International Journal of
Environmental Sciences & Natural Resources
ISSN: 2572-1119

Juniper Publishers
key to the Researchers

Review Article
Volume 7 Issue 1 - November 2017
DIO : 10.19080/IJESNR.2017.07.555702

Int J Environ Sci Nat Res

Price Policy of Drinking Water in Tunisia: Panel Application

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Submission: November 21, 2017; **Published:** November 28, 2017

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Abstract

This paper focus on policy of drinking water demand with application on Tunisian panel data. We estimate a model which explains consummate volume by the five slices of tariff corresponding to the progressive pricing. Long term results show that prices UP1, UP3 and UP5 has no effects on the preservation of the resource. Contrary to these three prices, UP2 and UP4 can be represented as a regulating mechanism. Concerning the global short run results, we notice that the coefficients of the prices UP1, UP3 and UP5 are negative what explains that these prices have an incentive effect. For the interregional short term results, price UP1 coefficient is negative and significant which mean that the proportion of the households which consume less than $20m^3$ is important within every governorate. The price UP2 which affect positively and significantly the consummate volume of drinking water represent a regulating mechanism.

Introduction

The management of drinking water demand can take numerous forms of the direct measures of regularization of the water use, until indirect measures aiming at the voluntary behavior. The non-tariff policy consists in calls launched to the public by awareness campaigns with educational programs and of similar initiatives which ended in deep modifications in the human behavior towards the preservation and towards the use of the water. The management of the demand constitutes the new policy of the World Bank regarding the resource management in water. In this approach, the instrument price can guide us in a rational use of the resource in water. Indeed, the price appeared as an incentive mechanism which urges the users to use the water in a more effective way. Besides, the price encourages the distribution companies of water to improve their qualities of the services, to satisfy the preferences of the consumers by the technical and financial means. So, a good management of the resource in water requires the adoption of a mode of pricing which allows supplying in a regular way the water to the various users with quantity and with quality satisfactory. This mode of pricing also allows avoiding any kind of overexploitation and the degradation of resource. A policy of sensible pricing has to answer at least four types of consideration: a use as effective as possible of the existing production capacity, an expansion of the capacity according to an evolution of the demand which is in touch with the real cost of the committed resources. The realization of the financial equilibrium and finally the considerations of social equity in the management of the resource in water. So the objective of the present paper will then be to analyze the policy of the drinking water in Tunisia.

Pricing of the Monopoly

In the case or the technological and economic specificities are based on services of water and purification of a natural monopoly, the organization of the market drives to a valuable fixation above the marginal cost (to avoid that the company makes losses because of the presence of the important fixed costs). However, the fixation of a high price for produced quantities cannot be the situation which corresponds to the social optimum. To save itself of such inefficient situations, the government has to take care of the property of the monopoly. So, the public authority can choose to produce itself the service what allows to reach the optimum Parétien (pricing in the marginal cost). But it should be noted that it is possible for the public authorities to attribute the management of the service to a private enterprise while regulating (use contracts-objectives). However, since it is difficult to oblige the company to produce at a competitive price (in the marginal cost), the government is in the obligation to subsidize the company by fixed transfers allowing them to cover its losses. One of the main objectives of the government aims at the fact that the services of the water assure the access for all to a drinking water of satisfactory quality for the consumers. At this stage, social approaches of pricing are possible and often practised (as the supply of free collective water, the payment of

a part of the invoice either a pricing by stages croissants, with the supply of a quantity limited by low-priced drinking water).

Pricing and Demand in Water

Generally, the demand in drinking water is relatively inelastic with regard to the price. This is justified by the fact that the water is an essential good where there is no substitute for the most part of the users and is considered as the complementary good for a lot of consumer goods. In the practical case, it is difficult to estimate a function of demand of drinking water, because of the systems of current pricing and the impossibility to arrest quantitatively the water consumption of the households (the individual data are rare, there is a multitude of modes of management). The used scales of pricing are generally not linear, they are presented or under a shape binomial (a fixed part and a variable part according to the consummate volume) either multinôme (progressive or decreasing pricing). The economic theory considers a function of demand which integrates the demands of the goods substitutes and complementary and also the constraint of income. Generally, the price of the water is not exogenous in the consummate, but especially endogenous volume because of the influence of the volumes distributed on the costs of potabilisation some water. The theory suggests that the whole price list is included in the function of the demand of the drinking water, but this is excluded for practical reasons. In this context, the literature which is interested in the development of the model of the function of demand of the drinking water, aim at testing empirically the hypothesis according to which: with which price (average or marginal) the consumers react when the water is sold by a scale multi-block [1-4]. Proposes a simple procedure which consists in incorporating at the same time the average price and the marginal price into the equation of the demand. The marginal price represents the price of the slice of consumption which exceeds the last block in which took place the consumption. On the other hand, the average price is obtained by calculating the average of the average prices of every slice of consumption. This average price includes all the fixed and variable costs [5]. Suggests taking into account the intra valuable structure - marginal; by including a said variable of difference in the estimation. This variable corresponds to the difference between what pays actually the consumer, and what he would have paid if his total consumption had been priced at the marginal price. The value of this difference will be positive under a progressive scale, and negative under a decreasing scale. The variable difference measures in theory the returned effects engendered by the fare structure. For a progressive or decreasing price list by slice, the difference having respectively the effect of a tax (economy realized for the consumers) or of a subsidy. The approaches proposed by specification of the demand presented up to here show some gaps. Indeed, they do not integrate into the problem of maximization of profit of the consumers the choice of the block in the structure of pricing. This choice appears as endogenous in the diversion of the demand in water. For that reason, the search for a function of demand of drinking water stays always an objective to achieve by several studies.

