Estimating Aggregate Levels of Property Tax Assessment Within Local Jurisdictions: An Extension of the Ihlanfeldt Model to Multiple Land Uses*

Gregory S. Burge
e-mail: gsb7771@fsu.edu
phone: 850-644-7647

Keith R. Ihlanfeldt
e-mail: kihlanfe@mailer.fsu.edu
phone: 850-645-0075

DeVoe Moore Center and Department of Economics
150 Bellamy Building
Florida State University
Tallahassee, FL. 32306-2220

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Abstract – Sales ratio studies are currently used by a majority of states to estimate jurisdiction specific levels of property tax assessment (LOAs) that are used to equalize educational funding. Sales chasing and the failure to adjust sales for time may cause estimates to inaccurately reflect true LOAs, leading to funding inequities. A recently developed econometric model with minimal data requirements has been shown to accurately estimate LOAs for single-family property. This paper provides evidence showing that the model accurately estimates LOAs for other major land use categories.

INTRODUCTION

Assessment-sales ratio studies use property sales samples to estimate the level of property tax assessment (LOA) within local jurisdictions, where the LOA is defined as the overall ratio of assessed value to market value. Ratio studies are used by 31 states and three Canadian provinces for indirect equalization, which involves obtaining an "equalized" value of the tax base in an effort to equitably distribute educational funding among local jurisdictions (Dornfest, 1997).[1] For a discussion of these topics see Ihlanfeldt (2004). Despite their popularity, ratio studies may yield highly inaccurate LOA estimates, which can lead to serious funding inequities across jurisdictions. There are two sources of bias in LOA estimates obtained from ratio studies. First, the practice of sales chasing (i.e., the selective reassessment of those parcels that have sold) by local tax assessors may cause estimated assessment-sales ratios to exceed true LOAs. Local jurisdictions may deliberately sales chase in order to lower the equalized value of their tax base and thereby receive more state aid.[2] Second, the failure to adjust sales prices for time may also cause sales ratios to inaccurately estimate LOAs. Typically, sales are used throughout the year leading up to the date of assessment. If prices are rising (falling), the more the sample of sales is distributed toward the beginning of the year, the greater the upward (downward) bias in the estimated LOA.

As an alternative to conducting assessment-sales ratio studies, Ihlanfeldt (2004) introduces an econometric model with minimal data requirements for estimating LOAs. His investigation verifies the accuracy of the econometric model, even for small counties, for single-family residential property. Support for the econometric model came from three empirical findings: 1) differences between the model's estimated LOAs and sales ratios adjusted for time of sale and free from potential sales chasing are uniformly small; 2) mean errors in predicting

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[1] Ratio studies are also used to monitor local appraiser performance and in the process of direct equalization.
[2] Another motivation for sales chasing is to improve perceptions of assessors' performance.

market values are smaller when using the model in comparison to those made by the local property appraiser; and 3) the model's estimated LOAs are more accurate than those produced by traditional sales-assessment ratios. The study focused only on single-family properties.

This paper investigates the accuracy of the Ihlanfeldt model for estimating LOAs for vacant residential, multi-family residential and commercial property.[3] While single-family residential properties constitute the largest portion of aggregate property value within local jurisdictions, Table 1 shows that these additional land use categories represent a significant portion of overall value for our sample counties. Commercial property accounts for a relatively constant percentage of total value across all sizes of counties, while multi-family and vacant residential properties are more significant in large and small counties, respectively. Summing across these additional land use categories, their value is on average roughly one-fourth of a county's total property value, regardless of the size class of the county. The overall LOA commonly used for indirect equalization is obtained by taking a value-weighted average of the LOAs estimated for individual land use categories. Hence, errors in the estimates for these additional land use categories can cause the overall LOA to be estimated with considerable error, even if the Ihlanfeldt model yields an accurate LOA estimate for single-family properties. Moreover, the number of sales is larger for single-family properties than for other land use categories. Because the Ihlanfeldt model depends on sales to identify value trends, the favorable findings obtained for single-family properties may not be generalizable to other property strata. Finally, as noted by Ihlanfeldt (2004, p. 9), the usefulness of the model may not extend to commercial property, given the greater heterogeneity of this property stratum in comparison to residential property strata (i.e., single-family, multi-family, and vacant residential land). For all of the above reasons, it is important to evaluate the Ihlanfeldt model for multiple land use categories.

We begin by replicating the Ihlanfeldt (2004) single-family property study for a stratified random sample of fifteen Florida counties using more recent sales data.[4] We then investigate the accuracy of the model for vacant residential property using the same fifteen counties. Our

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[3] Vacant residential property is vacant land that has been zoned for residential improvements. Commercial property includes retail establishments, offices, and buildings used for warehousing and manufacturing.

[4] Following Ihlanfeldt (2004), 5 counties are chosen within each of three population size classes: large (population greater than 250,000), medium (population between 100,000 and 250,000) and small (population less than 100,000). The data used here ends with 2003 sales reported on the 2004 tax rolls, while Ihlanfeldt's (2004) data ended with 2001 sales reported on the 2002 tax rolls.

investigation of multi-family residential and commercial property is more limited. Large counties are the only feasible test cases because they alone provide enough post-assessment sales to reliably create the benchmark LOAs needed for model verification. Hence, our investigation for these two property strata is conducted using eight large counties that provide a sufficient number of post-assessment sales.[5]

Our results show that, regardless of land use category, sales ratios suffer from sales chasing and the failure to time adjust sales prices. In Florida, these problems result in sales ratios uniformly yielding estimated LOAs that exceed true levels, and in most cases the difference is substantial. The results also confirm that the Ihlanfeldt model is useful for estimating LOAs for land use categories other than single-family residential. For multi-family residential property and vacant residential property, the same three empirical findings are obtained that provide support for the model in the single-family residential case. For commercial property, we find that the Ihlanfeldt model outperforms sales ratio studies and yields more accurate predictions of market value than those provided by local property appraisers. However, the average difference between the estimated *LOA* and the benchmark LOA is found to be somewhat larger than for the other property categories. We also find evidence to support the claim that overall LOAs are more accurately estimated by the Ihlanfeldt model in comparison to sales ratio studies.

PROPERTY ASSESSMENT AND INDIRECT EQUALIZATION IN FLORIDA

Before outlining the Ihlanfeldt model, we briefly review the property assessment process in Florida and how it relates to indirect equalization regarding state educational funds.For a more detailed discussion of this process see Ihlanfeldt (2004). Florida law requires county property appraisers to assess the just value of all real property as of January 1st of each year. Florida Administrative Code defines just value to be fair market value, the amount a property would sell for on the open market. County appraisers in Florida use a wide assortment of computer-assisted mass appraisal (CAMA) techniques to estimate just values. These just values, along with other variables, are submitted annually in individual parcel-level property rolls to the Florida Department of Revenue (DOR).

