Impact of Forestry-Related Ordinances on Timber Harvesting in St. Tammany Parish.

by

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Abstract

The proliferation of forestry-related ordinances is a growing trend in the Southern United States, with the greatest expansion of regulations in regions with growing populations that are in close proximity to urban areas. St. Tammany Parish in Louisiana is an excellent example of an increasingly exurbanized area that has passed ordinances deemed by many in the forestry community as being excessive both in terms of cost and regulatory rigor. In this study, we investigated if the passage of such ordinances has had an effect upon pine sawtimber harvesting activities in St. Tammany Parish. Results indicate that a significant negative relationship exists between a $10,000 road bond ordinance and the level of sawtimber harvest in the Parish.

Key Words: ordinances, regulation, timber harvest, urbanization, exurbanization
Introduction

A growing trend of concern to many in the forestry community is the proliferation of state and local government regulations of forestry practices on private land (Hickman 1993; Granskog et al. 2002; Jackson, 2003). Granskog et al. (2002) updated previous work by Martus (1992) and found that the total number of local ordinances had more than doubled across 13 southern states from a total of 141 in 1992 to 346 in 2000. Granskog et al. (2002) concluded that this pattern of growth in ordinances has continued since 1970 with the number of ordinances doubling every 5 years. Forestry-related ordinances are typically used to regulate harvesting activity, minimize damage to public roads, and to preserve environmental and aesthetic quality. However, ordinances passed at the local government level are of particular concern since these are often developed independently and without a full understanding of possible economic consequences (Green and Hains, 2001; Jackson et al., 2003). Additionally, such forestry-related ordinances often have unpredictable impacts on local forestry operations and the unintended consequence of reducing long term timber supply when landowners accelerate harvest to avoid new regulation they consider burdensome (Cubbage, 1991; Greene and Siegel, 1994).

A major factor in the increase of ordinances is a shift in population from urban areas to more rural settings. Former urban dwellers generally have fewer economic and personal ties to rural agriculture and forest economies and are therefore less likely to see a rationale for timber harvesting activities (Hickman, 1993). Granskog et al. (2002) linked the growth of local government ordinances to social conflicts resulting not only from the growth of urban areas, urbanization, but also to exurbanization, the migration of urban residents to rural areas. The new rural residents typically are unfamiliar with the historical importance of forestry to a local economy and react adversely to the unpleasant appearance of harvested areas by organizing community movements and lobbying local government to pass ordinances that are restrictive to forestry practices, often without considering the effectiveness of the ordinance itself or the economic impact on the local economy.

A number of studies have surveyed the existence of forestry-related ordinances across the South and have grouped them into one of five categories that included public property ordinances, timber harvesting ordinances, tree protection ordinances, environmental protection ordinances, and special feature or habitat protection ordinances (Hickman and Martus, 1991; Hickman 1993; Greene and Siegel, 1994; Spink et al., 2000; Granskog et al., 2002). Public property ordinances are intended to protect public roads and bridges from damage resulting from timber harvesting activity as well as to ensure public safety. Timber harvesting ordinances are adopted to restrict certain types of forestry or silvicultural operations and generally require adherence to best management practices and require harvest permits. Tree protection ordinances are intended to preserve trees as land is developed. Environmental protection ordinances seek to protect environmental and aesthetic values by retaining forested tracts. Special feature or habitat protection ordinances are designed to protect scenic or environmentally valuable area by requiring the use of aesthetic management zones.
Of the five types of ordinances discussed in the literature Hickman (1993) indicated that the most popular regulatory ordinances in the South are those directed at the protection of public property. Granskog et al. (2002) also indicated that public property protection ordinances account for nearly half of all ordinances in the South. The passage of such property protection ordinances has grown from 59 in 1992 to 158 in 2000 (Granskog et al., 2002). Ordinances of this type have the potential for negative economic impacts given that a common regulatory requirement of such ordinances is the posting of a performance bond that can range from $1,000 to $25,000 (Hickman, 1993).

St. Tammany Parish, located just north of New Orleans, Louisiana is a prime example of an increasingly exurbanized area that has passed ordinances deemed by many in the forestry community as being excessive both in terms of cost and regulatory rigor (Jackson et al., 2003; Martus, 1992). From 1970 to 2003, the population of St. Tammany parish has nearly tripled. This growing exurbanized population coupled with the historic role that forestry plays in the local economy, along with the proliferation of forestry related ordinances, presents an interesting opportunity for empirical analysis.

