Estimating Society's Willingness to Pay to Maintain Viable Rural Communities[*]

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[*] A previous version of this paper was presented at the 46th Conference of the Australian Agricultural and Resource Economics Society, Canberra, February 2002. Funding for the research work reported in this paper was provided by Environment Australia, Land and Water Australia and the National Land and Water Resources Audit. Errors and inadequacies in the paper remain the responsibility of the authors.

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Abstract

Ensuring the continued viability of rural communities has become a high political priority in Australia. Calls for measures to support rural communities have been prompted by substantial population declines in some country areas. In Europe and the United States of America, similar political pressures to keep rural communities viable are also apparent, often as a component of the "multifunctionality" of agriculture. The question addressed in this paper is whether or not the Australian tax-paying public would be willing to pay to avoid any deterioration in rural community viability that may result from environmental protection measures. As an integral component of a number of recent non-market, environmental valuation exercises using Choice Modelling, the value of these community viability benefits have been estimated. The results demonstrate a positive "existence value" held primarily by urban dwellers for the continued viability of rural communities.

Key words: rural communities, viability, choice modelling, multifunctionality.

1. Background

Australian rural society has undergone change as the agricultural sector has adjusted to changing economic conditions. Populations in rural areas have declined. Services provided to rural areas (and rural populations) have become more concentrated in larger rural centres and the fortunes of many small towns have waned. Many rural inland regions have experienced net migration and this has generated falls in population (ABS 2003). In 1911, 43 per cent of Australia's population was located in rural areas. By 1976, that figure had fallen to 14 per cent. It remained relatively constant at that level until the mid-1990s when it began to fall again. That is not to say that there have not been pockets of rural population growth – largely centred on some larger rural centres. However the populations of many other country towns have fallen.

There is some evidence to suggest that the broader Australian society would like to avoid a continuation of this decline in the viability of rural communities. Specific policies to support rural communities have been implemented. Governments have imposed rules to maintain levels of telecommunication services in rural areas and have convinced banks to install charters of "social responsibility" with promises of no further branch closures (******web reference). The urban-dwelling public's demand for maintaining the social structure of rural areas is regularly witnessed through donations made to various media appeals in times of "crisis" - such as droughts, floods and fires.

Whilst this evidence points to the existence of a demand, it is not in a form that is useful to the design of specific policies. More detailed empirical evidence[1] of the extent of the

[1] A call for estimates of non-environmental, non-market values was made by Portney (1994). What empirical evidence that did exist at that time was argued by Poe (1997) to be "myopic and points to policies that address only one side of the agricultural environmental relationship" (p5). Subsequently some attempts have been made to fill the void. For instance, Johnson and Desvouges (1997) estimated the value of employment effects of energy programmes and Morrison et al (19****) performed a similar task in the

demand held by urban people for viable rural communities would be useful in the policy process[2]. The aim of this paper is to make a contribution to that empirical evidence. It does so by detailing the results of two studies that were aimed at estimating the non-marketed values associated with the outcomes of alternative natural resource management strategies. Both studies employed the Choice Modelling technique for estimating non-market values but in different settings. The first involved the estimation of values associated with wetland management strategies for the Murrumbidgee River Floodplain, situated in southern inland New South Wales. The second study investigated values associated with the implementation of alternative natural resource management strategies across the whole nation and, specifically, in two agricultural regions – the Great Southern in south west Western Australia and the Fitzroy River Basin in Central Queensland. The two studies therefore offer empirical evidence on the extent of community willingness to pay for maintaining the populations of rural communities specifically in three diverse regions and generally across Australia when the viability of those communities is threatened by measures designed to provide environmental protection benefits.

The paper is structured as follows. In the next section, the issue of rural community viability is placed in the context of the multifunctionality of agriculture. A brief outline of the Choice Modelling technique is provided in Section 3. In Section 4, the results of the Murrumbidgee River Floodplain study are detailed. This is followed by Section 5, which contains the results of the second study. Some conclusions are drawn in the final section.

2. Multifunctionality in Agriculture

The last decades of the 20th century saw a shift in agricultural policy in many developed countries. Measures to support production levels through price supports and cost subsidies began to give way to policies with a focus on non-marketed aspects of agriculture. Agricultural industries have been argued to be sources of not only marketed goods and services but also non-marketed outputs including food security, environmental protection, viable rural communities, and heritage values (Anderson 2000). This "multifunctionality" view of agriculture has been accepted by the World Trade Organisation in part through its establishment during the Uruguay Round of the so-called "Green Box" of measures for agriculture that are exempt for the purpose of calculating the overall level of domestic support.

Hence, the agricultural policy emphasis in the United States (US) and the European Union (EU) has shifted away from support that is 'coupled' to production levels and towards 'de-coupled' measures that support income levels and target the provision of non-commodity outputs. It is instructive to compare the different approaches to this multifunctionality taken in Europe and the United States.
In Europe, agriculture is seen primarily as producing positive non-market environmental

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context of wetland protection.

