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The capitalized value of rainwater tanks in the property market of Perth, Australia

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SUMMARY

In response to frequent water shortages, governments in Australia have encouraged home owners to install rainwater tanks, often by provision of partial funding for their installation. A simple investment analysis suggests that the net private benefits of rainwater tanks are negative, potentially providing justification for funding support for tank installation if it results in sufficiently large public benefits. However, using a hedonic price analysis we estimate that there is a premium of up to AU$18,000 built into the sale prices of houses with tanks installed. The premium is likely to be greater than the costs of installation, even allowing for the cost of time that home owners must devote to research, purchase and installation. The premium is likely to reflect non-financial as well as financial benefits from installation. The robustness of our estimated premium is investigated using both bounded regression analysis and simulation methods and the result is found to be highly robust. The policy implication is that governments should not rely on payments to encourage installation of rainwater tanks, but instead should use information provision as their main mechanism for promoting uptake. Several explanations for the observation that many home owners are apparently leaving benefits on the table are canvased, but no fully satisfactory explanation is identified.

1. Introduction

Globally, there is a growing awareness that rainwater harvesting systems can make a contribution to water supply security and also reduce stormwater run-off. This awareness has resulted in European, North American, and Australian governments promoting rainwater harvesting systems. For example, in Britain, rainwater harvesting has been included as an element in government-supported social-housing projects, and in the U.S., several states, including Ohio, Washington, and Texas are considering or have already developed guidelines or regulations for rainwater harvesting systems (Jones, 2010). In Santa Fe County, New Mexico, rainwater harvesting systems are required features on new residential and commercial structures that are larger than 2500 square feet (Texas Water Development Board, 2005). In Australia, governments and water utilities have implemented a variety of financial incentive programs to encourage the installation of rainwater tanks. For example, the National Rainwater and Greywater Initiative – a nationwide program that ran from March 2009 to May 2011 – provided up to AU$500 for each household installing a rainwater tank. Sydney Water Corporation offered a rebate of up to AU$1,500 for the installation of a rainwater tank during the period 2002 to June 2011. From July 2007 to June 2009, Water Corporation (Perth, Western Australia) offered a AU$50 rebate for the installation of rainwater tanks of at least 600 L; and, at the same time, a rebate to a maximum value of AU$600 for rainwater tanks of at least 2 kL that were plumbed into a toilet and/or washing machine. A review of total installation cost information (e.g. AU$2109 for a 2 kL tank and AU$2464 for a 5 kL tank (Tam et al., 2010), discussed in detail below) reveals that in some Australian jurisdictions rebates covered more than half the purchase and installation cost of a rainwater tank.

Subsidies for rainwater tanks continue to be available in a number of Australian jurisdictions, including Western Australia, South Australia, and the Northern Territory, and recent research indicate that subsidies are likely to increase the adoption of decentralised water collection systems such as rainwater tanks (Tapsuwan et al., 2014).[1] However, it is not clear how important installation cost is a consideration for consumers purchasing a rainwater tank. For example, based on information collected as part of the ABS Water Use Conservation Survey (ABS, 2013), where respondents

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[1] www.savewater.com.au/products/rebates-incentives [accessed 6 June 2013].

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were able to select multiple options, only 5% of respondents indicated that rebates were a reason for installing a rainwater tank.

If subsidies to support the adoption of decentralised water collection and supply technologies are to have a positive impact on total social welfare, there must be net public benefits following the adoption of these technologies. The potential public benefits could be in terms of the savings that come from the ability to defer large-scale investments in new water infrastructure projects, such as desalination plants (Tam et al., 2010; Gardner and Vieritz, 2010) or, depending on the extent of adoption, potential flood mitigation benefits (Zhang et al., 2010). The public cost is the value of the subsidies provided. The private benefits from the installation of a rainwater tank include lower water-supply charges, and, in locations with water restrictions, access to restriction-free water during periods of water restrictions. Private benefits could, however, be substantially overestimated by residents if they do not have experience with the storage capacity and refilling reliability of rainwater tanks, an issue we explore in later discussion. The private cost is the installation and maintenance cost of the system.

For scenarios where there are both public and private costs, and or public and private benefits, the framework of Pannell (2008) can be used to establish the appropriate public policy response. In the Pannell framework, policy responses are grouped into five broad types: (i) positive incentives to encourage publicly desired changes, including subsidies, the main mechanism used in Australia to promote rainwater tank adoption; (ii) negative incentives to discourage adverse changes, often including polluter-pays mechanisms such as pollution taxes; (iii) information-provision activities, which includes demonstration projects as well as communication activities; (iv) support for technological development; and (v) informed inaction.

