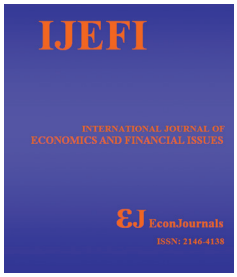

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Moderation Effect of Government Regulation on the Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability of Water Service Providers in Kenya

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ABSTRACT

The purpose of the study was to examine the moderating effect of government regulation on the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of Water Service Providers (WSPs) in Kenya. It adopted pragmatism research philosophy using explanatory sequential mixed design, while targeting a population of 616 and a sample of 352 respondents comprising of senior managers from eighty-eight registered WSPs in Kenya. Quantitative data was collected using a structured questionnaire; additional data was collected using interview schedule administered on key informants. Data collected, was coded, cleaned and analyzed to obtain both descriptive and inferential statistics. A two-step regression analysis and analysis of variance (ANOVA) was carried out to establish the nature and the magnitude of hypothesized relationships. The results showed that government regulation has a positive and significant moderating effect on the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of WSPs in Kenya. Unlike many studies which have focused on the demand side, this study focused on the supply side and revealed that financial sustainability is a product of many factors which government policy must address concomitantly thus calling for implementation of integrated water management policies.

Keywords: Government Regulation, Water Pricing, Financial Sustainability, Infrastructure Financing, Utility Efficiency, Subsidies
JEL Classifications: Q01, Q25, Q28

1. INTRODUCTION

In development literature, sustainability emanated in a response to models of economic growth that characterized the approaches to development over the past half a century (Tango International, 2009). The concept however, achieved recognition after the world commission on Environment and Development published the report entitled "Our Common Future" (also referred to as Brundtland Commission). In the report, sustainability was described as a means of fulfilling the requirements of the current generation without affecting the capacity of the emerging generations to satisfy their own needs (Lele, 2013). In water service provision, United Nation (UN) define sustainability in line with the European Union Water Framework Directive (EWFD) as comprising of three interdependent pillars that impact on the optimality of the sector. These include economy, environment and ethics (Bernard, 2003) commonly referred to as 3Es.

Worldwide, water is considered a basic human need, a human right, a key input in the industrial and commercial sectors as well as a major contributor to economic development (Chitonge, 2010; Tsitsifli et al., 2017; Montgomery et al., 2009). It is also considered a source

of life for all living things, it is a medium of transport, a key input in agricultural production, a solvent and a temperature regulator (Aung et al., 2018; Martínez-fernández et al., 2020). This recognition ignited the push for efficiency, public participation, accountability and financial stewardship in the provision of water (Langford, 2005; Means et al., 2005). This could partly explain why it was considered on the global map under the UN Millennium Development Goals (MDGs). Under the MDG, the goal was to reduce by half the population without access to water and basic sanitation (Hering et al., 2015; Lester and Rhiney, 2018). As a result, there has been increased investment in the sector aimed at improving access to water across the globe (UNICEF and World Health Organization, 2015). The end term evaluation of the MDGs reported an attainment of the global average water and sanitation access rate of 91% and 69%, respectively (UNICEF and World Health Organization, 2015).

Under the Sustainable Development Goals (SDGs), world economies sought to track the broader aspects of water service provision including access, quality, efficiency, integrated management, transboundary cooperation and public participation (Ait-Kadi, 2016). The SDGs also placed more emphasis on sustainability in the provision of the various aspects of water (Satterthwaite, 2016). The need for sustainability, emanated from the fact that, some countries reported regressive access rates as of the end-term review of MDGs (Satterthwaite, 2016). As a result, within the SDG, the economies under SDG 6, committed to addresses accessibility and sustainable management of water for all by the year 2030 under SDG number six (Alaerts, 2019; Satterthwaite, 2016). In water service provision, financial sustainability has been an issue of concern thereby prompting government interventions through various government regulations.

Government regulation involves the process that ensures a balance between attainment of economic efficiency and financial sustainability of a public entity, while at the same time ensuring attainment of maximum customer welfare (Ricks and Rossi, 2018). The attainment of these objectives is realized by setting of minimum acceptable standards, tariff policy, return cap, price caps, revenue ceilings as well as the provision of investment capital (Ricks and Rossi, 2018; Pinto and Marques, 2016). The government does actualize price regulations through pricing policies, imposition of revenue, price and rate of return caps (Ricks and Rossi, 2018). Others include minimum service level regulations in terms of setting minimum water quality levels, environmental protection requirements, infrastructure maintenance minimum standards, cost recovery levels and minimum customer service levels (Pinto and Marques, 2016).

Studies globally aimed at establishing the influence of government regulation on financial sustainability of water utilities, have yielded conflicting results with some lauded as an effective tool to protect the poor and the disadvantaged in the society aimed at enhancing water quality (Nahong, 2018). In other instances, however, this has been seen as a catalyst for inefficiency in service delivery and a key hindrance to the attainment of financial sustainability by WSPs (Singh et al., 2005; Rosegrant and Cline, 2002; Nahong, 2018; Ricks and Rossi, 2018). While government regulation is required to balance between efficiency, financial sustainability and customer welfare, there has been continued focus on customer welfare aspect therefore disregarding the other two aspects (Nahong, 2018).

