



# Using econometric analysis of willingness-to-pay to investigate economic efficiency and equity of domestic water services in the West Bank

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## ABSTRACT

The paper is aimed at providing evidence on economic efficiency, and equity of distribution of domestic water services in the West Bank. The study utilizes the CVM as a means of monetizing public preferences and households' WTP. In the CVM questionnaire, the dichotomous choice with follow-up debriefing questions format is followed by an open-ended follow-up question was undertaken. A second questionnaire survey was directed to employees from water institutions, which was mainly designed to investigate the reasons behind the full absence of private sector in the provision of water supply. The two samples were selected to ensure a representative samples in accordance with the Palestinian case. The main findings of this paper gauged the WTP with key socioeconomic variables suggested by economic theory and previous CVM studies. These results provide information on economic efficiency and equity of water distribution. The results will allow decision makers to develop new policies that can achieve more efficient and equitable domestic water services.

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## 1. Introduction

Water and life are closely linked. This has been known throughout history, and it is still the issue with specialists today. Water has always been scarce in Palestine, but growing populations place ever-increasing demands on water resources. Doubtless, water scarcity can be classified as a major concern in the Palestinian territories where access to, and control over, water resources is a constant issue of human survival. Winpenny (1994) revealed that scarcity growing and rising cost of water have led to the fact that water has to be allocated and managed more efficiently. The consensus, at least with economists, is that water should be dealt as an economic resource, which is necessary for improving the economic efficiency of water use.

The problem of water in Palestine is not only with shortage of water supply, but also municipal water quality is classified in the WB as follows: 77.9% is good, 18.1% is fairly good, and 4% is bad (PCBS, 2007). The control of the Israeli settlements and settlers over the Palestinian land and water resources is a decisive element in a broad relationship of inequality and dependency established

and promoted by the occupation over the last quarter century. The Israeli settlements have constituted no less than 72% of the WB lands (Aronson, 1998). Besides, the annually growth rate of population in the WB has been more than 3% per annum during the past decade, in parallel with the increase of building expansion, economic activities and human wants (PCBS, 2007). Added to this, the Palestinians abstract 20% of the estimated potential water resources' underlying the WB, Israel abstracts the balance and over-draws on its agreed quantum by more than 50%. Also, Palestinian per capita access to water resources in the WB is a quarter of Israeli access and is decreasing. Therefore, some communities in the WB are restoring to unlicensed drilling to obtain drinking water (The World Bank, 2009). As a result, the PWA has obligated to increase the quantity supplied of water to fulfill the deficit of water through purchasing these quantities from the Israeli Water Company (Mekorot). The spectacular situation is that Mekorot has started to decline these purchased quantities of water since September 2000 right now, although all of these water quantities are necessary to meet the WBs' people needs (PWA, 2005).

Given this, empirical studies that can contribute to provide information on economic efficiency and equity of water distribution are necessary to be taken into consideration, which may play an important role to achieve more efficient and equitable domestic water services in the WB.

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The study is organized as follows. The next section reviews some of the most important contributions in the literature, in order to locate the policy aims of this paper. Section 3 describes the methods employed to analyze the data: the CVM survey, the second survey, sampling and data collection, and econometric and statistical analysis. Section 4 presents the empirical findings of the paper and discussions of these results. Finally, concluding remarks and policy implications are in Section 5.

## 2. Policy objectives

### 2.1. Economic efficiency

Markets cannot efficiently allocate non-market goods or services with pervasive externalities, or for which property rights are not clearly defined. The role of measurement in the efficient allocation of resources is especially important in cases of public goods or resources. Empirical approaches of non-market valuations such as Contingent Valuation Method (CVM) enhanced by econometric analysis are likely to be utilized for estimating benefits for non-market goods and services (Haab and McConnell, 2003). In the language of welfare economics, the optimal path for water pricing is that in which the marginal benefit of the next increment of water supplied would equal the marginal cost of supplying that increment. Optimal water management, from this perspective, entails the allocation of water to its highest value uses, meaning that enhancing economic equity and maximizing welfare of society (Bakker, 2001).

