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Regulatory Takings and the Diminution of Value: An Empirical Analysis of Takings and Givings

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A hedonic model is used to measure the change in value of residential lots in Rockport, Texas, resulting from Section 404 of the U.S. Clean Water Act. Results show that average lot values initially decreased, went through a six-year adjustment period, and then stabilized on a higher price path resulting in a positive net effect on average lot values throughout the Rockport area (with the exception of a particular subdivision). The results indicate that Section 404 generated both regulatory "takings" and "givings," suggesting that both effects should be considered when assessing the benefits and costs of regulatory events and compensation claims.

Key Words: Clean Water Act Section 404, hedonic price method, interrupted time series, regulatory takings and givings, wetlands

JEL Classifications: C51, D61, R11, R21, Q15

Although many zoning and regulatory takings cases have been seen in the courts over the past few years (Runge et al. 2000; Runge et al. 1995), the general public became much more concerned with regulatory takings after the well-publicized case of *Lucas v. South Carolina Coastal Council* (1992). The United States Supreme Court concluded that when legislation deprives an owner of all economically viable use of the property, compensation is required under the 5th Amendment as long as the restriction was not originally part of the landowner's title. In *Pennsylvania Coal Co. v. Mahon* (1922), Justice Holmes gave the opinion that if a regulation "goes too far" it will be considered a compensable taking. This has been referred to as the diminution of value test: "How much value has been lost due to the regulation?" Following the Mahon case, the diminution of value test was used in a number of landmark takings cases, including *Agins v. City of Tiburon* (1980), *Deltona Corp. v. United States* (1982), *Loveladies Harbor, Inc. v. United States* (1988), and *Florida Rock Industries, Inc. v. United States* (1985).

More recently, the diminution of value test under the Lucas case ruling that compensation must be paid if all economically viable use has been denied was invoked in two United States

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Supreme Court cases: *Palazzolo vs. Rhode Island* (2001) and *Tahoe-Sierra Preservation Council, Inc. vs. Tahoe Regional Planning Agency* (2002). In the Palazzolo case, the Court ruled that a Lucas taking had not occurred because the plaintiff's (Anthony Palazzolo) property still retained substantial economic value even though the plaintiff could not develop the property as intensively as desired because of state wetland regulations. In the Tahoe-Sierra case, the Court ruled that a Lucas taking had not occurred because as soon as a housing development moratorium imposed by the Tahoe Regional Planning Agency was lifted, full economic value to affected land would be restored.[1]

In response to the number of takings cases entering the court system and to make the courts decisions easier, the United States House of Representatives and United States Senate put forth takings bills in the mid-1990s that would determine a preset level for the diminution of value that would constitute a taking. Though different in their respective levels, the bills were similar in their meaning: if an individual's property decreased in value by a certain percentage due to a government action, then a compensable taking had occurred. Although neither of these bills passed, they are likely to resurface in the future (The Bureau of National Affairs).

Other takings studies have focused on theoretical efficiency arguments to identify takings and potential compensation payments. Some of the more prominent research has been done by Michelman; Fischel and Shapiro; Blume and Rubinfeld; and Miceli and Segerson. These papers discuss efficiency and fairness of regulatory takings as well as moral hazard issues associated with regulatory takings, but do not include empirical data analysis.

There have been a number of other studies that show that regulations and zoning can have positive effects on property values. Parsons uses a hedonic property model following Palmquist (1984) and Mendelsohn to estimate property value changes in the Chesapeake Bay area resulting from regulations initiated by the Critical Areas Commission of Maryland. Parsons' results show that housing prices increase as a result of the regulation of the critical areas. Previous studies have also found a positive relationship between property values and designated greenbelts (Correll, Lillydahl, and Singell), public parks (Darling; Weicher and Zeibst) and particular types of wetlands areas (Doss and Taff; Runge et al. 1995, 2000).

Chressanthis studied the effect on housing prices from three zoning ordinance changes in Lafayette and West Lafayette, Indiana. Using a time series model, he measured the changes as pre- and post-event effects on housing prices to test whether or not more restrictive zoning practices cause housing prices to rise. His results showed that zoning could have a positive or negative effect on housing prices. Previous studies of urban growth boundaries that regulate land development within and outside of the boundary suggest that these regulations also result in property value gains for some land owners and losses to others (Gleeson; Knapp and Nelson; Runge et al. 1995, 2000).

