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Jose L. Oviedo,
Lynn Huntsinger
Pablo Campos
&
Alejandro Caparrós

CSIC
Consejo Superior de Investigaciones Científicas
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IPP
Instituto de Políticas y Bienes Públicos

INSTITUTO DE POLÍTICAS Y BIENES PÚBLICOS – CSIC

Instituto de Políticas y Bienes Públicos (CSIC-IPP)
Consejo Superior de Investigaciones Científicas
C/ Albasanz, 26-28
28037 Madrid (España)

Tel: +34 91 6022300
Fax: +34 91 3045710

http://www.ipp.csic.es

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Jose L. Oviedo (*corresponding author*)
Associate Research Professor, Institute of Public Goods and Polices (IPP)
Consejo Superior de Investigaciones Científicas (CSIC)
Albasanz 26-28, 28037 Madrid, Spain. E-mail: jose.oviedo@csic.es

Lynn Huntsinger
Professor, Department of Environmental, Science, Policy and Management
Mulford Hall 94720, University of California, Berkeley, California. E-mail: huntsinger@berkeley.edu

Pablo Campos
Research Professor, Institute of Public Goods and Polices (IPP)
Consejo Superior de Investigaciones Científicas (CSIC)
Albasanz 26-28, 28037 Madrid, Spain. E-mail: pablo.campos@csic.es

Alejandro Caparrós
Associate Research Professor, Institute of Public Goods and Polices (IPP)
Consejo Superior de Investigaciones Científicas (CSIC)
Albasanz 26-28, 28037 Madrid, Spain. E-mail: alejandro.caparros@csic.es

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Assessing the income value of private amenities in California oak woodlands

Abstract

A contingent valuation technique was applied to a 2004 sample of oak woodland landowners in California to assess its usefulness in estimating the non-market income and land price value of oak woodland properties. Non-market benefits have long been considered an important influence on rangeland landowners, but beyond comparing market production and land price, few studies have attempted to place a monetary value on them. Landowners were asked to estimate the maximum amount of earnings that they were willing to forgo before selling their property to invest in more commercially profitable non-agrarian assets, and the proportion of the price of their land that they think is explained by the environmental and/or amenity benefits that they derive from their land. The results showed that, on average, they were willing to pay $54 per acre for their land amenities and that 57% of the land market price is explained by these amenities. Regression analysis reveals that the value of amenities to landowners increases as the stated woodland market price increases, but gets saturated as property size increases. The proposed approach sheds light on landowner behavior and values and offers insights for outreach and policy development for private oak woodlands, and should be further developed and tested.

JEL Classification: Q15, Q23, Q51

Key words: contingent valuation, landowners, non-market valuation, private environmental benefits.

1. Introduction

It has often been asserted that *private amenities*, including environmental benefits to the landowner, have an important impact on landowner decisions about California oak woodlands (Standiford and Howitt 1992; Huntsinger et al. 2010). Efforts to value these amenities in California and other western States have been limited, and include study of the relationship of land prices to property size (Pope 1985), tree density (Diamond et al. 1987), distance to open space (Standiford and Scott 2002), presence of oak pathogens (Kovacs et al. 2011) and production value (Torell et al. 2001). The most common land use in oak woodlands is livestock grazing (Huntsinger et al. 2010), and West-wide, landowner environmental benefits are thought to be an important factor in explaining why land prices for ranches exceed production value (Torell et al. 2001). With land use change and fragmentation identified as threats to the extensive habitats and watershed provided by ranches in private oak woodlands, understanding landowner decisions and values is a conservation priority.

Advocates of conserving areas that produce agricultural and/or timber products as well as environmental services call them *working landscapes,* a term that fits oak woodlands well. The continued supply of oak woodland environmental services depends largely on the profitability of ranches and other agricultural pursuits, the amenity value of woodlands to their owners, and the opportunity cost of competing land uses. Estimating an income value for private amenities can contribute to understanding landowner decisions and responsiveness to outreach and policy in oak woodlands and is important to assessing the total income from natural resource lands. The cost and returns accounting system (AAEA 2000) for measuring landowner income in rangelands and other agricultural lands does not consider private amenities as part of the landowner's income, despite the long-standing characterization of ranchers, for example, as “lifestyle consumers” (Workman 1986). On the other hand, the System of National Accounts (United Nations 2009) does not include the flow of private amenities as part of the landowner’s income either. We present in this paper a contingent valuation technique designed for generating an objective estimation of the monetary value of such an income.

