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MOVING TOWARDS MORE EFFICIENT WATER MARKETS: INSTITUTIONAL BARRIERS AND INNOVATIONS

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In the western U.S., one finds a few water markets that function quite efficiently from an economic point of view. Most water markets, some operational for over a hundred years, are highly imperfect, characterized by high transaction costs, asymmetric information on buyer & seller sides, long administrative or legal processes, and excessive brokerage fees. The question is What features of the relatively efficient water markets account for their success and how many of these features can be carried over to the larger set of inefficient water markets?. What changes in the legal and institutional frameworks would be required? Examples will be presented, starting with the Northern Colorado Water Conservancy District's market for permanent transfers as a benchmark, contrasted with major examples of inefficient transfer processes undertaken by Denver suburbs in the last several years. The functions of traditional legal doctrines/practices such as no injury, beneficial use, forfeiture through non-use, and required drying-up of irrigated land upon sale of water are evaluated from an economic point of view and seriously questioned.

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Charles W. Howe and John D. Wiener

Abstract

In the western U.S., one finds a few water markets that function quite efficiently from an economic point of view. Most water markets, some operational for over a hundred years, are highly imperfect, characterized by high transaction costs, asymmetric information on buyer and seller sides, long administrative or legal processes, and excessive brokerage fees. The question is "What features of the relatively efficient water markets account for their success and how many of these features can be carried over to the larger set of inefficient water markets?". What changes in the legal and institutional frameworks would be required? Examples will be presented, starting with the Northern Colorado Water Conservancy District's market for permanent transfers as a benchmark, contrasted with major examples of inefficient transfer processes undertaken by Denver suburbs in the last several years. The functions of traditional legal doctrines/practices such as "no injury", "beneficial use", forfeiture through non-use, and required drying-up of irrigated land upon sale of water are evaluated from an economic point of view and seriously questioned.

Introduction

Some of the problems observed in the highly inefficient water markets of the western U.S. are well detailed elsewhere (e.g., Young 2005, Howe 2005, Howe and Goemans 2003, Howe 2000, Western Water Policy Review Commission 1998, MacDonnell and Rice 1994, Young 1986) and have been recently illustrated in colorful detail (Olinger et al. 2005, and see Colorado Water Conservation Board 2004). These features are in contrast to the well-working market in the Northern Colorado Water Conservancy District (see District website, Colorado Water Conservation Board 2004 and website updates, Howe and Goemans 2003, Michelsen 1994). The transferability of some desirable features and remediation of some undesirable features are attempted in current alternatives to traditional market operations under discussion in Colorado's Statewide Water Supply Initiative.

Problems in Existing Water Markets

One sobering view of problems for water markets is presented in Dellapenna's counsel to avoid them altogether (2005), but we proceed from the current Western water law distribution of property rights toward improvement through modernized institutions. Many of the current problems we would like to fix are based in careful policy established for social goals such as prevention of monopoly or concentration of power in water holdings (Howe 2005, 2000; Mead, 1887). We came by these problems honestly, and it is now incumbent upon us to review the questions, if these are the answers.

High Transactions Costs as Policy

To defend other water rights holders, parties seeking to transfer water use must prove no injury will be done to others; as a matter of policy, the burden of proof is supposedly entirely on the parties seeking a change, and that takes a great deal of engineering and lawyering (Nichols et al. 2001). Howe and Goemans (2003) show that numerous beneficial trades are likely excluded from traditional markets, judging by their frequency where costs are avoided (in the Northern district). The question was how to defend farmers from speculating capitalists (Mead 1887,

Hobbs 1997, Corbridge and Rice 1999, Cech 2004), but the transactions costs now prevent "ag-to-ag" trades that would help maintain and renew agricultural enterprise.