[2] Anderson (2000) makes the important point that "the package would not include the very blunt instrument of general support to prices of farm products regardless of where in the country those goods are produced" (p491).

spillovers such as biodiversity protection, aesthetic benefits, and public open space, so long as the style of production remains "traditional". The maintenance of traditional farming practices is perceived to be a necessary prerequisite for ensuring the supply of environmental and heritage values. The alternative to traditional farming systems might involve the reallocation of agricultural land to urban development or high-intensity forms of agriculture, both of which may threaten environmental values. Hence, European countries have implemented a number of policies that pay farmers to maintain traditional, low intensity farming practices. For example, under the Common Agricultural Policy (CAP) production support has been reallocated to measures designed to protect the environment (Latacz-Lohmann 2000). In the UK, the Countryside Stewardship Scheme (CSS) is used as a mechanism for enhancing countryside amenity values, whilst the Environmentally Sensitive Areas (ESA) scheme is designed to protect existing natural areas. Furthermore, many European countries place a strong emphasis on preserving the culture of country communities and villages for tourism and the non-use benefits of knowing that this way of life still exists.

By way of contrast, in the US greater policy focus is placed on managing the negative non-marketed environmental impacts arising from agriculture. Indeed, farmers and intensive agricultural practices are perceived to be part of the problem rather than the solution to reversing declines in environmental quality[3]. For example, farmers are supported financially to engage in water pollution control measures rather than to produce agricultural commodities (McCann 2001). Under the Conservation Reserve Program (CRP) and other measures such as the Sod-buster and Swamp-Buster programmes, farmers have been paid to set aside land from production in order to secure environmental gain. Thus, it is apparent that in the US, the goal of pursuing multifunctionality could involve tradeoffs between the environment, agricultural production, and rural community viability (Poe 1997). However, there is also a demand in the US for protection of open space, habitat and aesthetic values (often termed viewsheds), in both peri-urban and rural areas. This is the main driver for the establishment of conservation covenants in the US. There is also some focus on the maintenance of "traditional" farming in the US but to a much lesser extent than is evident in Europe.

In Australia, the policy focus has also shifted. Policies that sought to encourage production through price support and centralised marketing schemes have been phased out. Natural resource management (NRM) has become the key phrase in agricultural policy making. Programmes such as Landcare, the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality involve payments being made largely to landholders adopting measures to reduce the negative non-marketed environmental impacts of agriculture (AFFA ******). The view of agriculture is therefore akin to that taken in the US – agricultural practices are detrimental to the

[3] That is not to say that in Europe, farmers are seen as environmentally benign. Indeed nutrient run-off and pesticide pollution from intensive livestock production are major environmental issues. However, the emphasis in Europe remains on the support of traditional practices that are viewed as being less environmentally damaging than modern intensive agriculture.

environment. For instance, the reduction or withdrawal of agricultural practices encourages biodiversity protection. This is in contrast with the European situation where the continuation of traditional management practices is accepted as being complementary to the goal of maintaining species diversity.

The environmental impacts associated with agriculture (both positive and negative) do not constitute the only dimension of agriculture's "multifunctionality" of relevance to European, US and Australian policy. Declining terms of trade, technological improvement, and specifically the removal of price support schemes, have resulted in shrinkages in rural communities. Anderson (2000) suggests that such changes to the viability of rural communities are of concern to some societies. In particular he advances the "nostalgic attraction" that rural villages and landscapes have for urban dwellers who hold an option value for future visits to the countryside and a sense of military insecurity arising from de-population. In addition to these option and security values, urban dwellers may also enjoy cultural/bequest values of the lifestyle and history associated with country communities. Latacz-Lohmann (2000) argues that, in the European context, trade liberalisation may result in widespread abandonment and marginalisation of agriculture so that the positive environmental spillovers of agriculture in those areas would be diminished.

Furthermore, there are strong prospects that the viability of rural communities will be reduced if environmental policies are pursued vigorously. For example, taking land out of agricultural production and placing it in conservation reserves or revegetating the land with native species could impinge on the livelihoods of farming communities. As is the case in the US, multifunctionality in Australian agriculture could involve trade-offs between production and the environment and between the environment and rural community viability. However, it is a moot point whether or not policies designed to assist agricultural activities in rural areas are in fact merely support measures for agricultural production. Anderson (2000) judges that "some structured subsidies to address the issue of declining service provision in remote rural areas are WTO-consistent under the 'green-box' of the URAA (paragraph 2(g) of Annex 2) and the WTO's Agreement on Subsidies and Countervailing Measures (article 8.2(b))" (p490). Hence, countries contemplating the payment of such subsidies will need to be able to justify them both as to the rationale for their payment and the empirical extent of the costs society would bear if rural communities were to decline further.

In terms of the rationale for the payment of subsidies, people living outside of rural areas may be concerned about farmers leaving rural communities for a number of reasons. First, they may hold non-use values for the existence of viable rural communities and the associated cultural diversity that this brings to the nation. Secondly, urban dwellers may express an option value for preserving the functionality of rural townships so that the 'rural experience' can be enjoyed on future visits to the countryside. In addition, people residing within a rural region may hold a 'use value' for the level of access to services and facilities that they currently enjoy there. In terms of the potential extent of subsidies so justified, a quantification of the demand held by the society for viable rural

communities[4] is of use. These demands must be quantified using non-market valuation techniques because they are not evidenced in markets. The specific technique used in this paper is Choice Modelling[5].

3. Choice Modelling

Choice Modelling (CM) was developed initially in the marketing and transport economics literature (Louviere, Hensher and Swait 2001). The technique allows the estimation of the non-market values of changing from one resource allocation scenario to another. It is also capable of breaking down such values into their component parts as specified by Lancastrian demand theory (Lancaster 1966). It is able to yield estimates of the value of per unit changes in the attributes of the change that are important to people.