Previous studies have quantified the amenity component of rangeland market price in some areas of western US using the hedonic pricing technique, where the price people pay for a good is used to estimate the value of the characteristics of that good (Martin and Jefferies 1966; Pope 1985; Standiford and Howitt 1992; Torell et al. 2005). This approach is useful in understanding the contribution of private amenities to land prices but does not offer a direct

estimation of income values. The impact of sudden oak death on landowner costs and property values in California has also been assessed for homes near oak trees (Kovacs et al. 2011). Other authors have also studied the role of private amenities in US rangelands using various approaches, but without assessing income value (Smith and Martin 1972; Huntsinger et al. 1997; Starrs 1998; Sayre 2004; Huntsinger et al. 2010).

Contingent valuation is a method used to estimate non-market values for environmental features. Values are derived by asking people what they would be willing to pay (or willing to accept) to obtain/maintain (or to be compensated for the loss of) a good or service. This paper draws on a sample of oak woodland landowners in California in order to assess the usefulness of a contingent valuation technique in estimating the non-market private amenity income and land price value of oak woodland properties.

2. Landowner sample

California oak woodlands extend over 2 million hectares and are more than 80% in private ownership (CDF-FRAP, 2003). Landowners from two studies were used to develop a diverse sample for testing the outcome of a contingent valuation approach. In the primary study landowners were surveyed statewide in 2004 based on Forest Inventory Assessment plots previously used to assess hardwood volume in California (Bolsinger 1988). Methods are thoroughly described in Huntsinger et al. (2010). The Dillman four wave method was used (Dillman, 1978), resulting in a 64% survey response rate (98 questionnaires out of 154 attempts). Additionally, to augment valid responses to the contingent valuation question for modeling purposes, 17 additional oak woodland landowners were interviewed and asked to value their property as part of a study of foothill landowners (Sulak and Huntsinger 2007), making our final number of completed questionnaires 115 and including more than 10% of the California oak woodlands on an acreage basis. The resulting sample is not strictly representative of the proportion of responses among oak woodland landowners as a whole, but illustrates the potential of the proposed contingent valuation approach for valuing oak woodland private amenity income.

The average property size in our sample was large with almost half of the property under canopy cover (Table 1). Livestock grazing was the most common land use on large properties. Conservation easements of some type were present on 6% of the sampled land. More than half the landowners live on the property year-round, and 77% have a house on the ranch. Hunting is practiced by 38% of the sample, for personal, family, and/or commercial

use. The average landowner is middle-aged and male, and 43% work directly on the property. About half of landowner household income comes from the ranch (Table 1).

Table 1. Property and landowner characteristics of California oak woodland landowners respondents (n=115 and varies slightly by question).

Property characteristics	Mean	Confidence interval (95%)	
		Lower bound	Upper bound
Property size (acres)	6,461	1,430	11,491
Property under canopy cover (acres)	2,862	*	6,501
Properties where livestock graze (%)	70	62	78
Properties with big game species (%)	100	100	100
Sampled land under conservation easement contract (%)	6	*	14
Landowner characteristics			
Landowners practicing hunting on their properties (%)	38	29	47
Landowners living on the property year-round (%)	54	46	62
Properties with landowner private residential house (%)	77	69	85
Landowner's age (years)	61	59	64
Female landowners (%)	17	8	26
Landowners working on the property (%)	43	34	52
Property contribution to household income (%)	50	41	69

* Negative bound for the confidence interval.