According to the economic theory, Pareto efficiency, which is named for the Italian economist Vilfredo Pareto during the period (1848–1923), is classified as an economic standard has been used to identify the efficiency of markets in allocating consumptive goods. In this study, the consumptive good is domestic water services in the WB (Markandya et al., 2002; NOAA, 2007). Economic efficiency or Pareto efficiency can be achieved when the marginal cost pricing rule, which means the incremental cost of supplying an additional unit (marginal cost) equals the incremental amount that will be paid for a volume of water (marginal willingness to pay) (MacDonald, 2004). In other words, Rogers et al. (2002) and Young (1996) revealed that when water is priced at its real marginal cost, including environmental costs, it is put to its highest economically valued uses. Also, economic efficiency can be expressed in several definitions. For instance, a net benefit per unit of water, or a net benefit per unit of crop area, which means it can be defined as a total net benefit of using a resource (Cai et al., 2001).

### 2.2. Equity of distribution

Equity issues have led many economists to consider their preference for conducting efficiency analyses with aggregated estimates of the benefits and costs of changes in environmental resource allocations (Whitehead, 2000). The objectives of equity are matched with fairness of allocation across economically differentiated groups, and may be consistent with efficiency objectives. Achieving this goal may entail providing government subsidies or free service, or perhaps a differential pricing structure relies on income can be adopted, however resource allocation can take equity into consideration (Dinar et al., 1997).

Of equal importance is the issue of equity or income distribution impacts of environmental change, and how to incorporate equity into public policy analysis without sacrificing economic efficiency (Hitzhusen, 2007). Also, Gleick (1998) states that water management and planning should take principles of sustainability and equity of water distribution into consideration.

The investigation of equity depends on classifying the CVM sample into different groups based on location (urban, rural and

refugee camps). Also, other socioeconomic factors that are expected to be the most important demand shifters in the bid functions of Willingness to Pay (WTP). In particular, income and location are a strong indication can be used to gauge affordability and equity of water distribution for households. However, through this study the researcher seeks to evaluate the domestic water supply services whether or not equitable. This is of special value to provide equitable municipal water supplies for households.

### 2.3. Public and private goods

Hanemann (2000) showed that economists have drawn a difference between private goods (conventional market goods) and public goods. Two main principles adopted commonly to differentiate between public and private goods, namely: (1) rival principle and (2) exclusion principle. A public good is a good that is non-rival and non-excludable, meaning that people cannot be prevented from using a good, even if they do not pay for it. For instance, all people can receive the benefits of national defense whether they paid taxes or not, but a private good is a good that is rival and excludable, meaning that people can be prevented from using a good. As such, in order to receive the benefit of an orange or a television, a person should pay for the orange or the television.

However, water is not a pure public good, so that it can be classified as one of the common resources and environmental goods, even if it is provided for households by governmental utilities. In West Bank, there is a full absence of private sector participation in the provision of water supply. The researcher will therefore seek to investigate the reasons that impede the participation of private sector in this respect.

### 2.4. Privatization and efficiency

In competitive industries, privatization consistently improves efficiency and profitability. The benefits of efficiency are likely to increase GDP and economic growth. Consequently, private market factors can more efficiently deliver many goods or services than governments due to free market competition (Megginson and Netter, 2001; Nellis and Kikeri, 2002).

Rubin et al. (2006) indicated that usually private, local initiatives and management are more efficient than those of the central government. Furthermore, Schipke (2001) indicates that application of privatization system has been the true spirit in improvements of operational efficiency and profitability of individual firms, therefore there are a lot of quantitative studies have concentrated on these aspects. According to OECD (2003), privatization is believed to improve the output, profits and efficiency of the organizations that are privatized.

Given this, in the WB, it is anticipated that over time private municipal water markets can lead to lower and competitive prices, improved quality, and better delivery.

## 3. Methods

The CVM has been commonly applied in developed and developing countries. It investigated different environmental aspects, such as: water reliability and sufficiency, outdoor recreation, forest protection, and natural resource damage, to list but a few (Atkinson and Mourato, 2008). Also, the CVM has been widely used as one of the standard and flexible techniques to gauge the economic value of non-market goods (Hanemann, 1994).

The CVM is an example of a hypothetical-direct valuation technique requiring the active involvement of respondents. The CVM develops a framework of a hypothetical market used to elicit valuations for environmental and/or public goods from habitants and habitant's preference, expressed in terms of WTP.

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