ICF INTERNATIONAL
WATER MARKETS PERSPECTIVE
Leading Edge Economics and Regulatory Advice for Water Markets

Economic Valuation and Public Goods

It is often said that water companies operate for the public good—supplying essential services and protecting public health and our environment. In the context of England & Wales, the delivery of this public good has been in the hands of privately-owned businesses that are subject to a range of commercial and regulatory requirements. The need for regulation stems—in part—from a desire to align the interests of private sector businesses with the delivery of this public good.

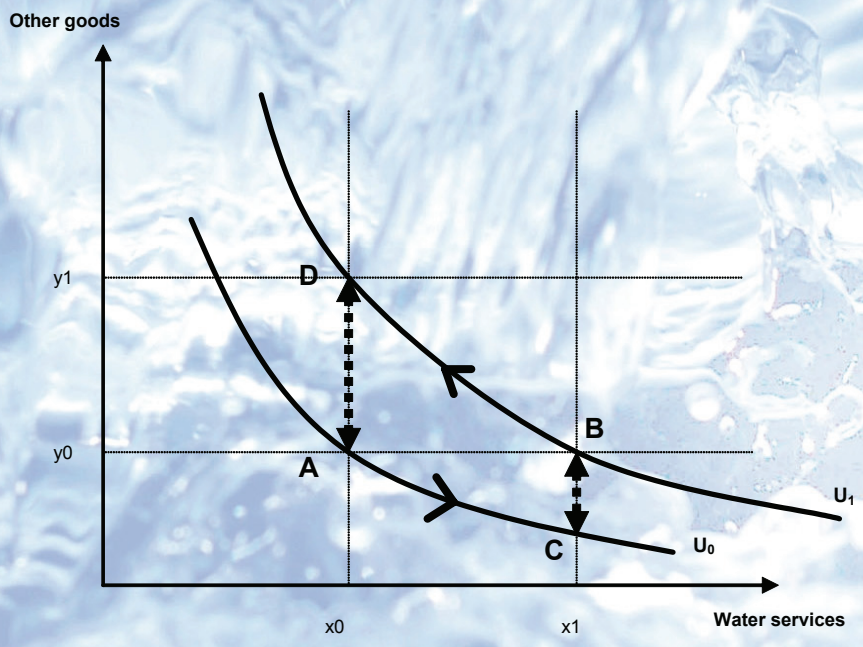
Recent work in the area of economic valuation is suggesting that these public good characteristics may matter when it comes to measuring the economic value of improving the provision of water services.

The task of measurement depends on the valuation concept adopted, the willingness to pay (WTP) for a customer service improvement, or the willingness to accept (WTA) compensation for a service reduction. The key issue is the extent to which WTA and WTP can differ as this would have different implications for decision-making about the economically efficient level of service provision.

These ideas can be illustrated using standard economic concepts as in Figure 1.

Figure 1 shows the social welfare trade-offs associated with different combinations of water services and (for ease of illustration) all other goods and services enjoyed by consumers. The curves U_0 and U_1 represent constant levels of welfare associated with different possible combinations of the goods. The welfare associated with U_1 is greater than U_0 indicating that welfare increases with increases in the consumption of both goods. Each point along the utility curves represents the same level of welfare that can be provided by different combinations of the two bundles of goods; the slope of the curves measures the marginal rate of substitution between the goods, i.e. how much of one good has to be sacrificed to enjoy an extra unit of the other good while keeping overall welfare at the same level.

