The Australian Journal of Agricultural and Resource Economics, 51, pp. 343–352

Historical regulation of Victoria's water sector: A case of government failure?*

E. Harris†

This paper analyses the role of government failure in Victoria's water sector between 1905 and 1984 as evidenced in the rise of in-stream salinity. It will be shown that high levels of salinity can, in part, be attributed to regulatory failure for two reasons. First, the method of water allocation, a compulsory minimum charge with the marginal cost of water being zero, encouraged over watering, resulting in increased water tables via groundwater recharge. Second, the government did not provide adequate finance for construction of appropriate removal of saline drainage water, and thereby allowed increasing in-stream salinity.

Key words: externalities, government failure, institutions, salinity.

1. Introduction

The economic impact of irrigation on in-stream salinity has become one of the major challenges facing the Australian agricultural sector in recent decades. As a result, substantial public funds have been invested into schemes, such as the *Salinity and Drainage Strategy* (1988), the *Cap* (1996), and the *National Action Plan for Salinity and Water Quality* (2000), intended to limit the continued expansion of salinity on land and its intrusion into waterways. Numerous studies, undertaken by public agencies and scholars, have investigated the causes and effects of salinity and future policy options to reduce projected increases (Conacher and Conacher 1995; Murray–Darling Basin Ministerial Council 1999, 2000; Department of Natural Resource and the Environment 2000a,b; Heaney *et al*. 2001; Pannell 2001, 2005; Pannell *et al*. 2001; Beresford *et al*. 2004). These studies have contributed to a more comprehensive understanding of the salinity problem and policy options available to minimise continued damage. However, only a very few of them have acknowledged the impact of historical institutional choices on salinity outcomes (Conacher and Conacher 1995; Beresford *et al*. 2004; Pannell 2005). Moreover, none explores the connection between historical institutional frameworks used to allocate and price water and salinity increases. This paper fills part of this gap by analysing how institutional frameworks used in Victoria's water sector between 1905 and 1984 contributed to the salinity problem now faced by that state.

* Many thanks to Andrew Seltzer, Robert Brooks, three anonymous referees, and the Associate Editor for helpful comments on earlier drafts. All remaining errors are my own.

† E. Harris (email: Edwyna.Harris@Buseco.monash.edu.au) is a Lecturer in the Department of Economics, Monash University, Building 11 (Menzies Building), Wellington Road, Clayton, Victoria, 3800, Australia.

doi: 10.1111/j.1467-8489.2007.00384.x

The methodology uses theoretical models that explain the potential pitfalls of public policy, referred to as government failure, to analyse effects of water-sector administration on salinity outcomes. Evidence of government failure is illustrated in the effects of derived externalities, that is, in-stream salinity. In-stream salinity is a classic externality that, according to economic theory, can only be rectified by government intervention, such as Pigovian taxes. Taxes act to increase input prices and align private and social costs of resource use. Evidence presented in this study suggests that policymakers knew of the perverse incentives created by underpricing water at the margin but did not intervene to alter the pricing system. In addition, successive governments did not provide finance for the State Rivers and Water Supply Commission (SRWSC) to invest in infrastructure to reduce the release of saline drainage water into river systems.

Recent interstate efforts, particularly the *Salinity and Drainage Strategy* (1988), have acted to reduce the historical problem of underinvestment in salinity mitigation. This strategy provides financial incentives for states to construct salinity interception and drainage diversion schemes. This acts to reduce salinity intrusion into river systems, particularly the Murray River, by making individual states' in-stream salinity contributions more transparent. Transparency is achieved by allocating salinity credits and debits in both monetary and electrical conductivity (EC) units recorded on an interstate salinity register. Credits and debits are adjusted annually in line with changes in activities that will affect in-stream salinity levels such as the construction of infrastructure to divert drainage water. As a result, this agreement encourages investment in salinity reduction programs.

The plan of this paper is as follows: Section 2 outlines the methodology of government failure applied in this study. Section 3, details the link between the institutional arrangement administered by the SRWSC and the rise of salinity during its existence as evidence of government failure. Section 4 offers some brief concluding remarks.

2. Government failure methodology

Traditionally, economists argued markets were unable to efficiently allocate and price natural resources because of endemic market failure. In recent decades, scholars have identified possible negative outcomes of political regulation, broadly labelling this government failure. Three main approaches can be used to analyse government failure: the public choice view identified primarily in capture literature (Downs 1957; Olson 1965; Stigler 1971, 1974; Mueller 1989); Austrian political economy (Boettke and Lopez 2002; Ikeda 2003; Boettke *et al*. 2005); and the taxonomy view (Wolf 1979, 1987; Wallis and Dollery 1995).

