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# Water Policy Development: An Application to Inter-State Trade

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## Abstract

In February 1994 the Council of Australian Governments (COAG) endorsed a strategic framework for water sector reform in Australia to be implemented by the year 2001. In response to the COAG strategy this project was initiated to examine the impact of water market deregulation. This project involves two stages. Firstly, deregulation of trade at the intra-state level and evaluation of the economic impact upon irrigation regions. Secondly, inter-state trade in water is examined. The aim of the project is to determine the economic impact of subsidy to a "state water authority", and the effect this has on the level and direction of trade between states. The model contains production systems representing irrigation regions, which are integrated into a spatial trade model. Linear programming techniques (*What'sBest!©*) were used to compute the regional water supply and demand curves and the spatial trade environment. The regional and spatial models are optimised subject to biophysical, channel and land constraints.

Keywords: irrigation water, spatial equilibrium, microeconomic reform

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[1] The views expressed in this paper are those of the authors, rather than those of Department Natural Resources and Environment or the Victorian Government.

# 1. INTRODUCTION

In February 1994, the Council of Australian Governments (COAG) endorsed a strategic framework for water sector reform in Australia to be implemented by the year 2001. In response to the COAG strategy, a major project was initiated by the Economics Branch and the Water Bureau of the Victorian Department of Natural Resources and Environment (DNRE[2]) in association with NSW Agriculture (see Jones, R., and Fagan, M., 1996), to assess the economic welfare effects of different water policy reforms.

A Water Policy Model (WPM) was developed to facilitate evaluation of a number of policy options (Eigenraam, M., et al, 1996a). The WPM was initiated to provide economic information on intra and inter-state water policy reform. The development of the WPM allows for the examination of the institutional and physical parameters influencing the trade of water, and provides for transparency in policy development and a forum for discussion. In this paper, the WPM is used to examine the impact of price deregulation on economic efficiency in the water market. The WPM provides trade estimates for the calculation of economic surplus measures to demonstrate the distortions on both the intra- and inter- state trade in water. Appendix I outlines concurrent research issues being examined with the WPM framework.

This paper highlights the need for a common approach on key issues affecting bulk water prices in all states. However, the paper does not purport to provide an approach on how water should be priced.

# 2. WATER POLICY REFORM

With changes to the Australian economy, particularly the move to improve economic efficiency through microeconomic reform, and broad community concerns about environmental degradation, there has been considerable attention focused on improving the process of resource allocation in the irrigation industry. Where possible, this has involved the introduction of market based mechanisms to replace the highly regulated approaches of the past. Substantial investment has also been made in salinity control and river environment protection.

In order for permanent inter-state trade in transferable water entitlements (TWE) to occur, water markets need to be deregulated and water entitlements re-defined. Water moving between states will have an impact upon state sovereignty, irrigation security and the future development of the irrigation industry.

Changes to irrigation water prices introduced by water authorities, aim to reflect the criteria outlined by the (COAG) Expert Group on Asset Valuation Methods and Cost Recovery. The "full economic cost" of water is defined by COAG as including:

- operating and maintenance costs,
- administrative costs,

[2] Formerly the Victorian Departments of Agriculture and Conservation and Natural Resources.

- externalities (resource degradation), and
- gross operating surplus (opportunity cost of capital plus replacement cost depreciation).

The volume and direction of trade in water will be influenced by the relative size of the fixed and marginal costs of water delivery (assuming there is no change to the production systems currently in place). Clearly regions and/or states with subsidised water prices will command greater purchasing power than if water prices reflect the full resource costs. If a region's consumption of water is subsidised there are likely to be economic efficiency costs in the water market resulting in the misallocation of water resources between states and regions.

## 2.1 Water Pricing Issues[3]

"Full economic cost" as defined by COAG can be interpreted by government and pricing regulators in a myriad of ways. Both Victorian and NSW regulators consider that their irrigators have achieved or are on track to achieve full cost recovery, although the definition of full cost recovery differs between government.

Victorian irrigators pay the full cost of delivery for water. In NSW the full cost of delivery is met by both the government and water users. The following section outlines how the states differ in their respective views of full economic cost.

### *2.1.1 Victorian Pricing Policy*[4]

Currently, Victorian water prices incorporate the cost of maintaining and renewing existing irrigation infrastructure (renewals accounting), administration and bulk water charges. The Victorian approach to full cost recovery differs from the COAG methods in that it fails to pass on the cost of externalities associated with resource management and the spillovers attributable to water use. These may include salinity, nutrient run-off and water recharge issues. A large proportion of these costs are met by the government through a variety of programs. In many cases a monetary value has yet to be determined for environmental externalities.

