Save the Manatee?"
Price Elasticity of Florida's Manatee License Plate

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Abstract:
The specialty license plate program in Florida allows the state to raise revenue for projects from those individuals who are likely to gain the most from the project. Consequently, the program alleviates some of the inefficiencies common in the public provision of goods by encouraging people to pay for the program voluntarily. To fully utilize the program the state needs to determine the revenue-maximizing price to charge for the specialty license plates. Herein, I examine the determinants of demand for the "Save the Manatee" license plate using a panel data approach to estimation. I demonstrate that care must be taken in estimating the price elasticities as they differ significantly depending upon the model chosen.

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I. Introduction

As far as species go, few are more innocuous. The manatee lolls in coastal waters, lazily munching aquatic plants to sustain its massive bulk. It is about as aggressive as the domesticated cow. Yet, as a protected species, it impedes the development of valuable coastal property in Florida. The manatee prefers the same warm waters as swimmers, anglers and recreational boaters, all of whom must pay special attention not to harm or molest the animals under penalty of law. The plight of the manatee has become emblematic of the threats unchecked growth represents for the environment in Florida. Paying for the protection of the species could threaten Florida's already strained budget.

The state of Florida and the U.S. Fish and Wildlife Service have listed the manatee as an endangered species. With this designation comes an obligation to enact a plan for the manatee's recovery (see U.S. Fish and Wildlife Service, 1999). But, as is the case with any government project, there is no guarantee that the project will receive adequate funding to accomplish its task. The constraint a budget places on a government forces it to make tough choices as it allocates its scarce funds among competing projects. Even if the government has a mechanism to determine the relative merits of different projects at different levels of funding, traditional methods of raising revenue will introduce undesirable distortions into the economy.

Occasionally instances arise in which a government has an opportunity to raise revenue for a specific project without simultaneously introducing an additional tax burden on its citizens. This study examines one such opportunity: The state of Florida offers for sale a specialty license plate that allows motorists to advertise their support for

manatees while providing financing for manatee related projects. By maximizing the revenue from sales of specialty manatee plates, Florida minimizes the need to impose additional, distortionary taxes in order to fund the Federally-obligated manatee projects. Failure to consider the full revenue potential of the specialty plate program impacts all Florida taxpayers, not just those who favor manatee protection.[1]

Many states now offer some alternative to their standard issue passenger-car license plates. With the advances in graphics capabilities, the artistic potential for license plates is endless. Some states charge an additional fee for the opportunity to choose a plate other than the standard issue. Others do not. The decision to issue specialty license plates is not without controversy. Police sometimes argue successfully that the new designs are difficult to read.[2] Yet, the opportunity to provide motorists with a choice in selecting their license plate design provides an opportunity to raise revenue that should not be ignored. Governments at every level are turning to fee-for-service programs to fill

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[1] Because Florida generates most of its revenue from sales taxes rather than income taxes, the marginal incidence of additional revenue requirements extends well beyond the citizens of Florida.

[2] Arizona, Pennsylvania and South Dakota each retired license plates for this reason. For information about the history and some thoughts about different plates, two web sites are of particular interest. The "License Plates of the World" (Anonymous, 2003) site offers pictures of an impressive number of plates and hosts forums about license plate collecting. Sproull (2003) hosts "pl8ster" (http://www.geocities.com/bsproull/) in which he discusses some interesting facts about different plates and rates the aesthetic merits of various plates.

shortfalls in budgets. As they do, economists continually urge governments to consider the efficiency implications of their pricing choices.

States monopolize the provision of license plates to keep orderly, centralized records - records that provide information about road use, driver demographics and help register voters. While there is an incentive to take advantage of this monopoly position by charging registration and licensing fees well above the marginal cost of providing license plates, states have generally resisted such temptation. Considering that licenses are mandatory, such restraint is commendable. Specialty license plates (and vanity license plates) are another matter altogether. Because individuals are under no obligation to replace their prosaic state plate with an alternative plate, usually more elaborate or colorful in design, states should be under no compulsion to price such plates at the marginal cost of provision. In fact, because most specialty plates are offered with the intent of raising money for some cause, the purchaser of the plate expects to pay a premium above the cost of provision.

