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interregional water trade

efficiency impacts of exit fees

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- *Exit fees can distort interregional trade in water and generate a net economic loss compared with open trade.*
- *Economic losses escalate at an increasing rate with increasing exit fees until the point where water trade is no longer profitable.*
- *The cost of the exit fee would be shared between the buyer and the seller of the water entitlement, with the distribution depending on the nature of water demand in each region. As demand is more elastic in the longer term, the distorting effects on trade become larger over time.*
- *Unbundling water access rights from delivery access rights and attaching the access fee (either annually or as a lump sum) to the delivery right would be a more efficient means of addressing the third party impacts of trade on delivery system costs. Unbundling would decouple recurrent nonvolumetric costs from the volume of water traded, allowing buyers and sellers to trade at market prices that reflected the true costs and returns from water use.*

what are 'exit fees'?

One mechanism proposed for managing the third party impacts of trading water rights out of one supply district and into another is the imposition of exit fees on irrigators who sell their water entitlements. Exit fees are a once-off payment by irrigators to the irrigation utility when access to delivery services is no longer required. The rationale for irrigation utilities imposing exit fees on irrigators for entitlements leaving a district appears to be that remaining irrigators should not be required to pay higher charges (that arise as a consequence of a smaller customer base) to cover the fixed costs of water supply. This reduces the potential for the stranding of irrigation assets.

introduction

A central objective of the National Water Initiative is to increase the productivity and efficiency of Australia's water use. This will require a commitment to facilitating water trade. However, recurrent costs that are not dependent on the volume of water delivered are a concern for irrigators and irrigation utilities in schemes where these costs are spread over a smaller customer base as a result of permanent out of scheme trade. This could lead to the 'stranding' of assets – a situation that can occur when an irrigation utility has large fixed infrastructure costs and fewer customers. Under the National Water Initiative, signatories have committed to managing any third party impacts that arise from trade, and it is important that these effects are addressed in an efficient manner.

Exit fees have been proposed as a means of managing these third party impacts. They could be used to mitigate the financial impact on irrigators remaining in a system when other irrigators are trading water out of that system, and to maintain the utility's revenue base from water supply activities. While determining what costs should be included in the exit fee is not the focus in this article, Brinsley et al.

(2000) propose that the fee be calculated as the net present value of any outstanding future charges that individual irrigators would have faced had they remained in the system. However, exit fees would lead to economic losses if they reduced the potential gains from trade.

The purpose in this article is to consider the economic implications of imposing exit fees on permanent out of scheme water trade. The 'unbundling' of water rights and infrastructure access rights is considered in the concluding remarks as a preferred approach to managing the financial impacts on irrigators remaining in a supply system that is a net exporter of water.

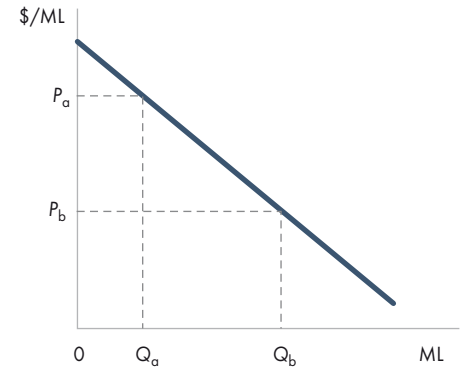
water trade and exit fees

determining the optimal level of water use

A demand curve shows the optimal level of water use over a range of different opportunity costs of water use. From a buyer's perspective, each point on a demand curve shows the maximum price a buyer is willing to pay for a given volume of water. From a seller's perspective, each point on the demand curve shows the minimum price a seller would be willing to accept to forgo a given volume of water use.