Many respondents found it difficult to answer the primary contingent valuation question, resulting in a 26% valid response rate (30 answers). This is at the low end of response rates now argued to be typical (Connelly et al. 2003), but is comparable to those in other economic studies (Bell et al. 1994), and in other contingent valuation studies of private landowners (Banerjee 2007; Kennedy 2001; Shaik and Van Kooten 2003). This number of observations is also comparable with other studies whose objective is closely related to ours; Diamond et al. (1987) used 30 observations in their study of oak woodland property values and oak tree density. Responses were from a spectrum of property sizes and land uses appropriate for illustrating the use of the contingent valuation approach to estimate amenity income values on a case study basis (Needham and Vaske 2008). Landowner comments indicated that they

found the valuation question challenging, and some were simply unable to provide a monetary value. This is common in contingent valuation because many people are not able or do not want to state their willingness to pay. This response is not a zero value, but only indicates that the respondent rejected the scenario in the valuation question. Mitchell and Carson (1989) consider these missing values (commonly known as protest response) as a non-response. In our sample, owning a larger property with the residence on it, and earning a greater proportion of household income from livestock grazing, made it significantly more likely that the landowner did not answer the CV question (Welch's t-test, $P < 0.10$). Similarly, Kim et al. (2008) found that cattle producers were reluctant to answer CV questions.

3. Do landowners act as investor-consumers?

Private amenity consumption implies that the land is bought and/or held not only as a capital investment but also as a consumptive good, termed an *investor-consumer rationality*. The contingent valuation design tested for this rationality and the values of private amenities were estimated through competitive market simulation—allowing landowners to choose among options for investment and income. Landowners stated their maximum *willingness to pay* (WTP) for the annual enjoyment of their oak woodland amenities, and the proportion of the price of their land explained by these amenities. To obtain an amenity income value, in theory the costs of land operations associated with landowner amenity enjoyment should be subtracted, for example the cost of thinning trees that obstruct a view. However, this is not possible with the survey data gathered, and it has to be assumed that all costs from land operations were from commercial activities. The joint production of amenities and commodities makes it reasonable to think that most land operations would not occur without commercial activities, for example without the sale of the stumpage for the thinned trees.

Assuming that oak woodland owners give up or are willing to give up potentially higher earnings from alternative investments in order to consume amenities from their land, a market simulation based on this willingness to pay (WTP) was developed. The difference in commercial earnings from the investment in their land, and the best potential alternative investment they could hypothetically make but would be willing to give up to keep their land, is the maximum price that they were willing to pay for consumption of amenities from their lands. We posit that this WTP represents the *income value* of the amenities consumed by landowners. In the questionnaire respondents were asked:

Imagine that you could earn more money by investing in other assets (for example stocks or bonds) of comparable risk and time frame. How much is the maximum amount of earnings you are willing to give up, per year, before selling your property in order to invest in an alternative that brings a higher return? (Keep in mind that by selling your estate your family and friends give up the exclusive right to enjoy the natural surroundings of your land, and you can no longer pass down this property to future beneficiaries): _____.

Although the question asked landowners about their total WTP, we interpreted the results using WTP per acre values. The questionnaire also asked landowners to state the market price of their woodland, and to allocate this price, as a percentage of the total, among the different benefits from their property, based on how much they think each benefit contributes to this total price. The questions were worded as follows:

How much do you estimate the current market value of your land to be without buildings or other infrastructure? _____

How important are each of the following to your personal value for your property? Express each as a percentage of the total value, so that the percentages total 100% at the bottom.

The benefits offered were: *Timber and firewood*, *livestock and pasture (both irrigated and non-irrigated)*, *crops*, *hunting*, *enjoyment of the landscape*, *having friends and relatives visit*, as well as an *others* option. Although livestock management activities do not affect land price the same way having pasture does, it was difficult for landowners to separate livestock from pasture benefits, and we decided to present both together. Most surveyed landowners were able to respond to this question.

Our contingent valuation questions yielded the information necessary to obtain the amenity benefits (WTP) expressed as a percentage of the total land value, which is the amenity profitability rate (r_A).

4. Landowners recognize and can value oak woodland amenities

Less than 9% of respondents believed that their annual earnings were enough to make the oak woodland a better investment than other options. About half thought that adding land appreciation to earnings was enough to make the woodland a better investment, while 44% thought that they would earn more with other investments, even considering land appreciation. Yet they had persisted in landownership to the date of the survey, despite what was, at the time, a highly competitive real estate market.