Lack of Information Hinders Price Discovery

The State of Colorado keeps no record of who currently owns water rights (see State Engineer Hal Simpson, quoted in Olinger et al. 2005). There is no public or required record of prices. Some cities will reveal what they paid, or would like to pay, while others will reflexively try to withhold that (see amusing anecdotes from Olinger et al. 2005). In a step even further into competitive market behavior, cities have concealed their activity, and even misinformed the public about prices (Olinger et al. 2005).

Robert Young recently commented to the UCOWR audience (2005) on the difficulties of estimation of non-market values. Where uses have not been allowed or not been for sale, (as in the constriction of "beneficial use", we are forced to non-market estimations – but again, this also creates asymmetry of information at best and more often for amenity, recreational and environmental values, absence of valuation. There is apparently substantial unmet demand. Voters passed 801 referenda between 1998 and 2003, committing more than \$24 billion in local and state funding for land acquisition, preservation and conservation (according to the Trust for Public Land as cited by Newburn et al. 2006). This is on top of every single state having a program for farm land preservation (Hellerstein et al. 2002), and vast federal spending for erosion control and water quality.

A small number of buyers has or has access to a great deal more information about what is possible, saleable, and economically useable than a large number of sellers, in a market in which high transactions costs work synergistically with use limitations and barriers to entry to further complicate a situation in which externally-imposed costs and conditions can change the transferability without any action by the owners of the unspecified resource. What the market is doing is not well known; enforceable contracts precede going to water court and filing change applications by months at the least and more likely by years.

Anti-Speculation Doctrine Works Asymmetrically but Fails to Curb Broker Profits

There is little disagreement about the importance of specification of property rights for well-working markets (Stiglitz 1993). The anti-speculation doctrine hinders the establishment of clearly specified property rights by preventing identification of what is finally transferable before the buyer is specified. That simplifies assuring "no injury", but it is not clear that this is the only way. It maintains high transactions costs, and disadvantages less-capitalized sellers unable to evaluate their property without help from well-funded would-be buyers, making specification asymmetrically difficult for sellers.

But, it fails to solve the current version of the problem, in which lack of information about water supply and demand seems to be enabling extraordinary returns to specialized knowledge. Brokers are acquiring remarkable profits, as illustrated by the stories in Olinger et al. 2005, such as that of the man walking back and forth down the hall between the seller taking millions less than the city buyer paces away will give the broker. Deals done literally in the dark are costing rate-payers millions of dollars for little or not apparent benefit (Olinger et al. 2005). The anti-speculation doctrine was intended to avoid concentration of economic power by undesirable

purchases that would adversely affect agriculture and social goals encouraging farming. The unusual brokerage situation reflects instead a particular form of speculation enabled by fears of both public officials and private parties, rooted in the lack of public information and the high costs of acquiring specialist knowledge. In both cases, inefficiency is created with losses for both parties to the transactions and the public.

Agricultural Efficiency Discouraged

Discouragement of efficiency of agricultural use is another widely-remarked set of issues looming (Neuman 1998) over water law. In April 2006 farmers were warned in the Arkansas Valley about the dangers of increasing their efficiency! (Breslin 2006). Conservation and efficiency are more than tricky where on-farm efficiency differs from system or basin efficiency, and there are important limitations on establishment of markets where "salvage" is prevented (amply discussed in Western Water Policy Review Advisory Commission 1998, National Research Council 1992). It is unfortunate that this remains an important problem despite the advances in technology that will eventually be employed (see Howe 2005).

Natural Monopsony or Oligopsony

There will usually be a substantial savings for least-cost gravity-operated transferee destinations and substantial investments required for difficult water transfers. There is a natural monopsony for short-distance moves, and major economies of scale for big projects (Easter et al. 1998, Howe, Schurmeier and Shaw 1986a,b, Young 1986). Geography has promoted a "thin" market with little price discovery due to little activity since small transactions have been uneconomic.

Non-Standardization of Commodity

Priority is reliability, in Western water law, and that means that each water right in a fully prior-appropriation system is uniquely described in time, place, volume and kind of use and in priority order or fulfillment (Hobbs 1997, Corbridge and Rice 1999). This makes valuation as complicated as possible, working together with the complexity of determination of the transferable fraction of water.

