Between Forced Resumption and Voluntary Sale: A Mechanism for the Collective Sale or Transfer of Irrigation Water

Jonathan Pincus and Perry Shapiro
Between forced resumption and voluntary sale: a mechanism for the collective sale or transfer of irrigation water

Jonathan Pincus and Perry Shapiro*
August 2008

Abstract:
Currently, the legitimate transfer of ownership of an asset occurs either through voluntary means—gift, bequest, sale—or through the use of state power—compulsory acquisition, resumption, eminent domain, court order. In Australia and elsewhere, compulsory acquisition of private property is followed by the payment of compensation, which may be too little or too great. This paper outlines an auction mechanism that is intermediate between the forced resumption of water entitlements and their voluntary sale. To be effective, the mechanism requires there to be competitive bidders in the auction, and so the mechanism would work best if there were an end to collusion between public agencies in the water market. The seller would be an irrigation district, which would be compelled by government to engage in the auction. The proceeds of any auction sale would be distributed to the individual irrigators, according to fixed and known fractional shares. However, in contrast with the use of forced resumption, under the Shapiro-Pincus mechanism no sale would be made unless each individual irrigator receives at least what he or she has nominated as a minimum required payment. This guarantee would be secured through the use of a secret reserve for the auction of the district’s water entitlements. The combination of a secret reserve, competitive bidding, and the share mechanism gives individual irrigators a financial incentive to nominate truthfully what each requires as a minimum payment. The mechanism may have other applications, including helping to secure unanimous agreement within an irrigation district, to offer to sell all of the district’s entitlements.

*Pincus is Visiting Professor, School of Economics, University of Adelaide; Shapiro is Professor of Economics, University of California at Santa Barbara. The opinions expressed here are not necessarily those of any organizations and institutions with which we are affiliated.
1 Introduction

The Murray-Darling basin is in crisis in south-eastern Australia, with environmental flows desperately needed. The Commonwealth Government has allocated $500m to the Murray-Darling Basin Commission (MDBC) for the purchase of 500GL of water for annual environmental flows. However, a combination of the continuation of the severe drought and the imposition of limits on the sale of irrigation water and water entitlements has meant that the Commission has had difficulty obtaining water for ‘iconic’ environmental sites.\(^1\) In addition, some irrigators are frustrated that they cannot buy or sell water or water entitlements, due to restrictions on trade.

Trade in water entitlements is sometimes restricted on geomorphic or hydrological grounds—in particular, trade in entitlements from above to below the Barmah Choke is forbidden (because the Choke constrains the amount of water that can be passed, and thus the MDBS cannot guarantee delivery every season); and some trades are forbidden or restricted on environmental grounds (eg, land salinity). But trade in water or entitlements that are unaffected by the Choke and other ‘technical’ considerations, has also been restricted.

Restrictions of this ‘non-technical’ kind have been placed not only on trade in water between irrigation districts and for the environment, but also on trade in water from irrigation to other commercial uses, including into cities and towns; and trade across state boundaries. A limit of 4 per cent on the sale of water outside an irrigation district has been imposed in Victoria by the State Government. In New South Wales, irrigation districts are for the most part owned and operated by the irrigators, as cooperatives; and the individual irrigators own entitlements to ‘shares’ in the water that is made available, rather than to water itself. Many NSW districts have put limits on sales, and a number have imposed so-called ‘export fees’ on water.

A number of non-‘technical’ reasons have been given for the imposition of limits on water trade. At the general social and political level, governments have stated their determination to preserve rural communities, as far as is reasonable and feasible, from the deleterious effects on irrigators and their communities that could follow the large-scale transfer of water from its current use in or allocation to irrigation. This kind of governmental policy pronouncements echoes the strong feelings and opinions of many people and businesses in rural areas, be they on farms or in the regional villages and towns that service the irrigation farming communities; and, to a large extent, may also reflect the feelings of Australians generally.

