Trading and Economic Efficiency in Selected Victorian Water Markets in Australia

By

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Declaration

I declare that this thesis is my own account of the research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institutes.

Made By

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[1] I suspended for six months during the study period.

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ABSTRACT

Optimal allocation of irrigation water is a modern economic and social concern of growing importance in Australia, as well as in many other countries. The market based mechanism has been advocated in the economics literature as an efficient and effective measure for allocation of irrigation water. Water markets and water rights trading have been operating for many years aiming to improve the efficiency of water allocation in the Murray–Darling Basin (MDB) in Australia. Several stages of the Council of Australian Government's water reform agenda have been implemented. Water right and land ownership have been separated so that allocations or entitlements of water rights become transferable. Farmers can therefore trade their water rights in water markets without having to transfer their land ownership.

Few empirical studies have been conducted into the efficiency and effectiveness of water markets. This study examines economic efficiency, competitiveness, and irrigators' response to the changes of economic and non economic variables in allocation water markets in Victoria that permit trading in irrigation water rights.

This study begins with an analysis of the economic theory of efficient allocation of water, the theory of goods underlying water markets, the public and private nature of these markets, along with attention of externalities, market structures and the role of natural monopolies in water industry. It provides an examination of the systems of water rights found in the literature, a discussion of the legislative basis of the water right systems that govern access to and use of irrigation water in each of Australian states and territories including the institutional arrangements shaping trade in Victorian water markets. The

legislative water right in Australia is the contemporary water allocation system and governs water entitlements and allocations. Water rights are essentially a bundle of entitlements that define the rights, privileges and limitations for the use of the water of an owner. The characteristics of water rights include universality, exclusivity, transferability and enforceability. In Victoria, under the *Water (Resource Management) Act 2005*, new regulations were issued, and a number of major changes to the water trading landscape were made, including the creation of an environmental water reserve; the unbundling of existing water entitlements into water shares, and the creation of the Victorian water register. On a national level, the key water policies are specified in the National Water Initiative in 2004. The *Water Act 2007* (Commonwealth) secures the water supply and water allocation equitably including the allocation for the riverine environment in MDB.

The demand and supply for irrigated water, the markets for water rights trading and the contestability of Australian water markets is analysed. Also, the existing water market mechanisms and trading including the evolution of the markets, their structure, and the trading rules and institutional arrangements in the Murray–Darling Basin region in Australia is described. The Murray–Darling Basin region is the most active region of irrigation water trading in Australia. The relevance of the determinants of demand and supply for irrigation water and the price elasticity of demand are discussed. The auction form of water trading in the water market is also described, and the Watermove water market in Victoria is analysed.

Empirical evidence on the economic efficiency of three water markets in northern Victoria is provided. The stochastic time series properties of water prices are established through statistical tests commonly used to evaluate market efficiency in financial and

commodity markets. The random walks of the stochastic properties of water price time series for the three markets are tested. The results of Augmented Dickey–Fuller's unit test, Zivot and Andrews unit root test with one structural break, and Lee-Strazicich LM unit root test with one structural break and two structural breaks suggest that the water price time series in the three markets that the water price time series are non stationary and follow random walks. The findings are very important, and prove that the three markets are efficient according to the theory of Efficient Market Hypothesis since the water prices cannot be predicted based on the available market information for traders.

More conventional scrutiny of industry efficiency is achieved through measures of the size distribution of firms. The measures which include concentration ratio, Herfindahl–Hirschman index, and Gini coefficient, are applied to analyse the three markets' concentration and competitiveness in terms of the market size, the number of traders who participated, the number of successful traders, and the quantity of water traded. These measures for the three water markets have consistent results. The outcomes of the three measures in the market structure, and the competitiveness for the three markets suggest that there are no monopolies and oligopolies in supply, and there are no monopsonies and oligopsonies in demand in the three water markets. Also, the outcomes of the analyses suggest that there are many irrigators participating in the three water markets, either as sellers or buyers, and they are price takers. However, one market is a relatively moderate concentrated market and a monopolistic competitive. The results suggest that the three water markets are between perfect competition and monopolistic competition.

Finally, models of water demand for the three water markets are developed and estimated with a view to measuring the strength of price and non-price factors driving changes in

the demand for irrigation water. The estimated OLS models of demand for water for the three water markets in this study suggests that the macro economic variables in relation to agriculture including the rural commodity index, the rural GDP and the rural export in Australia do not have influence on the demand for water in the three water markets. The estimated water demand models for the three water markets show that the evaporation has positive impact on the demand for water, and the water price and the rainfall have negative impact on the demand for water. The findings are consistent with the economic logic. The findings suggest that the direct explanatory variables, the water price, the rainfall and the evaporation, influence the demand for water in the three water markets, but they are water demand inelastic.