The first two models share a rational-choice approach to examine the political process and both are linked with sceptical views toward political solutions to perceived social problems (Ikeda 2003; Boettke *et al*. 2005).

Nevertheless, they differ in their analysis of why such failures occur in the public sector. Specifically, the capture school argues self-interest of all actors in the political system allows special interest groups to manipulate public policy outcomes to elicit favourable regulation, creating previously unavailable rents. However, Austrian political economy claims intervention fails not because of deception but because well-intentioned bureaucrats and politicians are subject to radical ignorance. This creates a divergence between actual and intended outcomes (Ikeda 2003; Boettke *et al*. 2005).

The third of these approaches, referred to here as the taxonomy view, is different from the above two views because it analyses government failure based on economic conditions used to identify market failure (Wolf 1979, 1987). This methodology creates a framework to compare shortcomings of both markets and governments by evaluating them on the same grounds: efficiency and distributional equity. Therefore, while markets fail due to externalities, monopoly (or increasing returns), market imperfections and distributional inequality, the taxonomy mirrors these failures in the government sector labelling them: internalities, redundant and rising costs, derived externalities and distributional inequality (Wolf 1979, 1987). Internalities are the goals applied within non-market (government) organisation to guide, regulate, and evaluate agencies and their personnel performance (Wolf 1979, 1987). However, these goals are not stringently tied to profit and loss criteria, and nor are they linked clearly to agency purpose. As a result, internalities affect non-market activities as externalities affect market activities causing divergence between actual and socially preferred outcomes (Wolf 1979). Redundant and rising costs are the tendency for non-market production to take place within the production possibility frontier and for cost functions to rise over time (Wolf 1979, 1987). This results in non-market failure because agencies ignore opportunities to lower cost functions and increase productivity resulting in technical inefficiencies. Derived externalities are the unanticipated side-effects of the non-market sector's attempts to correct market failure. These occur because of strong political pressure, short time horizons and high time discount rates by political actors that create demand for intervention before there is adequate knowledge or time to consider potential side-effects (Wolf 1979, 1987). Therefore, political actors tend to overlook potential externalities. Distributional inequalities, indexed on power or income, increase demand for some factors and skills at the expense of others. This taxonomy methodology is used in the analysis presented here. The main argument centres on identification of derived externalities in the form of in-stream salinity.

3. The State Rivers and Water Supply Commission (SRWSC) and salinity

The SRWSC was a statutory corporation created under the 1905 Water Act. Its aim was twofold: first, to centralise control over water financing arrangements and overcome large economic losses resulting from decentralised water administration of previous decades. Second, to promote rapid growth of the

irrigation sector that would stimulate economic development. In turn, this resulted in an acceleration of both irrigation and in-stream salinity proportionate to expansion of the sector for two reasons. First, the method of water allocation under the SRWSC, characterised by a minimum compulsory charge, with no volumetric charge, encouraged farmers to use more water than was socially optimal. Second, successive governments did not provide adequate finance to reduce the flow of saline drainage water into river systems. Because of these factors, the extent of salinity experienced in Victoria was higher than it would have been if the institutional framework had been more efficient in water allocation and financing arrangements.

Water allocation under the SRWSC was in the form of a water right assigned to each property. Water rights were assigned based on a one for one principle; that is for every acre determined suitable for irrigation, users were allocated one acre-foot of water. A water right had two associated features: first, it could not be sold separately from the land to which it allocated. Second, as noted, it was accompanied by a minimum compulsory charge requiring farmers to pay for a predetermined, minimum quantity of water regardless of whether they used it or not. Therefore, the marginal cost of water to farmers was zero. On the other hand, the marginal social cost of water was positive, as its use contributed to the rise of salinity by rising water tables and added saline groundwater discharge into river systems. Because the marginal private cost was less than the marginal social cost, farmers had an incentive to use more water than was socially optimal.

The link between over-watering and on-farm irrigation salinity in the form of high water tables was recognised as early as 1912. In that year, the SRWSC annual report noted 'excessive use of water by irrigators has caused a rise in the soil water-level, which in a few scattered areas has come so near the surface as to cause an accumulation of alkali through evaporation' (SRWSC 1912/13, p. 19). These observations continued into the 1920s and 1930s (Taylor *et al*. 1933; SRWSC 1937/38). By the late 1930s, the connection between the compulsory charge and problems of over-watering were firmly established. In 1937, findings of a Royal Commission tabled in parliament stated, 'A . . . defect of the system of water rights is the natural tendency on the part of irrigators to use the quantity of water for which they are required to pay, irrespective of its effects on the land' (McClelland *et al*. 1937, p. 24). This Royal Commission claimed excessive water use was encouraged by the one to one allocation principle noted above. It argued this system was inherently inflexible because buyers could not determine the quantity of water they required from year to year. Inflexibility had led to higher than average annual allocations, necessary only during drought years, becoming the standard volume allotment even in normal rainfall years.