One such Florida license plate, the "Save the Manatee" license plate, was the first plate in the U.S. to raise revenue for a specific environmental goal, the effort to preserve habitat for the manatees living in the coastal waters of Florida. In order to minimize the state tax dollars that go toward efforts to preserving manatee habitat and aiding in the recovery of the manatee, the state has an incentive to fully exploit its ability to raise revenue with the "Save the Manatee" license plate. Every dollar the manatee plate raises shifts a portion of the financial burden of manatee recovery project onto those who express a preference for manatees by purchasing the specialty plates. In the following section I describe the specialty license plate program and the efforts being made to save

the manatees in Florida. In the third section I describe the data used to develop a model that describes the demand for "Save the Manatee" license plates. In the fourth section I present my estimates of the price elasticity of demand for manatee plates and discuss the results. In the final section, I summarize the findings that suggest that estimates of the price elasticity of demand for the manatee plate are sensitive to accounting for county-level heterogeneity. Once I account for unobserved county differences, I find some evidence that suggests the demand for manatee plates is inelastic.

II. Background

Florida's specialty license plate program is the oldest in the U.S. and one of the most extensive. The program began in 1986 after the Challenger space shuttle tragedy (Malgreen, 1998). The commemorative license plates were meant to both memorialize those who perished in the accident and to raise revenue for space education in Florida's primary schools. Since the introduction of the first specialty license plate in Florida, 66 different plates have been available to registered motorists in Florida. Of those, four plates have been retired due to lack of interest. One more plate, the "Florida Quincentennial" plate, was meant to be temporary from its inception.

Florida's specialty license plates represent a vast array of interests. All of the major colleges, universities and major professional athletic teams are represented by a specialty plate. Eleven different environmental interests have their own plate. Eight different military distinctions, among them Medal of Honor recipients and Purple Heart recipients, have their own plate. There are 19 miscellaneous plates that raise money for the arts, education, breast cancer research and family planning programs, to name a few. Drivers pay a surcharge that ranges from $15 to $30 dollars a year, depending on the

plate. The surcharge goes into a trust fund that finances projects associated with the cause represented on the plate. Any group can petition the Legislature for a plate. The two requirements are that the group demonstrates sufficient demand for their plate to justify its printing and pays a $60,000 application fee. Upon legislative approval, the Florida Department of Highway Safety and Motor Vehicles (DHSMV) will start issuing the plate within a year (Florida Department of Highway Safety and Motor Vehicles, 2003).

Specialty plates can be quite lucrative. The "Save the Manatee" plate has generated almost $30 million for the Save the Manatee trust fund since the plate's introduction in 1990. The most popular plate, the "Protect the Panther" plate, has raised over $35 million since its introduction in fiscal year 1991. More than 13 million panther plates have been sold in Florida. Other plates have not been as popular. The "Girl Scout" plates have faded into obscurity due to a lack of interest while the "Tampa Bay Storm," the "Miami Hooters" and the "Orlando Predators" plates were discontinued when the professional teams they represented folded.

Competition among plates is keen. Proponents of particular plates rent billboards along Florida's highways exhorting Florida motorists to choose their plate. This competition serves two functions. First, it makes motorists aware of the opportunities available to them. They can elect to adorn their cars with plates that more exactly represent their interests (or car color). Second, it provides elected officials with some important information about what causes Floridians really care about. The popularity of the panther and manatee plates attest to the desire of Floridians to protect their

environment and the species that have come to represent the plight of the environment in Florida.

The "Save the Manatee" plate was the first plate among the Florida specialty license plates that expressed an environmental sentiment (the DHSMV introduced the panther plate in the following fiscal year). The Save the Manatees trust fund receives the proceeds from sales of the manatee plate. The trust fund is earmarked for rehabilitating manatees that are injured or ailing, for conserving and patrolling habitat critical for the manatee's survival and for educating the public about manatee issues. The trust directs about 50 percent of the funds to the Florida Fish and Wildlife Conservation Commission (FFWCC) each year. The FFWCC works with the U.S. Fish and Wildlife Service in its attempt to protect the remaining manatee populations. Most of the remainder of the fund goes to the Florida Advisory Council for Environmental Education (FACEE). FACEE provides educational grants for schools, zoos and other groups that educate the public concerning manatee issues.

