Sustainable Development and Economic Policy of Water in Tunisia
Application of Panel Data

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ABSTRACT

The present article aims to evaluate the actual water policy management and to see if it’s efficient either in macroeconomic level or in the regional one. Thus, the authors have recoursed, to a new set of explanatory variables to estimate an extended demand function in the short and long-run. Indeed, they have assumed that distributed volume of water is determined by the number of connections to Water supply network, the distribution performance, the linear loss index recorded in the distribution system, the evolution of the length of the water network and the water tariffs. The main results of this study are that, at the macroeconomic level, the price of water seems to be an efficient tool to waste reduction only in the long run. Consequently, the efficiency can be established only in the long-run. Indeed, the Tunisian consumer needs more of time to adjust its behavior to avoid all possible water waste. Nevertheless, the estimation of the said relation by region has shown that it exists, a large disparity and inequity between them.

KEYWORDS

Autoregressive Distributed Lag, Cointegration, Drinking Water, Vector Error Correction Model

1. INTRODUCTION

The importance of analysing of the demand for drinking water stems from the nature of this natural resource; it is often qualified as strategic and of paramount necessity. The water quantity and price depend particularly on several factors such as the evolution of the population and their life mode (Point 1993). Yet, despite the importance of water market, it was noted that research on estimating water demand function is scarce and mostly exploratory. Consequently, among the scarce works that tackled the estimation of the demand function, we can refer to the work of Howe (1982) which tried to detect the relation between the consumption and the price of water by recourse to a cross-sectional analysis.

In addition, Whittington et al (1991) established a drinking water demand function with the aim to assess the willingness of potential consumers to link to the connection to the drinking water network. Furthermore, the nature of price, as an influential factor in determining the demand of drinking water, has been one of the important topics in the literature. In this vein, Taylor (1975) proposed a procedure of incorporating both the average price and the marginal price into the demand equation. Nordin (1976) proposed to take into account the intra-marginal price structure by including ‘a difference variable’.

This variable corresponds to the difference between what the consumer actually pays and the amount he would have paid if his total consumption had been priced at the marginal price. In order
to estimate what prices makes the consumer react, Opaluch (1982) proposed a model with a marginal price and a variable of difference. Shabir et al. (2016) estimated a demand-function in some urban areas of Pakistan. Zeggah (2015) estimated a function of demand for drinking water in the presence of increasing rates of water tariffs. The estimation of water demand by water yield function allowed Zahra (2015) to conclude that price policies can be an important factor in the control of non-optimum use of their valuable inputs. In this context and using a dynamic water demand function, Hüssein (2017) shows that price can potentially be used as an effective policy tool for water demand management.

However, the works of Chicioine and Ramamurthy (1986) and Shin (1985) have rejected the possibility of perfect knowledge of the price structure of households. The authors have shown that the consumer can react to one perceived price which depends on the mean cost, marginal price, and a perception parameter. In the same vein, Nieswiadomy and Molina (1991) have shown that the value of this perception parameter depends on the price structure. However, with progressive pricing, consumers seem to be sensitive to marginal prices. Yet, in the case of degressive price structure customers are more sensitive to the mean price. Kotagama et al (2016) used a two-stage least squares econometric model with lagged average water price to estimate the demand function for residential water. This study indicates that it may be possible to manage water demand through modifying the price of water and reforming subsidies for residential water.

Other studies have tried to trace the efficiency of the water management using combined estimation of the capacity of available resources and their use (Bonriposi, 2013). This can be done by estimating the share of distribution water to each consumer by multiplying the total distribution quantity by multiplier coefficients of consumption or distribution (Charnay 2010). However, the problem is that the data of total distribution are usually provided by drinking water distributors (Reynard 2000 and Freiburghaus 2012). Nevertheless, in practical terms, there is virtually no measurement system to assess the quantities of water used. Neither is there an estimation of the share of private water withdrawals (Martin 2006), despite the frequent use of methods conducting surveys (Ganty et al 2009).

Effective management of the drinking water resource must act on the quantitative as well as the qualitative dimensions i.e. consumers should be satisfied with a continuous supply of quantity respecting quality standards. If not, consumers substitute tap water with perfect substitutes (Proulx, 2010; Levallois et al., 1999; Khiari et al., 2002). A strategic reflection should be taken so as to build an efficient sector because even the privatization of the drinking water sectors has led to social and urban problems.

In principle, to construct an efficient water market, it is necessary to add a set of variables to the price mechanism; this can virtually allow an efficient allocation of resources. In this context, Hænssen (1996) and Agehe and Billing (1996) aptly pointed the importance to build a set of incentive scheme in order to reduce the water waste. This can be done by using economic sanitary equipments (Renwich & Archibald, 1998; Höglund (1997).

The abovementioned problems show the importance to estimate the price elasticity of the water demand. To estimate a causal effect of price for residual water customers, the paper of Casey (2014) provides evidence of heterogenous price elasticity estimates from quasi-experimental methods that support the well-accepted notion that residential water demand is generally price inelastic, but certainly not unresponsive to changes in price. The importance of the estimation of the price elasticity must be considered throughout a continuous variation of water prices which can be used with the ultimate aim to know the real behaviour of consumers. In the case of Tunisia, a similar approach is necessary to explore and analyze accurately the current situation. This virtually would enable us to put an adequate strategy that can be adopted by the decision-makers in the management of drinking water through all regions of the country.

In the literature, this estimation can take several forms. In this work, however, we adopted the estimation of Panal data model using the recent developments of Nauges and Thomas (2000; 2003) and Nauges and Reynard (2001) with the aim of measuring the degree of efficiency of the policies in force. Thus, this central question need to be asked: in order to offer the water with the best-required
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