In this study, a theoretical hedonic model is formulated to estimate changes in residential lot prices in Rockport, TX due to Section 404 of the United States Clean Water Act. Unlike many coastal regulations, Section 404 strictly regulates whether land may or may not be developed. A landowner applies for a permit to develop a plot of land that may be considered a wetland. The United States Army Corps of Engineers reviews the submission, delineates the land, and then determines whether or not a permit will be granted. If not, the landowner is unable to develop the property, severely restricting potential uses of the land. Hence, the market value of lots without permits is likely to be low. However, the value of surrounding developable and developed

[1] In the Tahoe–Sierra case, the housing development moratorium was also challenged under the 5th Amendment as constituting a public use taking subject to compensation. The Court ruled however that the moratorium constituted regulation of property from private use, not acquisition for public use. In a related recent case, *Kelo v. City of New London* (2005) the Court expanded the scope of "public use" and taking of private property by eminent domain (with compensation) by ruling that the City of New London could condemn private property for economic development reasons.

property may increase due to the increasing scarcity of developable land. In the Parsons study, the increased property values are partially due to the decreased supply of homes in the area.

It is apparent that the diminution of value is an important concept when discussing regulatory takings and compensation. The question is, how might that amount be measured? In a recent literature review, Runge et al. (2000) provide considerable evidence that government actions and facilities can affect some property values negatively ("takings") and some positively ("givings"). Government actions reviewed in this study include farmland conservation and tax relief, public land grazing permits, public parks, surface transportation routes, airports, hazardous waste sites, air quality, zoning, and national economic policies. In many of the cases, the same government action or facility could have both positive and negative effects on private land values, resulting in both "givings" and "takings." Thus, the authors conclude that the net effect of a government action or facility on private property values is not clear and must be empirically determined for specific cases.

Empirical studies showing the magnitude of government "givings" and "takings" would be useful for courts to have a methodology for assessing changes in property values resulting from changes in government regulations. Such information would also be important if the U.S. government were to pass new legislation requiring compensation for "partial takings" (Runge et al. 2000). Finally, property value change measures are needed for economic efficiency or cost benefit analysis.

The overall goal of this study is to demonstrate a methodology for assessing regulatory "takings" or "givings" resulting from the effects of government regulations on property values. The methodology extends "events" models typically used to measure abnormal market investment returns to the case of measuring property value changes resulting from natural resource or environmental regulatory events. As previously discussed, few studies have empirically measured diminution of value resulting from regulatory events, and even fewer have considered the possibility that a regulatory event may result in "givings" as well as "takings."

In our case study, we hypothesize that the price of nonpermitted, undeveloped land in the Rockport, TX study area will decrease and the price of permitted undeveloped land will increase after the incorporation of Section 404. We report estimates of these losses (takings) and gains (givings) to affected property owners generated from a hedonic model incorporating unique price time adjustment features. To the best of our knowledge, this is the first study to empirically estimate regulatory "takings" and "givings" resulting from Section 404 wetlands regulations. Theoretical considerations underlying this study are presented in the next section. The study area, data, and model estimation and results are then discussed. The paper closes with a discussion of the results and conclusions.

Theoretical Considerations

Regulatory Events and "Takings" and "Givings"

Previous "events" model studies suggest that prices go through an adjustment period over time in response to some exogenous event, regulatory or otherwise (Bernknopf, Brookshire, and Thayer; Binder; Dodd and Warner; Fama et al.; Hamilton). In this study, property value adjustments over time in response to a regulatory event, such as wetlands regulation contained in Section 404, are generally modeled as

$$(1) \qquad p_{it} = f(\mathbf{z}_{it}, W_{it}) + \mu_{it}$$

where p_{it} is the price of parcel i in year t, $\mathbf{z}_{it}$ is a vector of attributes of parcel i in year t, W_{it} represents the wetlands regulatory event affecting the price of parcel i in year t, $f(\cdot)$ is the deterministic functional effect of parcel characteristics and the regulatory event on p_{it}, and μ_{it} represents random effects on p_{it}. In Equation (1), property values may change initially either when the new regulation is an-

nounced or when the general public becomes aware of the new regulation. These time periods may or may not be the same. Property values will then go through an adjustment period and eventually stabilize at some point in the future.