The success of efforts to protect manatees and their habitat is hard to quantify. According to the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service, 1999), manatee censuses are fraught with uncertainty because the only readily available methods of counting manatees are aerial surveys and mortality surveys. The most recent surveys of manatee numbers in the waters off of Florida are encouraging. The 2003 survey places the census at 3,113, the second highest count on record (Ackerman, 2003). One statistic that remains troubling, however, is that collisions with watercraft continue to be the largest human-caused source of manatee mortalities and historically accounts for roughly 25 percent of all manatee fatalities (U.S. Fish and Wildlife Service, 2002).

The specialty license program adds a twist to the question of how best to raise funds for projects such as saving the manatees. In essence, the state of Florida funds some of its programs as if they were charities. Monies raised from sales of specialty plates free up tax revenue for other expenditures. Consequently, it behooves the state to maximize the revenue license plate sales generate. There are few studies that examine the price elasticity of license plates. Alper et al. (1987) and Harrington & Krynski (1989) both found evidence that states failed to maximize revenue generated from "vanity" license plates – plates that allow the purchaser to customize the configuration of letters and numbers of their license plates. Alper et al. find that the elasticity of demand for vanity plates at the prices they were being offered varied from state to state, and concluded "that few, if any, states set fees at levels which would be consistent with net revenue maximization."(Alper et al., p. 108) Harrington & Krynski concludes that states tend to price vanity plates above the revenue-maximizing levels. Biddle (1991) focuses on the shift in demand for vanity plates as people become aware of the opportunity the plates offer. He uses the term "bandwagon effect" to describe the phenomenon of the demand for vanity license plates shifting out as people become aware that they have the opportunity to select their own message. Craft (2002) has taken more recent data to revisit both the Alper et al. (1987) and Harrington & Krynski (1989) studies. He finds that many states still set prices higher than the revenue maximizing levels and that most states fail to set the prices to the revenue-maximizing level.

No one has examined the demand for specialty license plates in the same light. Craft (2002) suggested that specialty license plates may complement vanity license plates but argues that there is insufficient data to adequately study specialty license plates. On a

national level, he is probably correct. State level data, however, provide an opportunity to add to our understanding of the demand for license plate variations. Ultimately, the evidence from Florida suggest that the demand for the "Save the Manatee" specialty plate is inelastic.

III. Data and Modeling Considerations

Although specialty license plates have become popular across the country, no one has yet chosen to analyze the demand properties of these plates. Unfortunately, the attention Alper et al. (1987), Harrington and Krynski (1989), and Biddle (1991) paid to vanity license plates has not led to an outpouring of interest in the subject. Only Craft (2002) has revisited the subject. One would think that a product as ubiquitous as license plates would attract more attention. One of the impediments of studying specialty license plates is that, unlike the case of vanity license plates, few specialty plates are comparable. For one, many states offer more than one plate with competing messages. Craft (2002) points out that there is not one price for these plates, but often many prices. In such cases, the determinants of demand may be difficult to isolate because individuals care differently about different causes. It is unclear which plates are substitutes or, potentially, complements. I avoid the problems of competing messages and different prices by focusing on one plate in one state.

The previous studies all rely on data aggregated at the state level. I rely on county-level data for one state for a 12 year period starting in fiscal year 1989-1990. There are 67 counties in Florida. These counties vary dramatically in many socio-economic characteristics. Some are extremely wealthy (such as Collier County). Some are exceptionally poor (such as Calhoun County). Florida is host to counties with large

retiree populations (such as Pinellas County) and counties with relatively young populations (such as Alachua County). At least one person in each county has purchased a manatee license plate in each year this study spans, which eliminates the potential problems associated with censored data. By restricting the data to one state, I avoid the problem of consumers facing different sets of plates from which to choose. The same set of plates is available in each county in Florida (although the set of plates available expands over the years). Each plate has the same nominal price as well. Differences in consumption patterns should arise due to differences in the characteristics of the populations of each county and real price differences in the "Save the Manatee" license plate among counties and over time.