Based on this assessment, the 1937 Royal Commission recommended that parliament alter the method of water provision to avoid over-allocation problems. It suggested replacement of compulsory minimums with volumes determined by individual landowners. This voluntary contracting system included a

volumetric charge for water based on the consumption of one acre-foot. For each acre-foot consumed, farmers would be charged a flat per unit rate determined by the SRWSC for their district (McClelland *et al*. 1937). However, farmers would still be required to pay for the entire annual contracted amount at the unit charge regardless of whether they used all the water or not. As a result, this proposal did not effectively increase the marginal cost of water to farmers. Its only advantage was that farmers were now able to opt out of irrigation by choosing not to enter a contract for water supply or to reduce (increase) the amount of water being delivered thereby limiting the degree of over-use. Nevertheless, these recommendations were not incorporated into legislation and the compulsory charge remained unaltered. This encouraged the continued rise of water tables and groundwater recharge.

Rising salinity was also encouraged by successive governments' refusal to provide the SRWSC with sufficient funds for disposal of saline drainage water away from river systems. In 1916, findings from a Royal Commission tabled in parliament noted the importance of directing drainage water away from river systems as a way of reducing in-stream salinity and improving water quality for downstream users (Johnstone *et al*. 1916). It recommended additional government finance be allocated for investigations into the effectiveness of diverting saline drainage water into drainage reservoirs. However, this finance was not provided and the SRWSC could not undertake these investigations. As a result, salinity investment focused on construction of drainage systems to reduce on-farm salinity that directed saline drainage water into river systems. Therefore, in-stream salinity continued to increase.

By 1937, increasing salinity levels in Victorian rivers had started to damage infrastructure and reduce irrigation productivity. This led the SRWSC to investigate methods for reducing the problem (SRWSC 1936/37). In the same year, the 1937 Royal Commission recommended an increase in public investment for salinity mitigation works to divert saline drainage water to storage lakes. It recommended that parliament make additional finance available for this investment as a matter of government policy (McClelland *et al*. 1937). However, no funds were forthcoming.

In the decades that followed, the SRWSC investigated methods to reduce in-stream salinity including the construction of silt dams to divert drainage water and the use of evaporation basins (SRWSC 1957/58). However, because much of this work was investigative it did little to prevent further intrusion of salinity into waterways. It was not until the 1960s that adequate funds were available to finance off-site storage on a broad scale. The federal government provided this funding in response to South Australian concerns about the increasing costs of Murray River salination. Finance was allocated to state water authorities for construction of off-site disposal schemes to reduce salinity in the river (SRWSC 1967/68). In later years, off-site drainage water disposal became an essential part of interstate salinity reduction programs, particularly the *Salinity and Drainage Strategy* (Murray–Darling Basin Ministerial Council 1999, 2000).

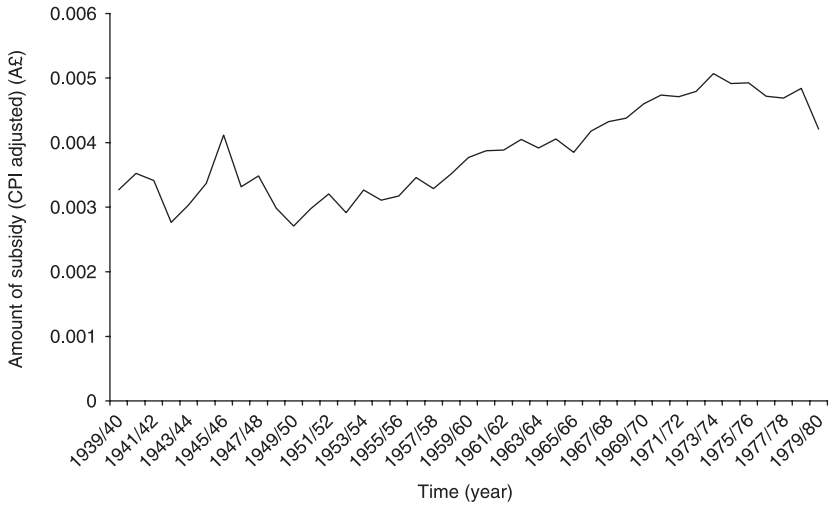

Figure 1 Per capita subsidy for country water supply from 1939/40 to 1978/79.
Source: SRWSC 1939/40 to 1978/79.