Thus, in response to a regulatory event, we hypothesize that property values for different tracts may increase or decrease over time after the adjustment period. This raises the possibility that the regulatory event may generate both "takings" (decreases in property value) and "givings" (increases in property values).

Hedonic Model

In our case study, a hedonic model was developed to test for the effects on property values of a specific regulatory event—implementation of Section 404 of the United States Clean Water Act in Rockport, Texas. Following Parsons, a hedonic price function for residential building lots in Rockport was conceptualized generally as

$$(2) \quad p_{it} = f[z_{i1}, \ldots, z_{in}, g(404)]$$

In the model, p_{it} is the price of lot i at time t, z_{ij} is the jth attribute on lot i, and $g(404)$ represents the part of the model that captures the effects of Section 404 regulations on the prices of lots in our sample.

In order to measure the effects of the regulation on residential lot prices, it is necessary to incorporate a dynamic adjustment component in the model, represented by $g(404)$ in the last equation. It is assumed that there is an initial change in property values from either the inception or anticipation of Section 404 followed by an adjustment period to a new equilibrium. Since there is no evidence that the marginal price effect from Section 404 regulations varied over the adjustment period, a parsimonious model with a linear time path through the adjustment period for lot prices is assumed. These assumptions imply that the g function is a linear function of time. We need to estimate four coefficients to determine the total long-term effects of the Section 404 regulations: a starting point, an initial effect, a speed of adjustment factor, and an end point. This estimation process is described in more detail in the following section.

Empirical Study

Study Area and Data

Rockport is a small town in Texas located 31 miles northeast of Corpus Christi on the Texas Gulf coast. The population today is around 9,000. In 2000, the median household income was $32,740 and the median home value was $103,600. Rockport is a well-established coastal community that has been heavily regulated under Section 404 due to the high proportion of wetlands in the area. There are a number of developments in the Rockport area, including ones that were created both before and after Section 404 permitting began. Rockport is a small suburb of Corpus Christi, which is where most residents go for many goods and services. As seen from the income and home value averages given, Rockport is not an exclusive coastal resort, and Corpus Christi data (which is easier to obtain and has a larger sample to draw upon) should serve as a reasonable proxy for deflating Rockport-based values into real dollars.

Tax values and legal addresses were collected on parcels from 1970 to 1995, as well as Multiple Listing Service (MLS) data for all sales in Rockport from 1985 to 1996.[2] MLS data on average sale prices for parcels in Corpus Christi, Texas, were also collected and used as a price index for Rockport to convert all Rockport sales values to constant 1995 dollars. This accounts for any concurrent market changes, such as the oil boom and bust that greatly affected South Texas. Additionally, sales values were not available for the entire study time-path, so it was determined that tax value data would be used instead.[3]

[2] MLS began in Rockport in 1985.

[3] Although actual sales price data are preferable, when such data are unavailable or incomplete, tax value data are a commonly used and accepted alternative (Megbolugbe; Taylor; Palmquist, 1980; Wilson and Smith). For other studies using tax value data, see also the recent review by Boyle and Taylor.

Table 1. Summary Statistics for Data

Variable	Value
Lot (n)	15,688
Average lot size (square ft)	8,506
Average sale price ($, 1995)	25,561
Waterfront lots	9,159
Corner lots	1,365
Cul-de-sac lots	1,769
Lots with city water	141,710
Lots with city sewer	5,659

The tax values for parcels are recorded by the tax assessor as a percentage of a parcel's estimated total value. These percentages were used to calculate 100% of the value for each parcel. Tax values are not necessarily equivalent to the price at which the parcel might sell, so actual sales in Rockport were compared with the recorded tax values for the same parcel subject to data availability. According to the Aransas County Appraisal District, tax values should be consistent within subdivisions and within years. Parcels sold and the corresponding tax values were therefore grouped by subdivision. The data with both tax values and market sales were used to compute subdivision-specific ratios between these two measures. The ratios were then used to adjust tax values for each parcel to a "market value" estimate. Careful examination of the data and consultation with local real estate agents convinced us that these constructed sales data on residential lots from 1970 to 1995 were adequate for testing our primary research hypothesis. As a result of Section 404 wetland regulations implemented in 1975, we hypothesized that property values in our study area would increase or decrease over time after an adjustment period. Summary data statistics for observations used in the model estimation are presented in Table 1.