Noting that benefits minus costs can be referred to as net benefits, the relevant policy space under the Pannell framework is shown in Fig. 1. In the figure, the upper right quadrant is the space where there are both public and private net benefits, and here the appropriate policy response is to provide information: rational consumers will adopt the technology if they are made aware of the benefits. (In this framework private benefits are measured without any incentive payments or penalties. These may be recommended as an output of the framework.) In the lower right quadrant, if the net private benefits are greater than the public costs, then no action is appropriate. If, however, the public costs are greater than the private benefits, negative incentives are appropriate. In the bottom left quadrant there are both public costs and private costs and no action is required: rational private consumers are unlikely to embrace a technology that lowers their welfare, provided that they have accurate information about it. In the upper left quadrant, if the private costs are greater than the public benefits, investment in technology development to attempt to increase public benefits or reduce private costs may be appropriate if suitable investments are available, otherwise the recommendation is no action; and if the public benefits are greater than the private costs, positive incentive policies are appropriate. Using this framework, for subsidy policies to support the adoption of rainwater tanks to be appropriate there should be net public benefits and net private costs from the installation of rainwater tanks that are less than the net public benefits.[2]

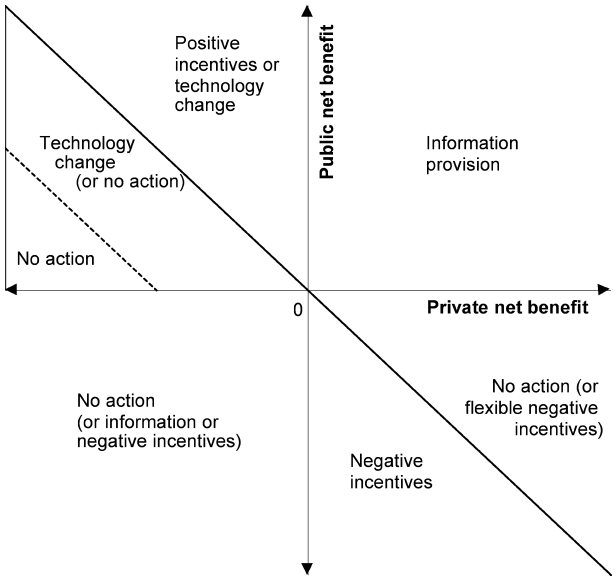

Fig. 1. Policy evaluation framework.

A number of studies find that the average cost of water collected from rainwater tanks is higher than mains water, especially in cities with large seasonal rainfall variations (Tam et al., 2010; Rahman et al., 2012; Coombes et al., 2002; Grafton and Ward, 2008). In a new investment analysis for Perth (Appendix A), we too find that there are net private costs from the installation of a rainwater tank. For a 2 kL installation the benefit: cost ratio under the base-case assumptions was 0.46 (range under sensitivity testing 0.22–0.71); and for a 5 kL installation the benefit: cost ratio for the base case was 0.43 (range under sensitivity testing 0.20–0.65). So, using a traditional approach to project evaluation, installation of a rainwater tank is associated with net private costs. Under the Pannell framework, the appropriate policy response would then be subsidy polices if the public benefits are greater than the private costs; or investment in technology development or no action if public benefits are less than private costs.

However, this investment analysis, in common with those cited above, considers only benefits arising from cost savings through purchasing less mains water. In reality, home owners with rainwater tanks may experience additional benefits beyond these cost savings – benefits from pleasure at perceived environmental benefits, from contributing to broader social goals, or from conforming with the behaviour of an esteemed group within society. If these additional benefits are substantial enough, and sufficiently common, we would expect them to be capitalised into property values. If this occurs, it changes the benefit-cost evaluation and this may have consequences for policy. For example, when there are positive net private benefits and positive net public benefits, under the Pannell framework the appropriate policy response is information provision, rather than subsidies.

The specific questions we investigate in this study are: (a) does a house with a rainwater tank sell for a higher price than a house without a rainwater tank? (b) If so, what is the premium? and (c) Is the premium larger than the value of water savings? To answer these questions we use the hedonic price method. The method has been used to study the way house improvements, such as bedroom and kitchen renovations, are capitalised into house prices (Harding et al., 2007; Wilhelmsson, 2008), and to estimate the extent to which environmental and recreational assets such as street trees, parks, green space, and air quality are capitalised into house prices (Geoghegan et al., 1997; Irwin, 2002; Acharya and Bennett, 2001; Polyakov et al., 2013), so it is well suited to these research questions.

[2] Once transaction costs and implementation lag issues are considered the sample space changes slightly relative to that shown in Fig. 1. Specifically, in the upper right quadrant, along the vertical, there is some space where positive incentives will be appropriate; and, along the horizontal, there will be some space where no action is appropriate. For a detailed discussion of these issues see Pannell (2008).