According to [6], the analysis of the demand of drinking water is especially focused on needs. The quantity of consummate water and the prices depend particularly on the evolution of the population, as well as on their lifestyle. The researches for the estimation of a function of demand of drinking water are rare and have especially an exploratory character, because the consummate quantities of water are often disconnected from the real costs committed by distribution companies. Among the works which were interested in the estimation of the function of demand of drinking water, we can quote the works which are given by [7]. And which put in relation the consumption and the price through an in section transverse analysis. Besides, and from a study concerning the demand of drinking water, Point (1993) puts the point on the problem of sharing of the resources between the various users. To do it, he takes into account three categories of use, the commercial, industrial and domestic use. The results show that the elasticity price becomes established around -0,167 with regard to the average price, for the department of the Gironde in France [8]. Insist on new aspects of the consumption. In this context the estimation of the request of the drinkable water supply, on all the territory in Tunisia, and for the domestic use in 2004, led to a function the elasticity of which was around - 0,42 with regard to the average price.

Price of Drinking Water in the Domestic Use

Generally, the origin of the problem of the price of the water for the households is essentially due to the part of the level of the price of the water with regard to income. In this case, the principle of solidarity in the field of the drinking water has to be made by the creation of the dimensions of integration of the considerations: social, environmental and economic. Let us note that this solidarity between small and big consumers aims at reducing the average price of the water for the small consumer with regard to the average price for a big consumer. The progressive pricing which takes into account the diameter of the meter, the size of the connecting to the subscriber and the volume of consummate water, ignores the socioeconomic characteristics of the subscriber. These characteristics present a fundamental factor to realize a social solidarity in the consumption of the drinking water. But this does not prevent that this pricing engenders some advantages. Indeed, the theory shows that a progressive pricing, can create an important financial transfer when the group of big consumers is brought to support 75% of the total costs for 50% of the total consumption, while the group of small consumers could pay only 25% of the total costs. In this case, the earnings by the small consumers become half of the normal price which they would have paid in principle, and the transfer between these two categories of consumers concerns 25% of the total costs of the water. The fact that the first low-priced slice concerns only few households and not all represent a criticism of the progressive pricing. However,

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for the poor and numerous families, the passage of a slice of consumption in another one becomes perfectly possible. In this case the role of the social slice in the social considerations of the households disappears. Because of this criticism of a progressive pricing, several countries look for solutions suited to reach certain social goals. In Tunisia, an envisaged solution consists in the use of a system in five slippery slices which stipulates that only the households the consumption of which does not exceed the ceiling of the fifth slice could benefit from a first low-priced slice. This procedure allows creating a phenomenon of incentive for the consumption of the resource. In other words, the pricing for the superior slice can involve a significant additional cost for certain users capable of covering the cost for the lower slices. The price of the superior slice is 5,8 times worth that of the lower slice. Besides, in some developing countries, the ceiling of the first slice varies with the number of people in the household. In this case, we get closer to the social pricing.

Empirical Validation

Model

The policy of the price of the drinking water in Tunisia was essentially based on a progressive pricing by slice of consumption. The objective of this strategy is to rationalize the consumption of the water which is very useful for the humanity. The application of a progressive pricing in the management of the water on all the Tunisian territory leads to a principle of regulation to manage well and preserve at best this rare resource. In this theme, we estimate an econometric model with the aim of distinguishing price slices affected by every governorate.

$$CV_{it} = \alpha_0 + \sum_{j=1}^{5} \alpha_j UP_{jit} + \varepsilon_{it}$$

Where CV is the consummate volume, UP_j are the unit prices of the five slices, $i = 1,....,21$ represent the Tunisian governorates $t = 1997,.....,2012$ and is the time.

Results and Discussion

The estimation of the model concerns the effects of long and short-term of every slice of price on the consummate volume. The application of unit root test in panel data (IPS, ADF and LLC) shows that all our variables are not stationary in level and become stationary after one differences which mean that are I(1). The result of this test led to us to test the cointegration of our model. Pedroni cointegration test confirm the presence of cointegration in our model then the long-term relationship exists between the variables. In this case, our model is a VEC one and it can be estimated using FMOLS, and ARDL specification method Table 1.

Table 1: Long and short term global results.