Model Specification and Estimation

The empirical specification of the hedonic price function was

$$(3) \quad y = \alpha + \beta \mathbf{z} + \gamma D_{\tau 1} + \delta[x_t/(\tau_2 - \tau_1)] + \varepsilon$$

where y is the sales value or price of lots in Rockport; $\mathbf{z}$ is a vector of property attributes; D is a binary variable equal to zero before period τ_1 and equal to one in that period and afterwards; τ_1 and τ_2 are the starting and end points (to be estimated), respectively, for the adjustment period; x_t is a variable that indexes the stage of the adjustment path at time period t; ε is a random error term; and α, β, γ, and δ are parameters to be estimated. Many of the variables included in the $\mathbf{z}$ vector relate to lot characteristics. These variables include: the lot size in square feet (LOTSIZE) and whether a property is a waterfront lot (WATCANFR), has water on two sides (WATTWO), is on a corner (CORNER), in a cul-de-sac (CULDESAC), has city water (CWATER) or city sewer (CSEWER), or has a natural gas hook-up (NATGAS). Other variables relate to the location of the lot. These variables include whether the lot is in the Fulton elementary school district (FULTON), the distance to the local elementary school in miles (DELEM), the distance in miles to downtown (DTOWN), and the distance in miles to the nearest highway entrance (DHWY).

The $\mathbf{z}$ vector also included a dummy variable for lots located in a particular subdivision, Cape Velero (CAPEVAL), which was adversely affected by Section 404. The subdivision was proposed in 1986 and most of the lots had been platted. The developer promoted the lots as waterfront or canal front before the canals were dug and/or dredged, and proposals for a marina complex and a lake were also described in the sales of the lots. However, the U.S. Army Corps of Engineers denied the developer permits for digging the canals, dredging the channel for the marina, and creating the lake. The lots quickly decreased in value and very little home construction actually took place. Due to this decrease in value, Cape Velero is a unique subdivision, since Section 404 affected it differently than other subdivisions in the data set.

The dynamic adjustment is captured through the time adjustment variable x_t, and parameters τ_1, τ_2, γ, and δ. The parameters τ_1 and τ_2 are the starting and end points of the adjustment and are estimated by grid search, choosing the pair that maximizes the R^2 of the model when the other parameters are estimat-

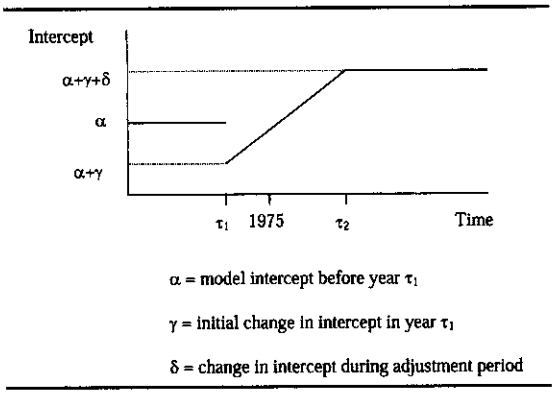

Figure 1. Illustration of Time Adjustment Variables

ed conditional on each possible (τ_1, τ_2) pair. Estimating the break points by grid search means that all other parameters are estimated conditional on a set of break points removing difficulties that could arise in simultaneous estimation of all parameters if no break points existed.