[5] The threshold for estimating reliable benchmark LOAs is set at 35 post-assessment sales. All counties (with the exception of Volusia County where data are missing from its tax roll) meeting this threshold for both multi-family and commercial property are included in the analysis.

DOR's Property Tax Administration Program (PTA) must verify the accuracy of the reported just values. For each county, PTA estimates a value-weighted LOA for each of seven defined property strata (single-family residential, multi-family residential, agricultural property, vacant residential lots, nonagricultural acreage, improved commercial and industrial property, and taxable institutional or governmental property), provided the stratum constitutes at least five percent of the total property value within the county.[6] PTA is only to approve the county's tax roll if the estimated LOA for each stratum is at least .90 (i.e., the total assessed value must be at least 90 percent of market value). If this threshold is not met, PTA recommends remedial actions. If the problem persists in subsequent years, PTA is required to disapprove the county's tax roll.[7]

PTA relies upon several approaches to obtain final value-weighted LOAs. Each year it conducts an "in-depth" LOA study for 33 of Florida's 67 counties and a "non-in-depth" study for the other 34, with counties rotated annually between the two types of studies. The in-depth studies involve estimating LOAs for four value classes for each property stratum. The stratum LOA is obtained by taking a weighted average of the four value class LOAs, where the weights equal the percentage of total value found in each value class. If the value class includes a sufficient number of qualified sales to constitute a statistically reliable sample, an average assessment-sales ratio is used to estimate the LOA. If too few sales are available, an average assessment-appraisal ratio is used.[8]

The non-in-depth studies involve averaging the results obtained from four different LOA estimation strategies conducted for each county: the Ihlanfeldt model, assessment-sales ratios, and two methods that compare the additional value that the local tax assessor adds to the roll to estimates of the market's growth in property value from the previous year.[9] Regardless of study

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[6] In practice, this means agricultural, nonagricultural raw acreage and taxable institutional/governmental property is rarely audited since they generally fall below the five percent threshold.
[7] Disapproval results in the loss of $20,000 of the $25,000 homestead exemption for all homestead property owners in the county until the issue is resolved.
[8] The appraisals are conducted according to IAAO standards, which specify that cost, market, and income approaches all be used in making the appraisals. The in-depth study methodology described in the text is required by Florida statutes (section 2, paragraph (c) of subsection (2) of section 195.096).
[9] One method estimates the growth in average property value using the results obtained from estimating a reduced form supply and demand model for each county. The other method estimates the growth rate by using sales samples in consecutive years to compute $(((JP_t/SP_t)-(JP_t/SP_{t+1}))/(JP_t/SP_{t+1}))$, where JP and SP are the mean just price and mean sales price of the sample, respectively. These methods, like assessment-sales ratios, fail to account for within year price appreciation. Note that all four of the non-in-depth estimation strategies rely upon the availability of recent sales. For those property strata where sales are not available (generally, an infrequent problem), PTA uses the in-depth study estimate of the LOA for the

type, the overall county LOA is obtained by taking a weighted average of the LOAs across property strata, where weights equal the percentage of total property value within the stratum.

In-depth LOA studies are required to be done for each county every other year according to Florida statutes. PTA's justification for using four different LOA estimation strategies in conducting its non-in-depth studies is that each has unique "strengths and weaknesses."[10]

The overall LOA plays a significant role in determining each county's allocation of educational funding from the state (counties in Florida serve as school districts). The funding formula includes the county's overall LOA, with lower LOAs resulting in less state funding. As we demonstrate below, due to the magnitude of funds involved, small errors in the estimated LOA for a county can significantly alter the mix of state versus local educational funding.

MODEL

The Ihlanfeldt model is designed to estimate dollar weighted LOAs that can be used in place of value-weighted mean assessment-sales ratios. For a more detailed description of the model see Ihlanfeldt (2004). Its key component is a property value prediction equation using all properties that have sold:

[1] $$SP_{i,t} = \alpha_0 + \alpha_1 JP_{i,Jan.1} + \alpha_2 X_i + \alpha_3 F(T_j) + \mu_{i,t},$$

where

$SP_{i,t}$ = the sale price of property i in time period t[11]

$JP_{i,Jan.1}$ = the just price of property i as of January 1 of the sale year

X_i = characteristics of property i (which will differ across property types), and

$F(T_j)$ = Fourier estimator.

The Fourier expansion supplements a simple quadratic function with trigonometric terms:

[2] $$F(T_j) \approx \gamma_1 z_j + \gamma_2 z_j^2 + \sum_{q=1}^{Q} (\lambda_q SIN(qz_j) + \beta_q (COS(qz_j) - 1)),$$

previous year as the non-in-depth estimate of the present year. An advantage of the Ihlanfeldt model over the other three LOA estimation strategies is that sales can be pooled across counties, as described below.

[10] While this is PTA's official position, we believe that the multiple strategy approach represents procedural inertia. PTA began using the Ihlanfeldt model in 2002. The other strategies have a much longer history.

[11] Certain sales are excluded following Ihlanfeldt (2004). Only "qualified" (i.e., arm's length) sales are used. Also, to delete apparent coding errors, we use filters that screen out properties with extreme (high and low) values for price and interior square footage and extremely high values on age and appreciation rate.

where $z_j = 2\pi T_j / \max(T)$. T_j equals 1 for the first month of sales used and max (T) equals the total number of months of sales price observations included in the sample. For example, if sales for the years 1998 through 2002 are used to estimate [1], then for January 1998, $T_j = 1$ and for December 2002, $T_j = \max(T) = 60$. The advantages of [1] are twofold: 1) the Fourier expansion allows for a highly flexible time trend in sales price, and 2) the lagged value of just price proxies for structural and locational characteristics of the property that affect its sales price, effectively reducing the vector of hedonic characteristics into a single variable. Furthermore, to the extent assessors' errors may be correlated with property characteristics, inclusion of X reduces the variance of the forecast error and may improve predictive accuracy. The X used here is limited to those variables found within the tax roll file that counties are required to send annually to the PTA (see Appendix Table A1).

