# Land Use Policy Prescriptions for Local Government Using Spatially Oriented Data

Clifford A. Lipscomb
Assistant Professor
Department of Marketing and Economics
Langdale College of Business Administration
Valdosta State University
Valdosta, GA 31698-0075
United States of America
Phone: +1-229-245-3774
Fax: +1-229-245-2248
E-mail: calipscomb@valdosta.edu

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## Abstract

This paper presents a model of land prices for the Lowndes County Industrial Authority, with the goal to recommend the parcels it should purchase to meet 2030 industrial employment projections. This model, coupled with a separate multi-criteria analysis by the South Georgia Regional Development Center that uses geographic information system (GIS) data, allows us to determine parcel development suitability for industrial purposes. Using different data sets with no overlapping variables, the hedonic regression model and parcel suitability study are used jointly to predict the similar parcels should be purchased and developed by the Industrial Authority.


## Introduction

Comprehensive land-use and transportation planning is essential to the successful growth of an area. This kind of planning seeks to determine the appropriate mix of land uses and transportation alternatives that will attract new businesses, new households, and retain existing businesses and households. It is easy to see the recursive relationship that exists between land-use planning and transportation planning: transportation planning impacts the existing land-use designations *and* the existing land-use designations impact future transportation planning. This is the justification for the simultaneous consideration of alternative land uses and the kinds of transportation alternatives an area will consider.

Valdosta, Georgia gained Metropolitan Statistical Area (MSA) status after the 2000 Census. The federal government requires of all urbanized areas "transportation planning activities that will improve the transportation system and help coordinate the area's future growth within the area bounded, at minimum, by the existing Urbanized Area plus the contiguous area expected to become urbanized within the next 20 years" (Final Metro 2030 Long Range Transportation Plan) as required by Title 23 (U.S.C. 134 Section 450.322). As part of these planning activities, the South Georgia Regional Development Center (SGRDC), which is the local Metropolitan Planning Organization (MPO) for the urbanized area, created a parcel suitability algorithm to determine the most likely land uses for each parcel in Lowndes County. This algorithm and its data requirements, which are included in the Lowndes Comprehensive Plan, will be discussed in the Methods section of the paper.

The use of this parcel suitability algorithm, we argue, should not be used alone to prescribe policy for the local government. While land characteristics (i.e. supply side characteristics) are captured by this algorithm, the *willingness to pay* by land consumers for certain land characteristics are not considered by this algorithm. Therefore, since actual land purchases (i.e. arms-length transactions) communicate willingness to pay information, it is important to consider jointly the demand for certain characteristics of land, including their location in the county, and the supply side characteristics of land. The willingness to pay for certain land characteristics will be modeled using a hedonic property value model, the details of which also will be included in the Methods section of the paper. We argue here that policy prescriptions for local government are possible using not only historical data on land sales and distance variables, but also geographic

descriptors of water and sewer infrastructure availability, concentrations of natural resources (water, forestlands, etc.), flood plains, and other descriptors.

Considering both the characteristics of land that make it suitable for particular uses and the willingness to pay for specific land parcels, this paper uses the two separate processes to determine the locations in Lowndes County that are most suitable for future expansion of industrial parks. Interestingly, the data requirements for each algorithm are completely different with no overlapping variables. So, these two processes can be viewed as the separate contributions of government agencies and academic researchers, which when brought together can be used to produce policy prescriptions for local government that are statistically validated.

**Theoretical Model**

Consider a metropolitan area with a variety of manufacturing and service activities distributed heterogeneously across space. Within this space, clusters of manufacturing and service activity exist in industrial parks created by the Industrial Authority of Lowndes County.[1] Land parcels are assumed to be of identical quality at all locations. Establishments choose to locate to the parcel that best suits their needs, whether or not these parcels are located within industrial parks; industrial activities "require large spaces per employee and tremendous external inputs such as utilities, transportation, and labor" (Hughes 1994, p. 306).[2] Establishments actually bid upon a bundle of characteristics associated with each parcel, including the distances of these parcels from the city center (a test of the monocentric model assumption), from interstate interchanges, from deep-water ports, and from other major urban centers. Other

characteristics in these bundles include the structural characteristics of the buildings that occupy these parcels[3] and the package of local public goods.