For a fixed pair of starting and end points, γ represents the initial price adjustment that occurs in time period τ_1. The parameter δ represents the size of the subsequent price adjustment to a new equilibrium that occurs between time periods τ_1 and τ_2. The variable x_t takes the value zero before τ_1 and in that time period goes from 1 to $(\tau_2 - \tau_1)$ incrementally during the adjustment period and equals $(\tau_2 - \tau_1)$ after time period τ_2. Thus, in years before τ_1, neither γ or δ enter the model. In period τ_1, the average price changes by γ in reaction to Section 404. In period τ_2, the average price has changed by $(\gamma + \delta)$, reaching its new equilibrium in response to the regulations. In between, the price adjustment travels on a straight line between γ and $(\gamma + \delta)$ as the term $[x_t/(\tau_2 - \tau_1)]$ takes on values of $[1/(\tau_2 - \tau_1)]$, $[2/(\tau_2 - \tau_1)]$, . . . , 1. To see graphically how this adjustment path works, see Figure 1. Since the data begins in 1970 and the regulation started in 1975, τ_1 is allowed to be any year from 1971 to 1975. The endpoint, τ_2, is allowed to be any year from $\tau_1 + 1$ to 1995.

A linear model for the empirical hedonic price function was estimated using OLS. According to Palmquist (1991), theory does not dictate the functional form for a hedonic equation unless there is costless repackaging, which only applies in the long run for differentiated products such as housing. If any particular characteristic on a lot can be separated from the lot and the amount of that characteristic varied independently, then the hedonic function is linear. Costless repackaging says that sufficient profitable arbitrage opportunities exist for individuals to relocate characteristics from where they are cheap to where they are more valuable (Palmquist, 1991). Given the small number of characteristics of lots (relative to houses) and the length of time in this study (25 years), we make the reasonable assumption that this is a long run model with a linear functional form.

Results and Discussion

The results of the hedonic model estimation are reported in Table 2. The model displayed an adjusted R^2 of 0.548 and an F-value of 1011.97. Approximately 20% of the data set was held back for out-of-sample validation. These observations were used with the model parameters estimated with the other 80% of the data to generate forecast values for these out of sample data. The model R^2 using these data was then computed and compared with the model R^2 using the data from which the actual parameters were estimated. The results from the 20% sub-sample show results similar to those reported above, with an R^2 of .561 compared with .548 for the full model, and an F-value of 269.56 indicating significant explanatory power of the model using the out-of-sample data.

The results reported in Table 2 indicate that time series adjustment path parameters were statistically significant. Allowing τ_1 and τ_2 to be determined by the model gave us estimates for these parameters of 1975 and 1981, respectively. This shows that Section 404 regulations began affecting property values in 1975 (τ_1) when the regulation was first implemented. Property values then underwent a six-year adjustment period and stabilized in 1981 (τ_2). The joint significance of the adjustment path parameters was tested and found to be

Table 2. Regression Parameters for Hedonic Model

Independent Variables	Parameter Estimate	T for H^0 Parameter = 0	Prob > |T|
INTERCEP	−25,081.00	−9.71***	0.0001
$D_{\tau 1}$	−4,308.38	−6.57***	0.0001
$x_i/(\tau_2 - \tau_1)$	17,178.00	26.28***	0.0001
LOTSIZE	1.85	30.41***	0.0001
WATCANFR	23,598.00	39.43***	0.0001
WATTWO	5,203.45	2.93***	0.0034
CORNER	−791.84	−1.26	0.2073
CULDESAC	7,274.45	12.53***	0.0001
CWATER	−1,765.90	−2.00**	0.0451
CSEWER	−2,633.83	−2.57**	0.0102
NATGAS	−1,150.84	−1.82*	0.0688
FULTON	29,929.00	24.89***	0.0001
DELEM	−2,818.31	−5.98***	0.0001
DTOWN	4,947.46	5.57***	0.0001
DHWY	−1,257.49	−5.82***	0.0001
CAPEVEL	−36,976.00	−29.74***	0.0001

Notes: n = 12,505. Adjusted R^2 = .548.
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

highly statistically significant ($F_{(2,12489)}$ = 489.75, $p < 0.01$). These results show the usefulness of including this adjustment path as opposed to a single-level shift variable.

With respect to other variables shown in Table 2, all coefficients had expected signs except for those on variables for city water and city sewer provision. Estimated coefficients are statistically significant at the 10% level except for CORNER. Increasing lot size by one square foot will increase the price of a lot by $1.85. On average, the value of a waterfront lot is $23,589 higher and the value of a lot with water on two sides is an additional $5,203 higher. The value of a cul-de-sac lot is $7,274 higher. The further the lot is from an elementary school, the lower the price. Since many parents want their children close to their elementary school, the sign on the parameter for distance from the local elementary school is plausible. Similarly, the further the lot is from the center of town and the closer it is to the nearest highway, the higher the price. Many areas in the center of a town consist of lower income or less desirable neighborhoods in which to live; therefore it is reasonable that the distance from downtown parameter is positive.