Figure A shows an illustrative water demand curve. An irrigator would be willing to pay up to price P_a to purchase Q_a megalitres of water. Conversely, if an irrigator owned Q_b megalitres of water, P_a is the minimum price that the irrigator would accept to place Q_b–Q_a megalitres of water for sale on the open market. At higher volumes of water purchased or sold, prices decline – for example, P_b is the maximum purchase price for the volume of water Q_b. This reflects the assumption that additional water would be used in lower returning activities or that the value of increased use on existing activities would decline.

A **water demand curve**

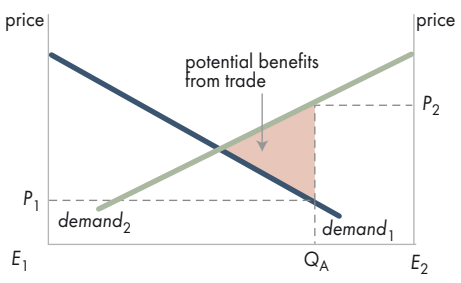


free trade between regions

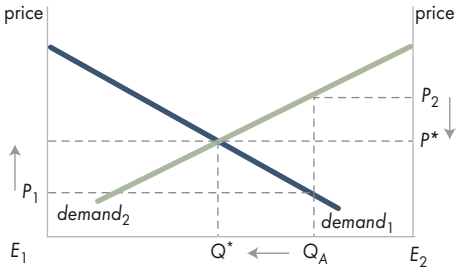
If there were free trade within regions, all irrigators would face a common opportunity cost equal to the market price, exclusive of any delivery charge. As a consequence, a regional water demand curve could be represented in the same way as for a single irrigator. Figure B illustrates the demand for water by irrigators in two regions. Water demand in region 1 descends from the right. The sum of the two region's demand is equal to the total supply of water within both regions and is shown E_1E_2. The demand curve for region 1 is drawn as in figure A. The demand curve for irrigators in region 2 is drawn such that the quantity of water available for irrigators in this region increases as you move from point E_1 to E_2.

In a situation where interregional trade was not allowed, the total supply of water is assumed to be divided between regions such that region 1 would

B **water demand with two regions**



C water demand between two regions



have E_1Q_A megalitres of water and region 2 would have E_2Q_A megalitres of water. Profits for irrigators in regions 1 and 2 would be maximised at P_1 and P_2 respectively.

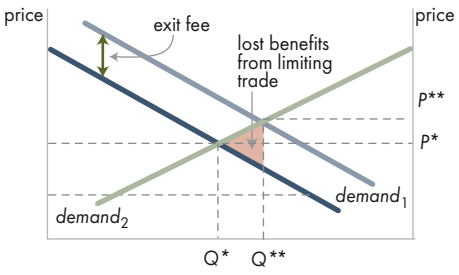
Water would be inefficiently allocated if inter-regional trade were not allowed as there would be potential gains from trade that were not realised. The potential benefits from free interregional trade are represented by the shaded triangle in figure B.

If interregional trade were allowed, a market price would be established such that the marginal returns from water use were equalised in each region (figure C). Starting from the no trade equilibrium of Q_A, it can be seen that the marginal return that irrigators in region 1 receive from the last megalitre of water used would be less than the marginal return that irrigators in region 2 received. Therefore it would be in the interests of both parties to trade that megalitre of water out of region 1 into region 2 at a market price somewhere between P_1 and P_2. This would increase the profitability of irrigators in both the exporting region (1) and importing region (2), with trade facilitating the transfer of water to a higher value use.

With free interregional trade, the efficient allocation of water would occur at Q^*P^*. It would not be possible to increase the gains from trade beyond this point as the net return of expanding water use in one region would be less than the net loss of reduced water use in the other.

efficiency impacts of exit fees

D water demand between two regions with exit fees



Introducing an exit fee on the sale of water would drive a 'wedge' between the price that the buyer (importer) would pay and the price that the seller (exporter) would receive. It would effectively act as a tax on permanent out of district water sales. While the maximum price that a buyer would be willing to pay for a given volume of water would be unchanged, the minimum price that a seller would be willing to accept would now include the exit fee. The demand curve in the importing region (2) would be unaffected but the demand curve in the exporting region (1) would be shifted upward, as shown in figure D.

