

Water Resource Economics: The Analysis of Scarcity, Policies, and Projects, R.C. Griffin. The MIT Press, 55 Hayward St., Cambridge, MA 02142-1315. May 2006. 402 pp. \$50. ISBN 0-262-07267-X.

This easy-to-follow text contains many excellent graphs, mathematical appendices, and special information boxes. Its theme of encouraging water resource managers fluent in the language and principles of economics is introduced in Chapter 1. Not to be confused with accounting, economics is about decision making, relative scarcity, pricing, understanding consequences of policies, debunking myths, and optimal resource use. It is emphasized that water will become increasingly scarce.

Chapter 2 introduces fundamental economic theory such as demand estimation, cost analysis, and allocation efficiency. Conditions for efficiency at the individual and aggregate levels are considered. Griffin points out that differential processing, reuse, and nonrival use make water more difficult to work with than most commodities. The concepts of marginal benefits and marginal net benefits are related to economic efficiency. Griffin's use of neutral economic efficiency yields a range of efficient allocations.

Chapter 3 introduces time preference and dynamic analysis. It is pointed out that society, business, and individuals have different rates of time preference. Time preference is different from the preference rates for inflation and risk. The social cost of capital is shown to be difficult to estimate. Attention is paid to arguments that the future is not given sufficient weight in long term water projects. Using ground water withdrawals and reservoir examples, Chapter 3 concludes with a discussion of how maximized net present value creates dynamic efficiency or measures dynamic improvements.

Chapter 4 examines the efficiency of rules and policies that guide water allocation and use. While stability is needed to accommodate investments in water capital, the ability to modify the rules in response to changing conditions is necessary for success. The relative merits and disadvantages of water resource property such as open access, common property, state ownership, and private ownership are discussed. Griffin points out that in most cases the criteria for success in free markets are not met for water. Extensive discussion follows of market failure, nonrival water use, externalities, and monopolistic distributions systems associated with water. However, market elements can be used by water managers to achieve greater efficiency in water allocation and use. Part II of Chapter 4 examines the legal institutions that govern the allocation and use of water. The economics of riparian rights, seniority rights, transferability, permit systems, correlative shares, and beneficial use requirements are examined. The problem of public allocations for wildlife and other nonmarket instream uses is discussed. Ground water is shown to be both a stock and flow resource. The economics of the rule of capture, common property rights, state property interests, correlative rights, depletion, and conjunctive management are presented.

Chapter 5 argues that most water shortages are caused by poor water policy. Since policy changes bring winners and losers, theoretic policies often give way to empirically based policies that include compensation tests. The topics of consumer and producer surplus are introduced prior to

discussion of the relative merits of price rationing, quantity rationing, demand shifting, and supply extending policies. Price rationing is shown to be economically superior to quantity rationing. Supply increasing projects can be structural or nonstructural and always impose costs on the parties that give up the water when a region's water is fully utilized. Use of net present value and change in net benefits to evaluate dynamic policies is shown. Secondary economic benefits should be counted only in projects that have a local accounting stance.

Chapter 6 presents cost benefit analysis (CBA) as a screening tool for competing policies and projects. Considerable effort is devoted to the historical evolution of CBA as applied to water projects. CBA differs from net present value analysis in that CBA includes both market and non-market goods. Difficulties in measuring costs and benefits such as reliance on data generated outside of economics and incorrect application of the alternative cost method to identify benefits are discussed. Techniques for evaluating multipurpose projects using bond financing are offered. The separable cost remaining benefits method of allocating costs is presented.

Chapter 7 specifies the goal of water marketing as achieving dynamic efficiency in water use through the use of transferable property rights. Transferability is related to the ownership forms discussed earlier. Property rights that do not foster transferability tend to keep water in less efficient uses. Two serious hurdles for water market development are high transaction costs and market failures. An example shows that upstream transfers are more likely to harm third parties than downstream transfers. Intersector and interbasin transfers can have the greatest impact on a state's economy. The economic losses in the region or use given up are regarded as more than offset by the gains of the recipients. Ground water trading is shown to be more difficult than surface water trading because of ground/surface water interaction, externalities, difficulties in quantification, and common pool problems.

Chapter 8 argues that water pricing is a serious tactic for combating scarcity and preserving user freedom of choice. Block and uniform rate volumetric pricing structures are examined. The proper price specifications for meter charges and connection fees are discussed. Many well known accounting pricing methods based that are primarily concerned with revenue sufficiency are economically inefficient because they lead to average cost pricing. Various accounting cost allocation approaches are shown to be inefficient when applied to water. A marginal capacity cost charge is suggested for cases of temporary, seasonal, and presystem expansion scarcities. While wastewater pricing is similar to that of water pricing, it encounters difficulties in measurement of individual use, which leads to inefficient price and fee structures.

While demand has many determinants, Chapter 9 points out that all proper estimates of demand must include price. The concept of demand being a functional relationship rather than a single point is emphasized. Relative advantages and disadvantages of eight demand concepts are presented. It is pointed out that math programming and activity analysis techniques are best used for industry and agriculture. Residential demand is best measured by regression techniques. Nonmarket valuation techniques surveyed

include contingent valuation, hedonic pricing, and travel cost. Issues in measurement and interpreting results in the residential, agricultural, and industrial are discussed.

Low numbers of market supply agents and limited water supply estimation techniques affect water supply analysis. Chapter 10 shows that the empirical task of developing a marginal cost estimation is useful for many applications. Unlike continuing activity costs, administrative and new activity costs weakly relate to water use. The concepts of fixed and variable costs are introduced. Rate, cost, and revenue based supply estimations are criticized with attention to the constant-cost-assumption. The problem of monopoly agents is shown to lead to inefficiency in pricing and water production costs for both public and private water producers. An outstanding discussion of privatization shows that regulatory costs may offset private over public cost advantages.

Chapter 11 discusses demand and supply models (DSM). Theoretical models show directions of needed changes, but quantification requires empirical models. Sample DSMs are helpful but most need physical and economic extensions that add considerably to research costs. A simple example shows gains from applying DSMs. Several existing empirical studies that ignore transaction costs are discussed.

The final chapter discusses ideas and challenges for the economic efficiency of water. This excellent book achieves its goal of clearly presenting economic knowledge to hydrologists, engineers, and water managers. It also offers considerable material for the experienced economists. Griffin's book will join my reference collection.

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