The coefficient on the dummy variable representing lots in Cape Velero is significant and negative. In fact, a lot in this subdivision is, on average, $36,976 lower in value than a comparable lot elsewhere. This is an enormous impact on value, particularly given that the average lot price in our sample is about $25,000. It is also clear that, although these lots have been platted and residential building can take place on most lots, the lack of additional subdivision development (marina, canals, and lake) due to the Section 404 regulatory event has substantially decreased the market value of these lots.

The coefficients on the two variables for city water and city sewer hook-ups had unexpected signs. Given that this area is at sea level, it was expected that city water and city sewer would be preferable to well water and septic tanks. However, the negative signs on the coefficients for these variables suggest the opposite, although the coefficient magnitudes are relatively small. It is possible that the service provided is of poor quality or more ex-

pensive than private provision of equivalent services. These unexpected signs are slightly worrying but respecifying the model in an attempt to rectify the situation would lead to pretest bias in all our coefficients, including the policy-related coefficients that are of direct interest in this study (Judge et al. 1982, pp. 72–78). Thus, it was decided to present the original model as estimated rather than shop for a model with all correct signs but potentially misleading statistical properties.

The coefficient on the Fulton elementary school district in Rockport is somewhat puzzling. The sign on this coefficient is reasonable; however, the magnitude seems unreasonably large. It is unlikely that Fulton is that much better than the other school districts in the area; therefore, this large parameter value is likely capturing other property value effects. After examination of the data, it was determined that the most expensive and exclusive subdivision in Rockport is in the Fulton elementary school district and most of the lots in the data set from the Fulton elementary school district are from this subdivision. Thus, neighborhood effects from living in an exceptionally prestigious subdivision may explain the magnitude of this estimated coefficient.

Finally, we turn to the interpretation of the time adjustment path coefficients γ and δ. Referring back to the hedonic model specification, the coefficients from these variables enter the model as intercept changes. Estimated values place the initial effect of Section 404 implementation at a price decline of $4,308 per lot and an increase from there over six years of $17,178 per lot, implying a net change in average price of $12,870. It is speculated that the regulation initially caused uncertainty in the real estate market, which commonly causes prices to fall as investors and home buyers place high negative value on uncertainty. After the initial uncertainty from the regulation, prices begin to adjust and then stabilize on a new price path higher than the original path. We contend that the higher price path is due to a combination of the decrease in the supply of available lots and the lower uncertainty. The regulation restricts the ability of developers to build new subdivisions in wetland areas. Since much of the Rockport area is composed of wetlands, Section 404 removed some land from development potential, thereby likely decreasing the supply of available building lots for sale. Also, over time, uncertainty over future land development options is reduced as more lots are permitted and real estate developers and buyers learn more about how Section 404 regulations affect development options.

The estimated hedonic model can be applied to assess property value losses and gains resulting from the Section 404 regulatory event. The difference between the old and new intercept of the hedonic model gives an average estimated increase in value for all lots of $12,870 at the end of the six-year adjustment period. The coefficient on CAPEVEL suggests that the average lot in the Cape Velero subdivision decreased in value by $36,976 as a result of development restrictions imposed by the Section 404 regulation. Thus, the net effect on Cape Velero lots was a loss of $24,106 ($12,870 − $36,976). This estimated average long-term loss in value represents "takings" from the Section 404 regulation from the perspective of Cape Velero lot owners. The estimated average long-term gain in value of $12,870 per lot for other building lots in the Rockport area represents "givings" from the perspective of these lot owners.

In summary, the hedonic model estimated in this study indicated a considerable long-term loss in average building lot value to some property owners in the Rockport area due to the Section 404 regulatory event. However, the model also indicated a considerable long-term increase in average building lot value to other property owners due to the Section 404 regulatory event. Our modeling results are consistent with previous studies that have found that land use regulations may have both negative and positive effects on property values. Thus, our results provide further evidence supporting the contention that both "takings" and "givings" should be considered when assessing the wealth effects of land use regulations on property owners.