One of the other main differences between the Victorian government and the COAG approach is the treatment of Community Service Obligations (CSO). In Victoria, a CSO is provided for some identifiable community or social benefit and is the result of a specific government directive. The CSO would not be supplied, or would not be supplied on the same conditions, by a Government Business Enterprise if it were acting in its own primary interest. Accordingly, Victoria apportions run of river[5] and headworks costs to the primary beneficiaries that can be identified and targeted. Generally, the costs associated with the supply of water are met by the rural user as the primary beneficiary of the system. There are no costs associated with the supply of water that are considered to be community service obligations of Government.

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[3] Discussion Paper, 'Bulk Water Charges for Interstate Trade', Water Bureau (1996), Department Natural Resources and Environment, Victoria.

[4] Op. Cit.

[5] "run of river" costs associated with water delivery.

### *2.1.2 NSW Pricing Policy*[6]

In NSW the rural water user meets 70% of the run of river or product delivery costs. The remaining 30% of run of river costs and capital costs of headworks and their operation are met by government. In September 1995 the NSW Government introduced a per ML charge of $1.35 to recover some resource management and maintenance costs. The charge was aimed at contributing to the cost of externalities and contributing towards the maintenance of the headworks.

The costs associated with the headworks and 30% of the run of river costs are deemed the responsibility of CSO's. The result of such a policy is that NSW irrigators receive relatively cheaper water than their Victorian counterparts.

As a result of the NSW Governments water pricing policy, NSW irrigators face the following cost structure:

- No headworks component (except for a small component of the $1.35 water management charge);
- 70:30 split on "run of river" costs;
- 100% of "in district" water delivery costs;
- all licensed users now pay the full cost of licensing activities.

### *2.1.3 Subsidy*

The bulk water prices charged for water in Victoria and NSW are $6.14 and $1.48 to $1.63 (plus $1.35) respectively. For ease of calculation the difference is modelled at $5.00[7]. Preliminary investigations into the maintenance costs of local infrastructure in NSW have revealed state government transfers. These vary between the irrigation regions with some receiving up to $10.00 per ML for water consumed (Pagan et al 1997). Two scenarios will be modelled, a subsidy of $5.00 and $10.00 with a low and average allocation.

The following section outlines the impact of the states' pricing policies in economic terms, and provides an overview of the methodology used to measure the impact.

# 3. ECONOMIC FRAMEWORK

Microeconomic foundations have been used to determine the demand and supply of water in the economy, and the interpretation of the pricing policies adopted by each state. Trade theory is used to extend the analysis into a competitive market environment.

In economic terms the part payment (70:30 split referred to above) by the NSW government is treated as an input subsidy to water users. Subsidies impact upon the economic efficiency and distribution of resources in the economy. Industries with subsidised inputs attract capital investment due to the lower cost per unit of production and receive a higher return per dollar invested in capital. Producers that have a high proportion of the subsidised input as part of their total costs will try to locate their production systems in the area receiving a subsidy. Trade theory suggests the subsidising region will obtain a comparative advantage in the market for the good being produced with the input subsidy.

For example, producers of grapes in NSW will have a lower marginal cost per tonne of grapes than Victorian grape producers. The NSW producers will be able to offer their grapes to the

[6] Op. Cit.

[7] Op. Cit.

market at a lower price up to the amount of the subsidy, all other things being equal. This would provide an incentive to grape producers, for example, to locate in NSW where the cost per ML of water is lower. Revenue generated from grape production will be captured by NSW producers and land suitable for grape production will attract greater economic rents.

The marginal return generated from the last ML of water used represents the value of the water to the user. If the user does not pay the full price for the water, extra profits are earned by the water user. Two economic outcomes can be observed: i) the subsidy to water users must come from another group within the economy; ii) the marginal return for the last ML of water is distorted by the amount of the subsidy.

The WPM is used to estimate the impact of allowing trade in water between NSW and Victoria, given that the full cost of water in NSW is not borne by the users. To achieve this we run the model to simulate free trade where all water supply prices are not subsidised. This result is then compared with the model results when water supply prices are subsidised in NSW.

The following section provides a brief description of the WPM and the regional models used for the estimation of the derived demand curves for water.

## 3.1 Spatial Modelling Framework

The methodology used here is an extension of the modelling approach used previously by the Victorian and NSW Departments (Branson, J., and Eigenraam, M., 1996., Eigenraam et al, 1996b). The WPM includes 14 Victorian and 9 NSW irrigation regions. The WPM is a spatial equilibrium model. Two alternative specifications of the spatial equilibrium model, the quantity and price formulations, were presented by Takayama and Judge (1971). The approach adopted in this study is the quantity formulation.

