Factors Affecting Residential Property Development Patterns

Authors

Abstract
This article is the winner of the Real Estate Development manuscript prize (sponsored by the Urban Land Institute) presented at the 2002 American Real Estate Society Annual Meeting.

This study uses a disaggregated data set, county property appraiser data, to track the number of new single-family housing units built in each section (square mile) of Alachua County, Florida by the year built over a twenty-year period. It explores the role of transportation, large-scale development, employment nodes, existing patterns of development and regulation on the spatial pattern of development. The results of the model suggest that the variables tested are important determinants of the growth pattern in Alachua County, but that much of the growth pattern is not explained by the explanatory variables employed in the model.

Factors Affecting Property Development Patterns

The pattern of residential development within the context of metropolitan growth and development has been the subject of an extensive literature. Among the streams of literature have been monocentric and policentric models, rent gradients and population density, and spatial mismatch and jobs/housing balance. Less examined have been the factors that determine the specific location of residential development from among the number of potentially suitable sites available. Textbook treatments (e.g., Miles et al., 2000; and Kone, 1994) of site selection suggest that factors that are important in locating a residential development include:

- Physical suitability for development: slopes, soils, hydrology, land availability
- Legal restrictions, government regulations (zoning and other land use controls)
- Existing land use patterns and location of other residential development
- Access, including proximity to interstate highways
Distance to employment sources
Distance to shopping
Availability of amenities (water, restaurants and shopping, golf, parks)
Neighborhood factors: age of surrounding housing stock, schools, crime

However, multiple sites may be suitable when evaluated across the range of criteria, yet one is developed. Further, development may move in a single direction or sector of a city although suitable sites are available in other areas. This suggests that certain factors may be more important than others in determining the location of new projects. McDonald and McMillan (2000: 136) note, “little is known about the spatial patterns of development because data is usually highly aggregated spatially.” This article uses a disaggregated data set, county property appraiser data, to track the number of new housing units built in each section (square mile) by the year built for Alachua County, Florida. Alachua County forms the metropolitan area for Gainesville. As the home of the University of Florida, it is an area with a defined employment node. It is also a significantly smaller city than has been the target of the limited research to date, allowing a focus on fewer locational variables, as it does not have a major airport, public transportation or a number of employment nodes. Alachua County also has a large-scale development, Haile Plantation, which may have had a major influence on the development pattern.

This article explores the role of transportation, large-scale development, employment nodes, existing residential development and regulation on the spatial pattern of development. As discussions turn to smart growth, compact development and the alleviation of sprawl, it is important to understand the forces that contribute to observed development patterns. Specifically, the growth pattern of single-family housing over the past twenty years is assessed.

Influences on Spatial Patterns of Development

McDonald and McMillan (2000) completed research that most directly impacts on this work. They studied the choice of development location for different forms of land use (industrial, commercial and residential) in the Chicago metropolitan area. For residential development, they found that proximity to commuter rail stations, highway interchanges and suburban employment nodes had negative effects on residential development. These variables were all specified as the inverse of distance to allow the marginal effect of each variable to decline rapidly. Distance to downtown and to O’Hare Airport also had negative and statistically significant coefficients. The authors conclude that residential development is more likely at greater distances from an interchange, and that commuter rail and employment subcenter have no effect on residential locations. As a result, the pattern of residential development is scattered. The results may reflect the already built-up nature of some sites, the high value of such sites and the negative
externalities associated with such sites as suitable residential location choices. Because of these negative externalities, households desire to locate where they have access to these locations but are not so close as to be negatively impacted by the externalities.

All cities and counties in Florida were required to prepare comprehensive plans as a result of the growth management legislation passed by the state in 1985. These plans attempt to guide and channel growth in the state and have as guiding principles the attainment of compact development and adequate infrastructure, with concurrency (the availability of adequate infrastructure before development) and urban service boundaries being among the implementation techniques. Observers of the implementation of concurrency in Florida suggest that a key problem with concurrency is that adequate transportation infrastructure was not available in the urban areas, and concurrency had the effect of causing development to move to fringe areas where new roads with capacity are available or less costly to build.

The cost effects of growth management have been explored, but the spatial impacts have not been as extensively explored. That growth controls raise housing prices appears to have been well established in the literature (Brueckner, 1991). Growth controls can have both direct and indirect effects on prices as they reduce the physical supply of land, restrict the development potential of sites or add to the costs of development (Friedan, 1979, 1982; and Dowall, 1984). Direct effects include increases in land costs as the supply of land available for development is limited, increases in lot preparation costs and shifting of development costs from the public to the project. Development costs are raised through fees, higher standards, required background studies and the time delays introduced to the process. As a result of growth controls, some developers may gain monopoly power as others leave the market, and other developers may reorient their activities toward different (i.e., higher cost) markets.