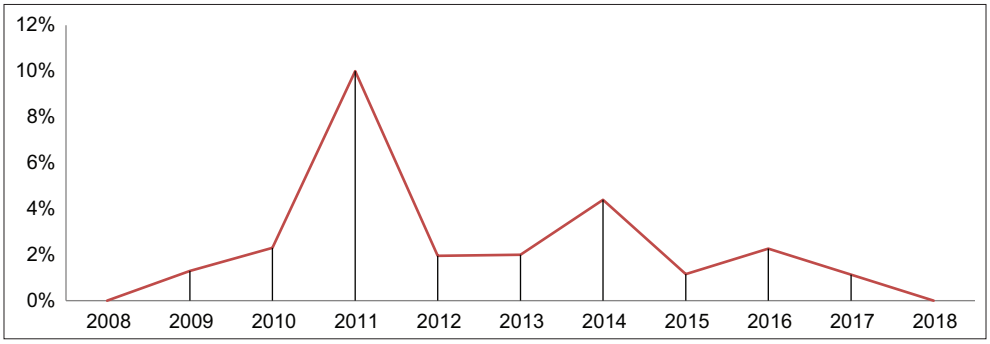
The skewed regulation has been identified as a key contributor to the low efficiency and financial sustainability levels among WSPs (Brealey and Franks, 2009). Given that government regulation is inevitable in water service provision, there is need to balance between the three main objectives of regulation; in effect, the WSPs will be protected from losses occasioned by economic and natural causes, while the customer will enjoy quality and sustainable water services (Mathur and Thakur, 2006). Fixing water prices for long periods of time, in some countries up to five years, while the cost of production, water demand and weather conditions vary within the period, impacts negatively on financial sustainability of WSPs (Brealey and Franks, 2009). Instead, water price indexation has been extolled as shield from unexpected losses by the WSPs (Brealey and Franks, 2009).

In Kenya, the need to ensure financial sustainability of the water sector was initiated in the late 1990s by the government through the Sessional Paper No. 1 of 1999. In the policy document, lack of attainment of full recovery by water utilities across the country was identified as a major setback to attainment of the MDGs (GoK, 1999). Similarly, various challenges were identified as impediment on the financial sustainability in the publicly provided for goods including water. Some of these factors were overreliance on public financing for operation and maintenance, fragmented management of the water schemes across the country, lack of a clear legal framework. Others were inadequate resources for network expansion and rehabilitation, cost insensitive tariffs, and uneven water resource distribution (GoK, 1999). The government hence forth proposed four key solutions including water resource conservation, supply of adequate quantities of good quality water and safe disposal of waste water, establishment of effective and efficient institutional framework, development of sound and sustainable financing mechanisms for the sector (GoK, 1999).

The proposals were finally actioned through formulation and operationalization of the Kenya's Water Act 2002 (Schwartz et al., 2017). In the Act, the government provided the legal framework necessary for the implementation of the strategies laid down under the sessional paper no. 1 of 1999 (Rampa, 2011). Institutional framework created separated policy, regulation, resource management and water service provision in order to foster financial sustainability of the sector (Schwartz et al., 2017). Following the operationalization of the Act in 2003, the regulator started tracking the performance of the Water Service Providers (WSPs) from 2005/2006 financial year. Among the parameters that have been tracked was the level of Operation and Management (O&M) cost recovery as a key parameter for financial sustainability. A WSP is assumed to have attained financial sustainability once 150% O&M cost coverage is attained. Since its implementation, it is estimated that 99% of the WSPs in Kenya are yet to attain the set full cost recovery (FCR) level of 150% of O&M cost coverage (WASREB, 2018). The few WSPs that attained FCR could not sustain it for more than three consecutive years as summarized in Figure 1.

Inability to realize financial sustainability could be attributed to high levels of inefficiency, sub-optimal water pricing, overreliance

Figure 1: Percentage of WSPs that attained Full cost recovery



Source:(WASREB, 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2018; 2019)

on subsidies, failure to implement current technology in the management of water and low water coverage as some of the government proposed regulations. For instance, according to the European Union Water Framework Directive of 2000, otherwise known as EWFD (2000), financial sustainability is influenced by pricing, efficiency, investment financing, asset management, subsidies, implementation of the right policies and public participation. Whereas, there are a number of variables that impact on the financial sustainability of the public provision of water, the moderating effect of government regulation on these variables seem not to have been empirically examined. In this regard, the study sought to examine the possible effect of government regulation on the joint influence of these factors on financial sustainability of water service providers in Kenya.

2. LITERATURE REVIEW

Government regulation is identified to be one of the external sustainability drivers (Lozano, 2015). It can either enhance or limit the sustainability of an entity. The main aim of government regulation in water service provision is to stimulate financial sustainability and efficiency while ensuring social sustainability (Barbosa and Brusca, 2015). While in some countries government regulation has been centralized, in others, municipalities and states adopt different regulation mechanisms, however, not much research has been done to confirm the superiority of either form (Barbosa and Brusca, 2015). In water service provision, government regulation takes several forms including defining the legal framework, directing on acceptable pricing policy, price caps or even revenue caps (Barbosa and Brusca, 2015). A review of literature on the influence of government regulation on WSPs' financial sustainability has revealed that the type and how the policies are implemented determine the outcome.