Linear programming (LP) techniques were used to solve this model using the *What's Best!©* software package. The model is solved as a quadratic programming problem (Takayama and Judge 1964) with an objective function which maximises net social welfare. Net social welfare is measured as the area under the excess demand and above the excess supply curves.

## 3.2 Regional Modelling Framework

There are two approaches to regional simulation: the representative farm approach and the regional model approach. As the name suggests the representative farm approach involves modelling a region using a number of discrete representative farm types. The regional model approach involves modelling the region as one entire farm.

The representative farm approach was adopted to allow for differences in the technology and production coefficients of different farm types to be modelled. The farm model approach allows for variables that reflect different levels of management to be modelled. For example, perennial pasture is grown and grazed more intensively on dairy farms than mixed grazing farms. Not only do inputs change between management systems, but also pasture quality, production and utilisation. Further, this approach has the added benefit of allowing intra-regional substitution opportunities to be identified.

The LP models maximise regional gross margin (M) according to:

$$M = \sum_{j=1}^{n} (c_j - a_{ij}.x_j.p_i)$$

where,

$c_j$ denotes all the revenue from activities j.

$x_j$ is the magnitude of activity j.

$a_{ij}$ is the amount of resource i used per unit of activity j.

$p_i$ is the cost of resource i.

$n$ is the number of $j$ activities;

$$\text{subject to: } \sum_{j=1}^{n} a_{ij}\, x_j \le a_i \; (i = 1,\ldots\ldots,m)$$

Activities represented in the models include livestock, hay making for on-farm use or sale, volumetric water allocation buying and trading, pasture transfers, labour hire and reconciliations for pasture, labour, watertable recharge and irrigation run-off.

Constraints include soil types, irrigation technologies (landformed, non-landformed, raised beds), various limits to some crops (such as rice) for environmental and administrative reasons, labour, volumetric allocation, off-allocation supplies, diversion/channel capacities, limits to watertable recharge and irrigation runoff, and various pool constraints for labour, pasture and crops, and hay selling.

### *3.2.1 Victoria*

One base model was developed to represent the regions. Three representative farms are modelled: mixed-grazing, dairying and horticulture (Branson, J., Eigenraam, M., 1996). The attributes of different regions are changed by modifying land, water and livestock constraints.

The Goulburn Murray Irrigation System (GMS) is divided into 14 regions (listed below) based on earlier work by Read et al. (1991):

| | | |
|---|---|---|
| Boort | Calivil | Campaspe |
| Cohuna | Dingee | Kerang |
| Murray Valley | Rochester | Rodney |
| Shepparton | Swan Hill | Tongala |
| Tragowel Plains | Pumped Districts | |

The region referred to as "pumped districts" includes the horticultural areas of Tresco, Nyah, Red Cliffs, Robinvale, Merbein and the First Mildura Irrigation Trust (FMIT).

The above regions account for approximately 85% of water used throughout the GMS. Private diverters and water works areas that represent the remainder of total water use have not been modelled due to difficulties in obtaining data and in accounting for the spatial location/distribution of these irrigators.

### *3.2.2 New South Wales*

Individual regional linear programming models were developed for the following irrigation areas and districts in the Murrumbidgee and Murray Valleys:

Murrumbidgee Irrigation Areas

Wah Wah Irrigation District

Murrumbidgee River private diverters

Denimein Irrigation District

Wakool Irrigation District

Benerembah Irrigation District

Coleambally Irrigation Area

Berriquin Irrigation District

Cadell irrigation region

The main activities represented in the models are lucerne, rice, wheat, oats, barley, soybeans, maize, sorghum, sub-clover and perennial pasture. These activities are generally specified as rotations. In some models, or for some soil types, enterprises are predominantly lucerne and pasture based, while for others rice and winter cropping are the major rotational choices.

Further details of the model specification and data used for each of these models can be found in Jones (1991), Wall, et al (1994), Curthoys, Marshall and Jones (1994), and Gunaratne, et al (1995a,b,c).

# 4. COMPETITIVE MARKET FOR WATER

The following section outlines the methodology for determining the regional derived demand curve for water and its role in the WPM. The combination of the annual allocation and the derived demand curve allow us to calculate the excess demand and supply curves for each region. The excess demand and supply curves are used in the spatial equilibrium model to determine the value and volume of water traded.

It is then possible to compare the initial autarky (no-trade) condition with the trade condition. The economic surplus areas are presented using the derived demand curves for each of the regions.

## 4.1 Estimation of Regional Derived Demand

This section outlines the method used to obtain the derived demand curves from the regional models. For this project the derived demand curves are based on a one part tariff structure[8]. Water is modelled as a homogeneous product comprising water right, sales water and "other water", which incorporates groundwater[9].