Hence, in addition to being used to estimate the value of changing to a new style of natural resource management, CM can be used to estimate the values of the attributes of the outcomes of the change that matter to people. For instance, consider a change in resource management that will alter the number of endangered species present in a region, the aesthetic appearance of the countryside and the recreational activities that are possible. Choice Modelling allows the aggregate value of the change to be disassembled into its component values (commonly referred to as attribute implicit prices). Hence, with the application of CM it is possible to estimate, for instance, the value to respondents of reintroducing an endangered species or improving water quality so that rivers become swimmable instead of only boatable.

In brief, CM allows the estimation of values associated with NRM changes, including the estimation of the values of the "attributes" of change. The impacts of change on those attributes do not have to be positive. Hence, while changing management strategies may positively impact species protection in a region, it may have detrimental impacts on the viability of the surrounding rural communities. The overall value of the change is therefore comprised of positive and negative impacts – internally off-setting each other.

The studies reported in the next two sections involved presenting to respondents CM questionnaires depicting alternative NRM strategies that yielded both positive environmental outcomes and, in some cases, negative impacts on the viability of rural communities. Specifically, respondents were asked to make choices between alternative NRM strategies and the status quo. The willingness to make a monetary trade-off between the options was assessed through the inclusion of a payment associated with the alternative strategies. By making choices between the options presented, respondents

[4] In the Australian context, the rural communities facing the reality or the prospect of decline are largely those that are dependent on primary production. So whilst in many rural areas of the EU and the US, the viability of communities may be a function of the profitability secondary and tertiary industry as well as farming, the viability of Australian rural communities is more dependent on the number of farmers remaining in an area. This difference is fundamentally a matter of different population densities.

[5] Alternatively known in the literature as Choice Experiments or Contingent Choice. See Bennett and Blamey (2001) for an exposition of the Choice Modelling technique in the context of estimating non-market environmental values. Louviere, Swait and Hensher (2001) provides a comprehensive conceptual treatment of the technique.

demonstrated their willingness to pay for alternative NRM scenarios and for unit changes in the attributes used to describe the alternatives. Given that one of those attributes in both studies reflected the continued viability of rural communities, the survey enabled estimates to be made for the value that respondents place on this non-market good.

4. The value of retaining farm populations in the Murrumbidgee River Floodplain[6]

Research objective

The primary purpose of the Murrumbidgee River Floodplain (MRF) choice modelling exercise was to estimate values associated with alternative wetland management strategies in the region. The alternative strategies involved potential reallocations of resources from agricultural uses to conservation. The strategies included the reallocation of irrigation water to wetlands and the requirement that farmers preserve wetlands in their natural state rather than draining them for agricultural production. Respondents were presented with three alternatives per choice question: A status quo management strategy, and two different wetland protection strategies that required respondents to pay a one-off environmental levy in return for environmental improvement that could be realised within a period of 15 years.

Respondents were told that the wetland protection strategies would generate positive environmental impacts including increases to the area of healthy wetlands, the population of water and woodland birds and the population of native fish. These three impacts were used as attributes in the CM application (see Table 1). However, the protection policies may also have a negative impact on farm viability meaning that some farmers could leave their farms and the region over the next 15 years. Information set out in the CM questionnaire specified that, while compensation would be paid to farmers and irrigators for any costs associated with the changes to wetland management, some farmers could nevertheless decide to sell their properties and leave the region. Thus one of the attributes used in the questionnaire to describe the outcomes of the alternative management strategies was defined as the number of farmers leaving the region[7]. A fifth attribute – a levy to pay for the implementation of the alternative strategies – was included to provide the monetary numeraire. All variables are defined in Table 2 and one of the choice sets developed for this study is contained in Appendix 1.

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[6] Full details of the research are provided in Whitten and Bennett (forthcoming).

[7] The use of absolute numbers as the metric for the farmers leaving attribute was the result of focus group testing that showed the alternative metric – the percentage change in the population of farmers – was too difficult for most respondents to comprehend. Hence, respondents seeking to understand the relative magnitude of the changes involved were required to make their own comparisons between total numbers of farmers and the numbers leaving.

Table 1: Attributes – MRF study

Attribute	Variable name	Unit of measurement	Levels used in questionnaire			
			Status quo	**Level 1**	**Level 2**	**Level 3**
Area of healthy wetlands	Wetlands	Hectares	2500	5000	7500	12500
Population of water and woodland birds	Birds	Percentage of pre-1800 bird numbers	40	60	70	80
Population of native fish	Fish	Percentage of pre-1800 fish numbers	20	30	40	60
Social impact	Farmers leaving	Number	0	5	10	15
Levy on income tax	Cost	One-off dollar cost per household in 2000-01*	0	20	50	200

*Australian dollars

Table 2: Variable definitions – MRF study

Variable	Definition
Farmers leaving	Number of farmers who leave as a result of management changes
Cost	Size of one-off levy on income via income tax
Wetlands	Area of healthy wetlands (hectares)
Birds	Number of native birds as a percentage of pre-1800 numbers
Fish	Number of native fish as a percentage of pre-1800 numbers
ASC1	Alternative specific constant equals 1 for options 2 and 3, else zero
ASC2	Alternative specific constant equals 1 for option 2 else zero
Age	Age of respondent (continuous)
Adelaide	Dummy variable equals 1 for Adelaide else zero
Griffith	Dummy variable equals 1 for Griffith else zero
Intended visit	Dummy variable equals 1 for respondents intending to visit the region else zero
Income	Log of respondent income (continuous)
Tert	Dummy variable equals 1 for tertiary education else zero
NDT	Dummy variable equals 1 for respondents indicating they do not trust government to make levy one-off or protesting against the payment vehicle on other grounds else zero
Levy	Dummy variable equals 1 where respondent indicated levy is not a good idea else zero
IV	Inclusive value representing the expected utility from alternatives in the lower level of the nest

Survey mechanics[8] and sample characteristics

In order to examine potential differences in values held by different populations, the respondent sample was drawn from four different geographic locations:

- Wagga Wagga and Griffith (major rural centres in the region);
- Canberra (a city upstream of the region); and
- Adelaide (a city downstream of the region).