In terms of pricing, the pricing policy applicable varies across nations, regions and uses (Rios et al., 2018). Government regulation through pricing policy defines, the cost recovery, subsidies, efficiency levels, and infrastructure financing within the sector. In Chile, the implementation of full cost recovery water pricing coupled with an elaborate direct subsidies as was guided by research, led to attainment of financial sustainability by Chilean WSPs and controlled the financial flows and efficiency levels within the sector (Donoso, 2017). In some instances like in Ghana, government regulation defined infrastructure financing, water pricing and subsidy systems (Badu et al., 2012). In Ghana, the government set up a reserve fund which financed infrastructure development while charging water at Full Cost Recovery (FCR) level coupled with direct subsidies to those unable to pay; the policy enhanced access to water and financial sustainability by WSPs (Badu et al., 2012).

In Japan, government regulation on water pricing played a key role in determining the financial sustainability of the sector (Shibuya et al., 2014). Price reviews required approvals from the municipal leadership which was hard to get affecting the timeliness of such reviews (Shibuya et al., 2014). In effect the average tariff review period averaged eight and half years while the country's inflation rate kept increasing (Shibuya et al., 2014). Given the vulnerability of the country to earthquakes necessitating frequent infrastructure rehabilitation and replacements, the lack of price adaptability was found to have negative influence on WSP financial sustainability (Shibuya et al., 2014).

In South Africa, the pricing policy was such that it included price caps while at the same time incorporating a minimum quantity of free water, also known as lifeline water (Ruiters, 2013). The policy ensured that only consumption that is higher than the free water quantity was paid for. Such a policy not only impoverishes the water utility but also introduces subsidy-allocative inefficiencies to those who are able to pay (Ruiters, 2013). In Yemen, a study undertaken to compare different pricing mechanisms, including increasing tariff block tariff (IBT), flat rate with a rebate and flat rate with a discount found that the latter two mechanisms facilitated attainment of financial sustainability while IBT was prone to inefficiencies created by unreasonably high prices for some users (Al-Saidi, 2017).

Studies have also shown that the form of regulation influences WSPs' financial sustainability as it defines the financial flows in the sector, efficiency levels, the applicable water pricing and the subsidy policies. A review of the Indian water service provision regulation framework showed that the system was fragmented with every city being under a different water board; which had the liberty to guide the management of water and sewerage service provision within their jurisdiction (Aggarwal et al., 2013). Among the liberalized aspects was the water pricing policy and the acceptable service standards, they were defined and controlled by the various water boards and municipalities. The findings of the study was such that full cost recovery, high efficiency levels and reduced subsidies were feasible in cities and municipalities

where clear regulation existed (Aggarwal et al., 2013). Similar findings were observed in Brazil which also had a fragmented regulation mechanism with multiple regulators adopting unstandardized pricing, investment and even water management policies (Barbosa and Brusca, 2015). In a study that sought to establish the influence of governance structure on tariff levels of Brazilian water and sanitation companies it was established that there was a positive relationship between regulation in terms of tariff level and WSP profitability (Barbosa and Brusca, 2015). In Italy, the implementation of the water sector reform through clustering of water management units in order to enjoy economies of scale, appropriate tariff setting policy which allowed for full cost recovery and contracting out the service provision to independent operators to minimize political interference enhanced financial sustainability among the Italian WSPs (Massarutto, 2020).

The Chinese form of regulation presents an example of a devolved water sector regulation system whereby the national government regulation was found to guide financial sustainability of the water sector by directing on the admissible components of the water price, the frequency of tariff reviews and the process of tariff adjustments while the local governments were allowed to make adaptations in line with their local circumstances and conditions (Wu, 2011). Government regulation in china influenced water prices, infrastructure financing, level and nature of subsides, and efficiency levels (Wu, 2011). In effect, the average water price had experienced a steady average annual increase of 16.5% increase since 1990 which led to improved financial sustainability of the Chinese WSPs (Wu, 2011).

In terms of the legal and judicial framework, it was established that government regulation through legal and judicial support to the sector or lack of it influences financial sustainability of WSPs. Rios et al. (2018) notes that the enactment of the France's 2006 water law led to near abolition of flat and declining pricing rates and they optimized on pricing policies. The government imposed controls to ensure that water charges are within the minimum wage hence defining the household subsidies as well (Rios et al., 2018). In Santiago, the legal and judicial support for implementation of water disconnections including the setting up of a separate court to address water management issues, enhanced collection efficiencies and in effect financial sustainability of the WSPs (Estache and Kouass, 2002).

2.1. The Study was Guided by the Research Hypothesis that

H_0: Government regulation has no moderation influence on the determinants of financial sustainability among water service providers in Kenya.

3. DATA AND METHODS

This study used the explanatory sequential mixed design whereby quantitative data was collected and analyzed, followed by qualitative data collection and analysis. The integration was done at the data analysis and results interpretation stage whereby, qualitative findings were used to validate and explain the quantitative data analysis results. The target population comprise of senior managers who are conversant with the financial sustainability status of the respective WSPs. The respondents included managing directors, managers in charge of finance and accounts, manager in charge of commercial department and finally, manager in charge of technical department, in all the registered eighty-eight WSPs. Both quantitative and qualitative data was collected using a structured questionnaire that had five-point Likert scale, ranging from strongly disagree to strongly agree, and interview schedule with key informants respectively.