This study has used parametric linear programming to determine the demand functions for irrigation water. OLS regression analysis was applied to the resulting stepped functions to estimate a linear demand function[10]. The function estimated through this normative process is an unconstrained[11] demand function in an unregulated market. The assumption is made that this function is applicable to the condition of a regulated water market. It is difficult to test

[8] Water can be charged at different rates for each water type ie) water right, sales water.

[9] For this analysis the groundwater component has been excluded until further information is available about the proposed property right changes surrounding its use.

[10] The curves are of the form $Q = a + bP$. where q is quantity and P is price.

[11] The model was solved after relaxing any constraint on the supply of volumetric allocation to the region. Other production resources, such as land, labour and capital, remained constrained.

the validity of this assumption as there is no data, time series or otherwise, to econometrically determine a demand function for water in a regulated market environment.

Irrigators seek to consume water up to the point where their marginal return equates the marginal cost of the water. The size of the intercept (*a* in Footnote 10) indicates the ability of a region to pay for water which is influenced by the pricing policies in place. If a region is subsidised this has the effect of shifting the derived demand curve up by an amount equal to the subsidy.

Figure 1 below shows an example of a linear derived demand curve for water. In the figure, *Pf* is the fixed cost of delivering a ML of water and *Q1* and *Q2* are the volumetric allocations of water. The method of calculating *Pf* is outlined above in the pricing policies of each state. The method used to determine the fixed cost influences the volume of water consumed by a region and the level of production. Table 1 shows the current fixed cost per ML of water for both states.

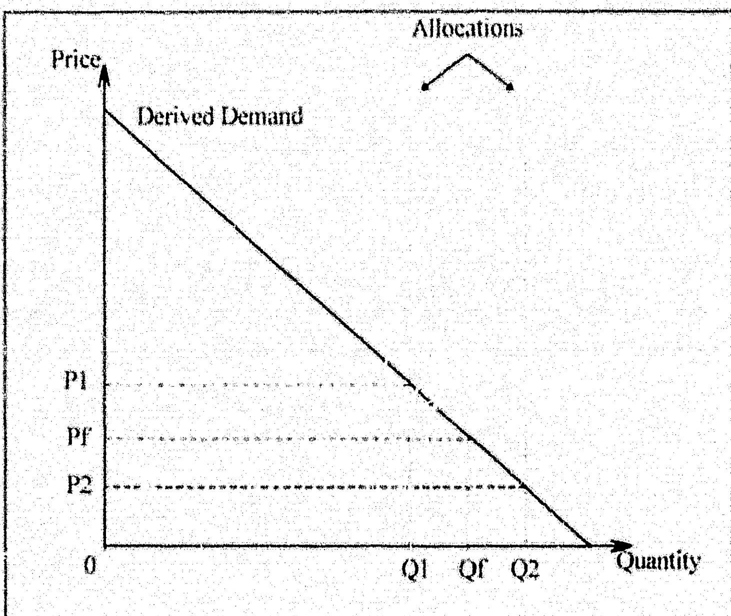


**Figure 1. Derived Demand**

The volumetric allocation, *Q*, is the water allocated to a region on an annual basis. The allocation is dependent on the availability of water in the catchment area and reserves carried over from the previous year (Branson, J., and Eigenraam, M., 1996).

**Table 1. Fixed Cost Per ML Water Consumed.**

| Victoria | | New South Wales | |
|---|---|---|---|
| Boort | 17.18 | Murrumbidgee Irrigation Areas (MIA) | 12.73 |
| Calivil | 17.18 | Wah Wah Irrigation District | 9.20 |
| Campaspe | 19.39 | Cadell Irrigation Region | 9.68 |
| Cohuna | 18.89 | Denimein Irrigation District | 9.68 |
| Dingee | 17.18 | Wakool Irrigation District | 9.68 |
| Kerang | 18.89 | Beneremban Irrigation District | 9.20 |
| Murray Valley | 18.68 | Coleambally Irrigation Area (CIA) | 8.02 |
| Rochester | 19.14 | Berriquin Irrigation District | 9.68 |
| Rodney | 20.6 | | |
| Shepparton | 19.91 | | |
| Swan Hill | 18.89 | | |
| Tongala | 20.6 | | |
| Tragowel Plains | 17.18 | | |

If the region was faced with a price *Pf* for all water consumed, the region will demand quantity *Qf*. The allocation of water varies annually, therefore in some years there will be an excess supply and in others a shortage of water. In Figure 1 two possible allocations are shown. At an allocation of Q1 there is an excess demand for water Qf-Q1, whereas at Q2 there is an excess supply of water Q2-Qf.

