An Econometric Test of the Endogeneity of Institutions: Water Markets in the Western United States

by
Kristiana HANSEN, Richard Howitt, and Jeffrey Williams

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Author contact information:

Kristiana HANSEN
Graduate Student
Dept. of Agricultural/Resource Economics
University of California, Davis
One Shields Avenue
Davis, CA 95616
hansen@primal.ucdavis.edu

Richard Howitt
Professor
Dept. of Agricultural/Resource Economics
University of California, Davis
One Shields Avenue
Davis, CA 95616
howitt@primal.ucdavis.edu

Jeffrey Williams
Professor
Dept. of Agricultural/Resource Economics
University of California, Davis
One Shields Avenue
Davis, CA 95616
williams@primal.ucdavis.edu
In the western United States, the tremendous spatial and temporal variation in rainfall suggests that substantial gains from trade could be achieved through water markets, despite physical and institutional impediments to water transfers. Depending on the relative importance of water supply uncertainty and trading impediments, markets are forming differently across the western United States. In many locations, trades take the form of short-term leases of water, where the underlying property rights remains unaffected. In other regions, transfers of permanent water rights predominate.

This article first discusses the salient features of western water markets with reference to a database of 3,554 western water transactions taking place from 1990 to 2005, which we compiled from the Water Strategist. The Water Strategist reports permanent transfers and leases (including price, quantity, buyer and seller identification, buyer and seller use, and some additional contract terms) in 14 western states.

We cast the decision to purchase versus lease water rights on an annual basis as a discrete, stochastic Bellman equation which captures the tradeoff faced by water agencies between current consumption and a future stream of expected benefits. Our theoretical model explains the observed relative predominance of sales versus leases within each state in the context of the varied risk profiles of water market participants.

The first buyer type is a municipal water agency who wishes to secure long-term supply to meet projected future growth. This water agency is risk averse, preferring to secure a permanent water right rather than exposing itself to the uncertainty of future water markets (through sequential short-term annual leases), ceteris paribus. The second buyer type is a high-value agricultural producer who is risk neutral and so indifferent between leases and sales. The environmental and third-party costs associated with water rights purchases make it more likely that this risk-neutral buyer will lease water rather than buy. Further, high-value agricultural producers are more likely to have existing supplies that fluctuate with general water supply availability; this buyer type is likely to be in the market only during dry years when its own supplies are low.

Using a probit specification, we quantify the economic, hydrological and institutional factors that drive trading activity towards temporary leases versus permanent sales of water rights in western water markets. The econometric analysis supports the conclusion that institutions have influenced not only whether water trades occur, but also whether trades are permanent water rights transfers or short-term leases.

This analysis shares key features with the make-or-buy literature of transaction cost economics. Quantitative analysis of the make-or-buy decision other than case studies is rare, largely due to the lack of uniform definition of asset specificity, uncertainty, and frequency across firms and industries. Water markets alleviate some of the difficulties for quantitative analysis by providing buyers and sellers with a discrete choice between leases and sales, which makes observation of their choices cleaner and generalization possible.