Table 2. Reasons ranchers gave for owning oak woodland properties in California, Tehama, Alameda, and Contra Costa counties (data from Liffmann et al. 2000).

Reasons	Score (from 1 = "no influence at all" to 5 = "strongly influenced")		
	Mean	Confidence interval (95%)	
		Lower bound	Upper bound
Holding the ranch is a good investment (n = 241)	3.00	2.84	3.17
Ranching is profitable (n = 237)	3.17	3.03	3.31
Ranching allows me to feel close to the earth (n = 240)	3.50	3.41	3.59
A ranch is a good place for family life (n = 243)	3.85	3.78	3.92
Ranching is what I have always done (n = 239)	3.59	3.43	3.75

Results from a 1999 survey of oak woodland ranchers where respondents scored the factors influencing retention of their oak woodlands in California showed that the most highly ranked were lifestyle and sentimental values (Table 2; Liffmann et al. 2000).

The surveyed landowners in our sample were willing to pay (give up as earnings) of $54 per acre on average for the private amenity consumption. The average stated land price was almost $4,000 per acre (Table 3), and the amenity component represented 57% of the land price. Of the amenity components, the heritage factor was the most important; among the commercial benefits, livestock and pasture made the main contribution (Table 3). Mean and standard deviation of these values are weighted by property size to derive values for the total sampled land.

5. Relating property size and landowner benefits

We used regression analysis to look at the influence of the variables from Table 1 and the stated land price on WTP per acre as a dependent variable. We included the squares of the continuous variables to test for nonlinear effects.

Table 3. Willingness to pay for private amenity consumption, stated land market prices and allocation of land price by benefit by oak woodland landowner respondents. Mean and standard deviation of these values are weighted by property size to offer a value of the total sampled land.

Class	Mean	Confidence interval (95%)		n
		Lower bound	Upper bound	
Mean willingness to pay (2004 $ per acre)	54	11	98	30
Mean stated land price (2004 $ per acre)	3,996	1,168	6,825	76
Allocation of the land market price by benefit (%)	100	100	100	101
Private commercial benefits (%)	43	38	48	
Timber and firewood (%)	*10*	*7*	*13*	
Livestock and pasture (%)	*26*	*22*	*30*	
Hunting (%)	*4*	*2*	*6*	
Crops (%)	*3*	*1*	*5*	
Private amenity benefits (%)	57	52	62	
Landscape/countryside beauty (%)	*13*	*10*	*16*	
Enjoying with relatives and friends (%)	*10*	*7*	*13*	
Heritage value (%)	*24*	*20*	*28*	
Conservation values (%)	*10*	*7*	*13*	

The first two of the models that fit best once correlated and non-significant variables are removed are the linear and semilog models that include property size and property size squared (Table 4). The results show a saturation effect, since the WTP per acre decreases with property size and increases with property-size squared.

Graphing the landowner WTP per acre function shows that WTP for amenities decreases non-linearly with property size (Figure 1a) and that the total WTP function