Data collected was cleaned, coded and analysed using SPSS version 24 to obtain both descriptive and inferential statistics. Descriptive statistics included mean scores and standard deviations. Inferential statistics included statistical tests (normality, linearity, normality, correlation analysis), regression analysis and analysis of variance (ANOVA) aimed at establishing the nature and the magnitude of hypothesized relationships. In the regression analysis, the relationship was considered statistically significant if the $P \leq 0.05$. Additionally, before undertaking regression analysis to establish the moderation influence of government regulation, process analysis was undertaken to confirm the appropriateness of government regulation as a moderator variable.

To test the moderating influence of government regulation on the joint relationship between water pricing, infrastructure financing, utility efficiency, subsidies and financial sustainability, a two-step regression analysis was undertaken. The first regression model sought to establish the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of WSPs in Kenya. While the second model introduced government regulation as the moderator variable to the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of WSPs in Kenya.

For purposes of validating the findings of the quantitative phase, interviews with industry experts drawn from the Ministry of Water, Sanitation and Irrigation (MWSI), the water works development agencies (WWDAs) and the Water Services Regulatory Authority (WASREB) were undertaken. The participants were selected through purposive sampling while ensuring representation from each organization category. Content analysis was used to analyse data collected in this phase and the results were used to validate the quantitative findings.

4. RESULTS

4.1. Response Rate

Out of 352 questionnaires that were administered to the respondents, 252 of them were returned for analysis which translates to 71.59% response rate as presented in Table 1.

4.2. Descriptive Analysis

Descriptive analysis results were presented using means and standard deviations; the average mean was 3.7 with a standard deviation of 1.056 as shown in Table 2.

4.3. Statistical Test Results

Various assumptions of the parametric data analysis were considered and tested before subjecting data to regression analyses.

Table 1: Response rate

Response rate	Frequency (F)	Percentage
Returned	252	71.59
Not returned	100	28.41
Issued	352	100.00

The response rate was considered adequate for the analysis

Table 2: Descriptive statistics for government regulation as a moderating variable

Government regulation	n	Mean	SD
If water prices are not controlled, it could lead to consumer exploitation by WSPs	252	4.05	1.170
Having fixed water prices against dynamic input costs causes mismatch between the two resulting to lack of cost recovery	252	4.11	0.935
The control of the minimum service standards imposes additional costs to WSPs impairing their ability cover their costs	252	3.44	0.996
The control of the length of time a WSP must take to attain full cost recovery delays attainment of financial sustainability by WSPs	252	3.89	0.969
Government regulation enhances financial sustainability of WSPs in Kenya	252	3.08	1.005
Devolving water service provision is likely to take back the gains of commercialization	252	3.54	1.242
Average	252	3.71	1.056

These included multicollinearity, normality, heteroscedasticity and linearity.

4.3.1. Multicollinearity tests

To test multicollinearity, the variables were subjected to the variance inflation factors (VIF) and tolerance tests in the regression analysis. The results in Table 3 show that VIF ranged from 1.104 to 1.965 which is below 5 hence within the acceptable level, ruling out multicollinearity problem amongst the variables (Daoud, 2009).

4.3.2. Normality tests

Normality tests are used to determine whether a set of sample data is well modeled by a normal distributed population. This was done using Kolmogorov-Smirmov tests statistics (KS-tests) and Shapiro-Wilk test (SW-test). According to Razali and Wah (2011), the KS-test tests if the data followed a specific distribution while, Shapiro-Wilk test is used to detect departures from normality because of kurtisis, skewness or both. The SW value must lie between zero and one; where values close to one mean that there is normality of data. Table 4 shows that in all the variables under investigation, the KS statistic ranged from 0.349 to 0.404 at $P < 0.05$, while the SW-test results ranged between 0.750 and 0.873 at $P < 0.05$. The results show that data was normally distributed.

4.3.3. Heteroscedasticity test

Heteroscedasticity test is used to determine whether there is a difference in the residual variance of the observation period to another period of observation. In this study, the test Glesjer was used. If the value $P > 0.05$, there is no problem of heteroscedasticity while if the $P < 0.05$, there is a problem of heteroscedasticity (Hair et al., 2012). Table 5 shows that all the variables under study have

Table 3: Multicollinearity tests results

Variable	Tolerance	VIF
Water pricing	0.509	1.965
Infrastructure financing	0.855	1.169
Price Subsidies and revenue grants	0.629	1.589
Utility efficiency	0.906	1.104
Government regulation	0.746	1.341

Dependent variable: Financial sustainability

Table 4: Normality tests

Variable	Kolmogorov-Smirmov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Water pricing	0.378	252	0.003	0.787	252	0.031
Infrastructure financing	0.349	252	0.046	0.771	252	0.046
Subsidies	0.404	252	0.008	0.768	252	0.044
Utility efficiency	0.385	252	0.000	0.750	252	0.000
Government regulation	0.332	252	0.000	0.873	252	0.000

Lilliefors significance correlation

Table 5: Tests of heteroscedasticity

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1					
(Constant)	2.265	3.792		0.597	0.553
Water pricing	−0.105	0.088	−0.248	−1.192	0.240
Infrastructure financing	−0.008	0.065	−0.019	−0.116	0.908
Subsidies	0.087	0.081	0.202	1.079	0.287
Utilities efficiency	−0.004	0.053	−0.012	−0.075	0.940
Government regulation	0.058	0.065	0.153	0.889	0.379

a $P > 0.05$, an indication that there was no heteroscedasticity problem.