A shift in the demand curve would mean that at each volume, a higher acceptance price, by the amount equal to the exit fee, would be required to compensate the seller. This is because sellers would have to pay the exit fee from the post-trade revenue that they received from the sale of water, reducing the effective price that these irrigators would receive from selling water. This would reduce the quantity of water that these irrigators were willing to sell, which would in turn lead to an increase in the traded price of water and lower demand for water in the importing region. This is shown in figure D – the volume of water traded would fall from Q^* to Q^{**} and the trade price increases from P^* to P^{**}. There is a commensurate economic loss compared with open trade.

Goesch et al. (2006) developed a stylised model of three irrigation regions, with water demand representative of typical irrigation districts in the southern Murray Darling

Basin, to examine the efficiency impacts exit fees. The price of water in each region before interregional trade was introduced were assumed and set at a level such that the marginal value of water in one region was significantly higher than in the other two, creating economic benefits from water trade.

Goesch et al. (2006) found that the larger the exit fee as a proportion of the traded price of water the larger would be the economic losses when compared with open trade. This would continue to the point where water trade was no longer profitable. For example, an exit fee levied on both exporting regions at 10 per cent of the traded price of water would result in economic losses of around 1.4 per cent compared with open trade, whereas a 30 per cent exit fee would reduce economic efficiency by around 18 per cent. The analysis also found that trade would cease when the exit fee reached 70 per cent of the traded price of water, and all potential economic benefits from trade would be lost.

Importantly, the modeling indicated that exit fees that were a small proportion of the traded price of water would lead to a relatively small economic loss compared with open trade but the economic losses would increase at an increasing rate as exit fees increased.

different exit fees between regions

There are likely to be two main implications if irrigation regions imposed exit fees differently or if some regions chose not to levy exit fees at all: first, the volume of water traded would be reduced compared with open trade (as explained above); and, second, the composition of trade would change – that is, the source of the water would change. The composition of trade would be changed as exit fees would alter the relative price of water in each exporting region until a new equilibrium was reached.

Using the three region model developed in Goesch et al. (2006), the authors found that the efficiency losses from imposing exit fees in only one exporting region would be less than if they were imposed on both exporting regions. For example, an exit fee equivalent to 30 per cent of the traded price of water imposed on irrigators in only one region would result in economic losses of around 3 per cent compared with open trade, whereas the imposition of a 30 per cent exit fee on both exporting regions would result in economic losses of 18 per cent.

High exit fees in one exporting region would tend to encourage trade to those with lower fees. Goesch et al. (2006) showed that an exit fee set at 70 per cent of the trade price of water would concentrate all trade to other exporting regions. The presence of excessively high exit fees in some regions could arise if, for example, the cost of future infrastructure renewal or a share of the volumetric costs of delivery were included.

The imposition of differential exit fees would be likely to provide an incentive for irrigation utilities to lift their fees to levels comparable with other regions. The ongoing escalation of exit fees would impose further efficiency losses.

It is important to note, however, that the fixed and variable costs of water delivery could vary significantly between regions if, for example, one used a gravity feed system and another used pressurised pumps. Provided exit fees were calculated to reflect the fixed costs of water supply, higher exit fees in some regions than in others would not create (further) inefficiencies by distorting trade or production patterns.

Nevertheless, the purchase of water entitlements for environmental purposes would also be concentrated in regions with lower exit fees. In turn, lower exit fees in some supply districts would tend to concentrate the regional flow-on effects of reduced water availability.

distributional effects of exit fees

The cost of an exit fee would be shared between the buyer and the seller of the water entitlement, with the distribution depending on the nature of water demand in each region. Irrigators with less flexibility to adjust their agricultural operations would tend to have more inelastic demand and would bear a greater proportion of the cost of the exit fee. Those with more elastic demand would most likely have more flexibility to manage their operations to mitigate the effects of the imposition of exit fees on water price.