#### *4.1.1 Regional Trading Blocs*

To aid in the presentation of results the regions in both states will be aggregated into trading blocs. Victoria is aggregated to the Murray Valley and the Goulburn Irrigation systems and NSW to the Murrumbidgee and Murray Valley systems. Table 2 below lists the regions in each of the trading blocs.

**Table 2. Regional Trading Blocs**

| | Regions |
|---|---|
| **VICTORIA** | |
| Goulburn | Boort, Calivil, Campaspe, Dingee, Tragowel Plains. |
| Murray Valley (MV-VIC) | Cohuna, Kerang, Murray Valley, Swan Hill. |
| **NEW SOUTH WALES** | |
| Murray Valley (MV-NSW) | Berriquin, Denimein, Cadell, Wakool |
| Murrumbidgee | MIA, Benerembah, CIA, Wah Wah. |

The following sections describe the method used to determine excess supply and demand curves for irrigation water.

## 5. REGIONAL EXCESS DEMAND CURVE

For the following analysis, the origin of the price axis will be the fixed cost of water delivery. As mentioned above, this has the effect of moving the excess supply and demand curves down by an amount equal to *Pf* (the importance of this will become apparent when the regions are aggregated in the trade environment). Figure 2 contains all the information necessary to calculate the excess supply and demand curves.

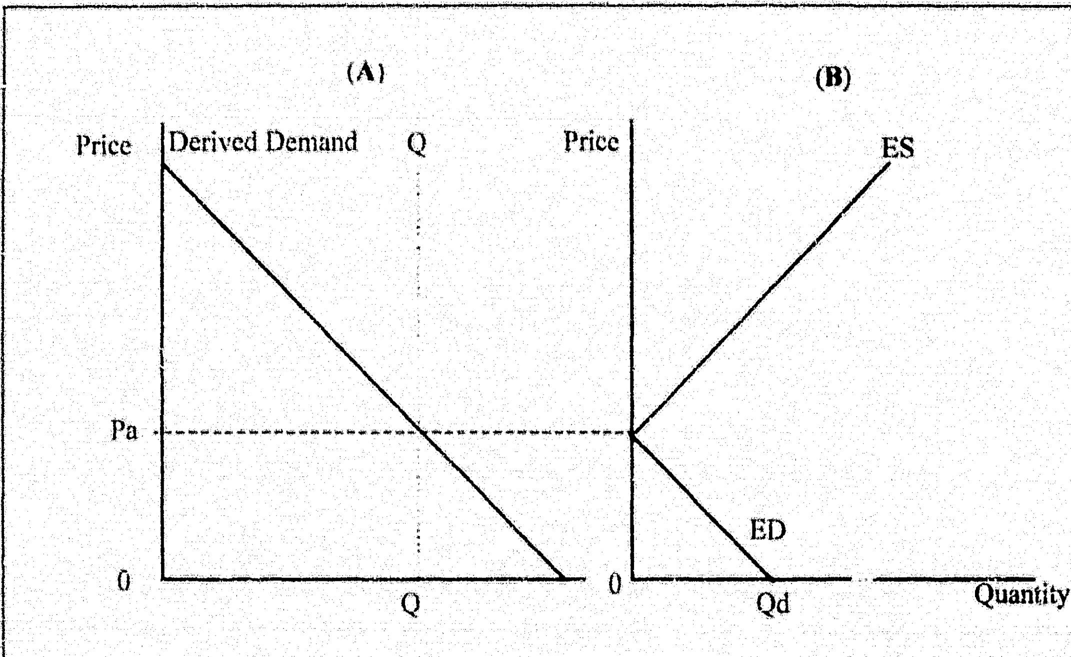


**Figure 2. Excess Demand and Supply**

The initial endowment of water in each region is the basis for determining the excess demand curve for the trade model. To the right of *Q*, demand is in excess of the volumetric allocation. The excess demand curve is shown in Figure 2 (B) by *ED*. The region is willing to demand water up to *Qd*. At any point to the right of *Qd* the marginal cost of water is greater than the marginal return (remembering that the price axis is set equal to the marginal cost, equivalent to the fixed cost per ML for delivery).

*Pa* is the autarky price of water for the region, determined by finding the price intercept for the given volumetric allocation. At prices above *Pa* the region is willing to give sell from their allocation for sale to another region. The excess supply curve is shown by *ES*.

## 5.1 Economic Welfare Measures

The change in economic welfare can be used to determine the impacts on each region from the introduction of trade (both at the intra and inter state level). The methods for calculating the effect will be shown first followed by the results for intra and inter state trade.