4.3.4.Tests of linearity

The linearity test was conducted to determine whether the relationship between the dependent and independent variables was linear or not using the deviations from linearity whereby, the relationship is assumed to be linear when the $P > 0.05$ and vice versa. The findings presented in Tables 6-10 show that all the variables have deviation from linearity greater than 0.05 ($P > 0.05$) an indication that the relationship between the dependent and independent variables are linear.

4.4. Confirmation of Government Regulation Moderating Effect

The confirmatory test was undertaken using process analysis. Table 11 indicates that $R^2 = 0.455$, $F(3,248df) = 53.474$ against an F critical value (3,248df) of 2.605, P 0.000 < 0.005. These results show that government regulation is a moderating variable for the relationship between water pricing, infrastructure financing, utility efficiency, subsidies and financial sustainability of WSPs in Kenya.

Table 6: Tests for linearity for water pricing

ANOVA table					
Source	Sum of Squares	df	Mean Square	F	Sig.
Financial Sustainability * Water pricing					
Between Groups					
(Combined)	369.181	68	21.717	1.703	0.078
Linearity	16.890	4	16.890	1.325	0.256
Deviation from Linearity	352.291	64	22.018	1.727	0.076
Within groups	573.695	180	12.749		
Total	942.876	252			

Table 7: Tests for linearity for infrastructure financing

ANOVA table					
Source	Sum of squares	df	Mean square	F	Sig.
Financial Sustainability * Infrastructure financing					
Between groups					
(Combined)	340.022	68	17.500	1.764	0.071
Linearity	63.127	4	76.399	7.699	0.008
Deviation from linearity	276.895	64	13.573	1.368	0.208
Within groups	864.486	180	19.211	9.923	
Total	1204.509	252			

Table 8: Tests for linearity for subsidies

ANOVA table					
Source	Sum of squares	df	Mean square	F	Sig.
Financial Sustainability * Subsidies					
Between groups					
(Combined)	459.563	68	27.033	1.921	0.071
Linearity	.004	4	.004	1.008	0.987
Deviation from Linearity	459.559	64	28.722	2.041	0.061
Within groups	633.176	180	14.071		
Total	1092.739	252			

Table 9: Tests for linearity for utilities efficiency

ANOVA table					
Source	Sum of squares	df	Mean square	F	Sig.
Financial Sustainability * Utilities efficiency					
Between groups					
(Combined)	895.433	68	52.673	4.196	0.096
Linearity0	197.795	4	197.795	15.757	0.026
Deviation from linearity	697.638	64	43.602	3.473	0.083
Within groups	564.884	180	12.553		
Total	1460.317	252			

4.5. Regression Analysis for the Moderating Effect of Government Regulation on the Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability of WSPs in Kenya

A two-stage regression analysis was done in the study starting with regression analysis for the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability as the first stage. This was followed by regression analysis of the joint relationship as moderated by government regulation. The results of the two-step regression analysis are shown in Tables 12-14. The two models are labeled as 1 for the joint influence test and 2 for the moderated joint influence respectively.

Table 10: Tests for linearity for government regulation

ANOVA table					
Source	Sum of squares	df	Mean square	F	Sig.
Financial Sustainability *Government regulation					
Between groups					
(Combined)	444.172	68	26.128	1.586	0.109
Linearity	104.303	4	104.303	6.331	0.016
Deviation from Linearity	339.869	64	21.242	1.289	0.245
Within groups	741.389	180	16.475		
Total	1185.561	252			

Table 11: Confirmatory test results for the moderation effect of government regulation

Model	R	R Square	SE	F-statistic	Df1	Df2	p-value
1	0.674	0.455	6.898	53.474	3	248	0.000

a. Predictors: (Constant), water pricing, infrastructure financing, subsidies, utilities efficiency, Government regulation

According to the results, model 1 yielded an R square of 0.176 while model 2 yielded an R square of 0. 233. The introduction of moderator variable led to the improvement of the R square from 0.176 to 0.233. These results indicate that water pricing, infrastructure financing, utilities efficiency and subsidies as moderated by government regulation explain 23.3% of financial sustainability variations while the same variables explained 17.6% of financial sustainability variations before introduction of the moderator variable. Government regulation therefore has a significant positive moderating influence on the joint relationship between water pricing, infrastructure financing, utility efficiency, subsidies and financial sustainability of WSPs in Kenya.

4.6. ANOVA Results

Table 13 indicates an F = 13.209 (4,247df), P = 0.000 for the joint influence model and F = 14.984 (5,246 df), P = 0.000 < 0.05 for the moderated joint influence model; This is an improvement from an F 13.209 (4,247df) prior to introduction of the moderating variable. The F-critical (5,246df) = 2.214. Given that F = 14.984 > 2.214, the study rejects the null hypothesis and concludes that, the model is a good fit and that government regulation has moderating effect on the joint influence of water pricing, infrastructure financing, utilities efficiency and subsidies on financial sustainability of WSPs in Kenya.

