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The Economic Effects of Using Property Taxes in Lieu of Direct User Fees to Pay for Water

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Introduction

It is frequently argued that water supplies in the western United States may not be adequate to meet future demand. Transfers out of agriculture, which typically accounts for over 75 percent of water consumption, have accommodated most of the new demand for water in recent decades. But in the face of droughts and continually increasing demand from urban, industrial, and recreational users, is there enough water to sustain agriculture and simultaneously meet the needs of a changing economy? The answer to this question depends partly, if not primarily, on the institutions—federal, state, and local—that price, allocate, and conserve water. Richard Howitt has argued that the costs of institutional change in water tend to be high because the rents from water use and current property right allocations change as institutions change, and concerns for equity (income distribution) are often of dominating political importance.[1] (Chapters 6, 7, 11, and 12 in this book have particularly cogent things to say on the importance of political and legal institutions in efficiently allocating water.)

This chapter explores the economic implications of using ad valorem taxes assessed on real property in lieu of direct user charges (prices) to pay for water development and allocation. Taxes used as a revenue source for government that are unrelated to the quantity of water demanded produce an implicit subsidy to water users, and special focus will be directed in this chapter to the inefficiency in the allocation of water when it is priced below its supply cost.

The geographical focus of the analysis is Utah, the state that ranks second to Nevada as the highest per capita consumer of water and which also

has some of the lowest water prices in the western United States.[2] Many of the water institutions and their pricing practices in Utah, however, exist in the other states, so the analysis has broad application to the whole western region of the United States. Public water districts have been created by statute to manage water sales and distribution in many western states,[3] and these districts typically have been given authority to levy property taxes in state and/or in local jurisdictions in order to generate revenues needed to meet repayment obligations to large water developers such as the federal Bureau of Reclamation.

The property tax is a highly dependable source of funds for the districts as it supplements the revenues from direct water sales. Eliminating this revenue source, therefore, could be considered threatening to a district's financial viability and thus will be strongly resisted. Hence, attention and analysis must be directed to whether or not direct water charges as a substitute revenue source for the property tax are politically as well as economically feasible. This chapter, therefore, will also address specific objections by the water districts and their supporters to replacing the property tax with direct user charges. It will also discuss the water-conservation implications of using direct charges in lieu of property taxes to pay for water. In general, it is widely believed that water conservation (reduced water use) can be best effectuated through government-mandated rules, such as requiring water-saving household appliances or limiting lawn irrigation to certain days or to specific times when evaporation losses are thought to be lower. If a certain level of conservation is desirable, however, the effectiveness of these mandated rules must be compared to the conservation efforts that will be made voluntarily by the final users themselves as they respond to higher water prices in lieu of property taxes. The argument advanced here is that voluntary price-induced conservation will usually be more flexible, pervasive, durable, and hence effective than command-and-control governmental regulations. This is not to say that government should have no role to play in conservation—educating water consumers, for example, about economically feasible conservation practices and technologies available may be very useful.

How important are water-related property taxes in Utah as a source of revenue for the water districts? The Utah Rivers Council conducted a study of water suppliers across the eleven contiguous western states, fifty-four of them outside of Utah and eight within.[4] The study found that Utah water districts have statutory authority to levy higher property taxes than districts located in most other states. Moreover, a higher percentage of Utah districts actually used property taxes than was the case in the other states, and these taxes constituted a higher percentage of total district revenues in Utah. Specifically, in the western region outside of Utah, of the twelve districts in the sample that used property taxes, eight received less than 16 percent of their total budget from these taxes. By contrast, in Utah, according to data assembled in

the State Auditor's Office,[5] property taxes accounted for between 17 and 20 percent of total revenues in four of the Utah districts, and between 32 and 67 percent in the other four districts. In addition, of the twelve suppliers sampled outside of Utah that collected property taxes, only three used the property-tax revenues for general fund purposes (such as administrative, operation, and maintenance costs), whereas in Utah all of the responding districts (only four of eight districts responded to the River Council's survey) used funds for these general purposes. In sum, Utah districts use the property tax to a greater extent as a revenue source than do comparable districts in other western states. Hence, the data suggest that Utah may be an especially apt location to investigate the economic implications of reducing the property tax in favor of direct water pricing.

The Property Tax and Efficient Allocation of Water Resources

In a market economy prices signal information to consumers and producers. Consider a hypothetical market for water. If water is not rationed by nonprice measures, consumers will consume water until the benefit derived from the last unit of consumption is equal to the price paid. The demand for water taken by a typical consumer is represented by the curve labeled *D* in Figure 9.1. Following conventional economic theory, the various points along the demand curve represent the marginal valuations by consumers of alternative quantities of water, and because of diminishing marginal utility, these valuations fall as more water is consumed. An aggregate demand curve

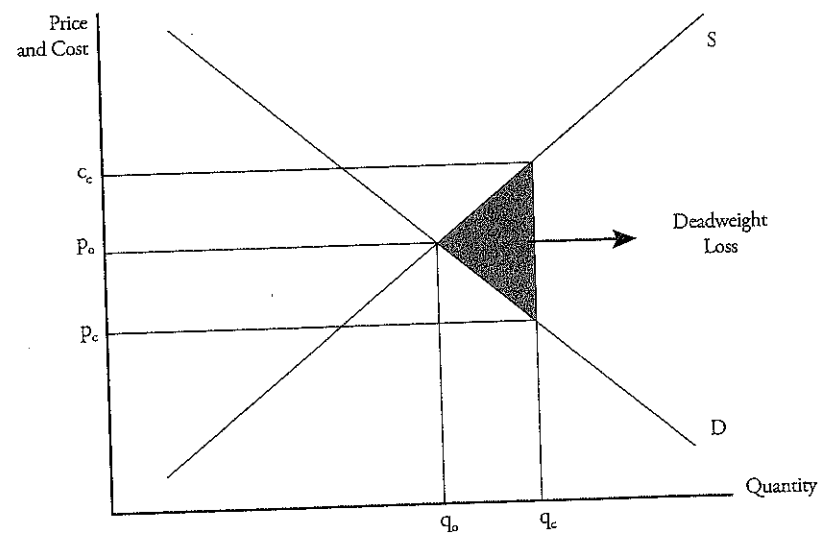

Figure 9.1 Ineffieiency in a water market due to underpricing

for water in a given market can be represented as the horizontal summation of water quantities demanded at various prices across all individual users.