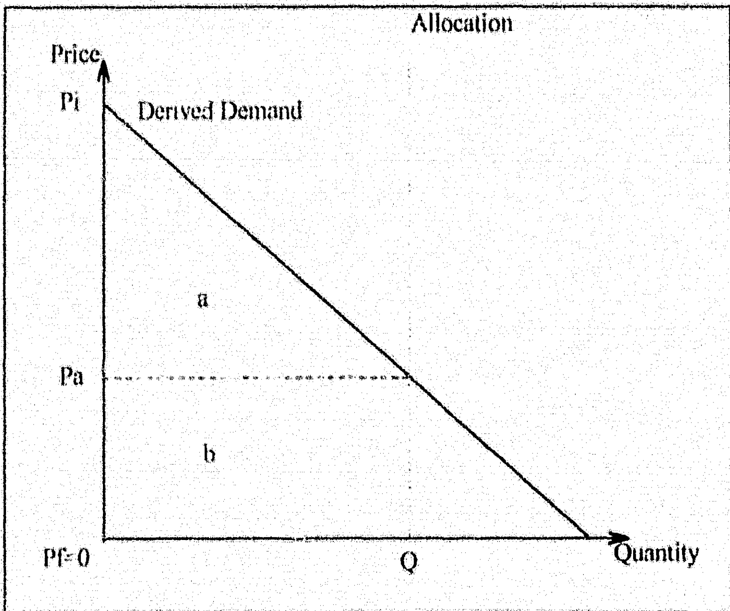


**Figure 3. Pre-Trade Economic Welfare Measures.**

### *5.1.1 Pre-Trade Economic Rent*

Figure 3 above shows the pre-trade economic surplus measures for a representative region with an allocation *Q*. The consumer surplus is measured above the price line and below the demand curve. For the allocation *Q* the region is willing to pay *Pa* for the water, but pays only *Pf*. The total consumer surplus for the region is then the sum of areas (a) and (b). Area (b) is a transfer from resource managers to the users of water. It is the difference between the willingness to pay and the actual price paid.

Under deregulation, area (b) represents possible economic rents that can be captured by regulators or participants in the water market. It would be possible for an owner (if we assumed for the moment that the water resource is privately owned) of water resources to extract a greater resource rent from the market. If regulators were to attempt to extract these rents they would be seen as monopolistic rents. Under the COAG and Hilmer arrangements this would not be allowed. An important aspect of deregulating the water market would be to include provision for the future capture of those rents. In determining the economic rents for market participants we are assuming here that the government is a benevolent supplier of water.

### *5.1.2 Post-Trade Economic Rent*

Figure 4 below shows the economic rents for two trading regions. *P1* and *P2* are derived from the price points represented *Pa* in the Figure 3 above for each of the regions. *P2* is greater than *P1* which means that region 2 is willing to pay a higher price for water than region 1.

This is represented in the trade area of Figure 4. *ES1* and *ED2* are shown by the curves *TS1* and *TD2* respectively.

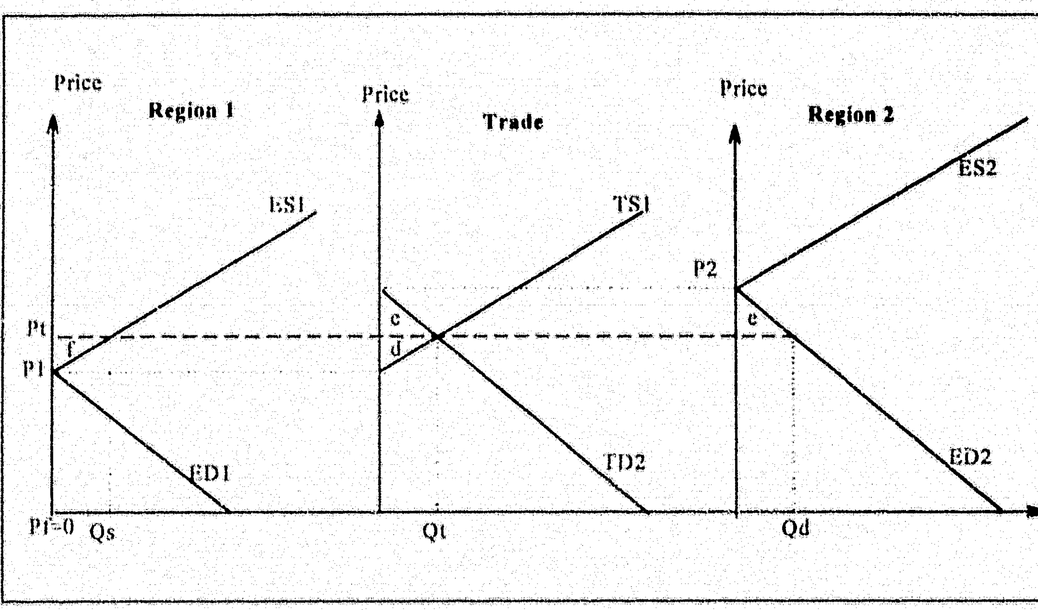


**Figure 4. Post Trade Economic Rents**

*Pt* is the equilibrium trade price with *Qt* traded. Trade has allowed for the movement of *Qt* ML of water from region 1 to region 2 at a price *Pt.* The sum of (c) and (d) is the economic surplus gain from trade. This is distributed between the two regions, with region 1 receiving the benefit of area (f) and region two the area (e). The sum of (e) and (f) is equal to the sum of (c) and (d), accounting for all the economic benefits.

