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Golf Courses In Maine: Land Type Valuation versus a Hedonic Pricing Analysis

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Abstract
Many studies have been conducted analyzing the economic impact of golf courses on the local communities. These studies examine economic impacts of tournaments, endorsements, and vacation expenses of the major golf courses in the United States. However, there is little research conducted on the environmental impact of Golf courses, specifically in Maine. This paper performs a hedonic pricing analysis using housing prices in proximity to golf courses and compares it to the valuation of various land types in Maine. Housing prices were collected in the towns of Auburn, and North Yarmouth both near and distant from the local golf course. A contingent valuation method using data from similar land areas is used to estimate the per acre value of all land types in Maine.

Cover Page Footnote
We would personally like to thank Professor Sahan Dissanyake for his two years of excellent teaching in Environmental Economics. In addition we would like to thank the rest of the Colby Economics Department for the education and training over the past four years.

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1. Introduction

Golf courses are primarily seen as places that provide recreational value to everyone who chooses to play the game. Not only do golf courses provide individual value in participating, but they can also be a large source of revenue for clubs and local communities. Some 26 million U.S. golfers contributed to the golf industry generating 69 billion dollars in revenue in 2011 (SRI International). General golf course valuation has been conducted, but no known evidence of the value of golf courses in Maine exists. However, when calculating value of golf courses, the environmental impact is rarely considered. Does developing new golf courses damage the existing ecosystem services of the area? Is the recreational and economic value of a golf course greater than the ecosystem benefits of the land it lays on? This paper will specifically focus on two golf courses in Maine, Fox Ridge Golf Course (Auburn, ME), and Toddy Brook Golf Course (North Yarmouth, ME). The paper will address two different research questions. First, what is the housing premium attributed to houses in close proximity to Maine golf courses? Next, what is the value of the ecosystem services provided by different types of land in Maine (specifically those in which the golf courses lay on)? These are important questions as each reveals values about the use of land in Maine. Once the values are calculated, the values of different types of land can be compared to the value of specific golf courses in Maine. From this, a cost-benefit analysis can be conducted linking the development of new golf courses in Maine (or existing courses) to the ideal type of land to lay them on. Our hypothesis is that golf courses in Maine significantly increase the housing prices of houses within one mile of the course. The paper is organized as follows: section 2 provides a literature review, section 3 looks at the data selection, section 4 shows the valuation methods, section 5 displays results and discussion, and section 6 offers a conclusion.

2. Literature Review

The available literature on evaluating golf courses and the monetary value they bring to our local economy varies depending on the location of the golf courses as well as the specific methods used to evaluate the financial impact they have on the surrounding community. Much of the literature looks at the golf industry as a whole, and determines national values that only appear to scratch the surface of the potential effects this sport brings to the American economy. To critically observe the economic impact of the golf industry it is imperative that we also minimize the area of study to a specific state in order to evaluate the economic value golf courses have on the local economy.

Two articles that attempt to place a value of the golf industry on a region are found in the papers, *Economic Contribution of Maine's Golf Industry in 2011* by Todd Gabe and James C. McConnon, and *Economic Impacts and Environmental Aspects of the Arizona Golf Course Industry* by Dr. Troy G. Schmitz. The article