According to McCann (2001), the "firm land consumption decision is modeled using a profit function" (p. 127). So, in this model, each establishment in an industrial park seeks to maximize its bid for a particular site subject to an acceptable amount of profit. Following Blackley (1984), the representative establishment is assumed to have a general production function $Q = Q[X, L(Z)]$ where Q is the level of output, X is a vector of nonsite factors of production that measure firm characteristics, and L is the site factor of production that depends on a vector of site attributes, Z. Then, the establishment's profit equation can be expressed as $\pi = P*Q[X, L(Z)] - nX - R*L(Z)$, where $\pi$ is profit, P is the market price of the product sold, n is a vector of average nonsite factor prices, and R is the unit price of the establishment's location. "Then, if we use average market prices for n, all differentials in factor availability over the metropolitan area are capitalized into the site price. Thus, the expenditure on the site input, $R*L(Z)$, is a function of site attributes, a formulation consistent with the hedonic theory of housing price determination" (Blackley 1984, p. 543). Therefore, the next step is to describe the data and methods used to create the parcel suitability model and to estimate the hedonic property value model.[4]

## Methods and Data

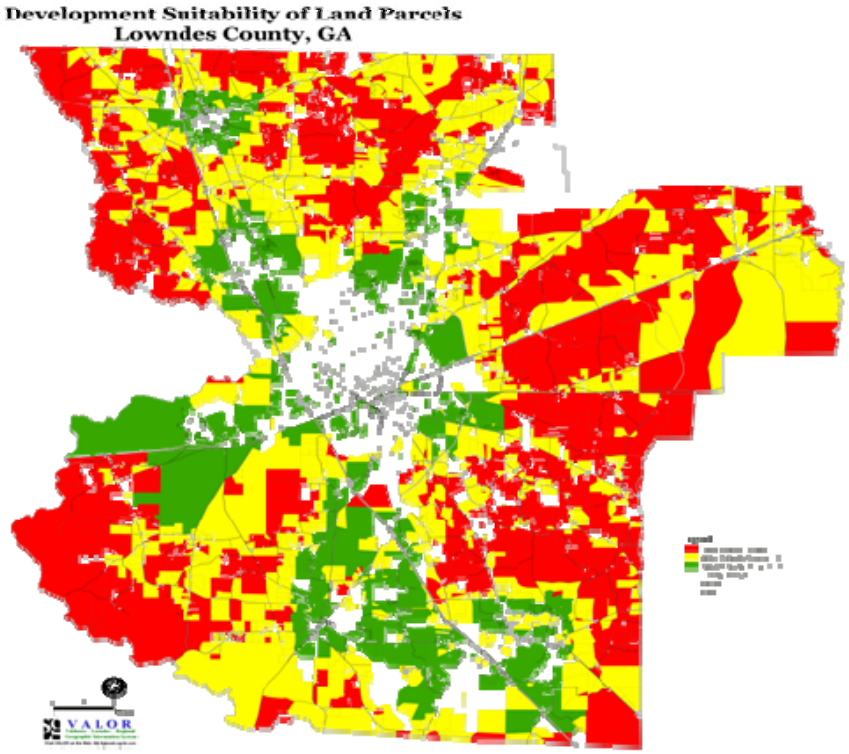
### *Parcel suitability model*

To create the parcel suitability model, the SGRDC finds the land parcels in Lowndes County that are not developed. Then, the coincidence of each undeveloped parcel with natural resources, transportation access, and water/sewer infrastructures is

analyzed and recorded as attributes of the parcels themselves. This process forms multiple data layers that may be overlaid on each other to determine parcel suitability. The specific variables include flood hazard areas, wetlands, ground recharge areas, transportation network access, and water and sewer infrastructure accessibility. Figure 1 shows the parcel suitability map for Lowndes County as well as the scoring process used to classify parcels according to a five-category multi-criteria ranking. Also, Figure 2 shows a map of the Lowndes County industrial parks.

*Hedonic property value model*

To create the hedonic property value model, data were collected from the Industrial Authority. These data include establishment names and addresses, the type of establishment (manufacturing or service), the year it opened for business, the number of employees, total payroll, whether or not the establishment has a freeport exemption on goods sold across state lines, the number of acres owned, and parcel site attributes such as fire insurance rating and the presence of water, sewer, and natural gas lines on the parcel. Once these data were obtained, then each address was geocoded by the SGRDC, which allowed the distance of each parcel to important locations to be calculated. These locations include the nearest Interstate 75 interchange, the deep-water port at Brunswick, barge service in Bainbridge, downtown Valdosta, the City of Atlanta, the City of Jacksonville, and the City of Tallahassee.[5]