The data for this study come primarily from two sources. Information concerning the annual sales of manatee license plates per county comes from the Florida DHSMV's Annual Report (Florida Department of Highway Safety and Motor Vehicles, 1989-2002). The Florida DHSMV reports the annual revenue generated from the sale of each specialty license plate, the price of each specialty license plate, and provides the total number of vehicles registered in each county. To obtain the number of manatee plates sold in each county I divide the revenue generated by the price of the plate. Although the data are reasonably clean, there are two aspects about the revenue data that bear mentioning: People can purchase sample plates from the FDHSMV. There is a small but devoted group of people who collect license plates. Sales of these plates are included in the revenue numbers generated each year. But, because the collectors do not pay the full price (they do not pay the vehicle registration fee), converting the revenue data to license sales can result in the apparent problem of fractions of license plates being sold.

Compounding this problem is the observation that some people make additional direct contributions to the Save the Manatee trust fund alongside their purchase of a manatee plate. Although, according to sources at the Florida DHMSV, the contributions are small, the DHMSV makes no attempt to separate them from the revenue generated by the sale of the plates. To partially adjust for these problems, I round all plate sales figures down to the nearest whole number. To calculate the percentage of manatee license plates in each county, I divide the number of manatee plates by the number of passenger-cars and trucks registered in each county. Motorcycles are not permitted to have specialty license plates.

The rest of the data come from the Florida Statistical Abstract (Bureau of Economic and Business Research, 1989-2002) published annually by the University of Florida.[3] The Florida Statistical Abstract provides data concerning many aspects of life in Florida. It reports the expected facts about income, births and deaths. It also reports a county-level cost of living index. Similar in nature to the Bureau of Labor Statistics' (BLS) price indexes, the county-level cost of living indexes allow one to compare purchasing power from one county to another. This is important in Florida, a state with vast diversity when it comes to affluence. Because there is no nominal difference in the price of manatee license plate from county to county (although the price did rise from $15 to $20 a year in 2000), deflating the county prices (and income) by the county-level cost of living index puts the decision to purchase a specialty license plate into the context

[3] The one exception is median age data. The Florida Statistical Abstract does not report median age for the years 1991, 1992 and 1993. For those years, I estimate the median age using the reported populations in each age group.

of relevant budget constraints for residents of each county. Finally, because I use 12 years of data, I also adjust all prices using the BLS consumer price index.

There is some agreement among the previous studies about what the demand for alternative license plates should look like. Each of the previous studies regress some measure of vanity plate purchase on a measure of price, state income, the number of years the plates have been available, and the potential number of letter and number combinations available. Alper et al. (1987) and Harrington & Krynski (1989) include the proportion of the state population that falls with the 25 to 44 age group. Craft (2002) refines the age category to include the proportion of the state population that falls within the ages 25 to 34. He argues that this population segment is the most likely to use the vanity license plate program to attract the attention of potential mates. He also adds the proportion of the state population on active military duty or of veteran status. While Alper et al. (1987), Harrington & Krynski (1989) and Craft (2002) use the percent of valid registrations that are vanity plates as their dependent variable, Biddle (1991) uses the number of plates that are vanity plates. He then controls for the number of cars in each state by including it as a regressor.

I examine both the percent of "Save the Manatee" plates and number of manatee plates sold in each county in separate equations. I alter the specification of my model in a couple of important ways. First, to control for possible differences systematic among the counties, I structure the data as a panel with 67 observations in 12 time periods. This will isolate unobservable within-county effects on the demand for manatee plates. Second, instead of isolating a particular age group within each county, I use median age as a regressor. I assume that the purchase of a manatee license plate is more likely to be