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seeking to examine the economic impact of golf courses in Maine focuses on the additional revenue, employment as well as the newfound labor income that Maine golf courses provide. The study results are based on recent surveys of courses, which estimate that the operations of Maine's golf courses combined generated a 2011 economic contribution of $269.5 million in revenue, 4,935 full- and part-time jobs, and $90.4 million in labor income (Gabe and McConnon, 2008). The paper also looks at the issues that Maine golf courses endure; including poor weather, competition from other courses and activities, and not enough tourists. However, despite these challenges, golf courses remain an important part of Maine's economy to residents and tourists alike. Moreover, the total revenue multiplier of 1.64 suggests that for every $1.00 of revenue generated from by Maine's golf courses, there is a total impact of $1.64 on the state's economy (Gabe and McConnon, 2008). While, the paper by Dr. Troy Schmitz also examines these revenue impacts of Arizona golf courses, it further explores the economic value of the golf industry by calculating the additional residential housing premium for those homes located in the golf course community. The study measures this premium attributable to all homes ever built in the golf course communities in Arizona to be $2,057,000,000 (Schmitz, 2006). Similar to the Maine golf industry, Arizona benefits immensely from the additional revenue brought in by tourists. While, both papers look to measure the effect tourism has on the local golf industry it appears as though the Arizona climate provides a much longer and more attractive golf community than Maine. We will look to add some of the tools used in the Arizona paper to determine whether or not Maine's golf course industry could benefit the local economy from the implementation of additional golf courses.

3. Data Selection and Manipulation

In order to find the additional economic value that golf courses bring to the Maine economy we looked to calculate the housing premium of the homes located within one mile of the Fox Ridge Golf and Toddy Brook Golf course. The courses are located in the towns of Auburn and North Yarmouth respectively. We choses two communities that differ in their socio-economic background in hopes of receiving a consistent relationship regardless of the mean ousing prices in the prospective towns.

The data looks to determine whether or not there is housing premium for homes built near golf courses, however it became apparent that there may be aesthetic services such as the view of rivers, lakes or the golf course itself that may contribute to these premiums. Although, we attempted to include these aesthetic services it became apparent that incorporating these values could lead to faulty results as the housing prices would not be taking into account the town's mean

housing prices. Thus, we were constrained to alter the data to subsequently omit these aesthetic services.

Table 1. Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
SalePrice	116	274,922.50	137,089.10	39,900	780,522
Beds	116	3.25	0.65773	1	4
Baths	116	2.29	0.7106	1	5
SqFeet	116	2321.21	806.66	544	4423
Iwithin1mi	116	0.26	0.4398	0	1

We have worked at looking at the various land types in Maine, and placing a classification on each type of land cover. The following are classifications of land covers: agriculture, grassland/pasture, forest: non-urban, forest: urban, forest: suburban, forest: adjacent to stream, forest: light partial cut or regenerating, forest: heavy partial cut, urban greenspace, open water: river, open water: urban river, open water: inland lake, open water: urban lake, open water: estuarine, open water: unclassified, wetlands: non-urban, non-coastal, wetlands: urban/suburban, wetlands: coastal, beach, and alpine. This specifies every type of land in Maine, which golf courses could potentially lie on.

4. Methods

A hedonic model was used including the following attributes, *Iwithin1mi, beds*^{2}, *baths*^{2} *and sq feet*. These attributes were regressed against the sale price of each of the 116 houses observed in the study. The regression contains *Iwithin1mi* and the variable is equal to 0 if the house is not located within one mile of either the Fox Ridge Golf Course in Auburn, ME or the Toddy Brook Golf Course in North Yarmouth, ME. The regression equation is depicted below:

Our values of various land types from the Manomet study were calculated using a contingent valuation method. Similar lands in other areas (i.e. eastern North America, northern Europe, and New Zealand) were used to value lands in Maine as these environments are roughly compatible in land type and socio-economic factors. Each type of land was valued by the ecosystem service it provided (aesthetic, disturbance reg. gas/atmosphere reg., habitat, nutrients, other cultural, pollination and seeding, recreation, soil reg., and water supply). Values were calculated in a per acre per year format.