Also, following traditional economic theory, the supply curve (S) represents the marginal opportunity costs of supplying various quantities of water to ultimate users. These costs include construction as well as operating and maintenance costs and are presumed to rise with increasing quantities of water supplied as scarce capital, labor, and management resources are attracted away from increasingly valuable alternative uses.

In such a market, only one water price will equate the marginal costs of supplying water (a point on the supply curve) with the marginal valuations of water by consumers (a point on the demand curve). Let us denote this price as p_o and its corresponding quantity demanded and supplied as q_o. This point is the equilibrium price and quantity that represents an efficient allocation of resources in the water market. Let us see why.

At any quantity lower than q_o, the marginal valuation for consumers of water is higher than the marginal cost of suppliers and, therefore, increasing the quantity of water to q_o would produce a surplus of value over cost. At quantities higher than q_o, the marginal valuation of consumers is lower than the marginal cost of water; thus quantities above q_o are more costly than they are worth. Too many resources have been allocated to supplying water to be efficient. It follows that at quantity q_o, the allocation of resources is efficient since the marginal value of water to consumers is equal to the marginal cost of supplying that water, and the market clears since the quantity demanded is equal to the quantity supplied.

Now, suppose that for one reason or another, the water price is not allowed to rise to the equilibrium price of p_o. Using ad valorem property taxes in lieu of direct water-user prices as a revenue-producing mechanism for a water district would be one such case. The market price, therefore, would cease to function as a mechanism leading to an efficient allocation of resources to water development and use. In effect, taxes on real property owners in the region of water deliveries can be regarded as a "subsidy" to water consumers since the assessed valuation of property for tax purposes is largely independent of the quantity of water use. Hence, the property tax itself is unrelated to the price of water and, therefore, has no direct role in determining how much water will be demanded.[6] Perhaps an indirect effect will be induced if the property tax reduces consumer income and water demand is responsive to real income changes. At most, however, this effect is likely to be small as expenditures for water are typically a small percentage of total income.

In Figure 9.1, assume that the subsidized water price made possible by the property tax is p_c. The associated quantity demanded is q_c, a larger quantity than is the economically efficient quantity of q_o. At p_c, therefore, excess demand exists, and consumers will want more water at this price than

at the equilibrium price. The history of water development across the globe is replete with examples of political responses to accommodate this excess demand that exists because of water subsidies. This problem is especially acute in the case of public water suppliers, since the sine qua non of politics is politicians seeking to deliver political favors requested by their constituents.

Note that the marginal cost of water at quantity q_c is c_c, above its value to consumers at p_c. The shaded area in Figure 9.1 represents the difference between what the quantities of water between q_c and q_o are worth to consumers and what it costs to supply that water. This surplus of cost over value is known as "deadweight loss"—a measure of economic inefficiency. This loss suggests that too many resources are being allocated to supplying water to be efficient since society values the "excess" resources devoted to supply water more highly in other uses. Of course, the quantification of the precise amount of deadweight loss is an empirical matter and will depend critically on how far the price is below the equilibrium price and what the elasticities of the demand and supply curves are for water. (These matters will be discussed later in the chapter.) It has been demonstrated elsewhere that water subsidies employed in federal projects have produced inefficient and premature irrigation development in the western United States.[7]

An important political implication of requiring users to pay the total supply cost of water is that then these water consumers will support politically only the construction of projects that are economically feasible—where expected project benefits are at least equal to project costs. On the other hand, if the costs can be shifted to other parties and the water is priced below its cost, then no such assurance would exist that water consumers will support only efficient projects. It follows that if part of the costs of water supply can be shifted from water users to owners of property via the property tax, water users can be expected to enthusiastically support water projects, even if the project costs in aggregate exceed project benefits. Such inefficient projects diminish rather than enhance the wealth and average standard of living of society as a whole. This is the important economic implication of deadweight loss.

Another extremely important consequence of pricing water below its cost for a specific water project is that other potentially lower-cost supply sources may not be given adequate consideration for meeting demand. Water quality reclamation, secondary water systems that provide lower-cost water for non-drinking purposes such as irrigation and industrial uses, more intensive ground water utilization, and water conservation practices, are supply alternatives with potentially lower cost than new water development projects most of which are sponsored by federal and state governments. It should be obvious that wealth is created most effectively by utilizing water supply sources that have the lowest costs.

Evaluating Objections to Eliminating the Property Tax

Many objections to replacing property taxes with increased user fees are raised by those in the water supply business, particularly by the public water districts. Perhaps the most important is the contention that if the price were raised, demand would be insufficient to use all of the available water supply, and hence this valuable resource would be unused or wasted. Another objection is that the public water districts that supply water to final users might not be capable of raising sufficient revenues from user fees to meet their contractual obligations to water wholesalers, especially the federal government. Still another is that raising final user prices to replace property taxes would discourage water conservation by the water districts, since higher prices would reduce the quantity demanded and plenty of water would appear to be available. It has also been argued that giving up property taxes as a revenue source would lower the bond ratings of water district debt and, therefore, cost the districts more to borrow money and thus imperil their fiscal viability. Finally, a frequently heard objection to raising water prices is that this would impose inequitable burdens on poor people. Let us investigate the validity of each of these claims.

Will Higher Prices Result in "Wasted" Water?

Two important questions surface if the price of water rises: (1) the effects on the quantity of water demanded, and (2) the effects on water conservation. Let us analyze these matters in turn.