Overall, both buyers and sellers of water entitlements would be worse off when faced with exit fees compared with a free trade scenario. Sellers would be worse off if, for example, the exit fee locked water into low returning activities and opportunities for trade were forgone. As discussed above, buyers would be worse off if they had relatively inelastic demand and the price of water increased to compensate sellers for the cost of the exit fee.

If exit fees were calculated to reflect the capitalised annual recurrent costs of supply services, water utilities should be no worse off than if there were no out of scheme trade. Compared with a open trade situation, exit fees would represent a transfer of wealth from entitlement sellers to the irrigators remaining in the system (via the water utility) as access fees for those remaining would stay the same as pretrade levels. At the regional level, the distributional impacts would be less certain and would depend on the demand characteristics of each supply district and the level at which an exit fee was set.

The distorting effects of exit fees on water trade would be smaller in water volume terms the more inelastic was the demand for water. As water demand is more elastic over the longer term, the distorting effect of exit fees on trade would become larger the longer they were in place. This, in turn, would lead to a distortion in long term investment if exit fees were maintained.

concluding remarks

The presence of any exit fee would reduce the volume of trade compared with what would have occurred under open trade and would lower the returns that irrigators received when they sold water. Importantly, the efficiency losses from exit fees would increase at an increasing rate as the exit fee would become a larger proportion of the trade price of water. The greater the number of regions that imposed exit fees and the longer they were in place, the larger would be the economic losses compared with open trade.

'Unbundling' water entitlements from access rights to the infrastructure and recouping delivery costs on the basis of the infrastructure rights may be a more appropriate method than charging exit fees to maintain a utility's revenue base if water rights permanently left the district.

Unbundling offers the advantage of decoupling infrastructure costs from trade in either water allocations or longer term entitlements. If the situation arose where the costs associated with unbundling water rights could not be justified, an alternative approach could be to attach the infrastructure access fees to the land serviced by the infrastructure (PriceWaterhouseCoopers 2006).

If infrastructure access rights were unbundled, irrigators could be required to pay the access charge annually. Alternatively, the annual access charge could be converted into a lump sum of the net preset value of the charges that the irrigator would have been liable for had they remained in the system. If this liability was independent of whether an irrigator elected to trade all or part of their entitlement, the incentive for trade would not

be distorted. The decision to put an additional megalitre on the market would not increase their liability over fixed costs; hence the trade would be made as long as the offer price was greater than the net value of using that megalitre on farm. If infrastructure costs were unbundled, buyers and sellers would be able to trade at market prices that reflected the true costs and returns from water use. At the same time, the remaining irrigators would not face higher infrastructure access fees.

Unbundling would also avoid the situation where an irrigation utility received an exit fee paid on water leaving the system and another irrigator who wished to enter the system paid the annual access fee.

If water rights were unbundled, an irrigator could trade water and infrastructure access in separate markets. If a buyer for the infrastructure access right could not be found, the irrigator could choose to continue to pay the annual access charge or a lump sum reflecting the capitalised value of the annual access fee. In the event that a buyer could not be found for the right to the infrastructure, an irrigator would be in the same position as if the rights remained bundled. That is, he or she would remain liable for the ongoing fixed costs of water delivery. If the delivery system was congested, the price of the access right might exceed the capitalised value of the annual access fees and the irrigator selling the access right might be able to earn a resource rent (profit).

As with all policy interventions, it is important that the benefits of unbundling the water resource rights from the delivery access rights exceed the transactions costs of doing so. In the context considered here, unbundling would have the greatest benefits in regions that were likely to be net importers of permanent water. In addition to the reason outlined above, unbundling and establishing a market for infrastructure capacity would be an effective and efficient mechanism for allocating delivery access, particularly if the system was congested.

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