consistent with charitable activity instead of seeking status among one's peers.[4] Because I focus on one plate in one state, the age of the specialty plate program does not vary. I do, however, include a year variable to control for any time trend in plate sales.[5] Finally, I include four dummy variables to indicate the introduction and continued availability of related specialty plates. The "Preserve Panther Habitat" plate was first available in fiscal year 1991. The "Sea Turtle" license plate's first sales were in 1998. The "Protect Wild Dolphins," "River of Grass," and "Wildlife" license plates appeared in 1999. The "Estuaries" and "Wild Flower" license plates were introduced in 2000. In light of Biddle's work, it is not clear that these plates will strictly be substitutes for the "Save the Manatee" plate. If any bandwagon effect is strong enough, alternative specialty license plates may be complements to, rather than substitutes for, the "Save the Manatee" plate. I limit my attention to these seven alternative plates because they are the most closely related thematically to the "Save the Manatee" plate. They all represent environmental concerns.[6] Whereas the previous studies rely on fairly small sample sizes, with 67 counties and 12 years of data, I have 804 observations at my disposal. A summary of the data appears in Table 1.

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[4] A test of the square of median age in all regressions did not allow me to reject the null hypothesis of a zero coefficient.

[5] I tested for a non-linear time trend by including year squared. Again, I could not reject the null hypothesis.

[6] A better accounting of the choices alternative plates represent might be illustrated with a simultaneous equations model. Unfortunately, data restrictions prevent such an investigation.

The exact specification of the empirical model is not immediately obvious. Alper et al. (1987) test four separate models using a double log logit form for their discussion. Harrington & Krynski (1989) choose a weighted least squares logit model for their estimates. Craft (2002) relies on a linear probability model for his estimates, arguing that the model fits the data better than the logit model. Each of the above studies uses the proportion of vanity plates to all plates as its dependent variable. Although the individual's choice whether or not to purchase a particular license plate is a binary choice, the aggregation of observed choices is not a binary variable. The dependent variable in each of these studies is continuous on the interval [0, 1]. Consequently, the logit specification of the model is not appropriate (see Greene, 1993 pp. 63 ff).

Like Craft, I use the linear probability model to estimate the parameters of my models.[7] In the context of aggregate data, OLS is susceptible to heteroscedasticity. If, for example, large counties tend to be wealthier counties, OLS estimates, although unbiased, may be inefficient. One approach is to allow for county-specific fixed effects by allowing each county's demand equation to shift. This can be accomplished by using panel data fixed effects estimation techniques. It assumes that the slope parameters are consistent throughout the population but the intercept parameters vary by county.

The first model posits that the log of the proportion of manatee license plates as a percentage of all registered passenger vehicles in each county ($L\%MP_n$) is a function of a county-specific constant shift parameter (α_n), the log of the real (purchasing-power and inflation adjusted) price of a manatee license plate in the county (LRP), the log of the real

[7] I use the TSP package to estimate the parameters of the models. I will gladly provide all data and non-proprietary programs to anyone interested in replicating my results.

per capita income in the county (LRINC), the log of the median age in the county (LMEDAGE), the log of the year (LYR), and the four dummy variables indicating the existence of competing plates in the year (DUM_i, i = 1, 2, 3, 4):

$$L\%MP_n = \alpha_n + \beta_1 * LRP + \beta_2 * LRINC + \beta_3 * LMEDAGE + \beta_4 * LYR + \gamma_i * DUM_i. \quad (1)$$

In the second model, I examine the log of the number of manatee plates sold in each county per year (LMP). To control for the size of the different counties, I include the log of the number of registered cars (LCARS) as an independent variable in the second model:

$$LMP_n = \alpha_n + \beta_1 * LRP + \beta_2 * LRINC + \beta_3 * LMEDAGE + \beta_4 * LYR + \beta_5 * LCARS + \gamma_i * DUM_i. \quad (2)$$