One of the variables examined in Alachua County is the influence of a major planned development, Haile Plantation, on development patterns. Haile Plantation has received recognition from a number of sources, including being one focus of a book on quality residential development (Ewing, 1996). Thorsnes (2000) discusses the effect of development size on the ability of a developer to internalize neighborhood externalities. Using empirical work conducted in the Portland metropolitan area, he finds that an additional acre added to a median size development increases the price of a lot by about 3%. Other studies of development size have been conducted that examine the relationship of house sales to private covenants, finding that houses in neighborhoods with covenants have price premiums (Speyer, 1989; Hughes and Turnbull, 1996). Alexandrakis and Berry (1994) find a premium for homes in master planned communities during economic upswings, but during downswings the premiums approximate the cost of providing additional amenities in such communities. Peiser (1984) found that
there were slightly higher net benefits to planned versus unplanned growth when he examined land development costs, transportation costs and social costs.

While there is a literature on the impact of large scale and planned development on house prices within those developments, the impact of such developments on surrounding property development has not been explored. Does a major planned development modify the path of development in an area by attracting further development?

**Gainesville and Alachua County**

Alachua County is in north central Florida and is the location of the University of Florida (see Exhibit 1). It has a population of about 225,000, with Gainesville being the seat of county government and having a population of about 95,000. The city has grown steadily over the past thirty years, and a major influence on its growth pattern has been Interstate 75. The interstate, built in the early 1970s, runs north/south through the county about seven miles west of downtown. The University is about two miles west of downtown and is the major employment center. Most affordable housing is located east of the university.

The State of Florida passed growth management legislation in 1985 that required all cities and counties in the state to prepare a comprehensive plan. Due dates for the plans were based on location in the state, with coastal counties and those in the southern portion of the state generally being the first jurisdictions required to complete a plan. Gainesville and Alachua County had due dates near the end of the required submission dates; their comprehensive plans were completed and approved in 1991. Florida’s growth management law is perhaps most well known for introducing concurrency. Concurrency is a form of adequate facilities ordinance that states that new development cannot be approved in an area if the development will drop the level of service on an element of the local infrastructure (roads, parks, water or sewer capacity) below a minimum level of service standard established in the plan. The greatest impact statewide has been limitations on new development along certain road segments due to traffic congestion. While Alachua County has several road segments that are congested, concurrency is not a factor in development patterns. However, there is a prevailing view that the regulatory and review process prior to the growth management law was more stringent in Gainesville than in unincorporated Alachua County, encouraging development in the county. After the comprehensive plans were adopted, the playing field might have leveled. The expectation in this study is that growth has experienced a continued out-movement from the core of the metropolitan area, and that growth restrictions have not impacted that movement.

The major employment node in the county is in the vicinity of the University of Florida, an area that includes the university, three hospitals and related commercial development. The proximity of this area to downtown, the government and entertainment center of the area, resulted in downtown and the university district
being treated as a single node of activity (regression results using both variables indicated the use of the single variable). Other major employment nodes in Gainesville and Alachua County are located at the interchanges of the interstate highway (I-75), of which there are five in the county. Smaller employment centers are located in the northwest portion of the city. The university’s research park is located about ten miles north of the campus, as is other commercial development that has been attracted by the city of Alachua.

Haile Plantation is a large scale planned development that provides a mix of housing types and has recently added a town center that provides office and commercial space. It is located southwest of the city, on a road known as Tower Road. The development encompasses approximately 1,500 acres, was begun in
1981, and had a population of over 4,000 in 1994 and probably well over 5,000 today. The projected population at build-out is 7,300 (Ewing, 1996). Adjacent to Haile Plantation are three relatively new schools, a neighborhood shopping center and a new park.

**Research Questions, Methodology and Data**

The fundamental research question is to explain the number of housing units built in each section (one square mile) in Alachua County in each five-year time period between 1981 and 2000. Thus, the dependent variable (*Built*) is the number of units built in each section in each of four time periods. The five-year increments allow smoothing of the data and enabled a simpler exposition of trends on maps. The set of explanatory variables are developed based on the above discussion. Of the total of 974 sections in the county, only 577 sections are included in the model. These are sections with at least one housing unit; a number of sections are not developed because of environmental restrictions. County property appraiser records are the primary source of data as they provide information on location and year built.

