Total emissions of SO_2 and NO_2 can be found in annual air quality reports published by Environmental Protection Agency of the Republic of Serbia. Hypothesis that will be tested is:

H2: SO_2 and NO_2 have a negative and statistically significant impact on price liberalization in heating sector.

As was earlier mentioned, multiple linear regression model is primary statistical choice for the analysis of 14 Serbian cities and therefore we have the following number of cities *I = 1,..14.* For all cities analysis runs in time period of 9 years, *t = 9*, so adequate regression model is:

$$y_{it} = \alpha + x_{it}\beta + c_i + u_{it} \quad (2)$$

Where y_{it} stands for dependent variable, α for constant, x_{it} K dimension row of vector that represents independent and dependent variable, β for K dimension column of vector value for dependant and independent variables, c_i is the specific impact of the analysed city, and u_{it} represents the residual. Before choosing the model, all adequate tests should follow the analysis due to choice of a proper model. All data and models in this analysis passed various statistic tests in STATA 12 software.

6. Results and discussion

Before estimating environmental effects of price liberalization through fixed effects model, descriptive statistics and correlation analysis are conducted.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Heat price	126	8.544762	4.268903	0	97.27
SO_2	126	16.58095	9.302367	3	69
NO_2	126	23.31667	8.899436	6	51
CO	126	.952381	.3397986	.29	2.2

Source: Authors' calculations

Descriptive statistics in Table 2 showed that maximum value of Required increase of business revenues (prices) for heating public utility companies is 97.27, which means that some of companies have serious problems with cumulated losses. On the other hand, maximum value of SO_2 (69) is higher that NO_2 (51), which indicates that public utility companies from heating area produce more SO_2 than NO_2. As for CO, its minimum value is 0.29, while maximum value is 2.2, which means that public utility companies from heating area produce less amount of this gas, but this can still be dangerous for the environment. Mean value and standard deviation value are important for providing quality analysis and in this case for the dependent variable, mean value is 8.5447, while standard deviation value is 4.2689. This goes in favour for further analysis and it is the same for all other variables in the analysis.

Correlation analysis is important for determining the strength of correlation between the variables. In this case, the implementation of full cost policy has a statistically significant impact on SO_2 and NO_2. Required increase in heating services prices has strongest correlation with SO_2 (-0.1246), while it has a weaker correlation with NO_2 (-0.1033). In both cases, variable *Heat price* has

negative correlation with independent variables, while it has no statistical significance to CO.

Table 3. Correlation analysis

	Heatprice	SO_2	NO_2	CO
Heat price	1.000			
SO_2	-0.1246*	1.000		
	0.0279			
NO_2	-0.1033*	0.0089	1.000	
	0.0347	0.9209		
CO	-0.0696	0.1932*	0.1424	1.000
	0.4387	0.0302	0.1116	

Source: Authors' calculations

Table 4. Panel data analysis

					Number of obs = 126	
					Number of groups = 14	
R-Sq.: within = 0.5274 between = 0.1582 overall = 0.2496					Obs per group min = 9 avg = 9.0 max = 9	
					F (3, 109) = 31.02	
Corr(u_i_xb) = -0.1938					Prob > F = 0.0261	
Heatprice	Coeff.	Std. Err.	t	p>|t|	[95% Conf. Interval]	
SO2	-.1977563	.1173812	-2.12	0.035	-.430402	.0348894
NO2	-.0953301	.1176137	-2.03	0.044	-.2384366	.2277765
CO	2.605048	2.261097	0.80	0.426	-3.858341	9.068437
_cons	9.467031	4.215869	2.43	0.011	1.111316	17.82275
sigma_u	15.021281					
sigma_e	9.2190824					
rho	.7263903					

Source: Authors' calculations

Table 4 shows the validity of model with environmental values and required increase of prices in heating sector with the p – value of 0.0261. Among the analysed variables, SO_2 and NO_2 have a statistically significant impact on prices of heating. If SO_2 emissions increase by 1%, estimated heating prices will be reduced by 0.1977 percentage points. In case of NO_2, the increase by 1% will reduce estimated heating prices by 0.095 percentage points. Therefore hypothesis H2 can be accepted since both SO_2 and NO_2 have a negative and statistically significant impact on full cost policy in public heating

sector of the Republic of Serbia. This actually means that thermal power plants should consider more sustainable policies with wider and effective implementation of renewable resources such as biomass.

7. Concluding remarks and recommendations

For too many years many of the public utility companies have been cumulating losses in their financial reports, while they have also received subsidies from state in order to cover the losses and continue with planned activities. In some cities, cumulated losses brought public utility companies to the edge of financial disaster that lead to collapse of companies in near future. Cities like Kragujevac, Smederevo and Valjevo are having huge difficulties with their public utility companies due to their high losses. In water supply sector public companies in Užice, Šabac and Valjevo face difficulties in providing quality services that in the end lead to losses in their accounts. These cities also have some infrastructural problems that have impact on financial results, but it remains that the implementation of full cost policy in these cities will cause a significant increase in prices that will on the other hand reduce the standard of living of local population. In heating area, city of Kragujevac has more problems than all other cities, which calls for drastic reactions that will prevent further losses in financial report of district heating facility in Kragujevac. As for garbage collection, city of Kragujevac again has some problems. The same case is in Smederevo where public utility company has losses in its financial account. By taking measures that include price liberalization, inflation rate would increase by 0.3567 percentage points and standard of living would be reduced by the same percent.

Environmental effects are also caused by implementing full cost policy. Since both SO2 and NO2 have statistically significant impact on price liberalization, most of the public companies should start thinking about strategies that involve intensive use of renewable resources. Sustainable strategies can help thermal power plants attract more assets from EU funds for serious reorganization and for becoming leaders in improving environmental performances. Consequently, thermal power plants will become promoters of sustainable development and they will not be recognized as polluters. Some thermal power plants have started with implementing sustainable solutions, but they must give invest great efforts in order to achieve environmental goals.

Price liberalization in public utility sector can have various economic, environmental and social effects that should be seriously considered by local and state authorities. One of the contributions of this paper is in conducting analysis of a possible future market structure from the sustainable

development aspect that can become real sometime in the future. Furthermore, analysis was conducted by implementing several statistical techniques that helped in estimating sustainability effects of utility service sector, which was not done in the past. Implementation of full cost policy definitely leads to higher inflation rate and reduced standard of living, but it can also lead to improving environmental performances because coal and oil would face competition in renewable resources. For now, price liberalization should not be considered in the Republic of Serbia due to low standard of living, but it is good to know what kind of effects can appear if authorities decide to start with the implementation of full cost policy. In many developed countries such as the Netherlands, Sweden or the United Kingdom, price liberalization in public utility sector brought huge shocks to service users and it took these countries a while to consolidate market of utility services.

Future studies should provide more detailed analysis of changes in utility sector, but these studies should be also oriented towards sustainable aspect of public utility service. It will be interesting to see what kind of impact the implementation of full cost policy has on different kind of ratios such as Return on Assets (ROA), Return on Equity (ROE), Debt to Net Worth or Acid Test. It will be also good if future research contains analysis of price liberalization impact on investment rate of utility companies, since with attracting more assets, utility companies can invest them in new facilities and improve the quality of provided services. Future analysis should also help in discovering what kind of impact liberalized prices of utility service could have on the price of renewable resource. This kind of analysis will help public utility companies to decide for inputs that can be used in their facilities and that can help them to achieve some economic and environmental benefits.

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