Figure 1: WTA versus WTP



Egmont House – 25-31 Tavistock Place, London WC1h9SU – +44 20 7391 4700 – +44 20 7391 4701 fax – icfi.com/watermarkets

Consider the initial bundle at point A (x_0, y_0); for present purposes x_0 can be thought of as initial level of water services. This is associated with welfare level U_0. A policy-maker may wish to understand what the WTP would be after an increase in the provision of water services from x_0 to x_1 (e.g. greater reliability or quality of service). The consumption of the bundle at point B (x_1, y_0) is associated with an increase in welfare to level U_1. This level of water services could also be enjoyed by sacrificing some of the other goods and moving along U_0 to point C. It can then be inferred that the WTP for the higher level of welfare associated with the bundle (x_1, y_0) relative to the bundle (x_0, y_0) is the distance BC, measured in terms of the amount of other goods consumers would be prepared to sacrifice to enjoy the improved level of water services. In this context "other goods" can be interpreted as expenditures on all other goods and services and hence BC has an obvious monetary interpretation. In other words, these trade-offs can be expressed in terms of water services and money.

Consider now the situation where the initial bundle is now point B (x_1, y_0) and a policy-maker wishes to know the WTA compensation for reducing water service provision to the level x_0, i.e. reduced reliability or quality of service. The resulting bundle is associated with lower welfare at point A leaving the appropriate question: How much compensation is required to ensure consumers would be no worse-off than the welfare level enjoyed at the original level of service provision (x_1)?

This can be measured by the distance DA or y_1-y_0 extra units of other goods, where point D represents the alternative bundle (y_1, x_0) and provides the same initial welfare U_1. The point highlighted by Figure 1 is that the WTP associated with the positive change from x_0 to x_1 is **less than** the WTA associated with the negative change x_1 to x_0.

From a theoretical point of view, Hanemann (1991) suggests that one factor which explains why WTA can exceed WTP is the extent to which goods (in our case money and water services) are substitutes.[1] Other explanations may relate to study design or psychological "loss aversion" (i.e. individuals more highly value the loss of a good compared to an equivalent gain). Horowitz and McConnell (2002) review evidence from a large number of empirical valuation studies in an attempt to identify which factors may be most important in explaining discrepancies between WTA and WTP[2]. Their main finding is that "on average, the less the good, like an "ordinary market good," the higher the ratio."

This point about the degree of substitution is illustrated by Figure 2.

---

1 Hanemann, M. W. (1991) Willingness to pay and willingness to accept: how much can they differ?, American Economic Review, 81, 635-647.

2 Horowitz, J. K. and McConnell, K. E. (2002) A review of WTA / WTP studies, Journal of Environmental Economics and Management, 44, 426-447.