| *Layer* | Best-4 | 3 | 2 | 1 | Worst-0 |
|---|---|---|---|---|---|
| *Flood Hazard Areas* | 0 – 10% of land area | 10-30% of land area | 30-50% of land area | 50-70% of land area | 70-100% of land area |
| *NWI Designated Wetlands* | 0 – 10% of land area | 10-30% of land area | 30-50% of land area | 50-70% of land area | 70-100% of land area |
| *Groundwater Recharge Areas* | | | | NOT in a recharge area | IN a groundwater recharge area |
| *Access to the Transportation Network* | Access via an Arterial Road/Street | Access via Paved Major or Minor Collector | Access via Dirt Major Collector or Local Paved Road | Access via a Dirt Minor Collector | Access via a Dirt Local road/street. |
| *Future Water Utility* | | | | IN a planned service area | NOT in a planned service area |
| *Future Sewer Utility* | | | | IN a planned service area | NOT in a planned service area |
| *Existing Water Utility* | Intersects the ¼ mile buffer | Intersects the ½ mile buffer | Intersects the ¾ mile buffer | Intersects the 1 mile buffer | DOES NOT intersect buffers of existing services |
| *Existing Sewer Utility* | Intersects the ¼ mile buffer | Intersects the ½ mile buffer | Intersects the ¾ mile buffer | Intersects the 1 mile buffer | DOES NOT intersect buffers of existing services |