To utilize the Fourier estimator, the length of expansion (Q) and the number of years of sales data used to estimate [1] must be selected. Keeping with the goal of predicting market value for January 1 of the tax roll year, they are chosen to provide the most accurate prediction for December of the preceding tax roll year.[12] Additional years of sales data provide more sales observations and therefore, more efficient coefficient estimates. However, biased estimates may result if the estimated coefficients are not stable over time. Predictive accuracy is the selected method for choosing between the efficiency versus bias tradeoff.

Predictive accuracy is measured using an auxiliary regression where sales prices for properties selling during December 2002 are regressed on predicted sales prices ($S^{\wedge}P$):[13]

$$[3] \quad SP_i = \alpha + \beta \cdot S^{\wedge}P_i + \varepsilon_i \, .$$

The value of Q and the number of sales years are jointly selected as the combination that best satisfies the requirements for an accurate predictor (Maddala, 1977, p. 346): $\alpha = 0$, $\beta = 1$, and a high R^2. The first two requirements prevent any systematic linear bias within the estimator, while a high R^2 increases the likelihood that prediction errors will cancel when summing sales price predictions across properties. Even if the predictor possesses these three characteristics, it is still possible for predicted values for unsold properties to be biased if the sample of sold properties is

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[12] Note that Q and the number of years of data are selected simultaneously. Equations are estimated for each combination (6 values for Q x 8 different time lengths = 48 combinations in the present case).

[13] Following Ihlanfeldt (2004), if there are fewer than 100 December sales, the auxiliary model uses fourth quarter sales. If fourth quarter sales are less than 100, the auxiliary model is estimated using all sales from the previous year. In a very small number of cases where December sales are just over 100 but the auxiliary model is failing to provide results that identify the proper specification for [1], fourth quarter sales are used.

selective rather than random. This issue is addressed by Ihlanfeldt (2004) for the case of single-family homes. While there is no direct evidence on selection bias within sales samples of multi-family, vacant residential and commercial properties, we have no reason to believe it is any more or less of a problem in these strata than in the single-family case.

The data used to estimate [1] come from the standard N.A.L. (name, address, and legal) Files that counties are required to send annually to the Florida DOR. The N.A.L. File lists all properties on a county's tax roll, the just value of each property for January 1 of the tax roll year, the use code for the property, selected property characteristics, and the most recent sales price. N.A.L. Files were obtained for the years 1995-2004. Only sales for the years 1995-2002 are used to estimate [1]. Early sales from 2003 (post-assessment sales) contained in the 2004 tax roll are used to investigate the reliability of the econometric model and sales-ratio methods.

LOA estimation first requires taking the summation of all predicted market values for properties on the tax roll that satisfy the same selection criteria used when selecting the sold properties that contribute observations to [1].[14]

[4] $\sum_{i=1}^{n} S\hat{\ } P = nM\alpha$,

where n is the number of tax roll properties, M is a vector of means of the independent variables, and α is the estimated coefficients vector.[15] The LOA is computed as:

[5] $LOA = \sum JP / \sum S\hat{\ } P$,

where the sum of just prices is computed for the same properties used to compute $\sum S\hat{\ } P$.

RESULTS

The goal of this paper is to compare the reliability of the Ihlanfeldt model in the estimation of LOAs for vacant residential, multi-family, and commercial properties with: 1) the accuracy of the model in estimating LOAs for single-family properties; and 2) the accuracy of the LOAs yielded by traditional assessment-sales ratio methods for each stratum. While both comparisons are meaningful, the latter should be the focus of states currently using ratio studies. We first present the results from estimating the model for single-family properties. Subsequent sections present results for the additional property types. We also report in the appendix the

[14] Qualified sales filters do not apply and filters on extreme values use just price rather than sales price.
[15] The variance of this sum can be computed as MVM′, where V is the variance-covariance matrix.

results from estimating the property value prediction models for each of the four property types for Broward County. These results are representative of those obtained for the other counties.

Single-Family Residential Property

Results from estimating the property value prediction models (equation [1]) and the prediction evaluation models (equation [3]) are summarized in Table 2. For single-family property R^2s for both models are uniformly high and the prediction evaluation models all have slopes that are close to one and intercepts that are small relative to average sales price.[16] Table 3 reports the estimated *LOA* and *LOA_L* obtained from estimating the econometric model. As in Ihlanfeldt (2004), the *LOA_L* is the ratio of the sum of just values divided by the lowest value of the sum of predicted sales prices within the 95 percent confidence interval. The differences between *LOA* and *LOA_L* are all small, indicating that the obtained *LOAs* have been estimated with a high degree of precision.[17] To determine the accuracy of the estimated LOAs, they are compared to sales ratios computed using "early" 2003 sales.[18] By construction, these post-assessment ratios are free from potential sales chasing and are minimally affected by time adjustment problems. The estimated *LOAs* are very close to the actual level of assessment. The mean difference between the estimated *LOA* and the benchmark LOA is roughly 1.7 percentage points, slightly less than the average difference found by Ihlanfeldt (2004).

A final check on the validity of the model is to compare its predictive accuracy to that of the local tax assessor. Reported in Table 4 are the mean errors for the model (sales price – predicted price) and the local tax assessor (sales price – just price) based upon early 2003 sales. Also reported are the percentage errors from estimating the total sum of market values. Prediction errors from the model are uniformly smaller than those of the local assessor.

The results in Tables 2 – 4 for single-family property are all consistent with those reported by Ihlanfeldt (2004). They therefore provide further confirmation of the accuracy of the model in estimating LOAs for single-family property.

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[16] As expected, the high R^2's for the property value prediction models are primarily driven by the just price and Fourier variables, with the *X* variables contributing little additional explanatory power. The same holds for the additional property categories. For example, for Broward County adjusted R^2's decline very little when excluding the *X* vector: .926 to .911 (single-family); .958 to .946 (multi-family); .818 to .799 (vacant residential); and .908 to .902 (commercial). The other counties showed similar results. For the prediction evaluation models, averaging across counties, the intercept is less than 5% of the mean (median) sales price within the county. This holds for the other property types as well.

[17] Differences between the estimated *LOA* and *LOA_L* are also uniformly small for the other property types.

[18] Early sales were taken to be sales that occurred during January 2003 if 100 or more of these sales were present. If not, sales during the first quarter of 2003 were used.

Vacant Residential Property

For vacant residential properties, LOAs are estimated for the same set of counties included in the single-family case. Results from estimating the property value prediction models and the prediction evaluation models are summarized in Table 2. Multiple years of sales data more frequently yield the optimal specification for [1] than is the case with single-family property. R^2s for the property value prediction equation are slightly lower on average in comparison to those obtained for single-family property. Nevertheless, 13 out of the 15 counties have values at .80 or higher.[19] The prediction evaluation models indicate that the vacant residential prediction model provides a good predictor of market value for each county. Estimated slopes are close to one and intercepts are small relative to average sales prices. R^2s are uniformly high, except for Charlotte ($R^2 = .37$) and Walton ($R^2 = .57$) Counties. Low R^2s do not invalidate the predictor but do increase the likelihood that prediction errors may not cancel when summing sales price predictions across a small number of properties.