---

\(^{1}\) The first step in the ‘Living Murray’ program, established in 2002 in response to evidence showing the declining health of the River Murray system, focuses on recovering 500 gigalitres of water per year for the River Murray, from 2004–09. (Murray Darling Basin Commission, 2008). By July 2008, the MDBC had 530GL ‘on its books’, but actually obtaining the water by June 2009 was described by the head of the Commission as ‘challenging’, due to the drought and the cap. Four Murray-Darling Basin Commission contracts for water purchase for 2007-08 were held back because of the operation the 4 per cent cap, discussed in the text (The Weekend Australian, July 12-13, 2008, p. 36).
In addition, the limits on trade have been justified as a means of protecting the financial interests of irrigators. The sale of one irrigator’s water or entitlements may impose economic costs or disadvantages on other irrigators in the district. A reduction in the level of irrigated farming activity will reduce the demand in the district for the services of the suppliers of no-water inputs (e.g., servicing of machines). This reduction in demand may lead to a rise in the price of the services, or a reduction in the service quality; or even threaten the financial viability of enterprises providing services into the district.2

Secondly, the sale of water outside of an irrigation district can affect the financial viability of the district’s irrigation authority or corporate body. These districts rely on revenue from the charges levied for the release of water to the individual irrigators. Most of the costs of operating the irrigation district are joint or common to the ‘customers’: they are ‘overheads’, and not costs attributed to deliveries of water to a specific farm or farms at a specific time. The usual way to charge for water is via a two-part tariff—an annual fee, plus volumetric charges for delivery. If a farm sells its entitlements outside of the district, and if the purchaser does not become responsible for the fixed charge, then the remaining irrigators in the district will be faced with higher charges, if the irrigation district is to continue to cover its costs as before the sale. In the technical language of economics, there may be a ‘pecuniary externality’ from sales of water outside a district. Even if the liability for the fixed charge is transferred to the purchaser, those who do not sell their water can suffer a financial disadvantage as a consequence of the sale: the fixed charge may not cover the fixed costs of the district; or there may be fewer economies of scale or scope in delivery.3

For these reasons, irrigators have some financial interest in water sales made by others in the district, and this may be reflected in restrictions or charges imposed by the irrigation district. It is the kind of situation for which the auction mechanism, outlined in this paper, has been devised.

As a result of the restrictions on trade in water, there are many frustrated sellers and many frustrated buyers. Several Victorian irrigation areas ran into the 4 per cent cap by three months into last financial year. This year, faced with requests for approval of trades in excess of the limit, a ballot system is being used by Goulburn-Murray Water, the state-owned authority that runs Victoria’s share of the Murray Basin, to select which sales will go through, until the 4 per cent limit is reached.4 Water is not going to where it is most highly valued (after accounting for the costs of transfer and transactions).

Longer-term issues are involved. Governments have budgeted over $3 billion for ‘water saving’ works in five years from 2004-5, mostly for irrigation infrastructure. It has been estimated that the costs per unit of water ‘saved’ by some of the proposed works will be many times the market price of water for irrigation.5 In addition, independent experts, as well as individual farmers and farm organisations,

---

2 For example, suppliers now have a smaller set of customers and the same fixed costs; or there may be a reduction in the opportunities to serve two or more nearby farms on the one service trip.


4 The Weekend Australian, July 12-13, 2008, p. 36.

5 Because of the restrictions on water trade, the market price may be inflated and not be a good guide to the value of the ‘saved’ water. (There are serious disagreements about how much of the water to be ‘saved’ will in fact represent a net addition to the hydrological system.)
believe that some irrigation districts will probably be uneconomic if, over the next few decades, climate change lowers precipitation in the basin, and raises evaporation losses from storages. Even without climate change, the system may already been over-allocated. That is to say, from a community-wide point of view it may be best if some farms or districts turn to dry-land techniques, or to non-farm use.

Ideally, such decisions should be voluntary and not be forced on the farmer or the irrigation district. Clearly, restrictions on trade restrict the opportunities for these adjustments to occur through market means. However, voluntary or market outcomes may be difficult to achieve, when they require a collective agreement or collective decision-making: within a district, some irrigators may prefer delaying, in order to obtain prices higher than others are prepared to sell for. This may drag out the process for years.

Ultimately, voluntary sales of water may not be sufficient to resolve the crisis of the Murray, and government may resort to the forced transfer or cancellation of water or water entitlements, and pay compensation. In these circumstances, governments need various mechanisms to assist in finding the least-costly but fair way to transfer or cancel entitlements.