**Figure 1: Parcel Suitability Map and Multi-Criteria Ranking System**

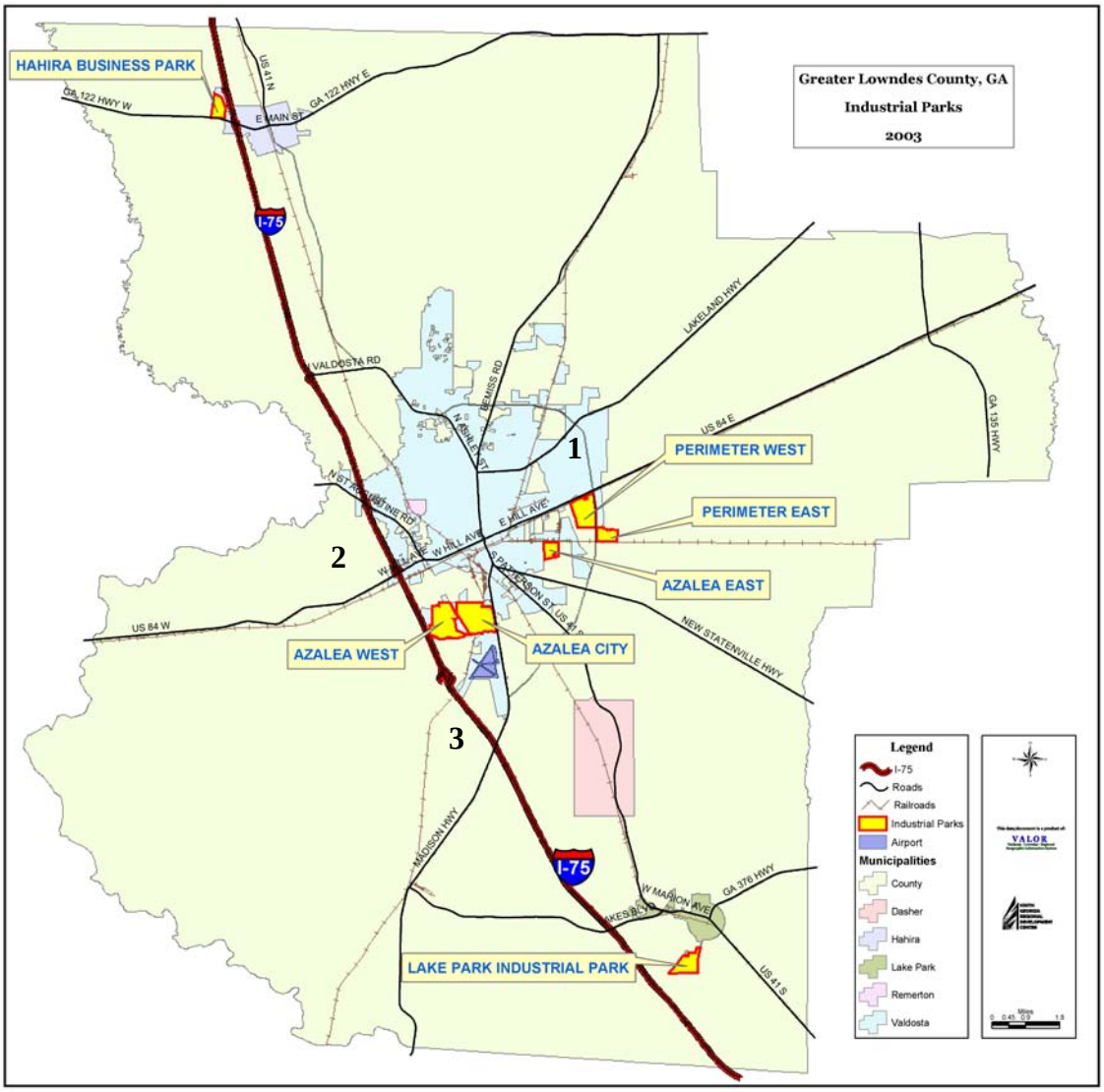



**Figure 2: Lowndes County Industrial Parks**

Since we do not have data on the characteristics of the structures that occupy the land, traditional hedonic estimates for structure characteristics are not attainable. Note that the dependent variable in this research (natural log of sales price) only accounts for the purchase of bare land, and not any structure that occupies the parcel. This suggests that we can decompose the sales price of the land into particular site attributes Z and determine the attributes of industrial park parcels that generate a positive and negative price premium. So, this study specifies the hedonic equation $\ln P_i = \alpha + \gamma Y_i + \sum \beta_i \ln Z_i + u_i$,

where $\ln P_i$ is the natural log of sales price, $\alpha$ is a constant term, $\gamma Y_i$ is the estimated coefficient for the YEAR variable times the YEAR variable, $\sum \beta_i \ln Z_i$ is the sum of the distance variables times an estimated beta coefficient, and $u_i$ is a random error term that is normally distributed with mean zero and constant deviation $\sigma$.

Using this hedonic regression model, we can estimate the marginal impact on sales price of being closer to the interstate, or the marginal price of additional acreage. For example, we can estimate the marginal change in sales price if a business locates one mile closer to downtown Valdosta, holding all of the other variables constant.[6] This is powerful information that can be used to inform the policy decisions of local governments as they choose future sites for industrial development.

**Table 1: Descriptive Statistics**

*DEPENDENT VARIABLE*

| Variable | Description |
|---|---|
| PRICE | Parcel Sales Price<br>*(Mean =179720; Standard Deviation = 501984)* |

*INDEPENDENT VARIABLES*

| Variable | Description |
|---|---|
| SPACE | Equals 1 if Business has Room for Expansion, 0 otherwise<br>*(Mean = .09; Standard Deviation =.29)* |
| FREEPORT | Equals 1 if Business has Freeport Exemption on Cross-State Sales, 0 otherwise<br>*(Mean = .78; Standard deviation = .41)* |
| YEAR | Year of Parcel's Purchase<br>*(Mean = 1996; Standard deviation = 7.69)* |
| ACRES | Number of Acres in the Parcel<br>*(Mean = 8.17; Standard deviation = 18.48)* |
| D_BWK | Distance to Brunswick, GA Deep-Water Port<br>*(Mean = 120.52; Standard deviation = 21.26)* |
| D_TLH | Distance to Tallahassee, FL City Limits<br>*(Mean = 82.28; Standard deviation = 9.53)* |
| D_RAILX | Distance to Nearest Railroad Transfer Station<br>*(Mean = 4.13; Standard deviation = 3.94)* |
| D_I-75 | Distance to Nearest Interstate 75 Interchange<br>*(Mean = 2.75; Standard deviation = 1.50)* |

## Results

*Descriptive Statistics*

Descriptive statistics are reported in Table 1. The average establishment located in an industrial park has 58 employees, operates on 8.17 acres, and has a payroll of $1,984,672. Also, we see that 9 percent of establishments have acres on which they can expand their operations and that 78 percent of establishments have freeport exemption, meaning that they can sell their goods across state lines without incurring an additional export-type tax.

Analysis also was conducted that relates current employment density (number of jobs per acre of land used) to projected employment based on analysis by the SGRDC. Currently, Industrial Authority-assisted establishments have an average employment density of six jobs per acre. But, by category, we see that manufacturing establishments in industrial parks have an employment density of nine jobs per acre compared to seven for service establishments. Table 2 below shows the 15 establishments with the highest employment densities in the industrial parks. These results will be discussed further in the Discussion section.

**Table 2: Top 15 Employment Density Establishments**

| Name | Jobs per Acre |
|---|---|
| Bath Craft Inc. | 46.0 |
| US Press Inc. | 33.3 |
| U.P.S. Center | 33.3 |
| Regal Marine | 25.2 |
| Shaw Industries | 23.2 |
| Five Star Foods Inc. | 22.5 |
| T.M. Poly Film Inc. | 19.7 |
| Firstline Corp | 16.7 |
| Grey Flex/Snap Rite | 16.6 |
| Beardin Trucking | 15.8 |
| MAAX U.S.A. | 14.9 |
| Market Bag Co. | 14.5 |

| | |
|---|---|
| Ryder Transportation Services | 12.7 |
| Dillard's Distribution Center | 12.5 |
| Roadway | 11.8 |

*Regression Estimates*

Land price variation for industrial property depends on relevant public goods and services such as streets and highways, sanitation, and police and fire protection (McDonald and Yurova 2006). In preliminary runs of the hedonic model, a lack of variation in variables such as fire insurance ratings, available expansion acres, and the presence of water and sewer infrastructure lead to a low degree of explanatory power of the dependent variable (natural log of sales price). Also, since we only consider the establishments that locate in industrial parks in Lowndes County, we avoid consideration of variables that relate to the tax structure. In addition, the Industrial Authority does not collect data on the characteristics of the establishment itself except for payroll and the number of employees. So, the log-log hedonic property value estimates in Table 3 depict the most parsimonious model that explains the variation in the natural log of parcel sales price.