Previous empirical work in estimating the impact of forestry-related ordinances is limited primarily to assessing the growth of ordinances and their perceived impact through surveying logging and forestry professionals (Greene and Haines, 1994; Martus, 1992; Martus et al, 1995; Spink et al., 2000; and Granskog et al., 2002). A limited number of studies have looked at relationships beyond surveys of existing ordinances and perceptions of those affected by them. Stier and Martin (1997) investigated the economic impact of a state level regulation in Wisconsin affecting a six county region along the Wisconsin River. The regulation required private landowners to leave buffer zones along the banks of the river. Kittredge et al. (1999) compared stumpage values over five years for two adjacent states (Massachusetts, which has extensive forestry related regulations, and Connecticut, which has extremely limited regulations) and found that such regulations do not adversely affect stumpage or landowner profits. As far as the authors are aware, no study has attempted to estimate a relationship between the timber harvest rates and forestry ordinances that are directly related to timber harvesting activities. The objective of this study is to evaluate the potential consequences of forestry-related ordinances by determining if the passage of such ordinances has had an effect upon timber harvesting activities. This will be investigated by modeling the relationship between timber harvesting practices and the passage of forestry-related ordinances in St. Tammany Parish. Harvest levels will be modeled as a function of stumpage prices, population, time, and forestry-related ordinances. The ordinances will be incorporated into the models through the use of dummy variables.

Data

The Code of Ordinances for St. Tammany Parish published December 31, 2002 was examined to determine adoption dates for ordinances that are forestry related. Section 12-003 defines the provisions for the land clearing permit that include the purchase price of the permit at $150, cost for inspection of $100, and requirements for a natural uncut buffer zone of at least fifty feet in width surrounding a harvest area. The provision also
allows for only one access opening which can not exceed one hundred linear feet. The proceeding requirements of Section 12 of the Code of Ordinances for St. Tammany Parish are defined collectively by six ordinances which were not defined individually. The ordinances that comprise the requirements of Section 12 were adopted in 1984, 1985, 1986, and three adopted in 1987. St. Tammany Parish Land Use Ordinance No. 523 Section 5.17 requires that a road bond in the amount $10,000 be posted by anyone who obtains a land clearing permit. This provision became effective on October 1, 1990. The provisions of the land clearing permit and the road bond are examples of what the literature refers to as timber harvesting and public property protection ordinances, respectively. Dummy variables were created for each of the individual ordinances enacted in 1984, 1985, and 1986, and for the road bond policy enacted in 1990. Another dummy variable was created to collectively account for the three ordinances enacted in 1987.

Stumpage prices for the state of Louisiana and the level of pine sawtimber harvest by parish since 1970 to 2003 were compiled (Louisiana Department of Agriculture and Forestry, 2004). The Louisiana Department of Agriculture and Forestry maintains a record of annual stumpage prices and timber harvested by parish as recorded through the collection of severance taxes from harvesting activities. Timber harvest data indicates the volume of Pine sawtimber harvested per thousand board feet (Mbf). Stumpage prices for Pine sawtimber were converted from nominal to real dollars using the 1982 Producer Price Index for lumber and wood products (Bureau of Labor Statistics, 2004). Population estimates for St. Tammany Parish for 1970 to 2003 were obtained from the U.S. Census Bureau (2004). Annual precipitation data for St. Tammany parish was obtained from for the years 1970 to 2003 (National Oceanic and Atmospheric Administration, 2004).

Methodology

A time series model was used to investigate the relationship between forestry-related ordinances and timber harvest levels in St. Tammany Parish. The model takes the following general form:

$$y_t = \beta_1 + \beta_2 x_{it} + \delta y_{t-1} + \epsilon_t, \quad \epsilon_t \sim \text{IID}(0, \sigma^2).$$

where the path of a variable $y_t$ is described in terms of contemporaneous and often lagged factors $x_{it}$ for $i=1,2,...,n$, its own past $y_{t-1}$, and disturbances $\epsilon_t$ (Greene, 2003). Our initial model consisted of timber harvest as the dependent variable while the independent variables included stumpage price, population, time, lagged timber harvest, and dummy variables for each year a forestry-related ordinance was active in St. Tammany parish.

Estimation of models like the one described above are often not straightforward due to the presence of the lagged dependent variable. When working with time series data, it is important to test for nonstationarity before proceeding with estimation (Kennedy, 1998). We can test for nonstationarity by using Dickey-Fuller unit root tests (Davidson and MacKinnon, 2004). If a unit root is present, then ordinary least squares estimation is not valid. Additionally, time series models often have autocorrelation problems, and when a model contains autocorrelation and a lagged dependent variable, least squares estimates
are biased and inconsistent. The Durbin-Watson h statistic (Greene, 2003) was used to test for the presence of autocorrelation within the model. Autocorrelation is often a sign of a misspecified model. An additional problem of heteroskedasticity is also often present in time series models. White’s test for heteroskedasticity (Greene, 2003) was also performed on the model.