2 What the paper offers
This paper suggests an auction mechanism, first proposed in Shapiro and Pincus (2008), which may be of use when voluntary water sales require collective as well as individual agreement; and when the coordinated sale of water or entitlements creates more net value than is generated in their separate usages or sale. The proposed mechanism is intermediate between resumption and voluntary sale. It requires compulsion or the treat of compulsion, to bring irrigation districts to offer water for sale; and it requires an authoritative determination of how the auction proceeds are to be shared. However, the auction design gives it qualities of fairness and efficiency that are arguably superior to those of resumption with compensation: no sale will take place unless the irrigators obtain what they individual nominate as required compensation, so that sale means that the value in use outside the irrigation district is greater than the value inside the district. Although the mechanism was devised to be implemented under threat, it could be adopted voluntarily by irrigation districts. In particular, its use may facilitate the voluntary sale of a fraction of the district’s water entitlements; for example, 4 per cent; or even 100 per cent. More speculatively, the Shapiro-Pincus mechanism may be attractive to agencies like the Murray-Darling Basin Commission, seeking to purchase water for various purposes. Finally, and most speculatively, the Commonwealth, if convinced of its merits, could urge that the Shapiro-Pincus mechanism be tried, especially, in a fractional version, before a State or any irrigation district restricts sales or imposes ‘export fees’.

---

6 The greater net value may arise from the cost savings within the irrigation district; or because of lumpiness in complementary productive inputs, the alternative uses are attractive only if water is available in more than some minimum amount. These are discussed further in section 4.
The Shapiro-Pincus auction has two desirable characteristics.\(^7\) Firstly, and more importantly, the mechanism ensures fairness in the sense that, if a fraction of the district’s water is sold using the mechanism, then each irrigator is guaranteed to receive a portion of the auction proceeds as large as or larger than the price that he or she believes is sufficient individual recompense. This first characteristic could help to reduce anger and resistance, when the water rights are to be resumed by government and the owners compensated. Possibly, its fairness may help to secure the voluntary adoption of the Shapiro-Pincus mechanism, amongst irrigators and governments. Secondly, the Shapiro-Pincus auction mechanism tests if the water is valued more elsewhere, than in its current uses. This characteristic will reassure economists in Treasury and elsewhere, that water will be moving from lower- to higher-valued uses.

As mentioned, there are interests other than those of the irrigators and the irrigation companies or cooperatives, also affected by the sale of water outside of a district. The losers include firms supplying into the district, material or equipment used on irrigated but not on non-irrigated farms, or providing irrigation-specific services; or firms servicing farms and farm families whose business falls or even disappears if farm output in the district changes in volume or composition; and their employees, and so on. (There will be winners, also.) The auction mechanism discussed in this paper does not compensate these other affected interests. The losers are candidates for targeted adjustment assistance, to ease the transition to the new economic and social environment.\(^8\)

The significance of the Shapiro-Pincus mechanism is that it provides a financial incentive for the individual owners of assets to reveal honestly (to their irrigation district or to the auction authority) the true minimum prices at which they would be willing to sell, or the true minimum compensation that they would be willing to accept. This ‘revelation’ result is explained in section 3 and is proved formally in Shapiro and Pincus (2008). It depends on the individuals having simple financial motivations, in the sense that they consider what monetary payment would compensate them not only for the financial consequences of the diminution or loss of their usual business\(^9\), but also for the disruption of their usual lives, the loss of their community and the like. Individual irrigators may have commitments to irrigated farming in their district; or may be concerned that the closure of the irrigation district will hurt friends, family, or others whom they wish not to be hurt; or will damage their regional community more broadly. Government structural adjustment assistance, to ease these concerns, may be a better use of public monies, than are the schemes for modernizing the irrigation infrastructure of what are possibly uneconomic districts. Nonetheless, so long as these concerns can be assuaged by monetary compensation paid to the irrigator, then the Shapiro-Pincus mechanism will do its work.

\(^7\) As is explained in Shapiro and Pincus (2008), the mechanism is a development of those proposed by Lehavi and Licht (2007) and Heller and Hill (2007). Montero (2008) proposes an auction system with shared proceeds, where the shares are set so as to solve optimally a revelation problem of the commons. See also Buchanan and Yoon (2000).

\(^8\) Pincus and Shapiro (2008), in the context of urban development approvals, indicates how the auction can be extended so that these spillover effects can be ‘internalized’. However, this extended version of the auction seems to have little application in the present case.