Table 3 contains a summary of sample statistics and shows how the samples compare to population means. An average response rate of 30.2 percent was achieved across all samples, which compares favourably to other Australian CM surveys. The median age of respondents was older than the population for the sample areas. Income and educational qualifications were also generally higher than the wider population[9]. Seventy-eight percent of respondents had visited the region and only 10.3 percent did not intend to visit in the future indicating the potential for option and bequest values.

Model specification

A multinomial logit model was used initially to describe the data relationships. The model of respondents choices was estimated using pooled survey data from the four sub-samples. The computer package LIMDEP was used to estimate the model parameters. The model was specified as follows, where V_j is the utility associated with alternative j:[10]

Status quo: $V_1 = ß_1$ Cost + $ß_2$ * 1 / Wetlands + $ß_3$ * 1 / Birds + $ß_4$ * 1 / Fish + $ß_5$ * Farmers leaving

Alternative 2: V_2 = ASC + $ß_1$ Cost + $ß_2$ * 1 / Wetlands + $ß_3$ * 1 / Birds + $ß_4$ * 1 / Fish + $ß_5$ * Farmers leaving + $ß_i$ ASC (socioeconomic and attitudinal variables)

Alternative 3: V_3 = ASC + $ß_1$ Cost + $ß_2$ * 1 / Wetlands + $ß_3$ * 1 / Birds + $ß_4$ * 1 / Fish + $ß_5$ * Farmers leaving + $ß_i$ ASC (socioeconomic and attitudinal variables)

Note that the model structure uses a 1/*x* form for the *wetlands*, *birds* and *fish* attribute parameter coefficients. The 1/*x* form allows for diminishing marginal values for increases in attribute levels. The *farmers leaving* and *cost* attributes are assumed to be linear due to the inclusion of zero as the status quo level of those attributes.

[8] The Dilman Total Design Method (Dilman 1978) was used in a mail-out/mail-back survey format.
[9] The sampling bias evident in the study restricts the capacity to extrapolate the results of the survey to the entire population.

[10] Definitions of the variables used are provided in Table 3.

Table 3: Sample sizes and respondent characteristics - MRF study

Sample	**Sample size**		**Undelivered**[a]		**Response** [b] (%)
Griffith	800		113		22.0
Wagga Wagga	800		96		33.0
Canberra	800		121		33.7
Adelaide	400		48		34.1
Total	*2,800*		*378*		*30.2*
Sample characteristics	ACT	Adelaide	Wagga Wagga	Griffith	Overall
Median age	48	52	49	52	50
Sex (% male)	61.8	60.2	55.8	66.2	60.9
Median annual h/hold income (A$)	52,000 - 77,999	36,400 - 51,999	36,400 - 51,999	36,400 - 51,999	36,400 - 51,999
Proportion with tertiary education (%)	52.3	42.5	28.4	26.0	37.9
Population characteristics[c]					
Median age	39	43	39	41	42
Sex (% male)	48.7	47.8	48.5	50.3	48.9
Median annual h/hold income (A$)	48,699	30,971	32,850	33,163	34,322
Proportion with tertiary education (%)	23.9	10.4	8.9	6.1	11.0

[a] Undelivered surveys were those returned to sender.

[b] Response rate expressed as a percentage of delivered questionnaires

[c] For all samples, the sample is significantly different from the population age at the 95 percent level of confidence. Population means sourced from Australian Bureau of Statistics 1996 census.

Tests of this initial model indicated that the critical 'assumption of independence of irrelevant alternatives' (IAA) was violated.[11] Hence, a nested logit model was constructed. It was assumed that respondent choice behaviour is characterised by two decision levels. At an upper level, respondents make a decision as to whether or not to support an environmental levy to fund wetland protection. Conditional on supporting a levy, the respondent makes a lower level decision about the particular protection strategy to support. The upper level decision was assumed to be influenced by a range of socioeconomic variables, attitudinal variables, and an inclusive value (IV) which represents the sum of expected utility from the choice alternatives nested below the 'support' or 'non-support' options. The lower level utility associated with each alternative was specified to be a function of the attributes. Hence, the nested multinomial logit model estimated is:

Upper-level choice:

$$V_{support} = ASC1 + \Sigma\, ß_i \text{ (socioeconomic and attitudinal variables)} + \alpha_1 IV_{support}$$

$$V_{no\ support} = \alpha_2 IV_{no\ support}$$

Lower-level choice :

$$V_j = ASC2 + ß_1\, Cost + ß_2 * 1 / Wetlands + ß_3 * 1 / Birds + ß_4 * 1 / Fish + ß_5 * Farmers\ leaving$$

where $V_{support}$ is the utility associated with the levy options and $V_{no\ support}$ is the utility obtained from selecting the status quo option. An alternative specific constant (ASC1) was specified for the levy option, and the socioeconomic and attitudinal characteristics were incorporated into the model as interactions with this ASC. The coefficient on the inclusive value for the *no support* option (α_2) was fixed to one because only one alternative exists in the lower level nest for this option. V_j is the utility function for management strategy j, where the set of J strategies includes the status quo.