4.7. Regression Coefficients

The introduction of government regulation as a moderating variable, caused the individual variable regression coefficients to change with water pricing changing from 0.136 to 0.013; infrastructure financing from 0.115 to 0.150; utility efficiency from 0.246 to 0.209, and finally, subsidies changed from −0.070 to −0.091.

Based on these findings, the study rejects the null hypothesis that government regulation has no moderating effect on the

Table 12: Model summary results for the moderating effect of government regulation on the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of WSPs in Kenya

Model	R	R square	Adjusted R square	Std. Error of the Estimate
1	0.420[a]	0.176	0.163	3.23414
2	0.483[b]	0.233	0.218	3.12610

[a]Predictors: (Constant), Utilities efficiency, Water pricing, Infrastructure financing, Subsidies. [b]Predictors: (Constant), water pricing, infrastructure financing, subsidies, utilities efficiency, Government regulation

Table 13: ANOVA analysis results

Model	Sum of squares	df	Mean square	F	Sig.
1					
Regression	552.661	4	138.165	13.209	0.000[a]
Residual	2583.536	247	10.460		
Total	3136.196	251			
2					
Regression	732.161	5	146.432	14.984	0.000[b]
Residual	2404.036	246	9.773		
Total	3136.196	251			

[a]Predictors: (Constant), Utilities efficiency, Infrastructure financing, Subsidies, Water pricing. [b]Predictors: (Constant), Government regulation, Utilities efficiency, Infrastructure financing, Subsidies, Water pricing

Table 14: Regression coefficients

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
1					
(Constant)	27.088	5.791		4.678	0.000
Water pricing	0.136	0.141	0.149	0.964	0.339
Infrastructure financing	0.115	0.102	0.142	1.122	0.266
Subsidies	−0.070	0.129	−0.082	−0.540	0.591
Utilities efficiency	0.246	0.090	0.336	2.739	0.008
2					
(Constant)	26.050	2.723		9.566	0.000
Water pricing	0.013	0.072	0.014	0.177	0.860
Infrastructure financing	0.150	0.049	0.186	3.088	0.002
Subsidies	−0.091	0.061	−0.108	−1.507	0.133
Utility efficiency	0.209	0.043	0.286	4.872	0.000
Government regulation	0.229	0.054	0.282	4.286	0.000

[a]Dependent variable: Financial sustainability

joint influence of water pricing, infrastructure financing, utility efficiency, subsidies on financial sustainability of WSPs in Kenya. Water service provision is a highly regulated sector due to the fact that water is both a basic need and a human right. These results imply that financial sustainability amongst Kenyan WSPs can be enhanced by implementing policies that concurrently influences water pricing, infrastructure financing, utility efficiency and subsidies. The influence is majorly through enacting enabling policies including the pricing, subsidy and financing policies.

4.8. Interview Results Analysis

The industry experts agreed that government regulation influences financial sustainability of WSPs in the country. According to the industry experts, regulation involves setting minimum service standards, development and implementation of an appropriate tariff policy and customer protection. They observed that that government regulation was smooth until the onset of devolution in 2013 after which conflicts emerged with different county governors wanting to set their own standards for WSPs within their respective counties. The experts opined that the attainment of financial sustainability by WSPs require to be guided by uniform minimum standards and pricing policy across the country.

Additionally, they identified the need for clustering of small WSPs into economically viable entities. This was seen as an important regulation because some WSPs were too small to fully cover their operation costs, to attract and retain skilled and competent staff and to grow the WSPs' ability to negotiate for infrastructure financing from development partners.

The need for an integrated water management was highlighted by the industry experts as it would ensure WSP financial sustainability, attainment and maintenance of minimum service standards, protection of water towers and increased access to water.

The interviewees indicated the need for involvement of WSPs by the National Treasury as they negotiate for infrastructure financing as that would improve the packaging of the financing proposals so that such financing incorporate a full project from sourcing water to storage all the way to distribution. They opined that such a financing enables attainment of financial sustainability of WSPs and thereby shorten the financing payback period.

5. DISCUSSION OF THE RESULTS

The introduction of government regulation caused the R square to increase to 0.233 from 0.176 before its introduction. The f-statistic also increased to 14.984 (5,246df) at a P = 0.000 from 13.209 (4,247df) at a P = 0.000. The critical value at (5,2246df) is 2.214; therefore, 14.984 > 2.214. These results confirm that the model is good fit and that government regulation is a good moderator variable for the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of WSPs in Kenya. The study further established that there is a positive moderating influence of government regulation of the on the joint relationship between water pricing, infrastructure financing, utility efficiency, subsidies and financial sustainability of WSPs in Kenya. The joint influence of the factors when moderated by government regulation explained 23.3% of the variations in financial sustainability of WSPs in Kenya.