It has been demonstrated already in the discussion surrounding Figure 9.1 that the quantity of water demanded will be greater at a lower price than would be true if the price were higher. Using a property tax as a price-substitute revenue source implies that the direct water price will be lower than if the price had to bear the entire revenue burden. Now, suppose that a water district has supplies available to meet the quantity demanded at the lower subsidized price. Returning to Figure 9.1, if quantity q_c of water is available for distribution, a final user price that is above p_c would reduce the quantity demanded to a level below the quantity supplied. We might refer to this as excess supply. What would happen to that water at this higher price? In the Utah case discussed, this unused water might well run off into sinks such as the Great Salt Lake or move into storage in reservoirs, lakes, and groundwater aquifers until they are filled to capacity. Hence, it is not clear that this water not demanded would necessarily be "wasted" or even go unused over the long run. In fact, stored water may have high value simply as supply insurance as protection against drought, and some environmental and recreational benefits could accrue from greater quantities of water in storage, even in sinks such as the Great Salt Lake where the salt content makes water unusable for many purposes. The point must be granted, however, that in a year of average or higher precipitation and runoff, lower quantities demanded at higher prices

may result in unused water, at least temporarily, or at best may be employed in lower-valued uses.[8]

This situation of unused water supplies is a common occurrence even without the effects of a higher water price. Given the length of time needed to bring new water supplies online and the fact that new water comes in quantity "lumps," water demand and supply are seldom equated in a given year or even over many years. In planning for future population and economic growth, supply agencies generally will have excess water until demand grows to match existing supplies. For example, the Wasatch Front of Utah is a rapidly growing urban area, both in population and economic activity. As pointed out previously, household demand for water is affected by income—as per capita income increases, the demand for water rises. In fact, it is roughly true that even if the price were constant, the demand for water would increase at a rate about proportionate to increases in per capita income and population.[9]

Because surface water supplies are generally stochastic, depending on more-or-less random precipitation and temperature, another pricing issue surfaces. If water storage facilities are not available to stabilize water deliveries through time, an efficient pricing system should incorporate flexible water pricing as available supplies vary. Prices could be raised in years and seasons of short supply and lowered in years and seasons of plentiful supply in order to equate quantity demanded and quantity supplied. Of course, because water prices are generally administratively set, some agency would have to be responsible for gauging supply and demand and setting efficient prices. An objection might be raised that governments have only weak incentives to manage such a system of efficient water prices, even if they have the responsibility and capacity to do so. This problem could be reduced if the pricing schedule as a function of available water supply were promulgated publicly and in advance of any particular supply conditions. The price expectations of water users would then become established as price-setting government would be expected to act in accordance with the rules. Under such a pricing system, arbitrary changes in prices would be more difficult without some formal public-approval process.

Elasticity of Demand and Water Conservation

The critical parameter affecting district revenues from direct water prices, as well as conservation of water by final users, is the price elasticity of demand for water. Price elasticity establishes how much water demanded would be expected to fall as the water price increases. Formally, price elasticity is the percentage change in quantity demanded that accompanies a percentage change in the price. For example, if the price were raised by 10 percent and, as a consequence, the quantity demanded falls by 5 percent, the price elasticity of demand is −0.5; that is, the percentage change in the quantity demanded is half as great as the percentage change in the price. (The

negative sign of the elasticity coefficient means that water price and quantity demanded move in opposite directions.)

Given what economists know empirically about price elasticity of demand for water (to be discussed shortly), it is perplexing that water prices are so often ignored in water planning. The most typical plan for increasing supply simply projects changes in population, and water demand is assumed to change proportionately because people have a certain water "requirement." Occasionally income is included as an explanatory variable in projecting the demand for water as it is rightly assumed that high-income people demand more water than do those with lower incomes. Of course, this neglect of price in planning implicitly assumes that demand for water is perfectly price inelastic (an elasticity coefficient of 0), meaning that the quantity demanded is completely unresponsive to changes in the water price. This assumption is surely wrong and usually leads to costly errors (popularly known as the "planner's curse") in anticipating how much water will be demanded when new water is available and some price is established to help defray the costs of providing it.

The author recently (May, 2011) attended a conference where the projected water demand in the years ahead for Las Vegas was discussed by the city's water planner. The price of water was never mentioned as a factor that would help determine the city's future water demand. This is very difficult to understand given the obvious importance of price as will be discussed shortly.

What factors influence the price elasticity of demand for water, and what are the numerical estimates from empirical studies? The responsiveness of quantity demanded to changes in the water price is determined primarily by the number and magnitude of the adjustments that users make. These adjustments are crucially important to what is popularly known as conservation.

Consider domestic (household) use, which will generally include water used outside the home in irrigating lawns, trees, shrubs, and flowers as well as inside the house in bathrooms, kitchens, clothing washrooms, and inside plant watering. Clearly, the type and quantity of adjustments made to the water price change will depend on the time interval over which the adjustments are made. Economists refer to the periods of adjustment as runs (i.e., short run, medium run, and long run). If the time period is very short (e.g., a day or even a week), the adjustment response to a price increase will likely be limited to routine things such as turning off the water tap sooner in the shower or reducing the time the lawn sprinkler is on. These limited adjustments imply that the price elasticity of demand in the shortest of runs will be "low"—perhaps from zero to −0.1. Over the longer run, however, additional quantity adjustments to a price change will be made—plumbing leaks can be repaired, heavy water-using fixtures and appliances in the household can be replaced by those that use less water, and an irrigation technology in the yard can be selected that uses less water. For example, for watering trees, shrubs,

and flowers, drip systems (that deliver a very high percentage of water applied to the root zone of the plant) can be used instead of sprinkling technology that generally loses more water to evaporation and percolation below the root zone. Even the plants chosen in and outside the house might be changed to those that require less water, or perhaps landscaping can be designed that has few or no plants at all. It is striking how different landscaping is employed among communities that face sharply different water prices. For example, in Salt Lake City (which has relatively low water prices), urban landscapes contain a plentitude of trees, shrubs, flowers, and lawn grasses that require relatively large amounts of water per unit of land, whereas in Tucson (which has high water prices), yards typically have either very few plants or varieties of plants, such as cacti, that consume little water.[10] In the long run, when all economically feasible adjustments are made to price differences, the price elasticity of demand for water may be high (−1.0, or even higher).