Results

Model estimates are contained in Table 4. Most of the variables are significant at the five per cent level and the choice model has a reasonable goodness of fit – as indicated by an adjusted rho squared statistic of 34 per cent.

[11] IAA is a requirement for the statistical validity of multinomial logit models. In this application, testing of the best performing multinomial logit model showed IIA violations at the 1 and 5 percent level.

Table 4: Model results – MRF study[a]

Model statistics		
N (choice sets)	3148	
Log Likelihood	-2400.30	
Adjusted rho-square (%)	33.58	
Lower level choice equations		
ASC2	1.20E-01	**
Cost	-0.12E-01	**
1 / Wetlands	-7.83E+03	**
1 / Birds	-5.10E-01	**
1 / Fish	-3.28E-01	**
Farmers leaving	-0.70E-01	**
Upper level choice equations		
ASC1	5.81E+00	**
Income	-3.45E-01	**
Intended visit	-4.44E-01	**
Age	1.01E-01	**
Tertiary	-2.16E-01	*
NDT	1.55E+00	**
Levy	2.11E+00	**
Griffith	5.39E-01	**
Adelaide	-2.28E01	
Inclusive value parameters		
IV No support	1.00	
IV Support	4.65E-01	**

[a] Model estimates are based on pooled data from the four respondent samples;

* denotes significance of parameter at the 10% level, ** denotes significance at the 5% level.

The implicit prices derived from the attribute coefficients estimated in the model are shown in Table 5. These estimates are measures of the amount of money respondent households are willing to pay to trade-off for a unit improvement in an environmental attribute or the amount they are willing to pay to prevent a farmer leaving the MRF region. The equation for calculating implicit prices (IP) for the environmental attributes is:

$$IP = - (-ß_{\text{non-monetary attribute}} / \text{attribute level}^2) / ß_{\text{monetary attribute}}$$

and for *farmers leaving* the IP formula is:

$$IP = ß_{\text{non-monetary attribute}} / ß_{\text{monetary attribute}}$$

Table 5: Mean implicit price estimates for MRF attributes (95% confidence interval in parentheses)

Wetland area ($ per 1000 ha)	Number of native birds ($ per 1% change)	Number of native fish ($ per 1% change)	Farmers leaving ($ per farmer)
11.39	0.55	0.34	-5.73
(9.05 – 13.71)	(0.35 – 0.79)	(0.24 – 0.45)	(-7.35 – -4.21)

Note: Implicit price estimates are average one-off household values for the specified unit change in attribute level that will be realised within the next 15 years. Values are in Australian dollars at year 2000 levels and are evaluated at the midpoint of the levels used in the survey.

Note that the IP for *farmers leaving* is a constant, while that for *wetland area*, *birds* and *fish* varies according to the level of the attribute (due to the functional form). Survey respondents were willing to pay, on average, a one-off amount of A$5.73 per household to prevent a farmer leaving (and thus avoid the related impacts on the rural community). The 95 percent confidence interval for this estimate is A$4.21 to A$7.35.[12] There is no significant difference in willingness to pay to prevent farmers leaving across the four sub-samples, indicating that values are invariant to the respondent's place of residence. This suggests that the 'non-use' values held by the out-of-region respondents are of a similar magnitude to the 'use' values held by respondents who reside in the region.

The implicit price estimates indicate the importance that the sampled respondents placed on maintaining rural communities. Marginal rates of substitution between the non-monetary attributes can also be calculated. For example, at the survey attribute level mid-points respondents are willing to trade-off:

One more farmer leaving = 503 ha of extra healthy wetlands = 10.4% extra native bird numbers = 17.0% extra native fish numbers.

5. The value of maintaining country communities: A national and regional perspective[13]

Research objective

The focus of this study was to produce value estimates for a set of generic attributes that characterise the environmental and social impacts of land and water degradation at national and regional levels. The study addressed the need to develop a better understanding of community willingness to pay for various environmental and social improvements associated with natural resource policies.
Five attributes were selected for the CM application (see Table 6). Three of the attributes

[12] Confidence intervals estimated using a random draw procedure of 200 draws, see Whitten and Bennett (2001) for more details.
[13] Full details of the research are provided in van Bueren and Bennett (forthcoming).

pertain to environmental dimensions of resource use. Social impacts of resource use changes were defined in terms of the net loss of people from country towns each year over the next 20 years. Respondents were presented with future scenarios in which the population decline is forecast to either reduce or accelerate, depending on the type of policy implemented[14]. A fifth attribute included in the choice model was an environmental levy. It was included as a means of estimating respondents' willingness to pay for different policy outcomes.

Table 6: Attributes – national and regional study.