The choices of Fox Ridge Golf Course and Toddy Brook Golf course was driven by the proximity of each to a environmental focus area in Maine. Looking at Fox Ridge Golf Course in Auburn, Maine, the grounds are within two miles of the Androscoggin River. The Androscoggin River has a combination of significant

wildlife habitats, forestry, and rare plants. In addition, some conservation concerns of the area include buffers on wetlands, restoration of the sites natural hydrology, and removal of invasive species. Fox Ridge is roughly two miles through forest from the Androscoggin, and therefore we have defined this courses land type as forest: adjacent to stream. Next, Toddy Brook Golf Course located in North Yarmouth, Maine, offers a different land type to the study. The Maine conservation focus area near Toddy Brook is the Maquoit and Middle Bay (the mouth of the Royal River flows into this area, the Royal River is adjacent to the course within two miles of the mouth). The Maquoit and Middle Bay area offers many ecosystem services including significant saltmarshes, bird breeding habitat, eelgrass beds and feeding areas for shorebirds. Some conservation concerns of the focus area include shoreline development, nutrient loading, eelgrass loss, fish passage threats, and disturbances to soil. Toddy Brook, with it's proximity to the Maquoit and Middle Bay, and location next to the Royal River, has been defined as open water: urban/suburban river.

Equation 1.

$$Log\_PredictedSalePrice = \beta_1 Iwithin1mi + \beta_2 Beds^2 + \beta_3 Baths^2 + \beta_4 Sqfeet + \varepsilon$$

5. Results and Discussion

Our results from our regression are depicted below:

Table 2. Regression Results

	(1)	(2)	(3)
VARIABLES	log_SalePrice	log_SalePrice	log_SalePrice
Beds²			-0.000536
			(0.00432)
Baths²			0.00471
			(0.00538)
Sqfeet		0.000205***	0.000194***
		(1.96e-05)	(2.47e-05)
Iwithin1mi	0.0987*	0.0751**	0.0811**
	(0.0502)	(0.0360)	(0.0370)
Constant	5.355***	4.885***	4.889***
	(0.0255)	(0.0486)	(0.0570)
Observations	116	116	116
R-squared	0.033	0.508	0.512
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

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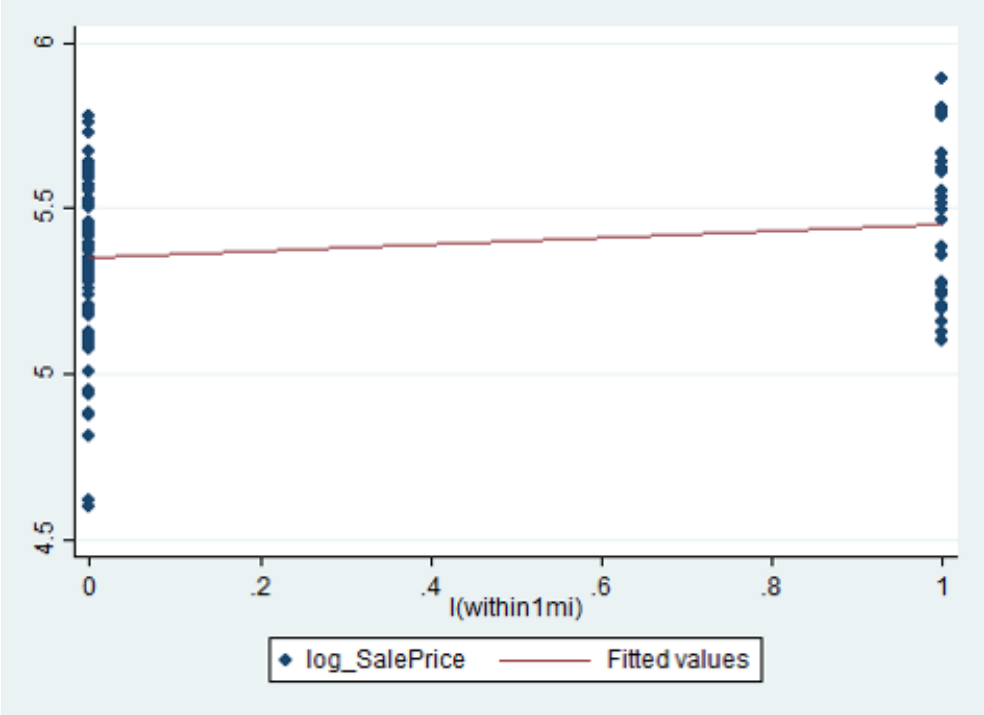
The regression resulted in two significant variables as well as two insignificant variables. Most importantly, however, the *Iwithin1mi* variable was significant at the .4% level of significance. The attribute states that the housing premium for houses within one square mile of a Fox Ridge and Toddy Brook golf course is estimated at $22,296. Moreover, houses within one square mile of golf courses are estimated to be 8.1% higher than houses located outside of this range in the surrounding town. Another significant variable, *sqfeet* states that for every additional square foot in a house, the housing price increases by $55 or .02% of its market value. This variable is statistically significant at any level of significance. The two variables, *beds*^{2} *and baths*^{2} were not statistically significant. One reason is due to the fact that bedrooms and bathrooms are subject to a small range for the majority of the houses in this study. Scatter fit plots of the two statistically significant variables in our regression are depicted below:

Graph 1. Log_SalePrice (y-axis), I(within1mi) (x-axis)



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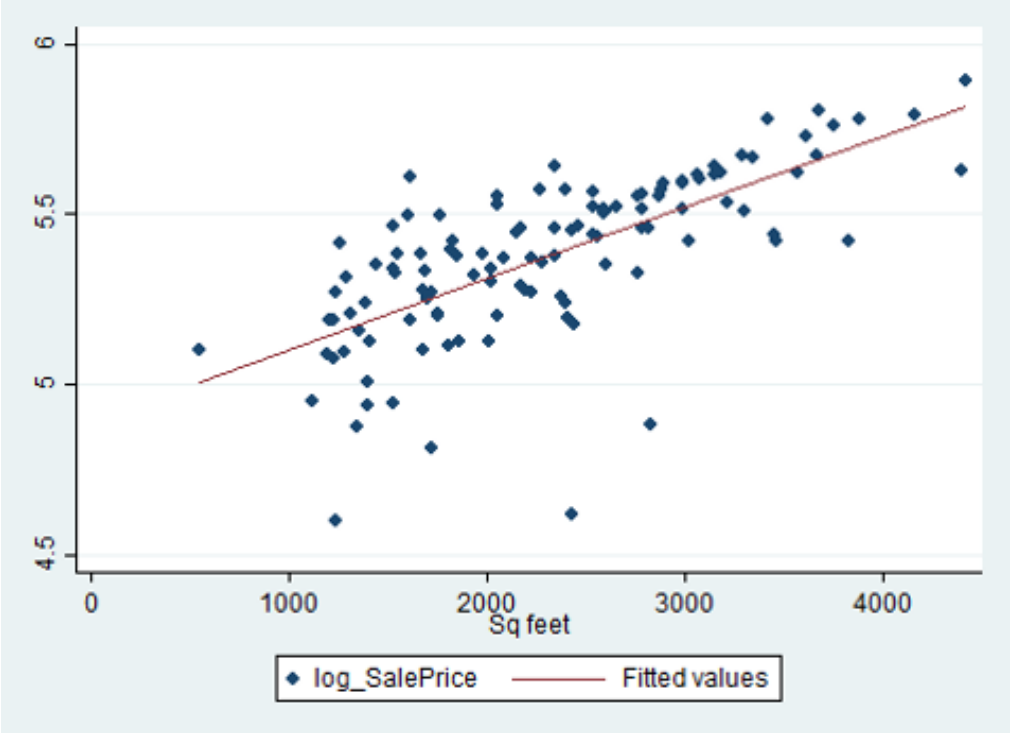
Graph 2. Log_SalePrice (y-axis), Sq Feet (x-axis)



The regression results produced suggests that golf courses in the Maine are significantly adding monetary value to houses in the surrounding community. In fact, the housing prices within one square mile of the golf courses in the towns of Auburn and North Yarmouth have increased by over 8% in these regions. With the average estimated increase of housing prices near golf communities in the United States as a whole listed at 7.6% this data suggests that Maine communities could benefit at a slighter higher margin from additional golf courses than some other states in the country (Pompe and Rinehart, 2011).