Evidence reflecting significant sales chasing with regards to vacant residential properties is also found in Table 3. Fourteen counties show just value appreciation rates for sold properties that are significantly higher than for unsold properties (for one county, Flagler, the appreciation rate for sold properties is significantly lower). These differences are frequently large, for example a 20 percentage point difference for Bay County. The importance of time-adjusting LOA estimates also surfaces in this stratum. Seven counties produce December sales ratios that differ significantly from 2002 sales ratios. Charlotte County, for example, yields a dramatically different LOA estimate (60.1 compared to 74.7) when using only December sales.

Estimated *LOA* levels are provided in Table 3. The estimated *LOA* is not statistically different (at the 95 percent level) from the benchmark LOA in 8 of the 15 counties. The mean difference between the estimated *LOA* and the benchmark LOA is roughly 3.1 percentage points, somewhat larger than the average difference for single-family properties (1.4). The model's performance is favorable when compared to sales ratio estimates. The difference between the 2002 sales ratio and the benchmark LOA is significant in all counties, with the mean difference

[19] The exceptions of Charlotte (.48) and Walton (.63) illustrate that a high degree of explanatory power coming from [1] is not a necessary condition for accurate LOA estimation. Both counties have *LOA* estimates that are close to their post-assessment sales ratio. Aggregate, not individual, level accuracy is what the model is designed to provide and this does not require a high R^2 for [1].

equaling 19.0 percentage points. The 2002 sales ratios also show a clear directional bias- all are uniformly higher than the benchmark LOAs.

As shown in Table 4, the model's predictions of market value for vacant residential property are more accurate than those of the local tax assessor in all 15 counties. However, both the model and the local tax assessor estimate the market value of vacant residential property less accurately than was the case with single-family properties.

Multi-Family Residential Property

For multi-family residential properties, LOAs are estimated for eight large counties for which a sufficient number of post-assessment sales are available to reliably estimate the benchmark LOA. Results from estimating the property value prediction models (equation [1]) and the prediction evaluation models (equation [3]) show that using one year of data, with various Fourier expansion lengths, is usually optimal. R^2s for the property value prediction model are uniformly high, with none below .95. Estimated slopes, intercepts, and R^2s of the prediction evaluation models all indicate that the multi-family property value prediction model is an accurate predictor for each county.

Evidence of widespread sales chasing in the case of multi-family properties is found in Table 3. Seven counties show just value appreciation rates for sold properties that are significantly higher than for unsold properties. Orange County reflects the largest gap with a difference of 7.0 percentage points. The importance of time-adjusting LOA estimates also surfaces in this stratum. Five of the eight counties show December sales ratios that are significantly lower than those using all 2002 sales.

The model's estimated *LOAs* reported for multi-family properties in Table 3 are highly consistent with estimates of the benchmark LOA. The *LOA* estimate from the model does not differ significantly from the benchmark LOA in six of the eight cases, with Orange and Pinellas Counties being the only exceptions. The mean difference between the two is roughly 2.3 percentage points, slightly more than the average difference in the single-family case. In comparison, sales ratios miss the benchmark LOA on average by 10.9 percentage points. A clear directional bias is also apparent, with sales ratios always much higher than benchmark LOAs.

The model's value predictions are also more accurate than those made by local property assessors. The absolute values of the percentage errors for the model average just 2.8 percent, compared to an average of 11.0 percent for local tax assessors. The model's errors are randomly distributed in sign while local assessors under-predict sales prices in every case. Collectively, the results indicate that the model is highly accurate for the case of multi-family residential properties with little decline in accuracy from the single-family property case.

Commercial Property

For commercial properties, LOAs are estimated for the same set of counties included in the multi-family residential case. Table 2 reveals that the optimal number of years of sales data and the choice of Q both vary substantially across counties. The explanatory power of the property value prediction equation is high, with R^2s ranging from .89 to .94. The prediction evaluation models yield slope and intercept estimates that are close to their targets and high R^2s, with .88 for Lee and Pinellas Counties being the lowest value.

The estimated *LOAs* for commercial property reported in Table 3 differ from the benchmark LOA by 3.9 percentage points on average, which is somewhat larger than the average errors for the other property types. Moreover, the model's estimated *LOA* is significantly different from the benchmark LOA in three of the eight counties. However, our judgment of the performance of the model for commercial property may be affected by the presence of fewer post-assessment sales within this stratum, which may result in less precise estimates of the benchmark LOA. The largest differences between the estimated and benchmark LOAs are found for two counties with comparatively small post-assessment sales samples. Excluding these counties, the average error falls to 2.7 percentage points.

For all eight counties LOAs for commercial property are more accurately estimated by the model than from 2002 sales ratios. Sales ratios overshoot benchmark LOAs by anywhere from 5.1 percentage points (Pinellas County) to as much as 21.5 percentage points (Duval County). The average error is 11.2 percentage points, which is over double the size of that yielded by the econometric model.

LOA estimation errors for commercial property are driven more by sales chasing than by a failure to account for the role of time. Positive and negative differences between 2002 and December 2002 sales ratios seem equally likely. On the other hand, sales chasing is found in every county. Table 3 shows that sold properties appreciated at significantly higher rates than properties not selling during 2002 in all eight counties. Table 4 also provides evidence that the model's predictive accuracy compares favorably with that of local county appraisers.

OVERALL LOA AND STATE EDUCATIONAL FUNDING

To illustrate how errors in the estimation of LOAs can affect the educational funding that counties receive from the state, Table 5 reports for Broward and Dade Counties the overall LOAs yielded by the alternative estimation techniques along with the state's share of funding implied by these LOAs.[20] For both counties, the state shares implied by the econometric model's overall *LOA* and the benchmark LOA differ by only 0.1 percentage points. The share differences implied by the overall LOAs yielded by the assessment-sales ratio and the benchmark post-assessment sales ratio are much larger- 0.6 and 0.7 percentage points for Broward and Dade Counties, respectively. Based upon actual 2004-2005 school year budgets, these differences would translate into an additional 8 and 13 million dollars of state educational funding for Broward and Dade Counties, respectively. These counties therefore receive more funding than they are entitled to if LOAs are obtained from assessment-sales ratios, because these ratios overestimate the true LOA.