Variable name	**Species**	**Look**	**Water**	**Social**	**Cost**
Attribute	Species Protection	Landscape Aesthetics	Waterway Health	Social Impact	Environmental levy
Description	The number of species protected from extinction by 2020.	The area of farmland repaired and bush protected by 2020	The length of waterways restored for fishing or swimming by 2020.	The net loss of people from country towns each year over the next 20 years	The amount of money households would be required to pay each year
Unit of measurement	Number	Hectares	Kilometres	Number	A$
Attribute levels					
National questionnaire					
Status quo	50	4 mill	1000	15000	0
Level 1	70	6 mill	5000	5000	20
Level 2	140	8 mill	8000	10000	50
Level 3	200	10 mill	10000	20000	200
Great Southern questionnaire					
Status quo	25	250000	100	1500	0
Level 1	35	500000	250	500	20
Level 2	70	750000	500	1200	50
Level 3	100	1 mill	800	2000	200
Fitzroy Basin questionnaire					
Status quo	5	250000	100	1200	0
Level 1	10	500000	500	450	20
Level 2	15	750000	800	1000	50
Level 3	20	1 mill	1000	1500	200

[14] As with the MRF study, the use of absolute numbers as the attribute metric required respondents to make their own assessments of the proportion of the population affected by each proposed change.

Survey mechanics[15] and sample characteristics

Three separate CM questionnaires were developed in order to examine how value estimates vary across different policy contexts. One questionnaire was designed to estimate respondents' values for resource use impacts at a national level, while the other two questionnaire versions each referred to one of two case study regions: the Great Southern region of Western Australia and the Fitzroy Basin region of Central Queensland. The same set of attributes was used in each questionnaire, although the levels of these attributes were different, reflecting the different characteristics of each region and the differences in scale between the regional context and the national context (see Table 6). A sample choice set from the questionnaire is displayed in Appendix 2.

The national version of the questionnaire was issued to a sample of households drawn at random from a telephone directory database of the Australian population. The region-specific versions of the questionnaire were issued to households from Albany and Rockhampton, which are major rural centres in the Great Southern and Fitzroy regions respectively. Separate samples from each of these centres were also surveyed using the national questionnaire. The sample sizes, questionnaire response rates, and socioeconomic characteristics of the samples are summarised in Table 7. Again, some sample self-selection bias is evident and this necessitates some caveats on the extrapolation of results.

[15] Again the Dilman Total Design Method was used in a mail-out/mail-back format.

Table 7: Sample sizes and respondent characteristics – national and regional study

Questionnaire version	Sample	Sample size	Undelivered	Response rate [a]
National	National	3200	363	17%
National	Albany	1200	79	17%
National	Rockhampton	1200	101	14%
Great Southern	Albany	1200	171	16%
Fitzroy Basin	Rockhampton	1200	75	16%
Sample characteristics		**National**	**Albany**	**Rockhampton**
Median age group		45 -54	65+	35 – 44
Sex (% male)		61	55	55
Median annual h/hold income (A$)		36,400 – 51,999	6,239 – 15,999	6,239 – 15,999
Proportion with tertiary degree (%)		35	23	26
Proportion supporting green groups[b](%)		24	27	13
Population characteristics[c]				
Median age		34	35	32
Sex (% male)		49	46	48
Median annual h/hold income (A$)		33,020	23,556	29,588
Proportion with tertiary degree (%)		14	6.2	6.7

[a] Response rate expressed as a percentage of delivered questionnaires

[b] Respondents were asked whether they donated money to a conservation organisation or whether they were a member of such an organisation.

[c] Population means sourced from Australian Bureau of Statistics 1996 census.

Model specification

A similar nested model structure was used to model respondents' choices of alternative options as that used for the MRF study[16]. As for that study, respondents were asked to choose between three alternatives. Two alternatives involved the payment of an environmental levy and the other alternative was a status quo option. The main differences in model structure (apart from differing socio-economic and attitudinal variables) are that all attributes enter the model linearly (as opposed to the $1/x$ functional form used for the MRF study) and there is no alternative specific constant (ASC) specified for the lower level choice options. Hence, the lower-level utility function for option j is:

$$V_j = \beta_6 \text{Species} + \beta_7 \text{Look} + \beta_8 \text{Water} + \beta_9 \text{Social} + \beta_{10} \text{Cost}$$

[16] Modelling was undertaken using the computer package Limdep. Initially a multinomial logit model was used to describe the data relationships. However, this specification was shown to result in breaches of the Independence of Irrelevant Alternatives (IIA) assumption.

where *j* is either the *no support* option or one of two alternative levy options. As in the MRF study, the upper-level utility associated with the support or non-support of a levy was assumed to be a function of socio-economic characteristics, attitudinal variables, and an inclusive value. Definitions for the variables are set out in Table 8.

Table 8: Variable definitions – national and regional study

Variable	Definition
Social	Viability of country communities, measured by the net annual loss of population from country towns.
Species	Endangered species, measured by the number of species protected from extinction.
Look	Landscape aesthetics, measured by the area of farmland repaired and bush protected (hectares).
Water	Waterway health, measured by the total length of waterways restored for fishing or swimming (kilometres).
Cost	The environmental levy, measured as an annual levy on household income
ASC	Alternative specific constant for the levy option, assigned a value of 1 for options B and C, else zero.
Sex	Respondent's gender, assigned a value of 0 for females and 1 for males.
Age	Respondent's age category, ranging from 1 to 6 (youngest to oldest).
Income	Respondent's before-tax household income category, ranging from 1 to 8 (lowest to highest).
Green	Dummy variable assigned a value of 1 for respondents who are members of, or donate to, an environmental organisation, else zero.
Confuse	Dummy variable assigned a value of 1 for respondents who reported that they found the background information confusing else zero.
IV	Inclusive value representing the expected utility from alternatives in the lower level of the nest.

Results

The sampling strategy enabled five different models to be estimated, three of which used data from the national questionnaire, and two of which were derived from the results of the case study regional questionnaires. The parameter estimates for the models are summarised in Table 9.