\(^9\) The subjective value may be based not only on the value of use by the owner; the owner may be holding the property in the expectation of selling to a developer, for a handsome price.
However, for some individuals there may be concerns that are ‘beyond the measuring rod of money’. Specifically, for altruistic or ideological reasons some individual irrigators may decide to undermine the auction itself, and ensure that it fails, despite its success being to their own financial advantage. Within reason, no amount of money may induce them to sell. The possibility of such non-compensable losses leads us, in Section 6, to suggest supplementing the mechanism with justifiable but somewhat ad hoc rule, to be used when water entitlements are compulsorily acquired.

3 Under threat of compulsory acquisition
The Shapiro-Pincus auction mechanism was devised to deal with situation in which a background threat of resumption is used to force owners to participate in a collective sale. The water or water entitlements to be put on offer at auction are those of irrigation districts, not of individual irrigators. Competitive bidding is required at the auction, for the mechanism to do its work. That is, bidders should not be restricted to governments, but could include other irrigation districts, water traders, not-for-profit organizations seeking environmental water, urban water agencies, etc. Indeed, the Shapiro-Pincus mechanism would work best in ‘thick’ auctions.

There are three elements: auction shares; nomination of minimum compensation; and a secret auction reserve. Firstly, there is a preliminary and non-negotiable assignment of individual shares in any auction proceeds. Next, each individual irrigator will nominate the minimum compensation at which he or she would be a willing seller. Lastly, a secret reserve is set to ensure that there will be no sale unless all individuals receive at least what they have nominated as the minimum acceptable compensation. For arithmetical reasons, the required reserve is the maximum of the ratios of the individual minimum compensations, divided by their respective shares in the auction.

This set-up induces the individuals to reveal true claims for minimum compensation from the auction proceeds, not falsely-inflated ones. In Shapiro and Pincus (2008), we present a formal mathematical proof of this surprising claim, which is explained informally now.

Consider the financial consequences for an individual irrigator of communicating to the district or auction authority an untruthful high nomination of the minimum price at which he or she would be a willing seller. Inflating his or her announced minimum price does not increase his or her payment, if a sale of the district’s asset goes through—this is because the distributed payment to each irrigator is a fixed percent or fraction of any sale proceeds. Now, it is the case that an untruthfully-high minimum compensation can raise the reserve price. However, and this is crucial, there is no financial upside, only a possible downside. Notice first that, since the reserve is secret, changing the reserve will not change the size of the highest bid—and the highest bid, if it in excess of the reserve, it what is shared with the individual irrigator. However, an artificially-high nomination could raise the reserve so that it exceeds the (yet-to-be-revealed) highest bid, when otherwise it would not have. If so, then no sale takes place when, other than for the untruthfully-high nomination, a sale would have taken place. Such a lost sale would have paid the individual at least the minimum price that he or she truly regards as satisfactory.\(^\text{10}\)

\(^{10}\) Specifically, a rise in an individual’s nominated minimum price for his or her property will increase the reserve only if that minimum price ‘determines’ the reserve (that is, if it is the nominated compensation become the
It is in this sense that there is no financial upside of an inflated nomination, only downside. On similar reasoning, the announcement of an untruthfully-low minimum price will not improve the expected financial value of the auction to the individual irrigator. That is, by ‘manipulating’ his or her announced minimum price, the individual cannot gain financially.

We have not specified how the shares in the auction should be determined. Because individual irrigators have pre-assigned shares to the district’s water, then those shares would seem to the obvious candidate. However, it may require government to set the shares directly, or to mandate the method by which shares are determined.11

The mechanism is fair in the sense that no one ends up with less than just compensation. This is because the reserve is set so that the sale will not go through unless the auction price is sufficient to compensate each irrigator for what he or she has nominated as the required minimum amount. Note, however, that if a sale is made, then the irrigators will receive more than these minimum amounts—the winning bid will exceed the sum of the minimum prices of the individual parcels.12 That is, there will be a sellers’ surplus. For the Shapiro-Pincus auction to have the desired effect of eliciting true minimum prices, that surplus cannot be distributed separately: the whole of the winning bid must be distributed according to the shares. Those who have low minimum prices, relative to auction share, would obtain more of the surplus than those with relatively high ratios of minimum price to share. It is possible that this distribution of the surplus could itself be considered unfair. However, to the extent that some individual irrigators are paid more, at least that is the result of a market-like test of the value of the water or entitlements, rather than through some judicial or statutory dispensation.13

Because the sale will not proceed unless each irrigator will receive his or her true minimum compensation, the Shapiro-Pincus auction provides a reasonably accurate test of economic efficiency, by answering the following question—Is the use of the water outside the district more valuable than its use within the district, or not?