CONCLUSION

The validity of the econometric model proposed in Ihlanfeldt (2004) for LOA estimation has been investigated for three categories of residential properties and for commercial property. Verification of the model for these additional land use categories is important because states may be reluctant to move away from assessment-sales ratio studies, unless the alternative approach can be accurately applied to multiple land uses. The support we have offered for the econometric model as applied to all land uses includes three findings: 1) small differences between the model's estimated *LOAs* and assessment-sales ratios adjusted for time of sale and free from potential sales chasing; 2) smaller mean errors in predicting market values when using the model in comparison to those made by the local property appraiser; and 3) more accurately estimated *LOAs* than those produced by traditional assessment-sales ratios. Our results, therefore, provide support for the use of the Ihlanfeldt model in estimating LOAs for all land use categories that

[20] State shares are obtained by plugging the overall LOAs into Florida's educational funding formula (Florida Department of Education, 2004-2005 Funding for Florida School Districts, available at http://www.firn.edu/doe/fefp/pdf/fefpdist.pdf).

commonly represent a significant percentage of a local jurisdiction's property tax base. Table 5 suggests that overall value-weighted LOAs are more accurately estimated using the Ihlanfeldt model and illustrates that errors in LOA estimation can have an important effect on educational funding.

A limitation of our analysis is that we were unable to investigate the accuracy of the model in estimating multi-family and commercial property LOAs within smaller counties. The precision of the model depends on the availability of recent sales and this may be a problem within smaller counties for these two cases. Of course, the reliability of assessment-sales ratios also depends on sales, so both the Ihlanfeldt and the traditional approach to LOA estimation may yield unacceptably large errors where sales are few in number.

Where recent sales are small in number, assessment-appraisal ratio studies are used by Florida and other states to estimate LOAs. However, appraisals are labor intensive and therefore costly and they are an opinion of value and therefore necessarily subjective (International Association of Assessing Officers, 1999, p. 49). In addition, sample chasing may upwardly bias assessment-appraisal ratio estimates of LOAs in the same manner as we have shown sales chasing inflates assessment-sales ratios. Sample chasing occurs when local property appraisers are able to successfully verify which properties are likely candidates for appraisals. These properties are then selectively reassessed. Although we have no evidence on the severity of this problem in Florida, our conversations with PTA officials indicate that it is a major concern.

One solution to the problem of estimating LOAs for smaller jurisdictions is to pool sales across jurisdictions that fall within the same real estate market. Because value trends should be similar among jurisdictions within the same market, the Ihlanfeldt model could then be used to estimate LOAs. In its use of the Ihlanfeldt model, PTA has adopted this approach.[21]

The cost of switching a state's LOA estimation procedure from the assessment-sales ratio approach to the Ihlanfeldt model will depend on whether the state already requires local taxing jurisdictions to annually submit their parcel-level property rolls to the state. If these data are

[21] Of course, pooling sales across jurisdictions requires a determination of the extent of the market. There are both econometric and conceptual tests that can be used for this purpose (Palmquist, 1991, 2004). Jurisdictions located within the same metropolitan area pass the conceptual test for being a single market. But for rural counties, econometric tests determining the extent of the market would be necessary. The Ihlanfeldt model has proven useful to the Florida PTA in this pooling approach. However, a lack of post-assessment sales in these cases makes LOA estimate verification impossible. In some cases even pooling sales does not yield enough observations to estimate the Ihlanfeldt model. As noted in footnote 11, in these cases PTA relies upon the appraisals that were done as part of its in-depth study of the previous year.

already being provided, the cost of estimating the model would be comparable to conducting assessment-sales ratio studies. If the data are not reported, there would be the additional cost of implementing a statewide standardized system of reporting roll data. However, this should not be expensive. To estimate the model, the only essential data required from local jurisdictions are price and transaction date for sales, and parcel id, land use category, and just value for all properties on the tax roll.

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TABLE 1

Property Value by Land Use Category as a Percentage of Total Value[a]

	Single-Family Residential	Multi-Family Residential	Vacant Residential	Commercial
Large Counties	77.2[b]	5.4	2.6	14.8
Medium Counties	78.4	2.4	7.9	11.4
Small Counties	72.4	1.4	13.2	13.1

[a] There are 5 counties within each size class. The counties are those that are used in the estimation of the LOAs for single-family homes and vacant residential land.

[b] These percentages are based on the 2004 county tax rolls.

TABLE 2

Results from Estimating the Property Value Prediction Model (Equation [1]) and the Prediction Evaluation Model (Equation [3])

	Property Value Prediction Model				Prediction Evaluation Model				
	Number of Obs	Number of Years of Sales	Number of Expansion Terms	R^2	Period	Number of Obs	Slope	Constant	R^2
Single-Family									
Large Counties									
Brevard	8255	1	0	.93	Dec.	673	1.06	-7732	.92
Broward	24655	1	2	.93	Dec.	2084	1.04	-7924	.91
Dade	111380	8	3	.90	Dec.	1156	.96	7219	.77
Sarasota	6458	1	1	.91	Dec.	564	1.04	-6415	.90
Volusia	7074	1	1	.93	Dec.	640	1.01	-1877	.91
Medium Counties									
Bay	2409	1	5	.90	Dec.	210	1.03	-3562	.91
Charlotte	3912	1	0	.92	Dec.	322	1.06	-10377	.92
Hernando	8630	3	5	.91	Dec.	287	1.04	-4404	.91
Indian River	3828	2	1	.91	Dec.	206	1.05	-9244	.92
Saint Johns	2020	1	1	.94	Dec.	165	1.00	314	.94
Small Counties									
Flagler	2304	2	1	.88	Dec.	107	0.98	-1193	.89
Highlands	1818	1	2	.92	Dec.	147	1.10	-9221	.94
Okeechobee	414	2	2	.92	Year	205	1.04	-3969	.92
Putnam	900	2	0	.88	4Q	118	1.00	1683	.88
Walton	537	1	1	.91	4Q	122	1.02	-4527	.93
Vacant Residential									
Large Counties									
Brevard	2752	1	5	.83	Dec.	302	1.04	-821	.89
Broward	425	1	1	.82	4Q	78	.94	6575	.80
Dade	1088	2	4	.85	Year	558	1.02	-2108	.83
Sarasota	10368	5	3	.80	Dec.	336	1.01	-874	.83
Volusia	1878	1	0	.85	4Q	538	.95	1959	.88
Medium Counties									
Bay	816	1	3	.85	4Q	199	1.15	-6919	.88
Charlotte	18664	8	5	.48	Dec.	502	.90	2562	.37
Hernando	4796	4	4	.85	Dec.	143	.99	-262	.81
Indian River	6389	8	4	.89	Dec.	123	.91	1571	.96
Saint Johns	2888	4	3	.81	4Q	142	1.01	34	.81
Small Counties									
Flagler	11845	6	1	.94	Dec.	507	1.06	-609	.93
Highlands	761	1	2	.94	Dec.	56	1.00	-211	.97