Table 9: Model results – national and regional study

Model	**1**		**2**		**3**		**4**		**5**	
Questionnaire	National		National		National		Great Southern		Fitzroy Basin	
Sample	National		Albany		Rockhampton		Albany		Rockhampton	
Model statistics										
N (choice sets)	2329		860		720		765		818	
Log Likelihood	-2196.05		-803.75		-645.29		-683.77		-802.10	
Adjusted rho squared (%)	23		21		24		26		17	
Lower level choice equation										
SPECIES	5.49E-03	**	2.39E-03	*	2.89E-03	*	1.28E-02	**	4.07E-03	
LOOK	6.01E-08	**	1.84E-07	**	2.04E-07	**	1.52E-06	**	8.07E-07	**
WATER	6.33E-05	**	4.55E-05		7.54E-05	**	1.29E-03	**	1.04E-03	**
SOCIAL	-6.94E-05	**	-9.46E-05	**	-6.74E-05	**	-4.52E-04	**	-1.15E-03	**
COST	-8.13E-03	**	-8.78E-03	**	-1.04E-02	**	-8.28E-03	**	-5.14E-03	**
Upper level choice equations										
ASC	-5.85E-01	**	-1.00E+00	**	2.40E+00	**	-2.02E+00	**	9.30E-01	**
SEX	-3.24E-01	**	5.01E-01	**	-5.96E-01	**	5.70E-01	**	-6.94E-01	**
AGE	7.96E-02	**	-1.22E-01	**	-3.50E-01	**	9.03E-02		-7.39E-02	
INCOME	2.62E-01	**	2.13E-01	**	1.72E-01	**	3.48E-01	**	1.15E-01	**
GREEN	2.47E-01	**	4.50E-01	**	6.49E-01	*	1.31E+00	**	2.02E-01	
CONFUSE	-7.07E-01	**	-6.77E-01	**	-1.05E+00	**	-7.74E-01	**	-6.37E-01	**
Inclusive value parameters										
IV no support	1		1		1		1		1	
IV support	3.4E-01	**	3.9E-01	**	1.9E-01		2.5E-01	*	2.3E-01	

Note: * denotes significance of parameter at the 10% level, ** denotes significance at the 5% level.

The model results were used to calculate implicit prices for each of the attributes, as reported in Table 10. The results indicate that respondents perceive declining rural populations as a cost. In the national context, respondent households are willing to pay approximately 10 cents per annum over a twenty year time period for every 10 persons that are retained in country communities. Whilst value estimates for the environmental attributes differ significantly across the three population samples, values for retaining rural populations are invariant. This result is consistent with findings from the MRF study where the farmers leaving attribute implicit price estimates were also invariant across the sub-samples.

Table 10: Mean implicit price estimates – national and regional attributes[a].

	Species protection	**Landscape Aesthetics**	**Waterway Health**	**Social Impact**
	A$ per species protected	A$ per 10,000 ha restored	A$ per 10 km restored	A$ per 10 persons leaving
National questionnaire				
National sample	0.67	0.07	0.08	-0.09
	(0.47 – 0.88)	(0.02 – 0.14)	(0.04 – 0.16)	(-0.11 to -0.07)
Albany sample	0.27	0.21	0.00	-0.11
	(-0.03 – 0.51)	(0.14 – 0.29)	Not significant	(-0.14 to -0.08)
Rockhampton sample	0.28	0.20	0.07	- 0.06
	(0.03 – 0.58)	(0.2 – 0.3)	(0.07 – 0.14)	(-0.06 to -0.08)
Great Southern questionnaire				
Albany sample	1.56	1.84	1.58	-0.56
	(0.77 – 2.33)	(1.06 – 2.79)	(0.92 – 2.40)	(-0.88 to -0.30)
Fitzroy questionnaire				
Rockhampton sample	0.00	1.57	2.02	-2.24
	Not significant	(0.41 – 3.25)	(0.94 – 3.55)	(-3.32 to -1.55)

[a] 95% confidence intervals reported in parentheses.

The case study regional questionnaires yielded significantly higher implicit price estimates, with values for country communities ranging between A$0.56 per annum for the Great Southern study to A$2.24 per annum for the Fitzroy study. Framing or scope effects could be responsible for these higher values. A framing effect is said to occur when respondents are willing to pay more for an attribute when it is assessed in a narrow context compared to when it is valued as part of a more inclusive package (Rolfe and Bennett 2001). It is possible that the case study questionnaire focused respondents' attention on a narrow set of impacts in a region they were familiar with, whilst the national questionnaire encouraged respondents to think more broadly. Alternatively, a scoping effect could be the dominant reason for the higher values. This refers to the situation where diminishing marginal values are observed for large changes in attribute levels, as is the case in the national questionnaire.

Another observation to be made from the case study results is that Rockhampton respondent households value the social impacts of resource use change more highly than Albany respondent households. This could reflect the different attitudes and socio-economic characteristics of these populations. For instance, it is apparent that a smaller proportion of Rockhampton respondent households donated money to environmental organisations than Albany households (Table 7). This observation supports the finding that, relative to Albany respondents , Rockhampton respondents place more weight on social impacts than environmental impacts. In addition to attitudinal differences, the resource issues pertaining to the Great Southern and Fitzroy Basin regions are substantially different, and this is likely to contribute to the observed differences in value estimates. The Fitzroy region is still undergoing agricultural development and land clearing whilst agricultural activity in the Great Southern is well established.