Although, for convenience of exposition, the Shapiro-Pincus auction has been discussed in terms of the sale of all of a district’s irrigation water, the same mechanism could be used to test the market for the sale of any fraction of the aggregate water entitlements, common across irrigators in the district (eg,
half); and this may well be more attractive to irrigation districts, than is an auction of all the water or entitlements. 14

The financial incentive that the Shapiro-Pincus mechanism provides for irrigators to reveal what they truly require by way of minimum compensation, does not depend on how the auction shares are determined, so long as they are non-negotiable, fixed, and sum to 100 per cent. However, the accuracy of the Shapiro-Pincus auction, as a test of economic efficiency, does depend on the correlation between the shares assigned to the individual irrigators, and the minimum prices they each announce. If the correlation were perfect, then the secret reserve would be easy to choose, because the value of the ratio of individual minimum price to share would be the same for everyone. In these unlikely circumstances, the mechanism cannot make the error of rejecting the change in the ownership or use of the water, when in fact a change would improve economic efficiency. Otherwise, the share mechanism does influence the efficiency of the Shapiro-Pincus auction. However, unless the correlation between share and minimum price is quite low, the mechanism we propose will provide a reasonably accurate test of economic efficiency. 15

4 Unanimous agreement to offer to sell

Thus far, we have categorised the proposed auction mechanism as being intermediate between compulsory acquisition (with compensation) and voluntary sale. The element of compulsion is that all irrigators in the district are required to participate (and, maybe, that there is an authoritative determination of the auction shares). The element of voluntarism is that no one is forced to sell at less than his or her nominated minimum compensation. However, the mechanism may be attractive as a means of bringing all the irrigators into voluntary agreement to test the market, collectively.

There are two reasons to discuss this possibility. Firstly, what the individual irrigators in NSW own are shares in any water that is made available; and they can sell that water only with the agreement of irrigator-owned cooperative. Collective agreement is needed. This first reason probably needs no further discussion, except to note that voluntary agreements may be stimulated by the recent public suggestions that compulsory resumption may be required in the Murray-Darling Basin.

Secondly, there may be more value generated by a coordinated or collective sale of water, than arises from a series of individual sales from the district. The Shapiro-Pincus auction provides a ‘market test’ of the change in the ‘ownership’ and use of the water or entitlements: Is the new, proposed use more

---

14 Possibly, also, the mechanism could be adapted to permit different irrigators to offer, into the aggregate, different proportions of their entitlements. However, the resultant situation may to be too complex to be practical. The complexity arises from the need for each irrigator to arrive at a minimum price at which he or she is willing to sell water, in circumstances in which other irrigators are offering for sale different percentages of their entitlements.

15 Any excess of the secret reserve over the sum of the individual minimum prices has an implication for the efficiency of the auction. The larger is the excess, the more likely that the highest bid will fall below the secret reserve, but above the sum of the minimum prices, and so the sale will not go through even though it would have satisfied the test of economic efficiency. However, we surmise that the Shapiro-Pincus auction will generally provide a much better test of efficiency, than occurs under current arrangements.
valuable than the current uses, where the current value is the sum of the subjective values placed by their owners on the individual ‘properties’ in their individual use? Of course, each owner could have tested the market, with regards to his or her own water or entitlement (subject to agreement of the irrigation district). However, the Shapiro-Pincus mechanism tests whether the process of assembly or aggregation itself adds value: when offered as an aggregate, is the value greater than the total value of the assets considered separately.

From whence could this extra value spring? For prospective buyers, a ‘lump’ of water may be needed to justify the making of ‘lumpy’ complementary investments—for example, a pipeline; alternatively, a minimum amount of water may be needed to achieve a desired result, for example, from flooding an environmentally-sensitive area; or, the alternative use of the land—e.g., a wild-life sanctuary—may not be economical or feasible if some parts of the district remain in irrigation. For the irrigation district, as was explained earlier, economies of scale or scope in local delivery of water, or in the supply of non-irrigation inputs, may mean that a choice should be made between operating at something like the past levels, or not at all.