Likewise, over the long run in irrigated agriculture, farmers may make a great number of possible adjustments to changes in water price: different crops, various irrigation technologies and irrigation practices, ditch and canal linings, and recovery of tail water for reuse.[11] Considering all of these adjustment possibilities, especially in the long run, it should come as no surprise that price elasticity of demand for water is much higher (more elastic) than is commonly recognized by water planners and water district managers.

What do empirical studies show the price elasticity of demand for water to be? First, a caveat must be noted. Good reasons exist for believing that the findings of empirical studies might well be biased downward (too low or too inelastic) compared to the "true" long-run elasticity of demand. As suggested previously, the water users at the time they are observed, and at which time the calculations of elasticity are made, may not have completed all of the adjustments they will make eventually. This is easily seen by discussing the two types of estimates of water price elasticity of demand.

Empirical studies are either time-series or cross-sectional, or perhaps a combination of both. In time-series analyses, the water use rates of the same consuming units (say households or farms) are observed at different points in time in which they face different real water prices. In contrast, in cross-sectional studies, different consuming units facing different water prices are observed over the same time period. In both cases, the basic units of observation are users consuming different quantities of water at different prices. Statistical (usually regression) techniques with price as an explanatory variable are then employed to estimate the coefficients of price elasticity of demand. Because the data on prices and quantities are more accessible for the same users at different points in time, time-series studies of elasticity are more common than cross-sectional studies.

A priori, however, a higher price elasticity of demand (more elastic) might be expected in cross-sectional than in time-series analyses. Why? As

suggested previously, cross-sectional analysis involves using different spatial units of observation (e.g., firms or households in various communities) at a given moment in time. The variation in prices and associated quantities demanded is normally quite large among various communities with disparate water supply conditions. Hence, as discussed previously, consumers of water probably have had a relatively long period to make quantity adjustments in response to these price differences. In short, the adjustment process will be approximately complete as the observations of water prices and their associated quantities are observed and recorded. On the other hand, in typical time-series analyses, observations will be the same consuming units over some time period such as consecutive years. The real prices of water (the nominal [observed] price corrected for inflation) may change only a small amount from one observation period to the next. This means that the adjustments in observed quantity demanded to even these short-term price changes may be far from complete as the next observation period begins. Hence, less variation in the quantities demanded probably will be observed than if the adjustment period was longer. This logic implies that lower estimates of elasticity of demand (more inelastic) probably will be observed in time-series than in cross-sectional analyses. This is really a variant of the logic that was used previously to suggest that short-run elasticities are lower (less elastic) than long-run elasticities.

This expected finding seems to be confirmed by actual empirical studies. Gardner and Schick made a cross-sectional study of average household water use in forty-four northern Utah communities in the early 1960s.[12] Water prices and average household consumption, along with several other variables such as the average lot size and the average value of the community's houses, were collected from each of these communities. A high degree of variation among these communities in water prices and associated quantities demanded was observed, and the price elasticity of demand was estimated to be −0.77—at the higher end of reported elasticities.

Dr. Gail Blattenberger, Professor of Economics at the University of Utah, has collected price elasticities of demand for urban water use from about fifty studies from the western United States, excluding Utah, and eight additional ones from Utah.[13] Most of these studies were of the time-series variety. As expected, some variation in elasticity estimates exists, but nearly all of them are between 0 and −1.2.[14] Blattenberger's data also suggest that the range of elasticity estimates for Utah are very similar to those for other western states and that −0.5 would be a fairly representative number for both areas.

What are the implications for water conservation of these price-elasticity estimates? Conservation of water may occur at many levels in the water supply chain, but primarily it occurs at the water district (wholesale) level and at the final user level. The water districts sometimes are required by law to implement conservation practices, and the districts often supplement these

requirements in order to increase the usable water supply available to their customers.[15]

The districts argue that replacing the property tax with higher direct water prices might reduce their revenues and hence their ability to promote and engage in conservation projects. Also, they maintain that a smaller water quantity would be demanded at the higher direct water price and hence reduce the need for district conservation. These arguments are of doubtful validity for two reasons. First, higher prices as a substitute for property taxes may be set at levels that would be revenue neutral for the districts (discussed later). But, more importantly, the higher prices would result in less water demanded primarily because users themselves would have an incentive to save water, making conservation at the district level less urgent. Of course, elasticity of demand is the critical determinant of how much water market revenues would decline if higher prices were imposed as well as how much final users would conserve on water use.

This relationship between price and conservation warrants further discussion, especially when conservation becomes most urgent in times of drought. As argued previously, if the quantity demanded falls because of a price increase, it is principally because water users are making their own economically optimal adjustments to the higher price. In short, this is price-induced conservation of the most fundamental kind. If conservation is perceived to be in the best interests of consuming units, it is likely to be the most ubiquitous as well as the most effective and permanent. The water districts are limited in their capacity to save water in any case. They may mandate practices such as requiring water-saving showerheads, more water-efficient toilets, smaller urban lot size, or any number of other practices, but the implementation of these practices would likely require a high degree of coercive power that is objectionable to water users if these practices are not really economically feasible for them. On the other hand, if final users face higher prices, they will have an incentive to consider and implement ways to conserve water without being coerced into doing so. This does not mean the water users would like the higher prices. The fact that the districts are concerned about smaller water quantities demanded if the price were raised is proof that they expect voluntary water conservation by the final users. The conclusion must be that the practice of using property taxes in lieu of water tariffs is clearly anticonservation, as has been suggested by Thompson as cited in note 15.