**Table 3: OLS Regression Results, Robust Standard Errors**
**(Dependent Variable: Natural Log of Parcel Sales Price)**

| | **All Industries** | **Service Industries Only** | **Manufacturing Industries Only** |
|---|---|---|---|
| | *Coefficient (Std. Error)* | *Coefficient (Std. Error)* | *Coefficient (Std. Error)* |
| Constant | 69.53*** (26.92) | 132.77*** (29.58) | 208.65*** (9.02) |
| **Natural log of Acres** | 1.022*** (.02) | 1.017*** (.034) | 1.014*** (.013) |
| **Year of Land Purchase** | -.0005*** (.0002) | .0031 (.002) | .0001 (.0006) |
| **Natural log of Distance to Brunswick** | -2.182*** (.804) | -3.75*** (.932) | -6.49*** (.205) |
| **Natural log of Distance to Tallahassee** | -11.109** (5.223) | -25.62*** (6.032) | -38.66*** (1.703) |
| **Natural log of Distance to Nearest Railroad Transfer Station** | .787** (.355) | 1.735*** (.409) | 2.69*** (.107) |
| **Natural log of Distance to Nearest Interstate 75 Interchange** | -.146 (.091) | -.35*** (.088) | -.514*** (.056) |
| **F-Statistic** | 613.85 | 2103.98 | 1874.01 |
| **R-Square** | .97 | .98 | .99 |
| **Root Mean Squared Error** | .16 | .13 | .06 |
| **Number of Observations** | 71 | 40 | 27 |

The regression results suggest seven different outcomes that relate to the spatial variation of parcel sales price in Lowndes County industrial parks:

1. A positive and significant relationship exists between the number of acres at a site and the sales price. This suggests that a one percent change in the number of acres corresponds to a 1.02 percent change in the sales price, *ceteris paribus*.

2. A negative and significant relationship exists between the purchase date of a site and the sales price. This suggests that the sales prices of more recent site sales have been artificially low and have not kept pace with inflation.

3. A negative and significant relationship exists between the distance to the deep-water port at Brunswick and the sales price. This suggests that as a land site is further away from Brunswick, the lower the sales price. Put another way, industrial park land in Lowndes County has an approximately 2.1 percent higher sales price for every one percent change in distance to Brunswick, *ceteris paribus*. In fact, the data suggest that this result is even stronger for the manufacturing industries in Lowndes County.[7] Of course, for non-marginal changes in distance, we expect this effect to be muted (less than 2.1 percent per mile closer).

4. A negative and significant relationship exists between the distance to Tallahassee and the sales price. This suggests that as a land site is further away from Tallahassee, the lower the sales price. Put another way, industrial park land in Lowndes County has an approximately 11.1 percent higher sales price for every one percent decrease in distance to Tallahassee, *ceteris paribus*. In fact, the data suggest that this result is stronger for manufacturing industries in Lowndes County. Of course, with so few manufacturing industries in the industrial parks (27), we expect this effect to be much less for changes in location greater than a few miles.

5. A positive and significant relationship exists between the distance to the nearest railroad transfer station and the sales price. This suggests that as a land site is further away from the railroad transfer station, the higher the sales price. Put another way, industrial park land in Lowndes County has an approximately .78 percent lower sales price for every one percent change in distance to a railroad transfer station, *ceteris paribus*. Of course, we expect this effect to be muted for changes in location greater than a few miles. Therefore, industrial park sites near railroad transfer stations do not command a positive price premium in Lowndes County.

6. A negative and significant relationship exists between the distance to Interstate 75 and the sales price. This suggests that as a land site is further away from Interstate 75, the lower the sales price. Put another way, industrial park land in Lowndes County has an approximately .14 percent higher sales price for every one percent change in distance to Interstate 75, *ceteris paribus*. Of course, we expect this effect to be muted for non-marginal changes in location.