As before, the elements of the mechanism are a competitive auction; sharing any auction proceeds; nomination by the individual irrigators of minimum compensation required; a secret reserve set to ensure no one is paid less than those minima. The same incentive would be brought to bear, for truthful nomination of the individually-required minimum compensation.16

A final comment: the case for the use by government of compulsory resumption is generally based on claims about there being high costs of voluntary coordination and agreement; or cost in delay—when there is an advantage of collective as opposed to individual sales, some irrigators may decide to ‘hold out’ for larger shares or higher prices. If more attempts at voluntary sale are permitted and made, then the case for compulsion may be weakened.

5 Contriving a supply curve for the MDBC
This section discusses the possible use of the Shapiro-Pincus mechanism within irrigation districts, if the MDBC (or some other body) were to call for tenders from NSW irrigation districts for the sale of water (for environmental purposes). The MDBC can avoid generating an incentive for individual irrigators not to tell the truth about the minimum compensation that they each require, by paying a previously-secret price to successful tenders. Unfortunately, this may be a satisfactory tactic for a once-only tender process, not a series. Nonetheless, the mechanism may still have some attraction, in bringing irrigation districts to respond to requests for tender of sale.

Consider a district deciding its response to a request from the MDBC to tender water or entitlements for sale. To simplify matters, the district is considering offering some fraction of the district’s water or entitlements, with the same fraction being applied to all of the district’s irrigators. As before, the

---

16 Because the cooperative have been used to making collective decisions, it is possible that there will be negotiations among the parties, and that the reserve could be set closer to the theoretical minimum, which is the sum of the individual minimum requirements for compensation.
mechanism requires that each irrigator inform the district of the price at which he or she would be a willing seller. If the district succeeds in the tender, then each irrigator is to be compensated at least as much as he or she states is individually required. To arrive at the required offer price for the tender, so as to meet these minimum compensations, the district takes the highest of the ratios of minimum price to share. This becomes its tender offer price, T. If that tender price is accepted, and the proceeds are distributed according to the shares, then every individual irrigator will receive at least what he or she asked for.

The Shapiro-Pincus mechanism is ‘incentive-compatible’ only when there is uncertainty in the minds of the irrigators about whether the district will succeed in selling water through the tender and, if so, at what price. If the MDBC used a strategy in which it secretly sets itself a price at which it would purchase the cheapest water on offer, then there would be no link between this price and what individual irrigators nominate as their minimum compensation. As in the earlier cases, an artificially-high nomination could mean that the district does not succeed in selling the water it is offering; but, if it does succeed in selling, then the price paid to the district would not be influenced by the artificially-high nomination, nor would the payments made to the individual irrigators in the district. In these circumstances, the financial incentive to nominate true minima would be retained.

However, setting a secret price in advance of a tender may be implausible or infeasible for a public body like the MDBC, especially if it seeks to purchase a pre-announced quantity of water before a given date. If the Commission does not succeed in securing all that it wants in the first tender, then it may attempt another. From a public relations or political point of view it may be hard to the Commission subsequently to offer prices higher than the price it paid for the earlier tender; yet, to elicit additional offers, higher prices may be exactly what are required. The knowledge of a price floor will open the possibility that untruthful nominations would advantageous.

There is an alternative for the MDBC, one which does not preserve the incentive for truth nomination of minimum compensation, but which still may be worth considering. The MDBC may announce the maximum aggregate volume that it wishes to purchase, and go into the tender process with a demand curve in mind, rather than a single, fixed but secret price. That is, the MDBC would keep secret the kind of prices that it would be willing to pay, as well as its maximum budget for this specific tender. The tender offers would be evaluated by the MDBC according to the Commission’s calculation of the costs of the water when delivered to the various iconic sites. The site- and source-specific delivery costs, including allowances for evaporation etc, would be announced with the call for tender. A district sells to the MDBC only is its tender offer price, T, plus costs of delivery is no greater than the “delivered” water price, P, which is set by the MDBC after examining the various offers. That is, the MDBC would choose the price-quantity combination at the intersection of the supply curve and its own demand schedule. Successful tenders would receive the common “delivered” price, P, less the site-specific costs of delivery: the net prices will vary for each supplying district.