Missing Transfer Mechanisms and Incomplete Markets

Because of the high transactions costs, in time as well as money, short-term transfers of use, usually called rentals, have been largely missing in Colorado, with two exceptions. Agricultural loans have been allowed with administrative approval, but kept to the local and the very little, so it was easy to determine no injury. The other exception has been "lease-backs" of water acquired by cities in anticipation of need or in excess of normal needs and used only in dry times. Appreciation of the value of the water right lies with the city; farm investment is discouraged. This has been called a "soft landing" for ending the affected agriculture. The reverse, where the farmer keeps the water right but contracts to transfer on specified conditions, is usually called an interruptible supply agreement or a dry-year option. This has only very recently been allowed and only for a time sufficiently short to prevent most potential benefits. Water can only be moved on short notice in dire situations and only for short duration (Hobbs 1997 as updated offers summary). There have been substantial efforts to establish short-term markets around the West, (Clifford et al. 2004), with varying levels of success for larger and longer-term markets (Slater 2005). The missing forms of transfer are synergistic with the lack of authority for some

uses and the lack of information about their value, in terms of beneficiary willingness to pay and as public goods or interests (see Young 2005, Vaux 2005).

Beneficial Use Limitation Barrier to Entry into the Market

Apparently for transparency of administration and in defense against speculators who would hold water out of the market, water rights are defined and perfected by their beneficial use (Hobbs 1997, Corbridge and Rice 1999), but limiting what can be a beneficial use has resulted in the problems of adequacy of supply for non-consumptive uses, for amenity, environmental, and recreational uses (Vaux 2005, Western Water Policy Review Advisory Commission 1998). Where in-stream flows held by the State are allowed, such rights are often little (e.g. "minimum reasonably necessary") and late (e.g. very junior) (Trout Unlimited 2002, 2003). Recreationists and fishing interests have depended on the kindness of strangers all too often. Forcing dispute resolution into the political and regulatory process has not been shown to promote certainty, as in specification of property rights (Slaughter et al. forthcoming).

Exclusion of Externalities Invites Political Involvement

Third-party impacts are widely appreciated as negative externalities from sales; Howe and Goemans recently provided in-depth review (2003) of community secondary and pecuniary impacts from water transfers out of a region. So far, either 18 or 19 bills seeking required of mitigation of secondary and pecuniary impacts of water transfers on areas of origin in Colorado have been defeated. "If you are winning, you probably like the rules."

Preventing water quality and other environmental regulation considerations in water transfers invites non-market intervention collisions with markets for water. Cumulative impacts from other water transfers impose increasing burdens of negative externality, directly from impacts such as lost productivity and higher expenses from degraded water quality, and indirectly by cumulating towards thresholds which may abruptly limit further changes (e.g., a total maximum daily load limit on water quality) or impose uncertainty and costs on subsequent actions (e.g., excessive out-of-priority well use forced abrupt readjustment of water rights in the South Platte River Basin; Strawn 2004). Meanwhile, the South Platte River Recovery Program for endangered species has imposed a substantial cost on the State as a whole (Bureau of Reclamation, 2003, Freeman 2003). Markets may be constrained in response. Uncertainty discourages investment.

Features of the Efficient Market in the Northern Colorado Water Conservancy District

Free Transferability

The Northern District is the Bureau of Reclamation's client for the Colorado-Big Thompson Project, which imports about 270,000 acre-feet of water per year across the Divide to the East Slope and South Platte Basin (see Northern District website for maps, history, etc.) Because this is trans-basin water, it is free of claims on return flows in the new place of use. And, because the District has relinquished claims on rights to second use, the water may be almost uniquely freely transferred (see also Michelsen 1994; Howe and Goemans 2003). Some other trans-basin water, in contrast, is freely transferable by the owner (e.g. Southeastern Colorado Water Conservancy District, client for the Frying Pan-Arkansas Project; see Southeastern District website), but not

by the user, since the owner retains rights to second uses (a significant source of revenue). In the Northern District, shares are transferred by holders, or rented, and the District is notified of a sale of ownership and delivers the water accordingly.