Meeting the Water District's Financial Obligations

Another issue of understandable concern to the water districts of giving up the property tax is potential impairment in meeting their repayment obligations to the developers of water, especially the federal government that distributes water to the districts from large reclamation projects. Facilitating

these payments was the principal reason the districts were created in the first place. This revenue-shortage worry, however, is probably overestimated and overstated. Why? Because another important implication of elasticity estimates discussed earlier is that if water demand is price inelastic, then direct water sales at higher prices will generate more market revenues for the districts than lower prices would. Price inelastic demand means that the quantity reduction resulting from a price increase is proportionately less than the price rise, so revenue (price multiplied by quantity) increases. Hence, greater market revenue will be produced by the price rise than may be anticipated by the districts. Of course, whether or not the increased market revenues from price increases will be enough to offset the revenue loss from eliminating or reducing the property tax depends on the magnitude of the price increase, the price elasticity of demand for water, and the proportion of total district revenues that are derived from property taxes.

Some purely illustrative (although quite realistic in the Utah situation) numbers will clarify these relationships. Assume initially that property-tax revenues provide one-quarter of total district revenues and that market sales of water provide the other three-quarters. Suppose that:

Property-tax revenue = $25 million
Revenue from water sales = $75 million
Total revenue = $100 million

Also, assume that the water price is $2 per unit of water (say 10,000 gallons) and that quantity demanded at this price is 37.5 million units.

Now, how high would the water price have to be if revenues from direct market sales were to fully replace the property tax and generate the same total revenue of $100 million? (This may be referred to as a revenue-neutral substitution.) Assume initially that price elasticity of demand for water is −0.3333. This means that if the price were increased 100 percent (doubled) to $4, quantity demanded would fall by 33.33 percent to 25 million units. Total market revenue would be $4 × 25 million or $100 million, and revenues from increasing the price would just offset the lost revenues from eliminating the property tax.

Of course, the more elastic the demand for water (the higher the absolute value of the coefficient), the lower would be the market revenues generated by a given price increase. For example, if the price elasticity of demand was −0.77 (much less inelastic than −0.33, and the number we found in our Utah study of household demand), then the price would have to be much higher to offset the revenues lost from property taxes because the reduction in quantity demanded would be much greater. If the proportion of total revenues provided by the property tax were smaller, then given the elasticity of demand, the smaller would be the necessary rise in the water price to be revenue neutral.

Consider an alternative set of assumed data:

Property-tax revenues = $10 million
Revenues from direct water sales = $90 million
Total revenues = $100 million
Water price is $2 per unit, and quantity demanded is 45 million units
Price elasticity of demand is assumed to be −0.5.

What market price would generate revenues of $100 million and thus be revenue neutral? If the price were raised by 33.33 percent to $2.67 per unit, the quantity demanded would fall by 16.67 percent to approximately 37.375 million units. Total market revenues would then be about $100 million.

Comparing the numbers in the two illustrative examples presented, we conclude the following, other things being equal:

1. The lower the dependence on the property tax in raising revenue, the smaller the price increase would have to be to replace the property tax and be revenue neutral.
2. The less inelastic (more elastic) the price elasticity of demand for water, the greater the conservation (quantity) response to a price change would be needed to be revenue neutral.

To summarize, the illustrative numbers suggest that allowing the market price of water to rise to cover the full supply costs and thus eliminate the need for a property tax would not involve Herculean price increases if revenues to the districts remain constant. But could this action be accomplished legally under the contracts held by the water districts? I discuss this question next.

Contractual Obligations to the Bureau of Reclamation

Officials of the public water districts argue that the question of eliminating the property tax is moot since the districts are legally obligated by contract to use property taxes to raise revenues to pay the federal government for water supplied by federal projects. To verify whether or not this is true, several of the repayment contracts between the federal government and the water conservancy districts in Utah were examined, including those for (1) the Uintah Water Conservancy District receiving water from the Vernal Unit of the Central Utah Project; (2) the Emery Water Conservancy District for water supplied by the Emery County Project, a participating project of the Colorado River Storage Project; (3) the Central Utah Water Conservancy District receiving water from the Bonneville Unit of the Central Utah Project; and (4) the Weber Basin Water Conservancy District, which gets water from the Weber Basin Project. The boilerplate stating the terms of these contracts is

similar in all four. The relevant parts of the Central Utah Water Conservancy District repayment contract will be examined here as illustrative.

> The District agrees to pay the United States the project repayment obligation of not to exceed $130,673,000 divided into (1) an irrigation repayment obligation of $16,400,000, (2) an ad valorem tax revenue obligation of not less than $38,005,000, and (3) a municipal and industrial obligation of $76,268,000 plus interest, the sum of not less than $47,000,000 shall be collected and paid from ad valorem taxes. . . . The District agrees to levy and collect ad valorem taxes as may be necessary to meet its obligations to the United States. . . . These collections and payments shall be required until the project repayment obligation is paid in full. Revenues from one-half mill levied and collected by the District under Section 73-9-16 of the Utah Code, and, as required, the revenues from one-half mill now authorized by Section 73-9-20, or the revenues from one-half mill levied and collected under said sections based on a projected increase in assessed valuation of property within the District of two and one-half percent per year compounded, commencing in the year of 1965, whichever amount is less, are hereby specifically pledged as security to repay the District's repayment obligation.

A 1985 Supplemental Contract is also relevant to the property-tax issue under discussion here.

> It is mutually agreed that the language in Paragraph 6(d) of the 1965 Repayment Contract regarding the minimum amounts and limitations on the ad valorem tax pledge is hereby superseded and the one-half mill pledge shall be based upon the actual assessed valuation of property within the Central Utah Water Conservancy District; Provided, however, that such pledge will not exceed the then current annual payment. This pledge includes the tax revenues necessary to pay $38,005,000 and $47,000,000 municipal and industrial cost obligation as specified in Article 6 (a) of the 1965 Repayment Contract.

The purpose and effect of the supplemental contract is that since the property values within the district boundaries were increasing at a higher rate than was assumed when the original contract was signed, the supplement provided that the one-half mill levy would apply to the higher valuations.