IV. Results

The regression results for models (1) and (2) appear in Tables 2a and 2b. For each of the models I compare the OLS (total) model to the panel fixed effects model. I suppress the county-specific slope parameters for the sake of brevity. Because both models take the double-log form, coefficients represent elasticity estimates. As expected, the price elasticity of demand for the manatee license plates is negative. Of particular interest, though, is that controlling for county-level fixed effects changes the magnitude of the price elasticity in both models. The estimated coefficients on price in both OLS models are significantly greater than unity. This would indicate that Florida has overpriced the "Save the Manatee" plate and could increase revenue by decreasing its (real) price. This contradicts earlier findings which suggested that the demand for vanity plates is inelastic. When one adjusts for county-level variations, however, the

opportunity for increasing revenue by adjusting the price of the plate largely evaporates. In both fixed effects models the estimates of price elasticity fall to below unity but by less than one standard error. In other words, the fixed effects models confirm the previous research that suggests the demand for specialty license plates is inelastic. But, because the price elasticity is statistically close to unity, one cannot predict with confidence that any increase in price will result in an increase in revenue.

The coefficients on the log of real income in each regression are positive but, as was the case with price, the impact of changes in real income diminishes in the fixed effects models. This implies that manatee license plates are normal goods and demand increases with income. Increases in median age, although positive and significant in the OLS models, become insignificant in the fixed effects models. In the second model, the numbered of registered cars has the expected positive effect on manatee license plate purchases in both the OLS model and the fixed effects model.

Alper et al. (1987) and Harrington & Krynski (1989) find modest evidence to suggest that the age of the vanity license plate program in each state has a positive effect on the proportion of drivers who opt to purchase a vanity license plate. Craft (2002), however, finds no such evidence and Biddle (1991), who specifically attempts to isolate any bandwagon effect in the demand for vanity license plates, also fails to uncover the presence of a bandwagon effect. In the OLS models, the log of year has an unexpected negative impact on the purchase of manatee license plates. This would imply that the demand for the specialty plates erodes over time. Once the county-level heterogeneity is controlled for the effect disappears.

Because controlling for county-level heterogeneity seems to leave the age and year variables superfluous, I re-estimate the fixed effects models and omit these variables. The results appear in the fourth column of Tables 2a and 2b. Notably, the price elasticity estimate in the percent model is now significantly less than unity and the income elasticities in both models are now statistically significant at the ten percent level.

Controlling for the introduction of additional environmental plates has a strong effect on the demand for manatee plates. Interestingly, however, the impact is not uniform across the plates. The coefficient on the turtle plates is negative in both models which indicates that the "Sea Turtle" plate is perceived as a substitute for the "Save the Manatee" plate. Both the manatee plate and the turtle plate are likely to attract the attention of people concerned with aquatic environmental issues.[8] The messages suggested by the trio of plates introduced in 1999, the "Protect Wild Dolphins," the "River of Grass," and the more general "Wildlife" plates, although not exclusively aquatic in nature, they do have an overwhelming water theme. And like the turtle plate, they appear to be considered substitutes for the manatee plate as. The coefficient on the dummy variable that represents the introduction of the last two plates, the "Estuaries" and "Wild Flowers" plates are not significant.

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[8] It is interesting to note that while both manatees and sea turtles are costal creatures, turtle plate purchases are strongly correlated with coastal counties and manatee license plates are not. It may be that the manatees are, in the environmental parlance, "charismatic mega fauna" which have general appeal while sea turtles garner less attention. This observation suggests that sales of specialty license plates may help characterize people's ranking of values toward different species.

The positive coefficients on the "Preserve Panther Habitat" plate across all the models are harder to interpret. It appears as though the panther plate is a complement to the manatee plate. On the surface this may seem odd because car owners cannot choose two different plates for their car. But, it does seem consistent with the bandwagon effect. The panther plate in particular is an extremely popular plate. Its popularity may increase attention for the specialty plate program in general and other environmental plates in particular. Furthermore, because panthers are terrestrial, people who care about them may have been less likely to buy a manatee plate anyway. Some people prefer marine recreational activities such as boating and fishing while others prefer terrestrial activities such as camping. Perhaps Biddle's search for an example of a bandwagon effect ended prematurely.