A time dummy (*Time*) is incorporated to reflect the four time periods (dummy variables are included for the second, third and fourth periods). This variable is designed to account for larger effects that impact the level of new home construction in the county over time. The level of new construction declined with each subsequent five-year period.

Explanatory variables include distances from downtown (*CBD*) and the interchanges of I-75 (*I-75 NODE*). These nodes are key employment locations and access points that would be expected to generate growth (there are five of these nodes labeled on Exhibit 1). Distance variables were also tested as polynomial (i.e., squared) and exponential (e.g., \(1/\text{DIST}\) and \(1/\text{DIST}^2\)), but the linear form proved most significant. The distance variables are expected to have a negative coefficient, as there would be less housing built as distance increases from the node.

The number of units at the beginning of the period (*DenTime1*, etc.) tests whether the extent of existing development in a section influences the likelihood of new residential development in the section. In other words, is there an inertia effect to development. This may be the result of existing developments continuing to build out, or the availability of infrastructure or services, or either reason. This variable would be expected to have a positive sign. It is interacted with the time variable to allow the inertia effect to vary over the time period.

A number of variables to represent housing value were tested, under the assumption that a value variable would reflect neighborhood effects. Low average property values are an indication of areas that are characterized by older, below average condition housing units. In Gainesville and Alachua County, the areas to the east of downtown have generally been the neighborhoods of greatest poverty.
However, if the goals of the comprehensive plan were to be achieved then an increase in growth in the low value inner sections would be expected. The variable (AFFORD) used was a dummy for sections with an average assessed value of $60,000 or less in current dollars.

As discussed, the city of Gainesville has historically been viewed as having more stringent growth regulations than Alachua County. However, after the adoption of growth management legislation in the state in 1985 and the adoption of a comprehensive plan in 1991 in both the city and the county, the regulatory environment in the county may more closely approximate that in the city. A dummy variable for location of a section in the city is included, and is interacted with the time dummy variable (GNVTime1, etc.). A negative coefficient is expected in time period one (1980–1985), possibly declining over time. If growth management leads to more compact growth then more development in Gainesville would be expected, and the sign would be positive after the adoption of growth management. Additional variables that are tested are the distance from Haile Plantation (HDIST) and a dummy variable for location in one of the sections that Haile encompasses (Haile).

The variables are as follows:

**Dependent Variable:**


**Independent Variables:**

*Time:* Dummy variables for time period;

*DenTime1, DenTime2, DenTime3, DenTime4* = Density (number of houses) at the beginning of the five-year period;

*I-75 NODE* = Distance from each section to the closest interstate node;

*CBD* = Distance from downtown business district;

*GNVTime1, GNVTime2, GNVTime3, GNVTime4* = Dummy variable for location in the city of Gainesville (about 10% of the sections) interacted with time period;

*AFFORD* = Dummy variable for sections with an average assessed value less than $60,000 (40% of sections);

*Haile* = Location in Haile Plantation; and

*HDIST* = Distance from Haile Plantation.

**Results**

Aggregating by year built for the four five-year periods finds that the total number of new housing units built in Alachua County has declined in each succeeding five-year period. From 5,641 new units in 1981–1985, the total declined to 4,708 in 1986–1990; 4,040 from 1991–1995; and 3,678 from 1996–2000. Almost 55% of all units (all sections with at least fifty new homes constructed) built in the 1996–2000 period were found in sixteen sections, with almost 21% in three sections. In 1991–1995, nineteen sections had more than fifty units built,
comprising 61% of all new units, and including two sections with 21% of the units built. The pattern was more dispersed in earlier years as twenty-six sections had greater than fifty new units built, comprising 63% of all new units. About 20% of the units were built in four sections during that period. Finally, twenty-eight sections had greater than fifty new units built, comprising 68% of all new units, in the 1980–1985 period. In that period, six sections had 32% of all new units. The growth pattern in the county is illustrated in Exhibits 2–5.

Exhibit 6 presents the results of three regression equations. The time variables are not significant in any of the specifications of the model, and are therefore not included in any of the reported results. The first result includes spatial variables (I-75NODE, CBD, AFFORD) and the density variables (DenTime1, . . .). All variable coefficients were of the expected sign and significant, but the overall explanatory power is low with an adjusted $R^2$ of .178. The second equation adds the Gainesville variable (GNVTime1, . . .) interacted with time to the equation. This variable coefficient is significant and of the expected sign in the first period.
In the next two periods, the coefficient estimate declines, as does the significance. However, in the final period the coefficient and significance increase, a result contrary to the expectation that the coefficient would decline as the county adopted more stringent growth management measures. The adjusted $R^2$ of the second model was .185, a marginal improvement over the first model.