The contract between the United States and the Weber Basin Water Conservancy District specifies that

> b. Nothing in the contract shall be construed to deny: (4) the United States a prior claim to all or such part of the proceeds of the ad valorem tax of one mill permitted to be levied under the

> authority of Section 100-11-16, Utah Code, as amended, as may be necessary in each year to assure the prompt payment of the amount due the United States hereunder in such year, and such prior claim is hereby expressly recognized by the District, but if under any law now or hereafter available the District shall in any year impose an ad valorem tax in excess of one mill on the dollar, the proceeds of such additional tax may be used by the District for mentioned bonds or other securities, free of any claim thereto by the United States.

In effect, this agreement states that property-tax revenues in excess of funds needed for repayment of the federal obligation may be used for the district's other financial purposes.

Actually, in the Weber Basin case, when the project costs turned out to be higher than originally anticipated, the contract was amended so that the district could reimburse the United States for a greater amount. An amended contract in 1961 states that "one-half of the mill levy could be used to generate revenues to repay the United States, and the other one-half shall be available for application on District bonds."

So what does the foregoing say about whether the property tax is an absolute requirement of the districts to raise revenues for their repayment obligations? It is quite explicit in these contracts that a property tax would be used to repay the United States for water deliveries. The financial obligations of the water districts, however, may be greater than the contractual obligations to the federal government, and the districts may borrow to cover these obligations as well and use the property tax as a device to redeem this indebtedness. The use of the property tax as a means of raising district revenues, therefore, cannot be attributed entirely to the contractual obligations to the federal treasury. But the documents are clear that the property tax is a contractual obligation to be used by the districts to raise revenues. But is this obligation irrevocable? This question will be discussed further later in the chapter.

Another issue affecting repayment obligations of the districts arises in the event that federal water is transferred from irrigation to industrial and municipal uses. The repayment charges would then have to be increased to reflect the fact that irrigation use is heavily subsidized in all federal reclamation projects, meaning that irrigators pay a smaller charge per acre-foot (AF) of water than do industrial and municipal users. These repayment changes are covered in official "block notices" given by the U.S. Department of Interior to the relevant water district. For example, a notice dated December 24, 1968, changed the repayment obligation of the Weber Basin Conservancy District when a block of 5,000 AF of irrigation water was transferred to municipal and industrial uses. The block notice specifies how the increased repayment obligation is to be distributed among the repayment categories, and in this particular case, an ad valorem tax was assessed that covered about 12 percent of the additional repayment obligation.

So what can we conclude from the documents reviewed? While these contracts, amended contracts, and block notices clearly indicate that the United States has built an ad valorem property-tax requirement into its contractual repayment agreements with the water districts in Utah, it does appear that changes in the contracts could be made if both parties were to agree. Hence, if direct water prices were to replace revenues derived from property taxes, the federal government must amend its contracts with the districts until repayment has been made in full, at which time the districts would appear to be free to raise revenues in whatever manner they wish.

Is this approval likely to be given by the federal government? Some of the contract amendments cited suggest that both the government and the districts are amenable to contract amendments when they serve the interests of both parties. The federal government, however, may be reluctant to agree to a change in repayment contracts, especially if the financial positions of the districts appear to be weak and there is risk that they may default on their repayment obligations. Given that the districts have been using sinking funds to acquire financial reserves to cover repayment contingencies, however, and the fact that the value of water is increasing through time, the districts appear to be healthy financially. If they could use direct water prices to raise the required revenues if they had the incentive and will to do so, the federal government might agree if requested. But why should the districts do so on their own volition given that the status quo is more than satisfactory from their point of view? It would not appear to serve their interests to give up a secure source of property-tax revenues. If the broader economic-efficiency rationale discussed earlier in this chapter for such action were sufficiently compelling, however, political intervention in the form of new statutes or simple arm twisting might be used to induce them to comply.

Bond Ratings and Debt Management

Another argument of the districts against shifting away from the property tax is that secure revenues from these taxes are indispensable for maintaining the favorable ratings on bonds they issue for water planning and development and other purposes. The ratings determine the rate of interest that must be paid on district debt, a significant component of the district's total costs.

Bond-rating agencies such as Standard and Poors, Moody's Investor Services, and the Fitch Rating Agency use a variety of criteria for rating the debt of states and their public districts among which are whether the debt is insured, the quality of district management services, anticipation of future regulatory or growth restrictions, and the reliability of implementing rate increases or other revenue sources to cover operational or capital costs. The question at issue here is whether collecting property taxes systematically improves bond ratings for those districts that use them?

The Utah Rivers Council survey referred to earlier queried water suppliers about the bond ratings on district debt.[16] For the forty-two agencies sampled outside Utah not using property taxes, eight issued no bonds, while thirty-four districts reported a total of fifty-seven bond issues with ratings. Of these, nine (15.8 percent) received the highest grade, thirty-two (56.1 percent) had a high-grade rating, and sixteen (28.1 percent) reported an upper medium rating. As would be expected, the bonds that were insured generally received the highest ratings. All of the ratings ranging from highest to upper medium, however, are considered to be "quality investment" grade, meaning that the debt is considered to be of low default risk to investors. Since none of these districts used property taxes to obtain revenues to pay off the bonds, it is obvious that a property tax was not a binding requirement for receiving a "quality investment" grade.

For the twelve outside-Utah agencies collecting property taxes, eighteen ratings were reported. Of these, six (33.3 percent) reported having the highest grade, eight (44.4 percent) received a high-grade rating, three (16.7 percent) received an upper medium grade rating, and one (5.6 percent) received a medium grade rating. Comparing these numbers with those in the previous paragraph, those districts using property taxes had 77.7 percent of issues in the top two rating categories, whereas those that did not, had 71.9 percent. At the other end of the rating categories, those that did not use the property tax had a slightly higher percentage in the upper medium and medium ratings, but in both cases, the differences were relatively small.