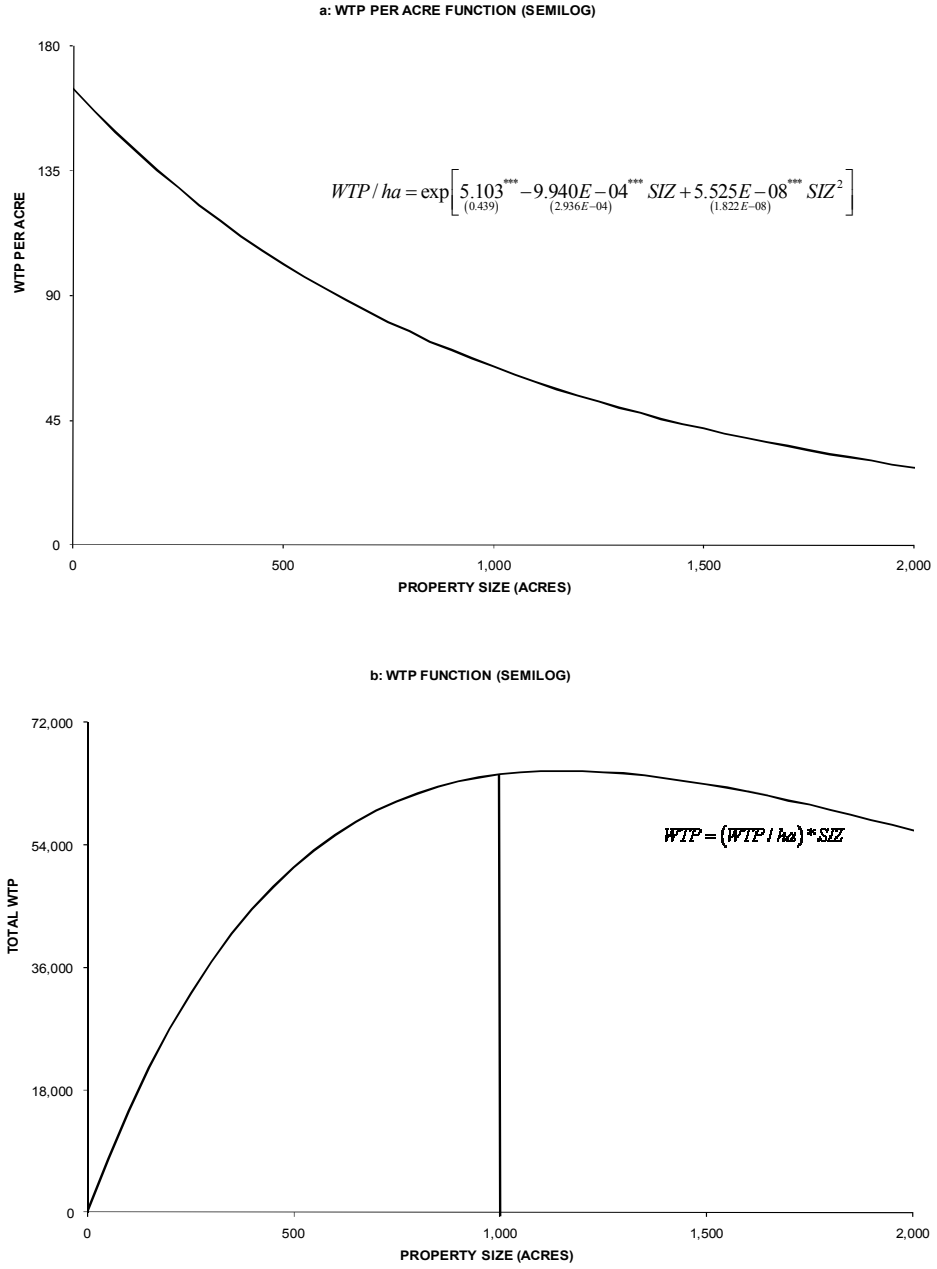
increases for property sizes up to around 1,000 acres and then does not increase further (Figure 1b). However, there is large variability in this function, and, according to the 95% confidence interval of the parameters, the property size at which the total WTP becomes flat is 650 acres for the lower bound and 2,700 acres for the upper bound (round numbers). This saturation effect in rural land amenities as property size increases was pointed out by Pope (1985) and these results show it is present in the California oak woodlands of our sample. Narrowing these bounds may require a much larger sample.

Table 4. Willingness to pay regression analysis results. Linear (WTP-lin models) and semilog (WTP-slog models) specifications among surveyed landowners. Dependent variables is willingness to pay per acre. A *White* regression was used when heteroskedasticity was detected (White 1980).

Variables	WTP-lin*	WTP-slog*	WTP-lin*	WTP-slog*
	Coefficients	Coefficients	Coefficients	Coefficients
Intercept	752.322**	5.103***	196.607**	3.892***
	(306.544)	(0.439)	(80.401)	(0.490)
property size [acres]	-0.241**	-9.940E-04***		
	(0.114)	(2.936E-04)		
square of property size [acres]	1.187E-05**	5.525E-08***		
	(5.739E-06)	(1.822E-08)		
stated land price [2004 $ per acre]			0.073**	1.042E-04*
			(0.028)	(5.351E-05)
square of stated land price [2004 $ per acre]			-4.972E-07**	-6.942E-10*
			(1.969E-07)	(3.701E-10)
N	30	30	29	29
R^2	0.0724	0.3025	0.2039	0.1271
Chi-square test	5.47*	10.81***	6.61**	3.95

* Standard deviations is shown in brackets; Asterisks (e.g.,*,**,***) denote significance at the 10%, 5%, and 1% level, respectively.