Facility Sufficiency

The service area of the Northern is also unusually well plumbed (see website for maps of major facilities) and it is much easier to move the water around than in most places. This is a far different situation from places where geography constrains matching supply and demand.

High Certainty Promotes Reliance and Sustains the Market

There is no question about the legality of existing arrangements, and no question about the persistence and availability of the market in "C-BT" (Colorado-Big Thompson project) Shares (Howe and Goemans 2003). Such a market is itself important in supporting investments; the price may be high but you know you can get water in a pinch, at least within the limits of physical supply. And the opportunity cost of being part of that supply does not include the traditional risk of forfeiture or diminution of the beneficial use. Because transfer is so easy, the market is continuous, "smooth", and acts as a short-term as well as long-term transfer mechanism.

High Levels of Some Information

When the District announces the annual allocation of water for each share, the information is public, including the source information for the decision. The amount of water available is known. And, the rental list (see website) provides some information on prices for rentals. Knowledge of prices paid for shares is less easily available, but it is apparent that ditch companies, irrigation districts, and municipalities have some idea, though it is a competitive market as noted above (Howe 2005, Olinger et al. 2005).

Efforts Toward Applying Some Lessons

The Colorado Statewide Water Supply Initiative (SWSI)

There is no State water plan, and none has been requested. The state enjoys or suffers a competitive private market, perhaps badly shown off by officials discussing concealment of prices and interest in order to avoid increasing the competition and prices sought (Olinger et al. 2005). In response to drought and very rapid population growth, the State has undertaken to improve the level of public information about water supply and demand through the Water Supply Initiative. The proceedings, major report, and findings are well-documented on the internet (Colorado Water Conservation Board). Discussions are still in progress as of this writing and probably this presentation on how to meet the near-term future needs (year 2030) for water supply. Unfortunately, political constraint effectively required that the investigation would take at face value claimed projects and processes planned to meet future needs, and credit them against analytically estimated future demands. Informed views suggested that the "identified projects and processes" might have been overly optimistic. Phase 2 of the Initiative continues some inquiries, but will also most likely decline to "handicap" the identified projects and processes for supply.

The SWSI will provide only a general view, helping a little with the information asymmetry, but probably not enough to have much effect. Whether the discussions and recommendations from

Phase 2 will have effect in time to alter the current trajectory is an open question. The State-established succeeding discussion and regional forum process is already in place, to undertake the political confrontations needed to make progress (see Colorado Department of Natural Resources website). One of the most valuable contributions may be the Phase 2 Technical Roundtable discussions of alternatives to permanent agricultural water sales.

The Missing Forms and Getting past Dry-Up

The SWSI agricultural alternatives group is considering three missing forms for transfer. (Also on the list are seeking the technical support to allow the eventual transfer of water which is saved from evaporative non-beneficial use or loss, by better technology and management and lower-water consuming crops, and "lease-backs"). The demands observed reduce to the need for three missing forms of transfer: a fast-operating spot market that could be met by a suitable water bank (Wiener 2005, Clifford et al. 2004), a long-term interruptible supply agreement form, and a long-term "rotating fallow", or later called rotating crop management form.

It is notable that "rotating fallow" was the name picked up from California deals on the Palo Verde Irrigation District and the Imperial Irrigation District; see their internet websites for further information. In debate on a bill authorizing similar deals in Colorado, HB06-1124, the name was changed to "rotating crop management" in respect of the point that here, at least, leaving land dried-up and fallow may be strikingly foolish in terms of erosion, weed control, soil quality and fertility management, and lost potential income from productive use (e.g. applications of small irrigation for many crops makes sense). In Crowley County, the "poster child" for "buy-and-dry", there are less than 5,000 acres left with water rights now, out of a system formerly irrigating 50,000 acres, and very few disused acres were even seeded (Heimerich 2006). The County suffered tremendously (Howe and Goemans 2003). "Dry-up" has become increasingly disliked, due to the negative externalities and loss of soil quality, and re-vegetation has been required in recent cases, to remedy some of that. Costs and times required for success remain, however, largely private information. These costs may be substantially higher than was earlier anticipated. We hope to avoid "dry-up" in the short as well as the long-term.