Okeechobee	644	2	0	.82	Year	579	1.02	-267	.83
Putnam	1282	3	0	.84	4Q	101	1.06	-80	.79
Walton	1831	2	4	.63	Year	1042	.92	8204	.57
Multi-Family									
Broward	1555	1	0	.96	Dec.	128	1.10	-23018	.96
Dade	1812	1	1	.96	Dec.	155	1.04	-10645	.97
Duval	625	4	2	.98	Year	201	1.00	137	.98
Hillsborough	299	1	1	.98	4Q	100	1.08	-17887	.97
Lee	466	1	3	.95	4Q	117	.97	4689	.84
Orange	691	1	2	.97	4Q	167	1.07	-8208	.97
Palm Beach	1009	2	1	.96	4Q	100	1.07	-15688	.95
Pinellas	717	1	5	.95	4Q	230	1.02	-2350	.93
Commercial									
Broward	483	1	4	.91	4Q	132	1.03	-24945	.91
Dade	2739	4	3	.89	4Q	172	1.05	-29907	.90
Duval	1770	7	3	.94	Year	333	.97	5043	.91
Hillsborough	874	4	3	.90	Year	289	1.02	-9198	.91
Lee	953	5	1	.91	Year	230	1.06	-29665	.88
Orange	2773	8	3	.91	Year	402	1.01	-7771	.92
Palm Beach	470	2	0	.93	Year	259	1.01	-21643	.91
Pinellas	1592	4	0	.92	4Q	109	1.05	7450	.88

TABLE 3
Alternative Estimates of Level of Assessment

	% Δ JP[a]		Sales Ratios			Model	
	Sales[b]	Non-Sales	2002	Dec. 2002	Early 2003[c]	*LOA*	*LOA_L*
Single-Family							
Large Counties							
Brevard	12.6*	11.9	100.5#	95.4	93.4	93.7	93.8
	(14691)[d]	(80101)	(8326)	(678)	(470)	(94483)	(94483)
Broward	17.3*	17.8	102.0#	99.5+	95.0	95.0	95.1
	(33847)	(243234)	(24090)	(1991)	(1376)	(286166)	(286166)
Dade	16.0*	15.5	101.5#	96.5+	93.0	95.3^	95.4
	(15214)	(137786)	(13421)	(1134)	(731)	(154458)	(154458)
Sarasota	13.7*	13.1	100.5#	95.4+	92.7	94.8^	94.9
	(10547)	(71601)	(6573)	(580)	(355)	(83872)	(83872)
Volusia	10.7*	10.1	100.2#	98.0+	94.1	95.3^	95.4
	(12407)	(92829)	(7036)	(632)	(461)	(104845)	(104845)
Medium Counties							
Bay	11.2*	8.2	100.2#	98.6	88.4	93.2^	93.4
	(3614)	(29040)	(2118)	(174)	(137)	(31703)	(31703)
Charlotte	12.2	12.0	100.1#	96.8+	90.6	92.3^	92.5
	(6146)	(32839)	(3887)	(317)	(217)	(38284)	(38284)
Hernando	8.1*	7.9	100.3#	96.2+	93.8	94.7	94.9
	(5125)	(30915)	(3131)	(285)	(170)	(35890)	(35890)
Indian River	10.1*	9.3	101.4#	97.5+	93.5	94.5	95.0
	(3012)	(16775)	(1935)	(211)	(342)	(19447)	(19447)
Saint Johns	12.0*	9.4	97.8#	94.4+	89.8	90.4	90.5
	(2913)	(21392)	(1981)	(158)	(107)	(26699)	(26699)
Small Counties							
Flagler	8.8	8.9	93.7#	89.0+	85.2	86.3	86.5
	(1474)	(9320)	(1300)	(107)	(242)	(13602)	(13602)
Highlands	6.6*	4.9	93.9#	90.7+	83.3	85.4	85.6
	(3075)	(18553)	(1830)	(147)	(376)	(21104)	(21104)
Okeechobee	8.5*	7.3	100.0#	95.6	90.8	93.3	93.9
	(379)	(3103)	(219)	(10)	(49)	(4316)	(4316)
Putnam	6.5*	3.7	96.9#	91.4+	90.6	87.0	87.4
	(961)	(6651)	(415)	(51)	(50)	(7474)	(7474)
Walton	9.4*	6.1	92.6#	89.5	87.2	86.1	86.6
	(975)	(5900)	(519)	(36)	(124)	(6766)	(6766)
Vacant Residential							
Large Counties							
Brevard	15.7*	11.2	94.8#	94.6	76.2	81.5^	82.5
	(6949)	(28510)	(2928)	(326)	(210)	(34792)	(34792)