Prior to the 1960s, lack of state funding for drainage disposal may have been the result of two exogenous shocks: the Great Depression (1930s) and World War II (1939–1945). These shocks would have acted to reduce funding available for this type of investment because of changes in government financing priorities. Nevertheless, these events were accompanied by a change in economic policy that emphasised Keynesian demand-side management. Therefore, investment in drainage diversion schemes would have been consistent with the overall thrust of public policy for two reasons. First, Keynesian economic management encouraged large-scale government investment in public works to stimulate economic growth by increasing employment. Infrastructure construction to remove saline drainage water would have created employment while reducing in-stream salinity to some degree.

Second, investment in the war effort would have taken priority during the conflict, reducing funding for removal of drainage water in irrigation areas. However, once the war ended, government policy was directed at employment creation for returned soldiers. A major part of this policy was the establishment of soldier settlement schemes in irrigated areas. These schemes, financed by government loans to solider settlers, increased public investment in the water sector. Figure 1 supports the importance of this post-war investment policy showing a sharp spike in per capita subsidy for country water supply in 1944/45. An essential requirement of these schemes was the maintenance of land and water quality to stabilise output levels and incomes. However, on-farm and in-stream salinity would have acted to reduce productivity of these settlements, lowering incomes and the ability of settlers to finance loans. Based on these considerations, it is reasonable to argue that employment and productivity benefits of public investment in drainage water disposal would have been higher than the costs. In turn, it could be claimed that lack of

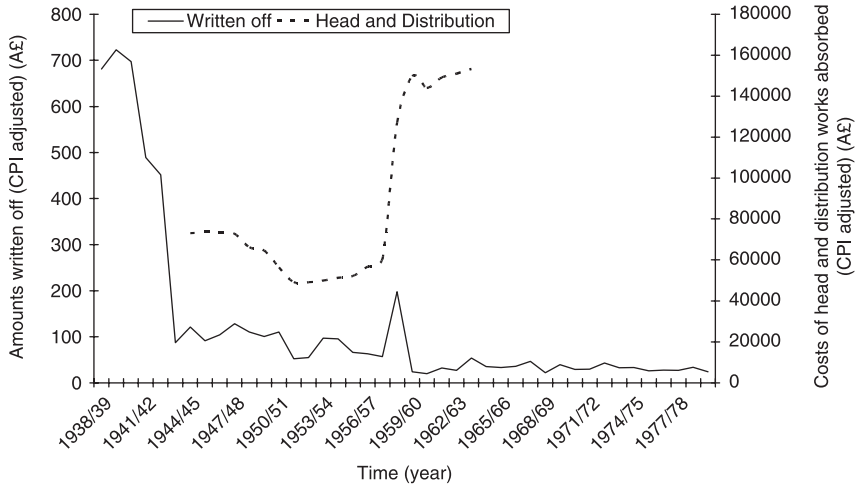

Figure 2 Irrigation costs absorbed by the Victorian State Government.

Note: The increases in amounts in 1959/60 was the result of additional construction which could not be undertaken by local authorities because they required heavy expenditure on headworks with capacities much above the immediate requirements of the areas served (SRWSC 1959/60).

Source: Harris 2002, 139–141.

finance for these works reduced the overall benefits of these policy initiatives to some degree.

Nevertheless, while the government did not provide funds to mitigate in-stream salinity, it continued to invest in irrigation expansion, the costs of which were not recouped from compulsory charge revenue. As a result, Victorian taxpayers were subsidising the irrigation industry (Figures 1, 2). The continued expansion in irrigation without corollary expenditure on effective drainage disposal increased in-stream salinity over the following decades. Comprehensive monitoring of in-stream salinity on multiple Victorian rivers was not undertaken during these decades. However, one set of data collected by the Murray–Darling Basin Commission between 1939 and 2003 measured salinity levels in the Murray River at Morgan, South Australia. Morgan is located between lock one and two on the river, just before the Morgan–Whyalla pipeline supplying Adelaide. Recent interstate salinity mitigation schemes, for instance, the *Salinity and Drainage Strategy*, measure the effectiveness of these schemes based on measurements at Morgan. The aim is to maintain salinity levels here at 800 EC, the World Health Organisations upper limit for drinking water, 95 per cent of the time.