Since no prior work has attempted to estimate a relationship between the timber harvest rates and forestry-related ordinances that are directly related to timber harvesting activities, no clear guidelines existed for determining what variables were necessary for inclusion in the model. Economic theory requires that stumpage price be included in the model. Since harvest in one period is directly influenced by the previous period’s harvest, a lagged harvest variable should also be included. Timber harvest levels may also be influenced by a wide range of factors that include the discount rate, U.S. housing starts, logging cutbacks in other regions due to restrictive legislation such as the Endangered Species Act, the level of Canadian wood imports, and exchange rates (Rucker et al., 1999). For the purposes of simplifying the model these numerous exogenous effects were internalized by expressing sawtimber harvest for St. Tammany Parish as a ratio of the total sawtimber harvest for the state of Louisiana. Since the aforementioned exogenous factors should affect timber production in Louisiana equally across all parishes, expressing harvest levels in St. Tammany as a ratio of state totals preserves needed degrees of freedom in the estimation when the time series is as limited as it is in this study. Harvest of pine sawtimber relative to the total harvest levels in Louisiana is depicted in Figure 1.

![Figure 1. Sawtimber Harvest in St. Tammany as Percentage of State Harvest over time (1970 – 2003).](image-url)
Notice the surge in harvest levels just prior to the 1990 implementation of the land use ordinance requiring a $10,000 road bond. Greene and Siegel (1994) indicated that ordinances can have the unintended consequence of accelerating harvest levels as landowners attempt to avoid new regulations they consider burdensome. By modeling harvest as function of ordinances and other relevant variables we will investigate whether a significant relationship exists between reductions in harvest levels in St. Tammany Parish and forestry-related ordinances.

The Ramsey RESET test (Greene, 2003) was used to test for omitted variables in the model for sawtimber. If the test indicated that the model was misspecified, additional variables were included until a satisfactory model was determined. If an added variable did not improve adjusted R² and did not rectify the omitted variable problem, it was subsequently dropped from the model.

Sawtimber Model and Results

The initial sawtimber harvest model included the variables stumpage price, population, time, lagged timber harvest, and dummy variables for each year a forestry-related ordinance was adopted in St. Tammany parish. Although testing indicated no problems with autocorrelation or heteroskedasticity, the RESET test indicated that the model was misspecified so additional variables were examined for inclusion in the model. These variables included rainfall, population at lags up to 5 years, and harvest lagged up to 5 years. The model that was ultimately chosen is as follows:

$$STHarvest_t = \beta_0 + \beta_1 Time_t + \beta_2 Population_t + \beta_3 Bond + \beta_4 Ordinance1984 + \beta_5 Ordinance1985 + \beta_6 Ordinance1986 + \beta_7 Ordinance1987 + \beta_8 STStumpage_t + \beta_9 STHarvest_{t-1} + \beta_{10} Population_{t-3}$$

where $STHarvest_t$ is St. Tammany pine sawtimber harvest in year $t$, $Time_t$ is the year, $Population_t$ is St. Tammany parish population in year $t$, $Bond$ is a dummy variable indicating years that the $10,000 road bond is in place, $Ordinance1984$, $Ordinance1985$, $Ordinance1986$, and $Ordinance1987$ are dummy variables representing the implementation of forestry-related ordinances in those respective years and the subsequent years the ordinances are in place, $STStumpage_t$ is the real Louisiana stumpage price for pine sawtimber in year $t$, $STHarvest_{t-1}$ is the ratio of St. Tammany pine sawtimber harvest to total Louisiana pine sawtimber harvest in year $t-1$, and $Population_{t-3}$ is St. Tammany parish population in year $t-3$.

It is expected that time, the lagged harvest variable, and stumpage will be positive in sign. Time was included to account for technological change in harvest practices, and as technology improves, harvest is expected to increase as well. Lag of harvest should also positively impact harvest. Higher stumpage prices serve as motivation for land owners to harvest timber resulting in a positive relationship. Population and the 3-year lagged population are expected to negatively impact harvest. As population increases harvesting activities are theoretically assumed to decrease (Granskog et al., 2002) and lagging the
population by three years may account for the period of time that is needed for new residents to become involved in local political activities. The expected signs of the bond and ordinance variables are unknown and the primary focus of this study, although the authors hypothesize that the bond variable will negatively impact harvest due to its relatively large financial obligation relative to the other ordinances. Regression results are shown in Table 1.