Broward	21.0*	17.3	100.6#	103.1+	72.6	67.7	68.5
	(1948)	(11007)	(432)	(34)	(67)	(12615)	(12615)
Dade	25.1*	19.2	96.6#	86.6+	76.8	72.9	73.9
	(1101)	(3271)	(565)	(51)	(71)	(4027)	(4027)
Sarasota	12.4*	10.9	89.1#	87.9	70.7	64.3^	65.1
	(8781)	(56391)	(2981)	(337)	(212)	(64929)	(64929)
Volusia	18.4*	15.6	100.2#	98.4	80.9	83.6^	84.2
	(4929)	(23024)	(1977)	(172)	(313)	(27017)	(27017)
Medium Counties							
Bay	24.2*	4.2	98.4#	99.9	60.2	64.2^	65.2
	(1420)	(8297)	(964)	(90)	(114)	(9339)	(9339)
Charlotte	50.3*	42.1	74.7#	60.1+	56.4	54.5	55.1
	(11968)	(44615)	(5833)	(504)	(272)	(72699)	(72699)
Hernando	14.4*	11.2	102.0#	100.5	86.2	88.5^	89.2
	(3660)	(26076)	(1572)	(146)	(273)	(28870)	(28870)
Indian River	16.6*	11.3	100.3#	99.1	91.1	90.1	91.5
	(2291)	(7342)	(1147)	(140)	(258)	(9493)	(9493)
Saint Johns	22.4*	15.1	98.8#	94.1+	78.7	77.8	78.7
	(2255)	(10391)	(713)	(41)	(76)	(12159)	(12159)
Small Counties							
Flagler	30.9*	35.1	96.7#	89.8+	77.6	82.7^	83.2
	(7242)	(12299)	(4327)	(508)	(228)	(15570)	(15570)
Highlands	7.9*	2.3	95.0#	89.6+	80.4	84.8^	85.8
	(3163)	(37140)	(778)	(58)	(188)	(39906)	(39906)
Okeechobee	54.0*	38.9	101.9#	102.8	88.1	88.0	89.3
	(1694)	(3045)	(579)	(40)	(43)	(3468)	(3468)
Putnam	9.5*	7.4	102.1#	89.4+	86.6	86.0	87.9
	(1700)	(13004)	(454)	(36)	(75)	(14586)	(14586)
Walton	23.0*	17.0	90.0#	89.3	74.4	71.3	72.5
	(1826)	(10559)	(1117)	(49)	(147)	(12006)	(12006)
Multi-Family							
Broward	16.2*	14.5	101.7#	98.9+	91.0	89.3	89.6
	(2385)	(14944)	(1764)	(144)	(103)	(17102)	(17102)
Dade	18.7*	16.1	99.4#	93.5+	93.9	93.9	94.4
	(2159)	(14096)	(2253)	(196)	(109)	(15990)	(15990)
Duval	11.6*	6.6	107.7#	106.7	96.1	95.6	96.9
	(355)	(764)	(259)	(14)	(37)	(1108)	(1108)
Hillsborough	10.2*	7.3	98.3#	94.6+	85.9	83.1	84.1
	(675)	(3948)	(313)	(39)	(73)	(4537)	(4537)
Lee	14.2	14.1	96.9#	94.7	84.5	85.7	86.3
	(731)	(3713)	(495)	(40)	(87)	(4377)	(4377)
Orange	15.0*	8.0	99.5#	100.8	87.7	95.4^	96.0
	(1041)	(7641)	(749)	(63)	(140)	(8604)	(8604)
Palm Beach	13.7*	11.1	96.2#	93.1+	84.4	84.2	84.5

	(1091)	(6668)	(673)	(48)	(114)	(7660)	(7660)
Pinellas	15.4*	13.0	99.3#	94.3+	88.5	93.1^	94.8
	(1140)	(6744)	(1087)	(133)	(102)	(7719)	(7719)
Commercial							
Broward	12.3*	8.3	100.9#	99.0	94.2	88.2^	90.8
	(1265)	(12644)	(547)	(48)	(92)	(13622)	(13622)
Dade	15.3*	9.9	95.6#	93.5+	85.3	87.7	88.1
	(1217)	(10229)	(1196)	(91)	(123)	(10930)	(10930)
Duval	12.3*	3.3	107.2#	105.3	85.7	93.6^	94.8
	(1040)	(2121)	(385)	(31)	(52)	(2959)	(2959)
Hillsborough	15.5*	7.3	97.9#	86.2+	89.1	87.8	88.5
	(954)	(9039)	(309)	(26)	(55)	(9566)	(9566)
Lee	9.3*	5.4	92.9#	100.3+	76.3	83.3^	84.2
	(550)	(3569)	(238)	(13)	(40)	(3966)	(3966)
Orange	7.9*	1.1	95.6#	109.9+	88.5	91.8	92.5
	(700)	(7051)	(407)	(34)	(98)	(7622)	(7622)
Palm Beach	14.8*	5.2	100.4#	103.1	86.6	86.8	93.5
	(788)	(5780)	(276)	(21)	(48)	(6327)	(6327)
Pinellas	10.9*	7.2	98.8#	94.3+	93.7	90.7	91.2
	(972)	(7779)	(459)	(47)	(79)	(8596)	(8596)

[a] Percentage change in just price from January 1, 2002 to January 1, 2003.
[b] Sales are those properties that were sold in 2000.
[c] Early sales are defined as January 2003 sales when 100 or more January sales are present and first quarter 2003 sales otherwise.
[d] Number of properties used in generating the estimate (for all columns) is given in parentheses.
* Difference between percentage change in just price for properties that sold and those that did not sell in 2002 is statistically significant at the five percent level (two-tailed test).
# Difference between 2002 and early 2003 assessment-sales ratios is statistically significant at the five percent level (two-tailed test).
+ Difference between December 2002 and 2002 assessment-sales ratios is statistically significant at the five percent level (two-tailed test).
^ Difference between estimated LOA and early 2003 assessment-sales ratios is statistically significant at the five percent level (two-tailed test).

TABLE 4

Comparing the Model's and County Assessor's Accuracy Using Early 2003 Sales

	2003 Sales		Model		Assessor		
	Number	Period	Mean Error	% Error	Mean Error	% Error	Assessor Error/ Model Error
Single-Family							
Large Counties							
Brevard	470	Jan.	1101	0.9	8418	6.6	7.3
Broward	1376	Jan.	-1193	-0.7	9121	5.0	7.6
Dade	731	Jan.	3593	1.9	12838	7.0	3.6
Sarasota	355	Jan.	2676	1.6	12339	7.4	4.6
Volusia	461	Jan.	1660	1.3	7342	5.9	4.5
Medium Counties							
Bay	137	Jan.	8896	6.3	16430	11.6	1.8
Charlotte	217	Jan.	1702	1.1	14709	9.4	8.5
Hernando	170	Jan.	1453	1.3	6920	6.2	4.8
Indian River	342	1Q	1393	1.1	8639	6.5	5.9
Saint Johns	107	Jan.	672	0.3	20901	10.2	34.0
Small Counties							
Flagler	242	1Q	2224	1.4	22925	14.8	10.6
Highlands	376	1Q	2239	2.4	15697	16.7	7.0
Okeechobee	49	1Q	3124	3.1	9207	9.2	3.0
Putnam	50	1Q	-7433	-7.9	8847	9.4	1.2
Walton	124	1Q	43	0.0	21799	12.8	512
Vacant Residential							
Large Counties							
Brevard	210	1Q	4867	10.9	10618	23.8	2.2
Broward	67	1Q	6314	7.1	24466	27.4	3.9
Dade	71	1Q	-6428	-8.3	17935	23.2	2.8
Sarasota	212	Jan.	2086	8.7	7036	29.3	3.4
Volusia	313	1Q	4167	10.3	7538	18.7	1.8
Medium Counties							
Bay	114	1Q	4739	9.2	20424	39.8	4.3
Charlotte	272	Jan.	9923	21.9	19694	43.6	2.0
Hernando	273	1Q	1412	7.1	2727	13.8	1.9
Indian River	258	1Q	573	2.2	2345	8.9	4.1
Saint Johns	76	1Q	16741	13.4	26608	21.3	1.6
Small Counties							
Flagler	228	Jan.	4271	11.2	8552	22.4	2.0
Highlands	188	1Q	1088	7.6	2813	19.6	2.6
Okeechobee	43	1Q	516	3.2	1925	11.9	3.7
Putnam	75	1Q	312	2.5	1664	13.4	5.3