For the third and fourth regression (Table 4--linear and semilog), the results show a positive association between the WTP per acre and the land price stated by the landowners with a negative sign for the square of this term. This implies that amenity values increase as the stated land price increases but that the contribution of amenity values to the land price is relatively lower for oak woodlands with higher land prices.



Figures 1. The saturation effect of property size on willingness to pay. (a) A semilog function of willingness to pay per acre shows a non-linear decline with property size. (b) A semilog function of total willingness to pay, obtained by multiplying the willingness to pay per acre predictions from the semilog regression (a) by the property size of the corresponding observation, indicates that after a certain property size is reached, landowner amenity benefits do not increase as property size increases. SIZ=property size; SIZ^2=property size squared.

6. The value of the flow of woodland benefits to the landowner

The contingent valuation results show that the amenity profitability rate (r_A) is 2% for the average landowner in the sample. This is a nominal rate since landowners were not asked to consider inflation when answering the question**.** Compared with other estimations of the amenity profitability rates in other Mediterranean oak woodlands (Campos et al. 2009), this value is low, probably because properties in California are larger and they are closer to the saturation point for amenity values.

This saturation effect is an important consideration if the goal is maintaining extensive woodlands. If landowners can obtain nearly the same amenity value from smaller properties, they do not need large ones if amenities are the only motive for owning the land. In contrast, income from grazing increases steadily with area of woodland range. This supports the "working landscapes" concept, where private lands conservation is achieved by combining production and environmental services, including landowner amenity benefits (Huntsinger and Sayre, 2007).

Consideration of landowner goals, motives, and needs when developing outreach or policy is important. The amenity values California ranchers have reported as important include having the freedom to make land management decisions and having relative autonomy on their lands, as well as enjoying natural beauty and feeling "close to the earth" (Liffmann et al. 2000; Huntsinger et al. 2010). In addition to the opportunity to access the capital revaluation in the land, the appeal of conservation easements to ranchers can be partly explained by the ability of the owner to continue the lifestyle and decision-making role, and the implicit recognition of stewardship and amenity values on the property. At the same time, having adequate forage for maintaining a commercial herd, and the availability of the infrastructure for marketing livestock products, are also crucial factors for those owning most of the larger properties (Sulak and Huntsinger 2007).

Since most oak woodland landowners are motivated by environmental as well as lifestyle amenities (all of which can be termed personally consumed "ecosystem services"), many want to maintain and steward the environment, and have responded to incentives that help them improve wildlife habitat and environmental quality while improving conditions for production (Symonds 2008). Fortunately, ranchers and oak woodland landowners enjoy amenities from their land that have positive externalities for society: the public enjoys natural beauty, wildlife, and many other ecosystem services from well-stewarded lands. Too often it is assumed that production and conservation are inversely related, and in fact there are

tradeoffs. However, as we have illustrated here, there are synergies that can be built upon to create effective conservation strategies for private lands.

This paper illustrates the usefulness and potential of a contingent valuation technique for estimating landowner income from amenities. The analysis sheds light on landowner behavior and offers some insights for outreach and policy development for private oak woodlands. It also provides information useful for further research on valuation. Costs associated with amenity income should be identified and assessed separately from other costs. Response rate was constrained by the complexity of the question and reluctance on the part of some landowners to monetize their values. Further testing of ways to ask the contingent valuation questions might result in a higher response rate, however, when respondents were asked why they had not answered, a typical comment was that the value of the land to them was beyond measure in dollars. This non-response could be interpreted as a sort of upper bound for the amenity income value (Spash and Hanley 1995). Ironically, those missing values represent an important part of what we seek to understand.

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