These findings agree with those of other studies which have shown that government regulation influences WSP financial sustainability through: defining financial flows in the sector line in Ghana where a reserve fund for infrastructure development was operationalised (Badu et al., 2012); defining admissible efficiency levels, applicable water pricing methodologies and the subsidy policies which in effect influenced WSP financial sustainability

(Wu, 2011; Rios et al. 2018; Shibuya et al., 2014; Massarutto and Ermano, 2013); setting up the acceptable form of government regulation (Aggarwal et al., 2013; Massarutto and Ermano, 2013; Wu, 2011) and finally the level of legal and judicial support for the sector (Rios et al., 2018;Estache and Kouass, 2002).

These studies reveal the role of government regulation in defining the environment for financial sustainability of WSPs. The results are similar to those of the current study which shows that government regulation moderates the relationship between water pricing, infrastructure financing, utility efficiency, subsidies and WSPs' financial sustainability. These results can be attributed to government regulation related to the Kenya's tariff policy which envisages full cost recovery by WSPs in 10 years, the controls for admissible cost components in water pricing, the legal framework guiding the sector and the set minimum service standards.

6. CONCLUSION AND RECOMMENDATION

This study established that, water pricing, infrastructure financing, utility efficiency and subsidies have a joint positive influence on financial sustainability of WSPs in Kenya while government regulation moderates the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of WSPs in Kenya. Government regulation influences this relationship through the pricing policy, setting of minimum service standards, implementation of an elaborate subsidy and infrastructure financing policies, prioritizing water in the government agenda, implementation of a clear legal and institutional framework.

From the foregoing, the study recommends that WASREB needs to implement a pricing policy that is premised on full cost recovery so that affordability issues are addressed through direct subsidies which should proportionately target the needy households. Implementation of such policies will ensure: financial sustainability of WSPs, sustainable access to water by all, equitable subsidy distribution and equitable charges to customers based on their ability pay. On efficiency, the study recommends that WASREB needs to monitor and ensure attainment of the minimum service standards by all WSPs so as to lessen the inefficiency costs passed on to the water users. The study further highlights the need for the MWSI to spearhead interagency collaboration between the different arms of the ministry, as well as collaboration with other ministries where water is a major input. Such collaborations will enable sustainable management of water resources, optimum application of infrastructure financing through reduction duplication of effort by different agencies and development of end-to-end financing proposals.

REFERENCES

Aggarwal, V., Maurya, N., Jain, G. (2013), Pricing urban water supply. Environment and Urbanization ASIA, 4(1), 221-241.

Ait-Kadi, M. (2016), Water for development and development for water: Realizing the sustainable development goals (SDGs) vision. Aquatic Procedia, 6, 106-110.

Alaerts, G.J. (2019), Financing for water-water for financing: A global review of policy and practice. Sustainability (Switzerland), 11(3), 1-25.

Al-Saidi, M. (2017), Urban water pricing in Yemen: A comparison of increasing block tariffs to other pricing schemes. Water International, 42(3), 308-323.

Aung, K., Jiang, Y., He, S.Y. (2018), The role of water in plant-microbe interactions. Plant Journal, 93(4), 771-780.

Badu, E., Edwards, D.J., Owusu-Manu, D., Brown, D.M. (2012), Barriers to the implementation of innovative financing (IF) of infrastructure. Journal of Financial Management of Property and Construction, 17(3), 253-273.

Barbosa, A., Brusca, I. (2015), Governance structures and their impact on tariff levels of Brazilian water and sanitation corporations. Utilities Policy, 34, 94-105.

Bernard, B. (2003), Past and future sustainability of water policies in Europe. Natural Resources Forum, 27(3), 200-211.

Brealey, R., Franks, J. (2009), Indexation, investment, and utility prices. Oxford Review of Economic Policy, 25(3), 435-450.

Chitonge, H. (2010), Who is subsidising whom ? Water supply cross-subsidisation policy, practice and lessons from Zambia. The Journal of Modern African Studies, 48(4), 599-625.

Daoud, J.I. (2009), Multicollinearity and regression analysis. Journal of Physics: Conference Series, 949(1), 1-6.

Donoso, G. (2017), Urban water pricing in chile: Cost recovery, affordability, and water conservation. Wiley Interdisciplinary Reviews: Water, 4(2), e1194.

Estache, A., Kouass, E. (2002), Sector Organization, Governance, and the Inefficiency of African Water Utilities (No. 2890). Washingtoni, DC.

Garson, G.D. (2012), Testing Statistical Assumptions: Blue Book Series. 12th ed. Asheboro: Statistical Associate Publishing.

GoK. (1999), Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management and Development (No. 824 KE99). Nairobi.

Hair, J.F., Black, B., Babin, B.J., Anderson, R.E. (2010), Multivariate Data Analysis. 7th ed. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Hering, J.G., Sedlak, D.L., Tortajada, C., Biswas, A.K., Niwagaba, C. and Breu, T. (2015), Local perspectives on water. Science, 349(6247), 479-480.

Langford, M. (2005), The United Nations concept of water as a human right: A new paradigm for old problems? International Journal of Water Resources Development, 21(2), 273-282.

Lele, S. (2013), Re-thinking sustainable development. Geographical Education, 112(757), 311-316.

Lester, S., Rhiney, K. (2018), Going beyond basic access to improved water sources: Towards deriving a water accessibility index. Habitat International, 73(1), 129-140.