7. A visual inspection of the residuals from the primary regression model shows no clear relationship to the dependent variable, suggesting that omitted variable bias is not a problem in this analysis. However, the variance inflation factors for each independent variable, used to detect multicollinearity, are very high for the LN(D_RAILX) and LN(D_TLH) variables (22.9 and 12.3, respectively). So, after we omit these two variables from the overall regression model, the estimates remain basically the same – the coefficient on LN(ACRES) retains its positive sign and significance level; the coefficient on YEAR retains its negative sign but is significant only at the 76 percent level (meaning the p-value = .24); the coefficient on LN(D_BWK) retains its negative sign and is significant at the 97 percent level (meaning the p-value = .03); the coefficient on LN(D_I-75) retains its negative sign and is significant only at the 70 percent level (meaning its p-value = .30); and the constant retains its positive sign and is significant at the 99 percent level.

## Discussion

### *Regression Estimates*

The regression estimates suggest several price trajectories throughout Lowndes County that may affect the parcels to be purchased by the Industrial Authority. First, the

Industrial Authority may wish to purchase relatively cheaper lands in the west and northeast sections of Lowndes County where water and sewer infrastructure exist or are planned. Particular parcels suggested by the model are the northwest tract at E. Hill Ave and Inner Perimeter, north of Perimeter West Industrial Park (Parcel 1 in Figure 2); the tracts north and south of Highway 84 West near Kinderlou Forest (Parcel 2 in Figure 2); and the tracts between Madison Highway, the railroad, and Interstate 75 south of the airport (Parcel 3 in Figure 2). Interestingly, these tracts predicted by the statistical model correspond very well to the most suitable parcels predicted by the SGRDC's Parcel Development Suitability project. Also, the data requirements for this project and the Parcel Development Suitability project were very different, suggesting that the same result from different data enhance the external validity of the regression estimates.

Second, the regression estimates also suggest that industrial park lands toward the east (toward Brunswick, GA) and southwest (toward Tallahassee, FL) have higher sales prices than land on the west and north.[8] From an investment perspective, the Industrial Authority may wish to purchase land that is adjacent to current Industrial Authority sites in the Perimeter East, Perimeter West, Azalea East, and Lake Park Industrial Parks (if it can obtain a lower price per acre) to keep transactions costs low. [Transactions costs include the costs associated with showing available properties to potential clients, driving times, etc.] If lands adjacent to these industrial parks are not available for purchase, then these results support the purchase of large tracts of land on the west and northeast portions of Lowndes County where land prices may be lower and accessibility to Interstate 75 is easy. This reinforces the recommendation to purchase Parcels 1, 2, and 3 in Figure 2.

Third, as we expected, data suggest that businesses pay a positive premium for access to Interstate 75. In fact, manufacturing businesses have higher premium for interstate access (a .51 percent increase in sales price when the site is one percent closer to an Interstate 75 interchange) relative to service industries (a .35 percent increase in sales price when the site is one percent closer to an Interstate 75 interchange). Based on this information, the policy prescription is that the Industrial Authority should seek to purchase lands that are near an Interstate 75 interchange, but not necessarily adjacent to the interstate *and* further away from an interchange. This result also reinforces the recommendation to purchase Parcels 1, 2, and 3 in Figure 2.

Fourth, the results suggest that a one percent increase in the number of acres at a site corresponds to a 1.02 percent increase in price. This suggests that the Industrial Authority could experience a positive return on future land sales if it keeps its operating costs low. However, related to earlier discussion, the policy prescription is for the Industrial Authority to explore business attraction incentives other than "cheap land" to keep industrial land sales prices per acre in proportion with commercial land prices in the local market.[9]

Finally, the hedonic property value model suggests nothing about employment density in these new land parcel purchases to meet employment projections. However, given the current average jobs per acre of approximately seven as well as the increasing future demand for residential parcels, special consideration given to new businesses locating to Lowndes County that will increase the average employment density is suggested.

*Other Estimates*

The discussion of regression estimates suggests the general areas of Lowndes County in which the Industrial Authority should focus its land purchases. Now, data on employment densities will be used to prescribe the *number* of acres the Industrial Authority should purchase to meet the 2030 SGRDC employment and population projections.

The SGRDC projects that between 119,256 and 137,595 people will reside in Lowndes County by the year 2030. It also projects total employment in the year 2030 to be 82,868, which is disaggregated into Wholesale (1,676), Manufacturing (6,706), Retail (18,917), and Service (55,629) jobs.