In contrast with the earlier situation, here the Shapiro-Pincus mechanism does not eliminate all incentives to exaggerate the required minimum compensation. This is because the final price that the MDBC sets will depend on the various tender prices on offer. Therefore, the final price paid by the
MDBC is not independent of what individual irrigators nominate as their minimum compensation. Thus, if a district’s tender price is ‘artificially’ raised, this may mean that the district does not sell anything to the MDBC; but it also may mean that it gets to sell at a higher price than otherwise. This is a risky strategy, but is not (as in earlier cases) a strategy dominated financially by truth-telling. Also, communication among individual irrigations, as to their intentions, which may be legal and in any case would be very hard to prevent, would also damage the tender process (as would illegal collusion across irrigation districts). However, these two objections may not be decisive reasons for the MDBC not to experiment with the mechanism.

6 Limitations

Earlier it was argued that, for ‘property’ threatened with being ‘taken’ by government through the power of eminent domain, the Shapiro-Pincus mechanism tests whether value is added by the very fact of aggregating the separate ‘properties’ into one single ‘property’. For irrigation water the Shapiro-Pincus mechanism tests whether selling all of the district’s water as an aggregate, is more valuable than selling each irrigator’s rights, irrigator by irrigator. A similar test can be made, regarding selling a fraction (say, 4 per cent) of the water entitlements: sell it as an aggregate, or sell it individually? Under the current arrangements, there is a collectively-owned right within each irrigation area, to control the sales by the individual irrigators. The Shapiro-Pincus mechanism assigns individual fixed shares in the value of the collective asset. In effect, it ‘assembles’ an aggregated asset, in such a manner as to make it more attractive for the owners to sell or purchasers to buy.

The mechanism is designed to provide a financial environment in which telling the truth is the best option. However, the force of this incentive depends on its size. The financial ‘penalty’ suffered from exaggeration is that a sale does not occur which, had it gone through, would have paid the individual at least what he or she truly believes is just compensation; and would have been paid more than that minimum in most cases. When discussing the use of the Shapiro-Pincus mechanism under the threat of compulsion (section 3), we have assumed that, in deciding upon the required minimum compensation, the irrigator takes into account not only strictly financial costs or lost opportunities, but also subjective feelings about the loss of accustomed ways of life and so on, as well as the deleterious effects on others. So long as nothing is ‘beyond the measuring rod of money’, then it is accommodated. However, there are ideological and similar motives to be considered, which may be sufficiently strong to induce the irrigator to forgo the financial advantages. For example, an irrigator may strongly disapprove of any efforts to reduce the use of irrigation water; or strongly disapprove of the means being used to achieve that end, which include compulsion or the threat of compulsion. By nominating an extraordinarily-high claim for compensation, a single irrigator can abort the auction; and may well decide that the financial ‘price’ is worth paying.17

17 Pincus and Shapiro (2008) discusses the possibility of extraordinarily-high but genuine demands for compensation; that is, what to do when there are (in technical terms) huge differences between compensating variation and equivalent variation.
Ultimately, the question is when it is reasonable for government to permit individuals, through voluntary or market-like means, to de-rail the pursuit of public policy objectives. In some similar circumstances, Australian law over-rides individual preferences: the use of eminent domain is a prime example in itself; so is the corporations' law on compulsory acquisition of minority shareholdings. Less forcefully, government may decree some upper limit on the nominated minimum compensation within the proposed scheme—for example, 150 per cent of the market price of water or entitlements. The effect, however, may be to provide a benchmark, and so render the scheme rather pointless.

7 Conclusions
This paper has outlined a mechanism for eliciting truthful information about the minimum compensation that an irrigator needs, in order to transfer ownership of water or water entitlements. The mechanism—competitive auction, shares in proceeds, secret reserve, nominations of minimum required compensation—could be useful as an intermediate step between voluntary sale and compulsory acquisition. It would work best if public authorities competed in water markets, rather than colluded. And the mechanism would work best if it had broad support amongst the irrigators and their organisations—then it could be applied in its wholly voluntary form, which may encourage relaxation of limits and charges imposed on water trades.

18 Compulsory acquisition of minority shareholdings of a public company can be triggered when one owner has 90 per cent of the shares.
References