Table 1. Sawtimber Regression Results

| Variable          | Coefficient | Std. Err | t    | P>|t| |
|-------------------|-------------|----------|------|-----|
| time              | .0049505    | .0022191 | 2.23 | 0.037*|
| population        | -4.17e-07   | 3.43e-07 | -1.21| 0.239|
| bond              | -.0250197   | .0060423 | -4.14| 0.001*|
| ordinance1984     | .0088232    | .006416  | 1.38 | 0.184|
| ordinance1985     | .0064636    | .0078158 | 0.83 | 0.418|
| ordinance1986     | .0067809    | .0074985 | 0.90 | 0.377|
| ordinance1987     | -.0051651   | .0077699 | -0.66| 0.514|
| stumpage          | .0001204    | .0000668 | 1.80 | 0.087**|
| harvest_lag       | .4899198    | .1418349 | 3.45 | 0.003*|
| population_lag3   | -7.16e-07   | 4.56e-07 | -1.57| 0.132|
| intercept         | -9.700696   | 4.348196 | -2.23| 0.037*|

* significant at 5% level  
** significant at 10% level

All variables have the expected signs, but only time, bond, and the lagged harvest variable are significant at the 5% level and stumpage is significant at the 10% level. Adjusted $R^2$ for the regression is 0.6649 indicating that 66.49% of the variation in sawtimber harvest is explained by the model. Since results indicate the absence of a unit root and autocorrelation, the regression estimates are unbiased and consistent. However, we also tested for multicollinearity and found that time, population, and the 3-year lagged population variables are significantly correlated. This means that we can be confident that the variables indicated as significant are indeed significant. However, we cannot be certain that the variables that did not test significant are actually not significant due to the inflated variances of these coefficients resulting from the multicollinearity. The effects of the ordinances passed in 1984, 1985, 1986, and 1987 were inconclusive, but the road bond policy had a negative impact of 2.5% on St. Tammany’s percent of state sawtimber harvest levels.

**Discussion**

This study analyzed possible relationships between local forestry-related ordinances and the harvesting of timber. Significant relationships were found between the road bond policy and harvest levels in the sawtimber model, but the effects of the other forestry-related ordinances are inconclusive.
The decrease in sawtimber harvest can be attributed to the fact that non-industrial private land owners often do not maintain forest land for reasons of profitability or as a source of income (Adams et al., 1982). Therefore non-industrial private forestland owners would be inclined to hold timber rather than harvest. The road bond ordinance indicates that the $10,000 security could be posted by either party involved in the timber sale. In the case of non-industrial private forestland owners this security is typically bonded by the logging firm. The requirement of $10,000 increases fixed costs for logging firms and may have the effect of reducing the number of firms that are willing to operate in St. Tammany parish and therefore reduce the number of timber harvesting bids. For these reasons it is not surprising to find a significant negative relationship between the road bond ordinance and timber harvesting in St. Tammany parish.

Based on our models, no conclusions can be made regarding the effect of the other six ordinances pertaining to the land clearing permit on harvest levels. It is assumed that any kind of additional regulation is typically not preferred by those who are regulated, but the degree of financial burden resulting from the provisions of the land clearing permit may not burdensome enough to have a significant impact on harvest levels. More research is needed to test this hypothesis.

This study was limited by the data accessible for estimation. The variables available were limited as was the time period spanned by the variables. This research could be improved upon by collecting more data. Future research could include the estimation of a panel data model to examine the effects of forestry-related ordinances in all of the parishes in Louisiana, and possibly bordering areas in states such as Arkansas and Mississippi. Data would need to be collected on ordinances in each parish, as well as data that is national in scope such as housing starts and Canadian wood imports.

Conclusions

The obvious impact that the St. Tammany road bond ordinance has on harvest levels provides possible indication of diminished property values for forest land. Our model indicates that the passage of the $10,000 road bond has a significant negative relationship with harvesting in St. Tammany parish, and it is reasonable to assume that this may have a negative impact on land value used for timber production purposes. This result should be of interest to other local governments in Louisiana since the State Legislature passed amendments in 1995 to the Louisiana Agricultural Protection Act that prohibits local governments from enacting any ordinances that diminish the value of timberland.

References


Louisiana Department of Agriculture and Forestry. October 11, 2004 http://www.ldaf.state.la.us/