The Long Range Transportation Plan suggests that total manufacturing growth in Lowndes County between 2003 and 2030 will be 1,787 jobs (page 7 of the Technical Process and Criteria for determining allocation and probable location of future developments in Lowndes County, Georgia). Assuming an extreme outcome (that all of these manufacturing jobs are absorbed into Industrial Authority assisted businesses), this suggests that the IA needs to purchase 198.5 acres (1787 jobs / 9 jobs per acre) to meet all of the projected manufacturing employment. Assuming a middle-of-the-road outcome (that half of these manufacturing jobs are absorbed into Industrial Authority assisted establishments), this suggests that the Industrial Authority needs to purchase 99.3 acres (893.5 jobs / 9 jobs per acre) to meet half of the projected manufacturing employment.[10]

For service businesses, the current employment density in industrial parks is seven jobs per acre. The projected growth in service industries by SGRDC is disaggregated into sectors. The sectors we consider here are 1) Transportation, Communication, and Public Utilities [TCU] and 2) Services (general). Further, we speculate that, in an extreme situation, all 675 jobs in TCU will be absorbed into the

industrial parks and one-eighth of the services jobs (10458 service jobs / 8 = 1,307 jobs). This seems to be a conservative assumption given the current number of employees in local industrial parks that work in service-oriented industries (2,631) versus manufacturing-oriented industries (2,300). Using these estimates, we compute the number of acres that will be required to meet service businesses as 283 acres (1,982 jobs / 7 jobs per acre). Of course, if other data suggest a different proportion of service jobs that would be absorbed into industrial parks, then those calculations can be computed easily. Fortunately, the Georgia Department of Labor's Local Area Profiles contain the data we need for these calculations. In Table 4 below, we show the relative percentages of manufacturing and service jobs in Lowndes County. Also, as expected, location quotient analysis shows the existence of a much higher concentration of manufacturing jobs in industrial parks compared to Lowndes County as a whole.[11]

**Table 4: Manufacturing and Service Establishment Comparisons**

| | |
|---|---|
| *Percentage of all Lowndes Co. Employees in Manufacturing* | 11.70 |
| *Percentage of all Lowndes Co. Employees in Service Industries* | 60.02 |
| *Percentage of all Industrial Park Employees in Manufacturing* | 46.64 |
| *Percentage of all Industrial Park Employees in Service Industries* | 53.35 |
| *Location Quotient - Manufacturing* | 3.984 |
| *Location Quotient - Service Industries* | 0.888 |
| *Sources: Georgia Department of Labor - Local Area Profiles; Industrial Authority; Author's calculations* | |

Therefore, naively assuming that historical trends in the demand for acreage remain the same, we would recommend the purchase of 600 acres to meet 2030 employment projections. However, changes in key personnel at the Industrial Authority

have resulted in fresh perspectives on business attraction, particularly the time spent recruiting new establishments instead of having them contact the Industrial Authority first. As Figure 3 below suggests, establishments locating to industrial parks in recent years have low jobs to acres ratios that may account for the low number of acres predicted to handle 2030 employment projections. So, given the high level of current interest in industrial land in Lowndes County (150 acres of the current 250 acres in inventory are likely to be leased to new clients in the next two years), which is a direct result of new recruiting efforts, it is recommended that the Industrial Authority purchase between 750 and 1000 acres immediately to build up inventory and to have on-hand several large parcels (at least 200 contiguous acres) for those clients with that kind of acreage needs. Then, if current demand for acreage remains strong, the Industrial Authority can re-evaluate its needs for more acreage in the next five years.