V. Concluding Comments

The findings of this study are generally consistent with past studies that have found that states fail to optimally price vanity license plates. There is some evidence that the demand for Florida's "Save the Manatee" specialty license plate is inelastic and that more revenue could be generated by raising the price. But the overall finding is that the specification of the demand function is critical to the conclusions being drawn. If one fails to account for the county-level heterogeneity in the data, one could wrongly conclude that the license plates are over-priced. When the nominal price of the "Save the Manatees" license plate increased from $15 a year to $20 a year in 2000, annual registration of "Save the Manatee" plates fell by 15,754 plates the first year after the price increase. But annual revenue generated by the plate rose by more than $350,000. This can be seen clearly in Figure 1 where annual nominal revenue is plotted with annual sales

of manatee plates. In 2000, revenue rises with the price increase while sales continue a downward trend.

Also important to the development of the specialty license plate program is the finding that some plates are considered substitutes for the manatee plate. As the specialty plate program continues to expand, the addition of new plates is likely to crowd out support for some existing plates. If the state cares only about raising revenue from the plate program, this observation has little relevance. But, for those elected officials one the lookout for better ways to gauge the strength of public sentiment toward different projects, the specialty license plate program could supply a treasure trove of information. And yet, equally important is the finding that some plates complement each other probably because they inform people about the specialty plate program.

Florida has good reasons for wanting to squeeze as much revenue as possible from its specialty plate program. For every dollar the "Save the Manatee" plate provides, one fewer dollar needs to be raised to pay for federally mandated manatee projects. Reducing the revenue requirement that the state must meet alleviates the impact of other, distortionary taxes. Furthermore, because the specialty license plate program matches specific causes with people who are interested in those causes, it provides a signal about the preferences of the electorate.

The lesson to be learned is fairly clear: States should not ignore the nature of demand when pricing the services they provide. A careful examination of the determinants of demand for specialty license plates will yield improvements in the generation of revenue. Considering there are 61 other specialty plates in Florida, this study only scratches the surface of the problem. I have not addressed in a systematic

way the nature of the cross-price elasticities of demand between plates. With the proliferation of specialty license plates, at some point the new plates will simply siphon demand away from existing plates. How people decide between plates has yet to be described.

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Table 1: Descriptive Statistics

Variable	Mean	Variance	Minimum	Maximum
# Manatee Plates	2,124.00	$1.09 \cdot 10^7$	2.00	17,507.00
% Manatee Plates	1.11	0.74	0.04	3.87
Cars	153,809.00	$6.04 \cdot 10^{10}$	2,637.00	1,673,004.00
Nominal Price	15.80	3.48	15.00	20.00
Real Price	17.42	4.65	12.87	48.03
Median Income	19,501.00	$4.03 \cdot 10^7$	8,533.00	44,862.00
Median Real Income	21,263.45	$3.14 \cdot 10^7$	11,413.68	56,991.66
Median Age	38.12	33.67	28.09	54.50
Panther Plate Dummy	0.91	0.08	0.00	1.00
Turtle Plate Dummy	0.27	0.20	0.00	1.00
Dolphin, River of Grass and Wildlife Plates Dummy	0.18	0.15	0.00	1.00
Estuary and Wild Flower Plates Dummy	0.09	0.08	0.00	1.00

Table 2a: Log Percent Manatee Plates (L%MP)

Variable	OLS (total) Coefficient	Fixed Effects Coefficient	
Intercept	1567.85**	n.a.	n.a.
	(252.93)		
Log of Real Price (LRP)	-3.21**	-0.70	-0.40**
	(0.45)	(0.38)	(0.12)
Log of Real Income (LRINC)	1.66**	0.45	0.32
	(0.09)	(0.28)	(0.17)
Log of Median Age (LMEDAGE)	0.98**	-0.15	–
	(0.13)	(0.25)	
Log Year (LYR)	-207.95**	-21.45	–
	(33.11)	(26.87)	
Panther Plate Dummy (DUM_1)	1.22**	1.29**	1.30**
	(0.09)	(0.06)	(0.06)
Turtle Plate Dummy (DUM_2)	-0.24**	-0.23**	-0.23**
	(0.07)	(0.02)	(0.02)
Dolphin, River of Grass and Wildlife	-0.14	-0.15**	-0.15**
Plates Dummy (DUM_3)	(0.08)	(0.02)	(0.03)
Estuary and Wild Flower	0.78**	-0.01	-0.10*
Plates Dummy (DUM_4)	(0.15)	(0.12)	(0.04)
Adjusted R^2	0.69	0.94	0.94
SSR	167.87	29.67	29.73
F test of A,B = A_i,B		51.45**	60.40**

Notes: Standard errors are in parenthesis. * denotes significance at the 5% level, ** denotes significance at the 1% level versus the two-tailed null hypothesis. Standard errors are heteroscedastic-consistent.