The essential differences between these two long-term forms and traditional management include *Long terms*: the duration of the deals, which become for practical purposes more like a partnership than a lease, with fully specified distribution of risks, costs, and benefits, and anticipation of needs to adapt. Also, there is implied *Non-exclusion*: potential inclusion of other affected interests, who would gain the ability to acquire rights to maintenance of desired conditions. Finally, there would be a considerable increase in cooperation and opportunity for *"benefit sharing"* (Howe 2005) among parties committing their resources to these deals. The people are no more obligated to anything than a landlord is obligated to her property – it is the property that is transferred as specified. A wider range of specification of contract terms would be involved, with more anticipation of contingencies and in effect, allocation of risks on a thoughtful basis. The management of these resources would be far more considered with the long term, affected interests, and the lengthy negotiation process involved, which should ameliorate the asymmetry of information problem.

The rotating crop management idea is that a predictable transfer of some specified fraction of irrigation water would be foregone at the farms and used by cities for base-load supply wanted every year. The interruptible supply idea is similar but the annual event is probably a payment and the occasional event (with frequency, and repetitions, as well as time of exercise of the option) is call for use of the water for a dry year increase in demand, a wet-year opportunity to refill aquifer storage while the farmer still has a good chance of a profitable crop, supply to refill storage after a drought, or fill-in for facility outages. Sensible parties will carefully identify factors increasing costs and schedule the payments accordingly, as well as indexing figures for the long terms involved. These are expected to be decades in duration, and perhaps effectively permanent. Although not yet well explored, it may be that the kinds of coordination and planning needed for these new forms of transfer could foster additional coordination efficiencies and economies of scale in water transportation, helping to overcome the tendency toward oligopsony or monopsony and to promote optimal solutions for infrastructure provision. Reallocation in place of "new" supply, should reduce needs for new structures.

These arrangements, at suitable scales of operations, would also tend to reduce problems of lack of information, lack of predictable markets, and should enable using improved efficiencies of irrigation when issues of technique and measurement are resolved.

Recommended Principles for Water Transfers

Among the principles recommended, certainty is an important goal. That in turn depends on foresight concerning the potential for "show-stopper" situations like an Endangered Species Act problem, or a water quality problem that could halt transfers. Other principles include considerations of scale, so that transferor organizations are large enough to use internal transfers and reallocations to maximize their physical situations (e.g. different land quality, salinity issues) and family situations, and so forth. The public good nature of adequate environmental information suggests investment in prevention rather than attempted cure (Vaux 2005), in parallel with public subsidy for water supply projects.

Technical and Transactions Costs Reduction

Already, there has been important acceptance of the idea of pre-determination of just what can be transferred, and that will help specify the property right as well as reduce the cost of making deals. The first pilot program water bank in Colorado failed (Wiener 2005), but it did achieve the acceptance of prior determination of transferable quantities, as at least a rebuttable presumption (State Engineer, Division of Water Resources, see Rules). The second proposed water bank in Colorado (in rule-making as of this writing) expands on that idea. Pre-determination of what is transferable helps meet the need for specification of the property right.

Tilting the Information Balance a Bit Less

Recording prices in some form, even if aggregated to cushion anonymity, seems critical to help develop price discovery and decent markets. Recording ownership might alleviate some concerns about speculation while allowing the benefits of future-oriented commodity management to play its normal role of smoothing markets. If the new long-term forms are employed, the level of coordination and planning required should help considerably with development and dissemination of information about the available supply and potential prices.

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