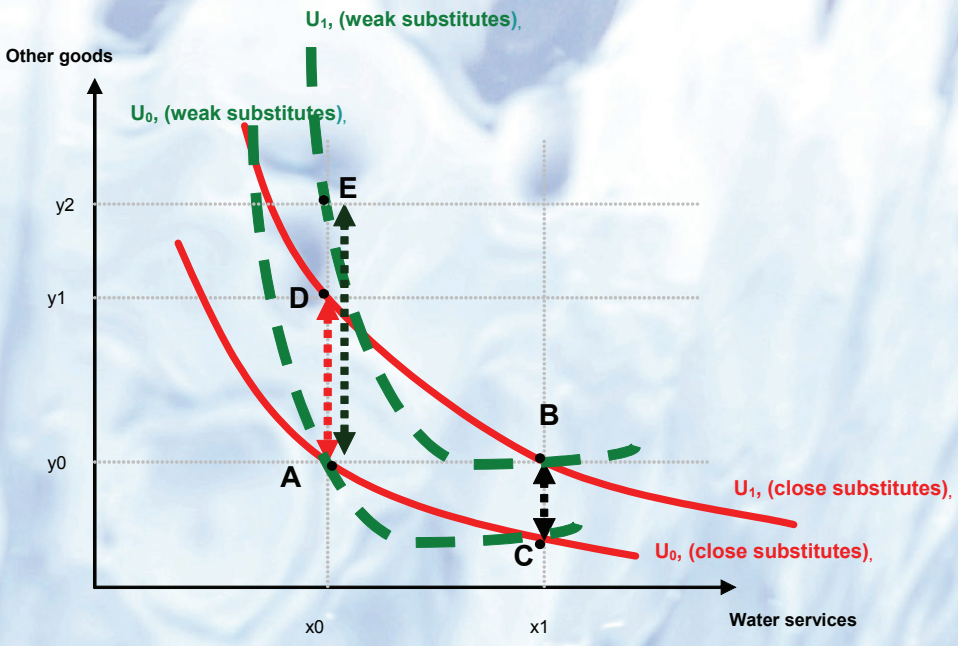


Figure 2: WTA versus WTP when goods are weak substitutes

The red curves replicate those shown previously in Figure 1 and now capture the money-water services trade-off if those goods are reasonable substitutes. The green lines illustrate the contrasting case of weak substitutes. Intuitively, if money is not a good substitute for a reduction in water services then it should require a **greater** level of compensation to offset the same unit reduction in water services. For essential public services like those provided by water industries, it could be argued that a weak substitution is a fairly accurate characterisation of the relationship between water services and other goods (money). This is shown in Figure 2 with the WTA now measured as the distance AE (y_2-y_0) compared to the distance AD (y_1-y_0).

Graves (2003) presents a theoretical analysis that makes sense of the empirical evidence on the WTP—WTA disparity for public goods.[3]

The relevance of this is that many aspects of water services possess the characteristics of public goods. The main point introduced by Graves (2003) is that the disparity traditional measure of WTP is **understated**.

Recall from Figure 1 and Figure 2 that the WTP associated with the increase in water service provision to x_1 could be expressed in terms of foregone units of other goods (the distance BC). However, this assumes that income levels remain constant at the levels associated with the initial bundle (x_0, y_0). Any improvement in water services will be financed through higher water bills. This means that the income level required to enjoy (x_1, y_0) must be higher than to enjoy (x_0, y_0). In this model, household income is generated via working, and hence, to generate the income needed to enjoy the higher welfare at (x_1, y_0) individuals must also forego leisure time, and hence the true WTP should be expressed in terms of foregone private goods and leisure time.

[3] Graves, P. E. (2003) The simple analytics of the WTA-WTP disparity for public goods, Department of Economics, University of Colorado.

Graves (2003) also suggests that this model can explain why stated WTP (obtained through valuation surveys) may be below this true WTP. Rational individuals will appreciate that their individual labour supply decisions and the associated income that is generated is unlikely to influence the level of provision for a collectively determined public good such as water services. The effect is a variant of the classic free-rider problem with the result that the lack of incentives for individuals to supply extra work effort to pay for additional provision of the public good results in under-provision relative to the "true" WTP.[4]

This recent literature provides evidence that the WTA-WTP disparity in the context of public good provision is explicable in terms of customer preferences and incentives to reveal those preferences.

As David Pearce has noted—in NAO (2003)[5]—evidence of a real disparity (rather than due to the design of stated choice surveys) means the choice of WTA or measurement of benefits and the choice of WTA rather than WTP could make a potentially substantial difference in the appropriate measure of benefits to apply in the CBA of water services.

Indicating perhaps that when it comes to water services absence really does make the heart grow fonder…..

About ICF International

ICF International (www.icfi.com) partners with government and commercial clients to deliver consulting services and technology solutions in defense, energy, environment, homeland security, social programs, and transportation. Combining passion for our work with industry expertise and innovative analytics, we deliver compelling results throughout the entire program life-cycle, from analysis and design through implementation and improvement. Since 1969, ICF International has been serving government at all levels, major corporations, and multilateral institutions. More than 1,600 employees serve these clients worldwide.

For Information

Scott Reid
Director, Water Markets
ICF International
Egmont House
25-31 Tavistock Place
London WC1H 9SU
United Kingdom

+44.20.7391.4711

sreid@icfi.com

4 The Graves approach can also be understood as an explanation for the general observation in developed economies that voters express desires for improvements in public services, but also seem reluctant to meet the associated increase in tax or charge burdens (with the result that public dissatisfaction at the under-provision of public services appears high.

5 National Audit Office (2003) Estimating the benefits of sewer flooding control, Report by Professor David Pearce for the National Audit Office, The Stationary Office, London.