The application of a simple ordinary least-squares linear trend line to these data shows an upward trend (Figure 3). Large variations in these data make it difficult to prove the existence of an underlying trend. However, a more detailed examination of salinity levels by Cunningham and Morton (1983) supports the claim that salinity was increasing during this period. The Cunningham and Morton (1983) study uses the same data set and applies a simple

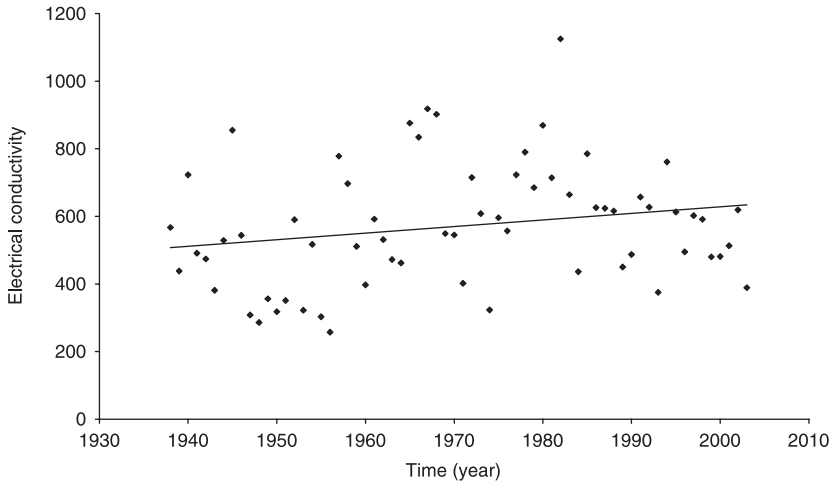

Figure 3 Murray River salinity levels at Morgan, South Australia 1938–2003.
Note: R^2 is 0.0432; t statistic is 1.70. Trend line is estimated using ordinary least squares regression.
Source: www.mdbc.gov.au 2003.

statistical model using chloride concentrations rather than EC units to analyse salinity measurements. They concluded that, apart from the peaks, there was a general upward trend in the data over and above that associated with a decline in water flow during the period (Cunningham and Morton 1983). The findings should be interpreted with caution given the proportion of salinity contributed by New South Wales irrigation areas cannot be disaggregated. Therefore, it is difficult to conclude what share of the increase was attributable to Victorian government failure as identified above. However, it is possible to argue, based on the evidence presented above, lack of action by the Victorian government to adequately deal with irrigation salinity problems identified over 1939–1984 almost certainly contributed to the upward trend observed to some extent. In turn, this suggests that, in part, in-stream salinity increases could be the result of government failure in water sector administration.

Evidence provided in this study supports the contention that at least part of the salinity problem experienced in Victoria today is because of government failure as defined by Wolf (1979, 1987) for two reasons. First, the government did not alter the water allocation system that underpriced water at the margin, encouraging over use. Over-watering increased on-farm salinity by inducing rising water tables and in-stream salinity via groundwater recharge. This supports Wolf's (1987) definition of government failure because the agency responsible for creating the derived externality did not alter its behaviour to prevent or limit the externality.

Second, successive governments did not provide finance for construction of large-scale schemes to prevent the flow of saline drainage water into river systems. Victorian economic development was underpinned by irrigation-sector expansion where large-scale public infrastructure investments overcame

private sector underinvestment. Wolf's (1987) taxonomy approach identifies the derived externalities that can result from these interventions as a class of government failure. In this context, lack of finance for construction of off-site storage of saline drainage water fits this definition of government failure. It was not until the 1960s when federal government funding became available to construct drainage diversion schemes that any real progress was made to reduce in-stream salinity. However, it was still another 20 years before funding was sufficient for broad scale application of these programs. Combined, these factors provide evidence in support of the claim that delayed action to effectively combat salinity was a non-market failure (Wolf 1979, 1987).

4. Conclusion

The evidence outlined above supports to the argument that high levels of in-stream salinity currently experienced in Victoria are, in part, the result of past government failure in water sector administration. Evidence shows that water allocation under the SRWSC based on the application of a compulsory charge encouraged over-watering by underpricing water at the margin. In turn, the knowledge that excessive water use was leading to water table rises in various irrigation areas was well recognised by 1912. However, while alternative methods of allocation and pricing were recommended, there was no change in government policy.

The evidence also shows that while investment in storage capacity and associated infrastructure continued to increase, there was no finance provided for effective removal of saline drainage water. As a result, saline drainage water flowed back into river systems, increasing in-stream salinity. In recent years, interstate initiatives, particularly the *Salinity and Drainage Strategy* that increased finance for comprehensive salinity mitigation schemes have gone part way to redressing this investment imbalance.

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