The final model adds the Haile variables, Haile and HDIST. In this equation, all coefficients are again of the expected sign and are significant with the exception of the I-75 node (it is significant at a 10% level) and the second, third and fourth periods for the Gainesville variable. This equation has an adjusted $R^2$ of .251.

**Discussion**

The results of the model suggest that the variables tested are important determinants of the growth pattern in Alachua County, but that much of the growth pattern is not explained by the explanatory variables employed in the model.
The beginning of the period density is significant for each five-year period, but the coefficient declines with each successive period. This suggests that while inertia effects are important, the growth pattern of Alachua County has become more dispersed over the study period. This dispersion is also suggested by the data on growth by section discussed earlier.

The I-75 variable declines in significance when the Gainesville and Haile variables are added to the equation. The declining significance of the nodes variable (in the last equation, it is significant at the 10% level) may suggest that the nodes are important centers of economic activity but that the size of Gainesville and Alachua County may result in a number of locations being relatively accessible to those sites when other variables are taken into account.

The affordability variable maintains the same relative coefficient through the three models; the coefficient implies that growth occurs away from sections with lower average house values, as expected. The final variable in the first model, CBD, also remains significant and of the same relative magnitude through the three models.
This result shows then the importance of the main employment node in the pattern of growth in the county.

In the second model, the introduction of the variable to reflect location inside or out of Gainesville is of the expected sign in the first period, implying that growth occurs away from the regulatory environment in the city. However, in subsequent periods, after the adoption of the state’s growth management law and the adoption of comprehensive plans in the city and county, the coefficient remains negative and significance declines and is insignificant in the second and third periods. In the fourth period, the coefficient is a negative on the order of the first period and is significant. After the Haile variables are introduced in the third model, the Gainesville coefficient declines in magnitude and significance in the final period. The results imply that there was a pattern of growth occurring outside the city prior to 1985, after that period growth may still be marginally more likely outside the city but the playing field appears to have leveled somewhat. It is difficult from the results to draw a strong conclusion regarding the effects of growth management, but the pattern does appear to have shifted post-1985.
### Exhibit 6 | Results

<table>
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<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
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**Notes:** Model 1: Adjusted $R^2 = .1777$; Gainesville (Growth Management): Adjusted $R^2 = .1845$; and Haile Variables: Adjusted $R^2 = .2515$. 
The magnitude of Haile Plantation in the context of the size of the county and the attractiveness of living in the planned community environment explains the growth of the development itself, and therefore the strongly positive coefficient. The pulling effect of Haile on surrounding development is not strong but the coefficient does have the expected sign, indicating that Haile Plantation may have a marginal attractive power to other development.

The regression results show that the importance of existing density and location relative to I-75 have diminished in importance as factors in determining the extent of growth in Alachua County sections over succeeding five-year periods. The decline in the Gainesville coefficient after the first period suggests some movement of development back toward the city and moderately priced areas.

**Conclusion**

Factors expected to influence the course of development generally impact housing construction as expected. However, the explanatory power of the equations is low. The patterns that emerge and the coefficients of the explanatory variables suggest that past patterns have generally continued with some shift in the influence of the variables. The pattern of development has been influenced by the presence of a large-scale development in Alachua County.

The results provide limited evidence of the impact of growth management. It is difficult to conclude whether growth management has had a major influence on development, as the patterns that emerge and the coefficients of the explanatory variables suggest that past patterns have generally continued with some shift in the influence of variables. Observers of the implementation of concurrency in Florida suggest that a key problem with concurrency is that adequate transportation infrastructure was not available in the urban areas, and concurrency had the effect of causing development to move to fringe areas where new roads with capacity are available or less costly to build. This type of pattern is contrary to an overarching goal of growth management (and of more recent Smart Growth initiatives), the promotion of compact, higher density development as a means to reduce public facilities costs and address other negative impacts of sprawl.

**Endnote**

1 One type of growth management technique that has been studied and that is being used in Florida is the urban service boundary (USB). Although used in Florida, they are a weak control there because they are applied on a jurisdiction-by-jurisdiction basis. Several studies have examined the housing and land price effects of urban service boundaries and have generally found that USBs raise housing and land prices. These findings are consistent with the discussion of the housing price effects of growth management, which suggest that constraints on land supply increase prices. Much of the evidence on housing and land prices is from Oregon, but other studies have examined

References