Variable	Coefficient	Std. Error	t-Statistic	Prob*
Long Run Equation (FMOLS)				
UP1	0.22	0.09	2.37	0.0184
UP2	-0.35	0.02	-14.45	0.0000
UP3	2.23	0.057	38.98	0.0000
UP4	-5.02	0.047	-107.08	0.0000
UP5	3.77	0.07	51.29	0.0000
Short Run Equation (ARDL)				
COINTEQ01	-0.15	0.02	-7.51	0.0000
D(UP1)	-0.06	0.02	-3.15	0.0019
D(UP2)	0.94	0.16	5.92	0.0000
D(UP3)	-3.8	0.71	-5.36	0.0000
D(UP4)	6.47	1.2	5.37	0.0000
D(UP5)	-4	0.77	-5.23	0.0000
Mean dependent var	0.028112	S.D. dependent var		0.074001
S.E. of regression	0.073335	Akaike info criterion		-4.458984
Sum squared resid	0.989548	Schwartz criterion		-2.732196
Log likelihood	901.1093	Hanan-Quinn criter.		-3.770638

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The estimation of the basic model showed that the five prices are significant in short term. The coefficients of the prices UP1, UP3 and UP5 are negative what explains that these prices have an incentive effect on the structure of consumption of the drinking water. On the other hand, the prices UP2 and UP4 represent no effect on the consummate volume. However and for a long-term tendency, prices UP1, UP3 and UP5 has no effects on the preservation of the resource Table 1. Contrary to these three prices, UP2 and UP4 can be represented as a regulating mechanism of the consumption in long term of the drinking water. Now, we focus in the interregional analysis to study the effects of different prices on 21 governorates of Tunisian territory Table 2.

Table 2: ARDL short run interregional estimation results.

	Cointeq01	D(up1)	D(up2)	D(up3)	D(up4)	D(up5)
Bizerte	-0.07***		0.12	0.82	-1.29	0.89
Jendouba	-0.03***	-0.028***	-0.56	2.28	-3.86	2.5
Le kef	-0.16***	-0.06***	1.17***	-6.81	11.5	-6.69
Siliana	-0.13***	-0.01***	0.82***	-1.4	2.37	-1.45
Béja	-0.14***	-0.03***	0.97***	-0.45	0.93	-1.07
Nabeul	-0.1***	-0.04***	0.38***	-1.44	2.49	-1.43
Zaghouan	-0.45***	-0.46**	2.99	-10.7	18.57	-13.32
Sousse	-0.08***	-0.03***	0.59***	-1.54	2.67	-1.96**
Monastir	-0.07***	-0.03***	0.49***	-2.06	3.42	-2.21
Mahdia	-0.09***	-0.06***	0.75***	-2.45	4.12	-2.78
Kairouan	-0.17***	-0.01***	0.59***	-4.67	7.9	-4.42
Kasserine	-0.23***	-0.07***	1.43***	-7.9***	13.44**	-7.99***
Sfax	-0.11***	-0.09***	-0.99**	-3.78	6.41	-3.89
Gafsa	-0.18***	-0.049**	0.91***	-4.32	7.35	-4.33
Tozeur	-0.15***	-0.05***	1.3***	-4.4	7.48	-4.5
Sidi Bouzid	-0.27***	-0.06***	1.21***	-8.2*	13.5	-8.13*
Gabes	-0.21***	-0.08***	2.19***	-5.17	8.95	-6.66
Kebili	-0.12***	-0.06***	0.36***	-1.98	3.36	-2.01
Medenine	-0.09***	0.015***	1.43***	-5.83	9.8	-5.7
Tataouine	-0.27***	-0.09***	0.72**	-7.56	12.56	-6.5
Grand Tunis	-0.11***	-0.031***	0.93***	-2.22	3.81	-2.47

*Significant at 10% **Significant at 5% *** Significant at 1%
According to (Table 2) above, it appears the error correction term is negative and significant for all governorates which confirm the long term relationship. The price UP1 coefficient is also negative and significant for all governorates, this mean that the proportion of the households which consume less than 20 m3 is important within every governorate. The price UP2 affect positively and significantly the consummate volume of drinking water in the majority of the governorate. This price seems representing a regulating mechanism in short term as for the long term. All other prices are globally not significant for the majority off governorates.

Conclusion

The regulation of the management of the drinking water, the pass by the creation of fare structures which present a number of important elements to be taken into account. The search for the equity (between the various categories of consumers and between the consumers of the same category), and the necessity of getting itself the sufficient global recipes to face financial commitments in term of protection of the resource, stay objectives to achieve. It of other term, fare systems have to end in the acceptance and in the consumer confidence and it by the distribution of a quality improved to avoid any notable danger of health. The choice of organization and regulation of the public services of drinking water and its impact on their quantity, the quality, and their price, are a priority concern of public decision-makers. The objective of the regulation being to reach an effective management of the services. Indeed there are three main criteria to estimate their performance. The first criterion is the static efficiency which defined by the absence of wasting in the resource management, and by the minimization of the costs of service. The second criterion is the efficiency allocative which requires that a rare resource is assigned to the users so that the economic value of this resource is maximized. The third criterion is the productive or technical efficiency which is a dynamic process which depends on efforts of adaptation of the developer (training of the workforce, the investment the research and development of which ... etc.), to reach has a lower production cost.

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