The hedonic model results presented in this paper also provide further evidence that mar-

kets go through adjustment periods in reaction to events that shock the market. Therefore, both "takings" and "givings" need to be determined after stabilization of the market. The results of our modeling suggest that the adjustment period could last for many years. The general methodology presented in this study can be applied in other markets to determine the length of the adjustment period and property value gains and losses after the market has stabilized. The resulting empirical data on gains and losses could be used in courts to estimate the diminution of value in regulatory takings cases and also applied in benefit-cost analyses of regulatory events.

Summary and Conclusion

The ability to accurately estimate changes in property value resulting from a regulatory event is important for determining potential "takings" and compensation to property owners. Knowing how much property devalues due to regulations is important not only in determining compensation, but also in setting more reasonable compensation payment standards. Although many theoretical models have been proposed in previous literature, empirical models on regulatory takings appear to be lacking. In this study, a hedonic model was developed to measure the effects of implementing Section 404 of the Clean Water Act on property values in Rockport, Texas. A time series component was incorporated into the hedonic model to assess the time specific changes of this regulatory event on property values.

The estimated time series adjustment path variables indicated that average building lot values in the Rockport area decreased initially by over $4,000 per lot in 1975. This decrease was probably due to uncertainty in the real estate market brought about by initial implementation of the regulation. There was a six-year adjustment period during which average lot values increased each year from the 1975 value to a new higher path in 1981, resulting in an average increase in property values above the preregulation level of approximately $12,870 per lot. This increase was most likely due to reduced uncertainty in the real estate market over time as buyers and sellers adjusted to the Section 404 regulations, and decreases in the overall supply of building lots because of the large amount of wetlands in the Rockport area. In the Cape Velero subdivision, however, Section 404 prohibitions on waterfront development more than offset these property value gains over time, resulting in a net loss in property value of more than $24,000 per lot. A limitation of our hedonic analysis was the need to use constructed sales price data derived from tax value data and limited actual sales price data. Although the use of tax value data is common in hedonic property value studies, future studies testing the effects of "events" (regulatory or otherwise) on property values should attempt to use actual sales price data if available.

An implication of the results of this study is that economic analyses of the welfare effects of government regulations should consider the potential of both regulatory "takings" and "givings." Both takings and givings need to be measured not only when considering economic efficiency, but also for issues of fairness as well. Runge et al. (2000, p. 48) point out that measuring both "takings" and "givings" in order to adjust compensation payments would represent a "formidable task." Be that as it may, the results of this study suggest that both "takings" and "givings" may result from the same government regulation in the same region and therefore an attempt to measure each value should be made.

The methodology presented in this paper provides a general approach for measuring the effects of a regulatory event on property values that accounts for both short-term and long-term effects. This methodology could be valuable for assessing the effect of regulations on property values, and in the quantification of diminution of value for regulatory takings cases that account for long-term effects. Identification and measurement of both regulatory takings (costs) and givings (benefits) would also facilitate benefit-cost analyses of regulations.

With respect to individual property owners,

future studies hold out the prospect of reconciling, at least in part, traditional and long-held beliefs in the inviolability of private property rights with higher social objectives, such as wetlands protection under Section 404 of the U.S. Clean Water Act. For example, the results of this study showed that wetlands regulation over the long run reduced some property values while increasing others. If a regulatory event can be shown to financially benefit property owners, at least these owners may be expected to support such regulations that meet higher social objectives (such as wetlands protection) even if it means relinquishing some private property rights. Of course, people whose property values decrease as a result of the regulation would be expected to object to the regulation and perhaps demand compensation. Thus, property rights concerns and conflicts as a result of regulatory events are likely to continue, particularly with respect the need to compensate private property owners for diminution of value. Future studies such as this one that account for both short- and long-run effects can hopefully facilitate regulatory event conflict resolution by showing that people may in fact gain from the regulatory event, and where people lose from event, showing what fair compensation may be after markets have had time to adjust. By identifying both gainers and losers from a regulatory event, these future studies also would help to determine Pareto Efficient (or Potential Pareto Efficient) regulatory events where gainers could compensate losers and still be better off.

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