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The impact of water ownership and water market trade strategy on Australian irrigators' farm viability

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ABSTRACT

Reforms in the Murray-Darling Basin over the past several decades have led to well developed water entitlement and allocation markets. Irrigators now use a diversity of water trade and ownership approaches, ranging from owning relatively large amounts of water entitlements relative to their annual demand and selling when they have excess water, to owning smaller amounts (or less secure) water entitlements and relying heavily on water allocation markets to meet annual demands. Some irrigators do not trade at all. Although the benefits of water markets in reallocating water have been well established, there has been very little empirical analysis of the impact that water ownership and water market trade strategy has had on irrigators' farm net incomes. This study uses irrigation industry survey data collected over a five year period from 2006/2007 to 2010/2011 across the Murray-Darling Basin to investigate the relationship that water trade strategy and water ownership have with farm viability (namely farm net income and rate of return). Although this is an interesting period to investigate these relationships, it must be noted that it was a period of extreme water scarcity and high water prices; hence any interpretation of results must take this into account. It was found that the actual volume of water received (which is a measure of water allocations for that region and size and security of water entitlements) is a more significant and positive influence on farm net income than water ownership per se, with this result most strongest in the horticulture industry. Water reliability is not as important in the broadacre industry as other industries. Selling water allocations was a significant and positive influence on farm net income and rate of return. Buying water entitlements was sometimes associated negatively with farm net income and rate of return in our time period, with no statistical significance found for the impact of selling water entitlements in the current year.

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1. Introduction

Due to a persistent drought from 2002–2003 to 2009–2010, the River Murray in Australia endured record low flows and irrigators in the Murray-Darling Basin (MDB) faced considerable stress in dealing with reduced rainfall and water allocations, higher temperatures and a decline in some commodity prices (CSIRO, 2008; Connell and Grafton, 2011). The drought was broken in 2010 with flooding across the MDB. The economic viability of irrigated agriculture is influenced by how resilient irrigators are to water reductions. Resilience is influenced by the ability of farmers to adapt their production techniques, management skills, strategic choices (such as whether to buy or sell water), farm capital, natural capital, and community capital to deal with reduced access to water, terms of trade and a range of psychosocial influences (Kingwell et al., 2013; Wheeler et al., 2013).

In response to the historical over-allocation of water, fundamental water policy reforms have been introduced in Australia to deal with environmental impacts of water scarcity and the drought (Crase, 2008). The debate about the impact of government policy, the response of farmers and the role of the market are highly politicized in the MDB. The efficiency of water markets has been well publicized (e.g. Grafton et al., 2011; NWC, 2012), as has their ability to provide farmers with an opportunity to supplement farm income through trading in water allocations. In general, markets allow farmers to achieve greater allocative efficiency and provide incentives to enhance their technical efficiency. Allocative efficiency refers to water being allocated to where it generates the most value (income), while technical efficiency refers to the

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improvements in the efficient use of water through technology. A key question that has remained unanswered is whether participation in water markets makes irrigation farms more viable. In particular, if water is supposedly moving to higher valued uses, is it moving to more profitable farms within industries? Are farms that sell (or buy) water allocations and entitlements financially better off than those who do not? Is water ownership important, or is volume of water received a more important influence on farm net income? Similarly, is the size of water entitlements ownership of more importance than the size of land irrigated? Do different security types of water entitlement ownership matter? These questions have been rarely studied in the literature, and a fuller understanding of the empirical relationships between farm characteristics/water trading strategies and farm performance will allow greater informed and coherent policy decisions to be made within the MDB. We use unit-record level data from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) irrigation farm surveys from 2006–2007 to 2010–2011 to explore these questions.

2. Water markets in Australia: background, use and impacts

The MDB is the largest river basin in Australia, and consists of a northern basin and a southern basin. The southern part of the basin (sMDB) is comprised of irrigation districts located in New South Wales (NSW), Victoria and South Australia (SA). The northern part of the basin (nMDB) includes irrigation districts in northern NSW and Queensland. Irrigators in the sMDB receive seasonal allocations of water linked to water entitlement ownership, which is determined by historical water use, security of the water entitlement owned, environmental conditions, and quantities stored upstream (NWC, 2011). Regulated water entitlements have different levels of reliability (namely high, general and low security) by area. Each entitlement has a long-term average annual yield (LTAAY) attached to it. For example, a water entitlement with an estimated reliability of 90–95% (which is a high security entitlement) would expect to receive full allocations at least 90 years out of 100. The majority of water entitlements allocated in the MDB is general security; followed by high and then low (Fig. 1 provides a graphical overview of regulated surface water entitlements across the MDB in 2011–2012).