Lozano, R. (2015), A holistic perspective on corporate sustainability drivers. Corporate Social Responsibility and Environmental Management, 22(1), 32-44.

Martínez-Fernández, J., Neto, S., Hernández-Mora, N., Del Mora, L., La Roca, F. (2020) The role of the water framework directive in the controversial transition of water policy paradigms in spain and Portugal. Water Alternatives, 13(3), 1-26.

Massarutto, A. (2020), Servant of too many masters: Residential water pricing and the challenge of sustainability. Utilities Policy, 63(1), 101018.

Massarutto, A., Ermano, P. (2013), Drowned in an inch of water How poor regulation has weakened the Italian water reform. Utilities Policy, 24, 20-31.

Mathur, O.P., Thakur, S. (2006), Urban Water Pricing: Setting the Stage for Reforms. New Delhi: National Institute of Public Finance Policy.

Means, E.G., Ospina, L., Patrick, R. (2005), Ten primary trends and their implications for water utilities. American Water Works Association,

97(7), 64-77.
Montgomery, M.A., Bartram, J., Elimelech, M. (2009), Increasing functional sustainability of water and sanitation supplies in rural sub-saharan Africa. Environmental Engineering Science, 26(5), 1017-1023.
Nahong, M. (2018), The moderating effect of efficiency and non-market capability in relationship between government involvement and resources to performance of water supply companies (PDAM) in Sulawesi Indonesia. International Journal of Law and Management, 60(2), 402-412.
Pinto, F.S., Marques, R.C. (2016), Tariff suitability framework for water supply services: Establishing a regulatory tool linking multiple stakeholders' objectives. Water Resources Management, 30(6), 2037-2053.
Rampa, F. (2011), Analysing Governance in the Water Sector in Kenya (No. 124). Brussels.
Razali, M.N., Wah, B.Y. (2011), Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-darling tests. Journal of Statistical Modelling and Analytics, 2(1), 21-33.
Ricks, M., Rossi, J. (2018), Foreward to revisiting the public utility. Yale Journal on Regulation, 35, 711-719.
Rios, P.C.S., Deen, T.A., Nagabhatla, N., Ayala, G. (2018), Explaining water pricing through a water security lens. Water (Switzerland), 10(9), 1-20.
Rosegrant, M.W., Cline, S. (2002), The politics and economics of water pricing in developing countries. Water Resource Impact, 4(1), 6-8.
Ruiters, C. (2013), Funding models for financing water infrastructure in South Africa: Framework and critical analysis of alternatives. Water SA, 39(2), 313-326.
Satterthwaite, D. (2016), Missing the millennium development goal targets for water and sanitation in urban areas. Environment and Urbanization, 28(1), 99-118.
Schwartz, K., Tutusaus, M., Savelli, E. (2017), Water for the urban poor: Balancing financial and social objectives through service differentiation in the Kenyan water sector. Utilities Policy, 30(2017), 1-10.
Shibuya, M., Hernández-Sancho, F., Molinos-Senante, M. (2014), Current state of water management in Japan. Journal of Water Supply: Research and Technology, 63(8), 611-624.
Singh, M.R., Upadhyay, V., Mittal, A.K. (2005), Urban water tarrif structure and cost recovery opportunities in India. Water Science and Technology, 52(12), 43-51.
Tango International. (2009), Sustainability of Rural Development Projects Best Practices and Lessons Learned by IFAD in Asia. In The Eighth in a Series of Discussion Papers Produced by the Asia and the Pacific Division. Rome, Italy: International Fund For Agricultural Development.
Tsitsifli, S., Gonelas, K., Papadopoulou, A., Kanakoudis, V., Kouziakis, C., Lappos, S. (2017), Socially fair drinking water pricing considering the full water cost recovery principle and the non-revenue water related cost allocation to the end users. Desalination and Water Treatment, 99(1), 72-82.
UNICEF, WHO. (2015), 25 Years Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment. Available from: https://www.unwater.org/publications/whounicef-joint-monitoring-program-water-supply-sanitation-jmp-2015-update.
WASREB. (2010), Impact: A performance Report of Kenya's Water Services Sub-Sector. Available from: https://www.wasreb.go.ke/impact-report-issue-no-3.
WASREB. (2011), Impact: A performance Report of Kenya's Water Services Sub-Sector. Available from: https://www.wasreb.go.ke/downloads/wasreb_impact_report4.pdf.
WASREB. (2012), Impact: A Performance Review of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/impact-report-5.
WASREB. (2013), Impact: A Performance Review of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/impact-report-6.
WASREB. (2014), Impact: A Performance Review of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/impact-report-7.
WASREB. (2015), Impact: A Performance Review of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/impact-report-8.
WASREB. (2016), Impact: A Performance Review of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/downloads/wasreb_impact_report9.pdf.
WASREB. (2018), A Performance Report of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/impact-report-issue-no-10.
WASREB. (2019), Impact: A Performance Report of Kenya's Water Services Sector. Available from: https://www.wasreb.go.ke/impact-report-issue-no-11.
Wu, H. (2011), Pricing water for sustainable cost recovery: A study on China's water tariff reform. Water Practice and Technology, 6(4), 1-10.