6. Concluding remarks

The results of the two studies presented in this paper demonstrate that both rural and urban Australians value the continued viability of rural communities. This finding is robust in that it has been replicated for three diverse and geographically separated regions across a variety of rural, regional and urban populations, as well as in the national context.

It remains difficult to draw direct quantitative comparisons across the results of the two studies given their differing contexts. Most significantly, comparison is hindered by the different approaches used to define the impact of natural resource management policies on country communities. In the MRF study, the social impact attribute was defined as the number of farmers leaving the region. In the second study, the number of people leaving country towns was the focus. These two attributes are not the same. The net migration of people from country towns is a 'catch all' measure for population change while *farmers leaving* is open to interpretation. That is, the exit of farmers may also lead to the closure of businesses that support other members of the community. Other factors that complicate the comparison include:

- The two studies employed different frames and scopes. The importance of framing and scope effects on value estimates was demonstrated in the second study.
- The MRF study used a one-off tax as a payment vehicle whilst the second study used an on-going, annual environmental levy collected over a 20 year period. Hence, the implicit prices derived from each study need to be adjusted to take account of the different payment frequency.
- The response rates achieved in both surveys mean that the data collected may be subject to extrapolation problems associated with sample bias.

Despite these complications, it can be concluded that both studies reveal a consistency in value estimates between rural and urban populations. Comparisons within each study of the values estimated for respondents living in rural and urban areas showed no significant differences. This is a result not expected *a priori* given that the composition of the values enjoyed by the two groups of people could be expected to be different. However, it

appears that the values of a viable rural community enjoyed directly by people living in a rural area are equivalent to the "nostalgic attraction" of the areas felt by urban dwellers for country townships.

There are numerous policy implications that follow from these results. Not the least of these is a justification for the redirection of wealth from the city to rural areas to ensure that rural Australia remains viable. It is worth reinforcing the point that this should not be achieved through price intervention in commodity markets but rather through payments specifically designed to achieve the goal of maintaining rural communities. Payments for environmental stewardship may assist in this quest.

A caveat to this conclusion is that the results do not necessarily justify the provision of support to rural areas in the absence of any environmental stewardship obligations. The context of the study was one in which environmental damage control and rural viability were directly linked. Where no such link exists, the conclusion that declining rural viability warrants wealth redistribution cannot necessarily be drawn.

In line with this contextual caveat, the converse of the support argument is that policies impacting rural and regional Australia need to be assessed carefully for any detrimental impact they may have on the viability of country communities. These impacts should be factored into the policy assessment process.

The results presented in this paper provide information that is important in the development of environmental stewardship payments and in the assessment of other environmental management strategies. The use of the results is, however, subject to a number of caveats. First, incorporation of the values held by local people for their own communities into the policy determination process may involve double counting if income projections have also been included. Local people may have traded-off the value of rents created in the income generation process when answering the CM questionnaire. Hence, to include the locals' community viability value estimates in addition to producer surplus estimates would be double counting. Separating income rents from other values that may be bound up in the viability value estimates — such as option values and the non-marketed use values associated with life in a vibrant community — cannot be achieved from the results reported here. From a conservative perspective it is thus prudent to leave aside the locals' value estimates in any examination of policy options that involve impacts on rural communities.

Not so for the values estimated for people living outside the local community. There is a much-reduced chance of double counting in that case, given the distant relationship between financial well-being in the cities and rural community viability. However, it is important to note that the values estimated in this study are not merely payments for country people to keep doing what they are currently doing. Rather, the values relate to the viability of communities – which may be maintained through a range of economic activities other than traditional agriculture. It is in the assessment of such alternatives that the values reported here will be of particular use.

The value estimates reported must also be considered in a relative context. Not only are they contextual — that is, they relate to the value of rural decline resulting from

environmental protection policies — but they must also be considered relative to the other, environmental, values associated with those policies. Direct comparisons between the attribute implicit prices is not straightforward because of the different units of measurement involved across attributes. However, potentially, rural viability may be a lesser priority than environmental protection. The conditions pertaining in each policy circumstance will be important in determining the relative importance of the components of value.

Furthermore, the results reported relate to case studies in Australia involving Australian respondents. They indicate that the movement toward cross-compliance payments for multifunctionality outputs in agriculture observed in the US and EU has support in the Australian context. Specifically, the results suggest that the Australian public is willing to pay to avoid any negative rural viability consequences that environmental restoration and protection policies may have for Australian farmers.

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Appendix 1: Murrumbidgee River Floodplain study choice set

6. Suppose options A, B and C are the **ONLY** ones available, which would you choose?	**I Pay** Levy	**What I get** Healthy wetlands	Bird numbers	Native fish numbers	Farmers leaving	**I would choose** *Tick one box only*
Option A No Change	*0NIL*			*1* 	*2NIL*	☐ 1
Option B						☐ 2
Option C						☐ 3

1Foldout symbol key used in questionnaire

Symbol key
(use for questions 6 to 10)

Area of healthy wetlands		= 2500 Hectares (6000 acres)
Water and woodland birds		= 20% pre 1800 bird numbers
Native fish		= 20% pre 1800 fish numbers
Farmers leaving		= 5 farmers

A summary of the situation

Healthy wetlands	2500 Hectares (6000 acres)
Water and woodland birds	40% pre 1800 numbers
Native fish	20% pre 1800 numbers
Farmers leaving	No farmers leaving

Appendix 2: National and regional impacts of land and water degradation study choice set