Walton	147	1Q	19162	16.6	29546	25.6	1.5
Multi-Family							
Broward	103	Jan.	-787	-0.3	23150	9.0	29.4
Dade	109	Jan.	-3569	-1.2	18047	6.1	5.1
Duval	37	1Q	-5229	-3.3	6206	3.9	1.2
Hillsborough	73	1Q	811	0.5	24737	14.1	30.5
Lee	87	1Q	4296	2.3	29026	15.5	6.8
Orange	140	1Q	13179	9.8	16572	12.3	1.3
Palm Beach	114	1Q	-1386	-0.6	35150	15.6	25.4
Pinellas	102	1Q	9945	4.6	24691	11.5	2.5
Commercial							
Broward	92	1Q	-73533	-9.1	46461	5.8	0.6
Dade	123	1Q	19968	3.0	93808	14.7	4.7
Duval	52	1Q	13819	4.2	47575	14.3	3.4
Hillsborough	55	1Q	15010	2.8	58860	10.9	3.9
Lee	40	1Q	130284	13.3	232338	23.7	1.8
Orange	98	1Q	18931	2.8	77628	11.5	4.1
Palm Beach	48	1Q	28219	4.2	91224	13.4	3.2
Pinellas	79	1Q	131	0.2	39804	6.3	304

TABLE 5

The Impact of Overall LOAs on State's Share of Educational Funding

	Broward			Dade		
	Sales Ratio	Model *LOA*	Early 2003	Sales Ratio	Model *LOA*	Early 2003
Single-Family	102.0	95.0	95.0	101.5	95.3	93.0
	(73.9)[a]	(73.9)	(73.9)	(69.3)	(69.3)	(69.3)
Multi-Family	101.7	89.3	91.0	99.4	93.9	93.9
	(7.4)	(7.4)	(7.4)	(9.0)	(9.0)	(9.0)
Vacant Residential	100.6	67.7	72.6	96.6	72.9	76.8
	(1.2)	(1.2)	(1.2)	(1.5)	(1.5)	(1.5)
Commercial	100.9	88.2	94.2	95.6	87.7	85.3
	(17.5)	(17.5)	(17.5)	(20.2)	(20.2)	(20.2)
Overall LOA	101.8	93.1	94.3	100.0	93.3	91.3
State's Share (%)	54.8	54.1	54.2	58.2	57.6	57.5

[a] Percentage of total value within property type in parentheses.

APPENDIX

TABLE A1

Property Characteristics used as Independent Variables[a]

Variable	Description
totliv, totlivsq	total living area in square feet and its square
age, agesq	age of major improvement and its square
activity	a variable indicating the number of sales that occurred in the year of the sale within a square mile area containing the property.
unit1-unit3	dummy variables indicating the unit of land measurement (*unit1* = 1 if land measured as front footage, which is the number of feet bordering the street facing the front of the property, 0 otherwise; *unit2* = 1 if land measured in total square footage, 0 otherwise; *unit3* = 1 if land measured in acres, 0 otherwise. *unit1* = reference category)
nounit1-nounit3	for each unit of land measurement a variable that equals the number of units (e.g., total square footage) if that unit of measurement is being used and zero otherwise.
tenplus	dummy variable for whether multi-family property has 10 or more residential units
retail, office, industrial	dummy variable indicating type of commercial property

[a] The listed variables are available for all counties. Some counties (but not Broward) also report improvement quality as rated by the property appraiser and exterior veneer. Where available, these additional variables are included for all of the property types (except vacant land).

TABLE A2
Property Value Prediction Model (Equation [1]) Results for Broward County
(Absolute t-statistic in Parentheses)

Variable	Single-Family	Multi-Family	Vacant Residential	Commercial
Just Price	0.85	0.87	1.26	1.03
	(149.8)	(38.2)	(35.6)	(27.7)
Fourier Variables				
z	1664.95	10019.95	-27.00	221051.50
	(0.5)	(2.6)	(0.0)	(0.2)
zsq	295.45	-400.77	221.89	34293.83
	(0.6)	(0.7)	(0.1)	(0.2)
sin1	-1219.65		-9031.52	-39356.75
	(1.7)		(1.4)	(0.2)
cos1	-1680.08		-3923.65	-129060.52
	(0.9)		(0.3)	(0.2)
sin2	-327.08			7379.32
	(0.9)			(0.1)
cos2	49.14			-8250.81
	(0.1)			(0.1)
sin3				-19854.22
				(0.4)
cos3				3409.76
				(0.1)
sin4				-9812.61
				(0.3)
cos4				-4282.86
				(0.2)
Characteristics (X)				
totliv	26.68	23.10		15.51
	(28.3)	(16.1)		(5.2)
totlivsq	1.27e-3	5.20e-5		-1.72e-4
	(6.3)	(2.0)		(4.2)
age	-895.12	533.56		-6749.32
	(17.2)	(0.7)		(1.9)
agesq	14.81	7.13		103.84
	(17.0)	(0.7)		(1.9)
activity	-21.85	-62.11	-399.65	-401.40
	(9.5)	(1.7)	(0.9)	(0.2)
unit2	-4373.21	-9664.01	30957.49	40098.21
	(4.7)	(0.9)	(2.8)	(0.1)
unit3	50957.35		5074.62	-400244.49
	(18.2)		(0.3)	(0.3)

nounit1	-39.80	36.14	28.86	271.59
	(3.3)	(0.5)	(0.3)	(1.2)
nounit2	0.38	0.64	0.23	0.64
	(10.2)	(1.4)	(1.7)	(1.7)
nounit3	-5.78		133.63	1277.19
	(1.4)		(2.2)	(0.3)
tenplus		44850.90		
		(4.3)		
retail				91789.53
				(3.3)
office				83984.25
				(2.7)
Constant	16157.24	-46413.00	-87.65	193907.60
	(6.0)	(2.8)	(0.0)	(0.3)
Observations	24655	1555	425	483
Adjusted R^2	.9262	.9575	.8181	.9081