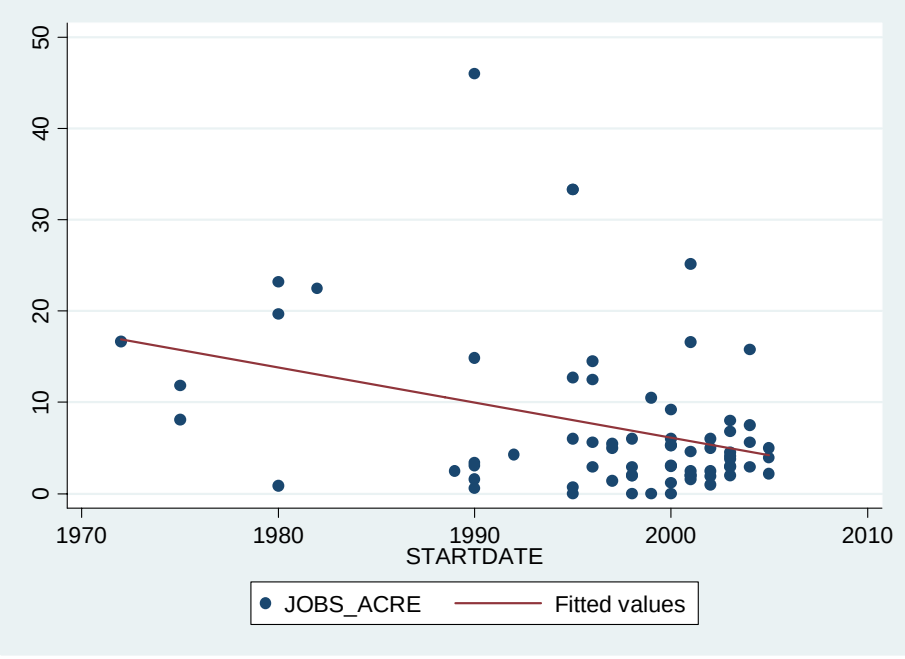



**Figure 3: Jobs per Acre over Time**

## Conclusion

The findings from this research are instructive to local governments and to policy researchers. First, this research is instructive to other local governments in that it shows how cooperation between policy researchers and local government officials can result in meaningful policy recommendations that will benefit the community and region. Data sharing between two different sections of local government (the Industrial Authority and SGRDC), coupled with statistical analysis provided by a policy researcher, produces two different approaches that, when combined, provide insight and policy recommendations for local government far beyond what each communicates individually. In other words, the community gains from gestalt compared to the individually coordinated efforts of these agencies.

Second, this research is instructive to policy researchers in that the view from the "ivory tower" is certainly enhanced when data and insight are provided by local government officials. The complementarities offered by the local government policy "lens" help to guide the overall research approach. The end result is the recommendation of specific policy changes based on multiple data sources and multiple empirical approaches, which enhances the external validity of such a study and provides a template that can be followed by other communities.

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[1] A very comprehensive article on the history of the literature on industrial parks is Peddle (1993).
[2] Recent anecdotal evidence provided by the Industrial Authority suggests that approximately ten potential employers over the last ten years were dissuaded from locating to Lowndes County because of a lack of large tracts of land (at least 200 contiguous acres). This information will be extremely useful as the Industrial Authority seeks new sources of funding from the Valdosta City Council and Lowndes County Board of Commissioners in 2007.
[3] The Industrial Authority database does not include the characteristics of the structures that occupy each parcel. Therefore, no structural characteristics are included in the regression models to be estimated.
[4] Solving the profit equation for R while introducing a satisfactory level of profits gives us the bid-rent function $R = (P*Q[X, L(Z)] - nX - \pi)/L(Z)$. In this case, the slope of the bid-rent function is negative and convex to the origin if land and non-land production factors are mutually substitutable inputs, irrespective of the type of good produced.
[5] The distances to cities such as Atlanta, Jacksonville, and Tallahassee are important to control for the impacts of major population centers that may demand the products produced by businesses located in industrial parks. These distances can be viewed as control variables used to estimate the spatial variation in parcel prices. However, not all of these variables in the present study significantly explain land prices in the empirical models.
[6] To address the concern of potential spurious correlation between the distance variables and the dependent variable, we re-scaled all distance variables so that the distance of an individual establishment to, say, any point outside the county stops at the Lowndes County line. This technique, used by Lipscomb and Farmer (2005) previously in residential hedonic models, essentially forces the effects of distance on sales price to equal zero at all points outside the county. The use of these re-scaled distance variables in preliminary runs of the hedonic regression model did not significantly change the coefficient estimates, which suggests that spurious correlation is not problematic. Separately, we used the variable interaction technique of Fik, Ling, and Mulligan (2003) to control for the influence of space on dwelling prices, which produced no significantly different results from the method used here.
[7] From a welfare economics perspective, we must not strictly interpret these coefficient estimates, particularly for the regression models for manufacturing and service industries only, due to so few observations. But, the direction of impact of these distances on the natural log of sales price is instructive.
[8] Of course, realize that only four businesses operate currently in the Hahira Business Park, suggesting that we cannot say anything definitive about land characteristics in the north end of the county.
[9] In the future, it may be beneficial to estimate the local economic impacts of Industrial Authority agreements with new businesses (impact of newly created jobs, indirect employment, etc.) and compare them to the economic impacts of allowing the lands to remain in the open commercial and industrial land markets.
[10] For benchmark purposes, four development authorities were contacted regarding their employment densities. They are the City of Pearson, Bainbridge-Decatur County, Thomaston-Upson County, and the Development Authority of Cherokee County, all in Georgia. These four authorities were selected at random from an Internet search. The maximum employment density (Cherokee County) was 10.3 whereas the minimum (City of Pearson) was less than one. Given the Industrial Authority of Lowndes County's average employment density of eight, one can argue that relatively speaking, the Industrial Authority of Lowndes County has done well at attracting industries that bring lots of jobs per acre of land consumed by the business.

[11] Here, following Isard *et al.* (1998), location quotients are calculated as $LQ_{ij} = \frac{share_{ij}}{share_{in}}$,

where $share_{ij}$ is the percent share of employment in industry classification *i* in the industrial parks (*j*); and $share_{in}$ is the percent share of industry *i* in the county (*n*). If the LQ > 1, then employment is more highly concentrated in the industrial parks than in the county.