Water markets were initiated in Australia in the sMDB in the early 1980s with various reforms undertaken over the past two decades, and, since then, trade in water allocations (water allocated seasonally based on water entitlement and availability) and water entitlements (the long-term right to receive seasonal water allocations) has increased considerably. To date, trade in other water market products (such as options, leases and future contracts) has been limited (Tisdell, 2011). Unlike other areas in Australia, most parts of the sMDB are hydrologically linked, which allows water trade to occur over a large distance. Fig. 2 shows water allocation trade was adopted far earlier than entitlement trade.

Over the decade, trade volumes have increased in response to climate and water supply variability and the implementation of water market reforms. Increased trade also reflects irrigators' growing adoption of the water market (Wheeler et al., 2010). Over the past decade, water has been traded from predominantly annual crops (such as rice, cotton and mixed farming in NSW) to dairy and horticulture crops (Victoria and South Australia mainly) (NWC, 2011). This is reflected by the fact that demand for water in perennial horticulture activities and vegetable production is generally more inelastic relative to broadacre activities such as dairy and rice (Hughes, 2011). For example, Hughes (2011) reports an average 5.5 ML/ha used for horticultural activities in the MDB, compared to 13.5 ML/ha for rice.

Change has occurred rapidly in recent years, especially to irrigators' opening and closing allocations (Tables 1 and 2). Tables 1 and 2 illustrate the water scarcity that many irrigators faced in the Millennium drought, and how water allocation cuts were implemented across the Basin. In 2008–2009, all irrigators in the MDB had their allocations reduced, with Victorian irrigators in the Goulburn and Murray systems receiving only one-third of their water entitlements by the season's end, while SA irrigators received less than one-fifth.

Water allocations have traditionally driven water demand and prices in Australia (e.g. Tisdell, 1996; Brennan, 2006; NWC, 2011). Fig. 3 illustrates the significant increase in water prices that were experienced between 2005 and 2009. Irrigators can buy (or sell) water from water brokers in a variety of ways (online platforms, telephone sales, manual sales). Irrigators can match offers themselves and prepare their own contracts, but traders may need legal assistance. For intrastate trade, a single approval to trade form must be completed by the buyer and seller, but for interstate trade, an additional form must be completed by the buyer and seller for the state of destination. Formal water markets in Australia began as uniform price open call markets, though a variety of other water markets (such as double auction water markets) have been used (Tisdell, 2011). Online open call platforms for water allocations typically collect weekly offers for sale and purchase through water exchanges, with a pool price (the average price of the last fulfilled sale offer and buy bid) being created to maximize the volume traded.

The development of water markets in Australia is considered to have allowed the movement of water from lower valued, inefficient uses (e.g. rice and cotton farming) to higher valued uses (e.g. horticulture). The ability to trade water provides flexibility for irrigators in water use, production and farm management strategies. Many economic studies based on regional outcomes have found increased economic efficiency and gross domestic product from the existence of the MDB water market (Peterson et al., 2004; Qureshi et al., 2009; NWC, 2010; Jiang and Grafton, 2012). The following section hypothesizes how various water ownership and trade can impact upon farm income.

2.1. Theoretical links between water and farm viability

One of the major strategies irrigators can adopt to manage seasonal risks and conditions are trading water allocations and entitlements (Brennan, 2006). Assuming farmers are profit maximizers (or loss minimizers), as sellers, water sales should provide additional income in excess of any reduction in income associated with lower irrigated production. For buyers, water purchases should enable the generation of additional irrigated production income above the total cost of the additional water. Therefore, it is usually argued that trading will lead to greater farm profits (although there may be a lag between such trading and the long-term impact on profits, particularly for water entitlements (Bell et al., 2007)). However, we believe the relationship needs more careful consideration.

2.1.1. Accounting for water costs and revenues in farm income

There are three main definitions of irrigation farm viability (see Ashton et al., 2010) and water use and trade impacts on each in various ways. Definitions are shown in Box One.

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