From Manomet, we have values to be placed on every type of land in Maine (shown below in Table 3):

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Table 3. Average value estimate per acre per year (USD 2011) by land cover class and ecosystem service

Land Cover Type	Code	Aesthetic and Amenity	Dist-urbance Reg.	Gas/ Atmos. Reg.	Habitat Refugium	Nutrient Reg.	Other Cultu-ral	Pollina-tion and Seeding	Rec-reation	Soil Reg.	Water Supply	Total
Agriculture	11			$11			$34	$10	$49			$103
Alpine	95				$7							$7
Beach near structure	61	$57,519	$10,899						$25,382			$93,800
Forest: adjacent to stream	24		$53	$71	$163	$183			$198	$277	$469	$1,414
Forest: non-urban	21			$71	$52	$183	$106		$66			$478
Forest: suburban	23	$1,574		$71		$183	$89		$691		$586	$3,193
Forest: urban	22			$71		$183	$89	$3,246	$5,298		$586	$9,472
Grassland/ pasture	12		$2	$7	$34	$9	$48		$23	$2		$123
Open water: estuaries/ tidal bays	45	$99	$1,734		$30	$18			$160			$2,042
Open water: inland lake	43	$180				$218	$9		$1,211			$1,617
Open water: river	41						$9		$1,173			$1,182
Open water: urban lake	44	$161				$218	$9		$14,775		$568	$15,730
Open water: urban/ suburban river	42	$86				$12,026			$16,034		$568	$28,715
Urban herbaceous greenspace	31	$15,468					$89					$15,557
Wetland: urban/ suburban (fresh or salt)	52	$3,704	$4,167	$5		$1,151	$3,190		$3,531		$17,374	$33,122
Wetlands: non-urban, non-coastal	51	$436		$5	$27	$908	$20		$450			$1,846
Wetlands: salt/coastal	53	$436	$371	$5	$117		$20		$450			$1,399

Values in the table are displayed in a per acre per year format. As we see from the table, alpine, agriculture, and grassland have significantly lower per acre ecosystem services than each of the other land types. On the other hand, Wetlands: urban/suburban, open water: urban/suburban, and beach near structure have the highest values of ecosystem services. We have defined the land near Fox Ridge Golf Course as Forest: adjacent to stream, and Toddy Brook Golf Course as Open water: urban/suburban river. In this case, for Fox Ridge, we estimate each acre to be worth approximately $1,414 in ecosystem services, and for Toddy Brook, $28,715 per acre in ecosystem services. These numbers can be used in comparison to the significant numbers produced in our regression including housing prices.

6. Conclusions

We can reject our null hypothesis stating that golf courses in Maine have a statistically significant impact on housing prices of houses within one mile of the golf course according to our data. In addition, lands located near wetlands (rivers, coastal, beaches) have the highest per acre value of ecosystem services in Maine. On the other hand, rural lands (grassland, alpine, agriculture) have the lowest per acre value. Referencing our analysis of previous literature, golf courses in Maine provide economic stimulation to the state. The results of our study should be taken into consideration when developing new golf courses in Maine. While we encourage the development of golf courses in Maine because of their economic value, it is most valuable to place a golf course on land with lower ecosystem

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service values. For instance, a developer should encourage a golf course project on a grassland or agricultural land in Maine, as economic benefit of golf courses outweighs the loss of the ecosystem services of the land. However, a developer must take into consideration the ecosystem services potentially being lost when developing a golf course in a (for instance) beach near structure (which provides roughly $93,000 per acre in ecosystem services). Future research should expand on the results of this study and potentially find ideal locations in Maine to develop a golf course. Another valuable research project stemming from this study would look at the existing golf courses in Maine, and evaluate each of their conservation efforts (especially those which are located on high per acre ecosystem service benefits). The results of this study are relevant and novel in the local environment and economy.

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