In Utah, half of the ratings were obtained directly from the water conservancy districts (only half responded to the survey), while the rest were acquired from Moody's Investor Services. The eight districts reported eight bond issues, but one was an unrated state of Utah loan. Of the remaining, seven (28.6 percent) received the highest grade rating, four (57.1 percent) had a high-grade rating, and one (14.3 percent) had an upper medium grade rating.

For those districts outside Utah not using property taxes as a revenue source, 71.9 percent had ratings in the top two categories of highest grade and high grade. Those districts using the property tax had 77.7 percent in these two categories, while in Utah, those using the property tax (all of them) had 85.7 percent in highest grade and high grade. Considering all of these numbers, those districts that collected property taxes had a slightly higher average bond rating (and therefore lower interest costs), but the differences are small. Given the other factors that also affect ratings, this evidence is by no means conclusive that the ability to collect property taxes reduces the interest rate paid on district indebtedness. Moreover, a district always has the option of insuring its bonds to increase its rating whether or not a property tax is levied. Of course, insurance is not without cost, so this may or may not be a financially feasible course to follow, especially since insurance has only a minor effect on the quality of the debt.

For many decades, the state of Utah has acquired highly favorable ratings on its debt for which it is justly proud, and this reputation for financial rectitude might have spilled over to the favorable ratings given to its water districts. (This point may have become increasingly important in recent months as many state and local governments appear to be in serious and worsening financial condition.) What seems to be clear from the data analyzed, however, is that there is no systematic tendency for the rating agencies always to favor those which use property taxes to collect revenues.

Full-Cost Water Pricing and the Poor

A final concern that surfaces whenever proposals are made to increase utility prices (and water deliveries at the retail level are generally considered to be like public utilities that deliver electricity and natural gas) is whether "poor" people can afford to pay these higher prices. So will the replacement of property-tax revenues to the districts by an equal revenue increase provided by direct water charges result in increased burdens on the poorest of the district's customers? The answer is by no means clear. Two considerations seem especially relevant.

First, it is not obvious, *a priori*, that the distribution of direct water charges from metered use would fall disproportionately more on low-income people than does the property tax that would be replaced. People at the lower end of the income distribution also own property (especially homes) that is taxed to raise revenues for the water districts. Unlike the income tax, poor people are not normally exempt from paying property taxes. Hence, property taxes are generally more regressive than income taxes. Moreover, people at the high end of the income-distribution ladder would pay more for direct water charges than their low-income counterparts since they have larger homes and more spacious grounds that use water. They also own more water-using businesses and belong to golf clubs and use other recreational facilities that consume large quantities of water. Therefore, a detailed empirical analysis of the income distribution effects of replacing property taxes with direct water charges is needed to settle this issue.

Second, many cities and other governmental entities have attempted to reduce income inequality by offering utilities at lower rates to low-income customers. These are often referred to as "lifeline" rates. In the case of water, this usually takes the form of a progressive fee schedule for water with a low price charged for the first block (say 10,000 gallons), a higher price for the next block, and so on. One justification commonly given is that people are required to pay a lower price for water they really "need" for drinking and basic household uses and higher fees can be charged for water blocks that are devoted to less valuable uses such as yard irrigation and swimming pools. A casual inspection of the block rates actually used in Utah, however, suggests that the first block of water at the lowest price is typically so large that even middle-income

consumers do not exceed that block. This implies that low-income people, compared to those in higher income brackets, are not helped as much by the block system as they could be if the lowest block were not so liberal.

Quite another rationale can be given, however, for a progressive water fee schedule—to induce conservation. As water users pay higher marginal prices for increasing blocks of water, they will undoubtedly be motivated to be more economical in its use.[17]

Unfortunately, no empirical evidence is known to this writer that would shed much light on these income-distribution questions, so any justification for low water prices for the poor is weak. What we do know is that, in general, using price concessions on specific commodities such as electricity or water to effectuate more equality in the distribution of income is inefficient in resource allocation as demonstrated by the discussion of subsidies earlier in the chapter. Much more efficient policy alternatives are available for income equalization, such as direct income support to the poor incorporated in income tax exclusions, food stamps, and welfare programs.

Conclusions

Preserving the property tax as a mechanism for producing revenues for the public water districts has little theoretical or empirical justification. Hence, extra care should be taken to make sure that public water districts that may be created in the future are not burdened with this flawed policy. Failure to price water at market-clearing levels where marginal supply costs are fully covered has produced inefficient water development and allocation that should not be repeated.

As for existing water districts that have extant rules and procedures in place, this analysis suggests that they could survive and even thrive by relying on increasing direct charges on water users that more fully reflect the full supply costs. It may be true that those districts that have relied most on property taxes, and have therefore produced the greatest distortions between consumer valuations and water supply costs, would need to raise prices by a considerable amount in order to replace the lost revenue, but doing so would induce significant increases in water-use efficiency through voluntary conservation, especially in the long run. These conservation effects would be strongly salutary in precluding the necessity of relying on costly development of new water to meet increasing future demands from agricultural, domestic, industrial, and recreational users.

The only important caveat to increasing direct water prices is the "surplus" water problem discussed at length earlier. Water prices should not be raised so much that available supplies would be inefficiently used. This may be a more complex question than appears at first blush, however, since some or most of this water might move into places where it could be stored and used at a later time when demand has increased.

It appears that contracts between the districts and the federal Bureau of Reclamation would need to be renegotiated in order to eliminate the property tax as a revenue source, but it is difficult to see why the federal government would not be interested in increasing water conservation so long as the treasury is fully repaid. The water districts seem to be fully capable of managing their debt and repayment obligations without the property tax, current protestations from them notwithstanding. The argument that they need the tax to retain their financial ratings in order to acquire debt at favorable interest rates seems dubious. In fact, if this argument for the property tax were valid, how is it that water districts without the power to tax have the ability to acquire debt at almost equally favorable rates?