Figure 5 below shows the economic surplus areas with trade under the Derived Demand curves. Figure 5 is an extension of Figure 3. with the economic gains from trade areas shown in Figure 4 shaded. At price *Pt* Region 1 sells *Qs* while Region 2 buys *Qd.* There is a financial transfer of *Pt*Qs = Pt*Qd* from region 2 to region 1.

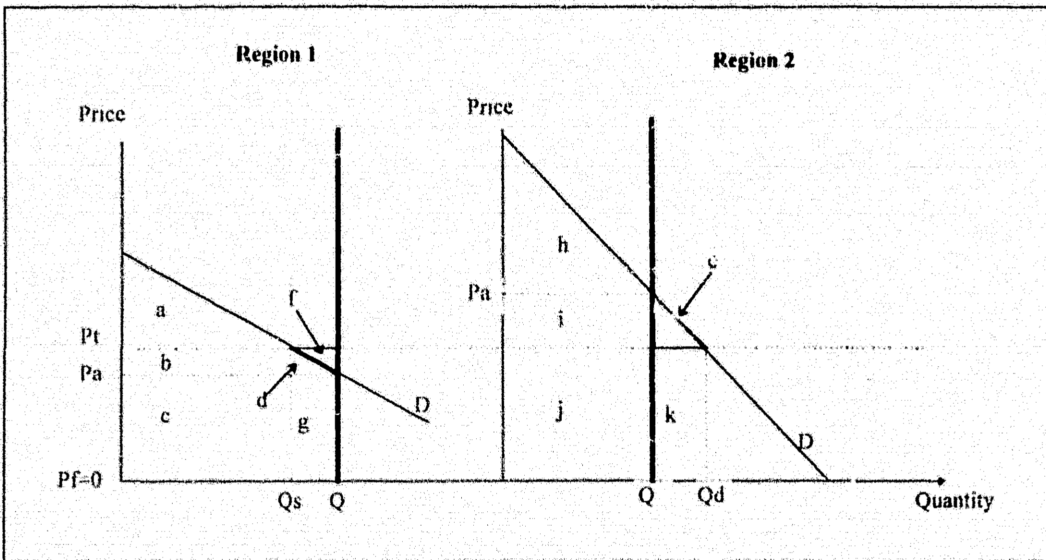


**Figure 5. Derived Demand with Trade.**

In Table 3 below the pre and post-trade economic rents are shown. Both region 1 and 2 gain by *f* and e respectively. Region 2 gains because they can consume more water post-trade than they could pre-trade. In contrast region 1 gains from the opportunity to sell water to region 2.

The intercept and slope of the respective demand curves will influence the volume and value of trade. From Figure 5 above it can be seen that the surplus gains of each region will change with the slope and intercept. It is the relative change in *f* and *e* that will be measured to determine the impact of a subsidy on the delivery of water to a region.

As noted above in Section 5.1 there is an economic transfer to the consumers of water. In the table below the transfers are measured pre and post-trade.

**Table 3. Economic Surplus Measures and Changes[a].**

| | Region 1 | Region 2 |
|---|---|---|
| Pre-Trade Consumer Surplus | a,b,c,d,g | h,i,j |
| Post-Trade Consumer Surplus | a,b,c,d,g,f | h,i,j,e, |
| Change | f | e |
| Pre-Trade Transfer | c,g | i,j |
| Post-Trade Transfer | c,b | j |
| Change Transfer | (b-g) | (i) |

a) Parentheses indicate negative.

# 6. RESULTS

### *6.1.1 Trade Conditions*

The irrigation system is physically constrained by the capacity of the rivers and the irrigation channels. These constraints limit the amount of water delivered in a fixed period of time. This modelling has allowed for trade by substitution. This means regions can trade water to a point further down the river by substitution (as long as this meets the minimum or maximum flow requirements). For example, a region downstream can trade upstream. This would be achieved by the region downstream allowing their water to run by and the region upstream withdrawing the equivalent amount. The net result downstream past both regions would be zero. This is also possible if two rivers are delivering to a common point. A user on one river can allow some of their water to continue down to the junction of the rivers and a user on the other river can withdraw an equivalent amount. The net effect is zero at the junction.