Table 2b Log Manatee Plates (LMP)

	OLS (total)	Fixed Effects	
Variable	Coefficient	Coefficient	
Intercept	1081.03**	n.a.	n.a.
	(208.24)		
Log of Real Price (LRP)	-2.14**	-0.81*	-0.73**
	(0.33)	(0.37)	(0.15)
Log of Real Income (LRINC)	1.10**	0.54*	0.50**
	(0.09)	(0.27)	(0.18)
Log of Median Age (LMEDAGE)	1.00**	0.008	--
	(0.12)	(0.24)	
Log Year (LYR)	-144.37**	-7.09	--
	(27.31)	(26.67)	
Panther Plate Dummy (PDUM)	1.28**	1.22**	1.22**
	(0.08)	(0.06)	(0.06)
Turtle Plate Dummy (TDUM)	-0.23**	-0.23**	-0.23**
	(0.06)	(0.02)	(0.02)
Dolphin, River of Grass and Wildlife	-0.14*	-0.15**	-0.15**
Plates Dummy (DDUM)	(0.07)	(0.02)	(0.02)
Estuary and Wild Flower	0.44**	0.04	0.02
Plates Dummy (EDUM)	(0.12)	(0.12)	(0.05)
Log Cars (LCAR)	1.15**	0.54**	0.54**
	(0.02)	(0.12)	(0.12)
Adjusted R^2	0.96	0.99	0.99
SSR	149.32	29.02	29.03
F test of A,B = A_i,B		45.72**	53.03**

Notes: Standard errors are in parenthesis. * denotes significance at the 5% level, ** denotes significance at the 1% level versus the two-tailed null hypothesis. Standard errors are heteroscedastic-consistent.

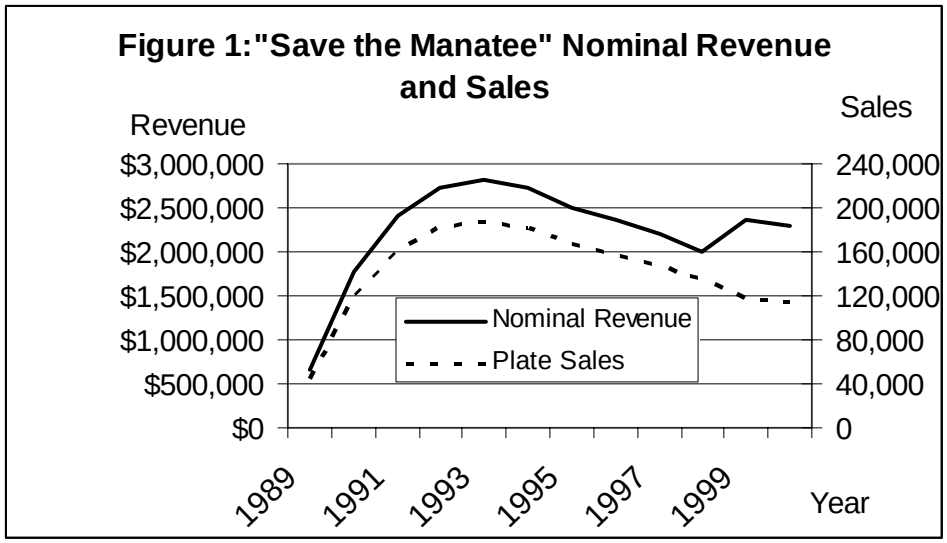
Figure 1:"Save the Manatee" Nominal Revenue and Sales
Revenue
Sales
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
240,000
200,000
160,000
120,000
80,000
40,000
0
Nominal Revenue
Plate Sales
1989
1991
1993
1995
1997
1999
Year