A critical issue is the timing of replacing the property tax with higher user charges. A prudent policy would appear to be to increase the price at approximately the same rate as the rate of increase in demand in order to prevent current supplies from being inefficiently used. After all, the costs of existing supplies are largely sunk costs that have already been expended and are, therefore, irrelevant to efficient water development. Hence, for existing developed water, a gradual shift to direct water charges is probably most feasible if the water market is to clear.[18]

The point relating price to economically efficient allocation of resources deserves further emphasis. Only if the water price is equal to the marginal supply cost will demanders and suppliers receive signals leading to efficient allocations of water. Even if political considerations or contractual agreements prevent the complete elimination of the property tax as a revenue source for the water districts, price can still be used to move toward more economically superior allocations. It must be remembered that what occurs at the margin is what counts most for economic efficiency. Block pricing could be used to meet certain revenue goals and to aid the poor, but economic efficiency and conservation goals would be more nearly achieved if the water price were set at the unsubsidized price (at the marginal supply cost).

For new water development that may be planned to augment future supplies, a requirement should be imposed that the final water users must contract to pay the full incremental costs, and this requirement should apply to irrigators (who traditionally have been subsidized by federal policy) as well as other user types. And there must be no possibility of reneging on the contracts after they have been signed and delivered. This may turn out to be a significant political problem as new supplies are likely to be costly and water users have traditionally been able to influence political benefactors to give them more favorable prices. Only by requiring that the beneficiaries pay the full cost, however, can uneconomic new water projects be prevented. For too long, water projects have been subsidized by separating water prices from supply costs, thus leading to premature and uneconomic development.

The fundamental water problem in Utah (and other western states) is not that existing supplies will prove to be inadequate to meet increasing future demands. This is a fallacy artificially induced by failing to regard water as an economic good like most other goods. The basic problem is that pricing policy has been infected and distorted by political favors in the form of subsidies and concessions to different interest groups. Using property taxes as a revenue substitute for direct water prices is one such example. So many water "problems" could be solved if this commodity were priced at the level required to cover supply costs and equate supply and demand.

Notes

1. Richard E. Howitt, "Drought, Strife, and Institutional Change," *Western Economics Forum* 1, no. 2 (Fall 2002): 11–14.
2. Utah Foundation, *Creating an Oasis: Part Two: Water Consumption, Pricing and Conservation in Utah*, Research Report No. 650, April 2002, http://content.lib.utah.edu/cgi-bin/showfile.exe?CISOROOT=/wwu&CISOPTR=34&filename=35.pdf.
3. Jon R. Miller, "On the Economics of Western Local Water Finance: The Central Utah Experience," *Land Economics* 69, no. 3 (1993): 299–303.
4. Utah Rivers Council, *Mirage in the Desert: Property Tax Subsidies for Water* (2002), http://www.utahrivers.org/wp-content/uploads/2011/03/URC-Property-Tax-Mirage.pdf.
5. Utah State Auditor's Office, *Survey of Local Government Finances Summary Data, various years 1992–2000*. Data for the various water districts by year can be obtained from the website www.sao.ut.gov/lgreports.html.
6. Of course, if the property tax is used as a substitute revenue source for direct water pricing, the resulting lower price can be said to increase the quantity of water demanded. But to the individual property owner who pays the tax, the magnitude of the tax itself is unrelated to the quantity of water demanded by that property owner.
7. B. Delworth Gardner, *Plowing Ground in Washington: The Political Economy of U.S. Agriculture* (San Francisco, CA: Pacific Research Institute for Public Policy, 1995), chap. 12.
8. Unused water could conceivably cause legal difficulties as well. Prior appropriation law requires that water be put to beneficial use; otherwise it can be appropriated by others. In the face of stochastic water supplies due to variations in snowpack, however, all appropriation states have given appropriators some leeway before the forfeiture requirement is exercised. For example, a bill passed in the 2008 legislative session in Utah makes it easier for public entities to own and hold (hoard) water rights for future use. A city can get a nonuse designation and keep the right for a much longer time than was possible under the previous law.
9. This phenomenon of water hoarding by large distributors that must plan for future growth, such as the Salt Lake City Water Department, is already highly controversial as water marketers would like to have this water available for trading to other users who are experiencing tight supplies.
10. Brandon Loomis, "Will Utah Cities Run Dry, or Is Shortage Avoidable?" *Salt Lake Tribune*, June 7, 2008, A1+.

11. B. Delworth Gardner, "Water Pricing and Rent Seeking in California Agriculture," in *Water Rights*, ed. Terry L. Anderson (San Francisco, CA: Pacific Institute for Public Policy Research, 1983), 83–112.
12. B. Delworth Gardner and Seth Schick, *Factors Affecting Household Water Consumption in Northern Utah*, Utah Agricultural Experiment Station Bulletin 449 (Logan, UT: Utah State University, 1964), 1–25.
13. Professor Blattenberger also has collected elasticity estimates from the eastern United States and a few foreign countries, but these appear less comparable to the region discussed here than those from other states in the arid West.
14. An exception is an elasticity estimate for water consumption of −1.57 to −1.63 made by Hewitt and Hanemann (Hewitt, Julie A. and W. Michael Hanemann, "A Discrete/Continuous Choice Approach to Residential Water Demand Under Block Rate Pricing," *Land Economics* 71, no. 2 (May 1995): 173–92), who employed a discrete/continuous choice model rather than standard regression analysis to estimate their price elasticities. Their work shows that the choice of analytic method may also be an important determinant of elasticity estimates.
15. Barton H. Thompson Jr., "Institutional Perspectives on Water Policy and Market," *California Law Review* 81 (May 1993): 671–74.
16. Utah Rivers Council, *Mirage in the Desert*.
17. I am indebted to Randy Simmons, an actual city mayor, for calling this to my attention.
18. The question of an optimal pricing policy as between fixed user charges and a levy on metered quantities used is complex and is discussed in Griffen, Ronald C., "Effective Water Pricing," *Journal of American Water Resources Association* 37, no. 5 (October 2001): 1335–47.