The allocations modelled are listed in the Table 4 below:

**Table 4. State Annual Allocations**

| **VICTORIA** | **Allocation** |
|---|---|
| Goulburn | 160% |
| Murray Valley (MV-Vic) | 160% |
| **NEW SOUTH WALES** | |
| Murray Valley (MV-NSW) | 118% |
| Murrumbidgee | 116% |

## 6.2 Gains to be made from Trade

The impact of different water pricing policies has been estimated using the WPM. Three key results are presented in this paper.

i) A subsidy of $10/ML in NSW causes an estimated increase in water demand of around 100,000 ML per year. Without the existence of this subsidy, this volume of water could not be profitably used for irrigation purposes in NSW.

ii) The existence of an implicit subsidy on water raises the price of traded water from around $21/ML to nearly $30/ML because of stronger demand in the water market. A summary of these results are presented in Table 4.

**Table 5. Volume of Trade[a]**

| **Subsidy** | **Goulbourn** | **MV-Vic** | **Murrumbidgee** | **MV-NSW** | **Price** | **Vic Supply** |
|---|---|---|---|---|---|---|
| **$** | **ML** | **ML** | **ML** | **ML** | **$** | **ML** |
| 10.00 | 539,199 | 412,929 | 13,622 | (965,750) | 29.76 | 952,128 |
| 5.00 | 504,510 | 397,600 | 33,779 | (935,889) | 25.71 | 902,110 |
| Zero | 469,820 | 382,271 | 53,936 | (906,028) | 21.66 | 852,092 |

a) () indicate demand.

iii) Because the existence of an implicit subsidy on water increases demand beyond the point where marginal costs equal marginal revenue, there is an economic efficiency cost associated with the use of this additional irrigation water. The WPM provides an estimate of the economic efficiency costs of around $15 million per year, for a subsidy of $10/ML. This reduces to $6.5 million for a subsidy of $5/ML (see Table 5).

**Table 6. Trade Surplus ($ million)**

| Subsidy $ | Goulbourn ML | MV-Vic ML | Murrumbidgee ML | MV-NSW ML | Total |
|---|---|---|---|---|---|
| 10.00 | 1,409,439 | 615,438 | 1,014,935 | 24,642,463 | 27,682,274 |
| 5.00 | 771,720 | 334,643 | 108,042 | 17,796,057 | 19,010,462 |
| Zero | 274,450 | 115,910 | 80,585 | 12,061,430 | 12,532,375 |

# 7. CONCLUSION

The model indicates that a $10.00 subsidy by the NSW government would generate a market distortion of approximately $15 million. These are annual losses to the water market. The volume and value of water trade are effected resulting in an inefficient allocation of water resources. The most significant of these distortions can be observed between the trading areas. The distortion may impose significant water trading pressures on the smaller low income regions.

In terms of the implications for the direction of water policy in the Murray-Darling Basin, this paper has shown that inconsistent approaches to water policy reform in different states can impose significant economic efficiency costs on the economy. Any further moves to deregulate inter and intra-state trade in irrigation water will need to be preceded by a consistent approach to water pricing across catchment and distribution networks.

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# 9. APPENDIX I

WPM was intended for use by those associated with the development of water policy. The Water Bureau (DNRE) and the Division of Economics and Evaluation have identified four keys issues: Water pricing; Stranded Assets, Water Security and Interstate Trade.

***Stranded Assets:*** Given changes to the Water Act (1989) governing the transfer of water entitlements (TWE) both inter and intra-state, social problems associated with "stranded" irrigation assets have become an issue. Water moving out of districts will increase the renewals charge per megalitre for water remaining in the district, which could force more water to be sold.

An intermediate 2% cap has been placed on water right movements into and out of irrigation districts to control the rate that adjustment occurs.

***Water Security:*** Irrigators in Victoria have two water products, water right and sales water. Water right is a fixed volume of secure (95%) entitlement, while water sales do not have a fixed volume and have a varying security (between 0 and 100%). Since the building of Dartmouth Dam, irrigators have enjoyed a high level of security for sales water, with their entitlement rarely falling below 200% water right. Recent policy changes including the setting of bulk water entitlements, the capping of further diversions from the rivers and the increased flexibility with which water can be traded will change the security of water irrigators have enjoyed.

There is a need to better define the property rights associated with sales water. With this comes an opportunity to break the historic link between water right and water sales, and in so doing, develop irrigation products that meet the requirements of all irrigators.

***Water Trade:*** Changes to the Water Act (1989) governing the transfer of water entitlements (TWE) both inter and intra-state have increased trade in water, particularly intra-state, over the past 5-10 years. Existing water policies allow the temporary movement of water between states, but do not allow for permanent trade.