Does State Growth Management Change the Pattern of Urban Growth? Evidence from Florida

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Abstract

Do state growth management programs protect marginal environmental lands, and just as importantly, how would we know if they did? We evaluate growth management in Florida by using a regional adjustment model to explain changes in population and employment densities in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee during three five-year periods spanning 1982 through 1997. This paper innovates by showing how adjustment models provide a framework for testing the impact of land use regulation, allowing us to test the hypothesis that Florida's growth management program changed that state's development pattern. Population density changes in Florida counties are significantly different from the rest of the Atlantic Southeast. Within Florida, counties that were early growth management compliers had significantly different population growth patterns. The evidence suggests that Florida's growth management program is associated with higher population densities, and hence less land consumption. The evidence during the 1992-1997 period is primarily due to higher density population growth in the four largest and most urbanized counties in South Florida's environmentally sensitive Okeechobee Basin, which includes the Everglades.

Urban growth has clear impacts on the environment. The growth management movement in the United States had its genesis, in part, in efforts to control environmental externalities associated with land development (Bollens, 1993). In recent years, scientific advances have increased the list of possible environmental impacts from urban growth. Urban runoff creates water quality risks, including beach closures in urban areas. Increases in the size of a metropolitan area can be associated with changes in commuting patterns that in turn lead to increased vehicle emissions. Urban growth can lead to development pressure in sensitive habitats, leading to loss of wetlands, forest, and open space. The relationship between global warming and greenhouse gas emissions leads to questions both about the energy efficiency of low density urban development and also about possible loss of forest canopy to urban growth. Heat island effects associated with the urban development, while a nuisance at times, could create energy needs and, during heat waves, health risks in a period of global warming.

All of these impacts require careful science, and the purpose of this paper is not to assess the environmental case for growth management. Instead, we examine a related question. If governments wanted to alter the spatial pattern of urban growth, could they? There is little recent empirical evidence on this question, and the evidence that does exist is mixed. This paper innovates by using a regional adjustment model to specify testable hypotheses about whether the growth management program in Florida altered Florida's development pattern. As such, this research is as much about how to study land use regulations as it is about Florida.

I. Background: Growth Control, Growth Management, and Previous Research

State growth management programs date to the 1970s. Before that time, with the exception of Hawaii, municipal governments had largely unfettered authority to regulate land use. The early state attempts at growth managements were at times focused specifically on environmental impacts, although in many states the framework broadened to other development questions (Bollens, 1992 and 1993).

At approximately the same time as state growth management programs were developing, local growth control became a recognizable phenomenon. Glickfeld and Levine (1992) document several techniques used by California municipalities to restrict growth – often population growth – in their communities. As these two trends – growth management and growth control – evolved, the two became rather different. Growth controls were often a reaction to population growth (including growth in the metropolitan area surrounding the municipality) and constrained local ability to finance infrastructure associated with growth (Glickfeld and Levine, 1992). Growth management evolved to focus more on careful planning that on restricting growth (Bollens, 1992). While the two are not the same (e.g. Landis, 1992), both growth control and growth management touch on the general question of whether regulation can influence development patterns.

An earlier literature examined the effects of growth control. Landis (1992), in a comparison of seven paired growth-control and "pro-growth" cities in California using data from the 1980s, found little support for the idea that growth controls had an effect.

Landis (1992) reported that there was not consistent evidence for the propositions that growth control cities had slower population growth, added new housing at slower rates, or had faster increases in house prices, compared to both the "pro-growth" cities and, for housing starts, the expected share of county housing starts based on pre-growth control levels. Landis (1992) concludes that the growth control regulations in the seven study cities were "… largely irrelevant to the management of urban growth."

Glickfeld and Levine (1992) similarly found little evidence that local growth controls in California reduced residential or non-residential construction. Fischel (1991), on the other hand, cites considerable evidence that growth controls increase housing prices. While economic theory suggests that increased prices are a sign of reduced supply, the evidence on housing prices typically does not bring associated evidence on urban growth patterns or land consumption, leaving the question of the impact of local growth controls on land use patterns unsettled.

The local growth control programs, though, might not have been the best place to look for a regulatory effect. Some local programs were designed with loopholes (Landis, 1992), in part reflecting a mixed political consensus but in part reflecting the inherent difficulty of managing the problem of metropolitan growth on a municipal scale. Also, the details of the local programs varied from place to place and time to time (Glickfeld and Levine, 1992), and the state programs, some now two decades old, likely provide a more long-lived, stable framework to test regulatory impacts, while also providing larger sample sizes if, as we do here, one uses sub-areas (such as counties) of a state as the unit of analysis.

This paper evaluates growth management in Florida by examining its relationship to spatial patterns of economic development in the Atlantic Southeast region between 1982 and 1997. The analysis uses a regional adjustment model—a dynamic, two-equation structural model that accounts for interaction between population and employment in the growth process—to determine regional characteristics that are associated with equilibrium densities of people and jobs county-by-county in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee in 1987, 1992, and 1997. Dummy variables (defined later in this paper) are used to test whether the adjustment process in Florida is significantly different from the other six states in the Atlantic Southeast. The study period covers three critical stages in the evolution of Florida's growth management program: The trailing years of the original (1975) Local Government Comprehensive Planning Act; the (1985) adoption of the Florida State Comprehensive Plan and Growth Management Act; and an ensuing 12 years of implementation and revision of that legislation. The regional adjustment model allows us to examine whether the adjustment process worked differently in Florida during these three stages of statewide planning, and whether there is there evidence of incremental change over the three five-year time periods that can be attributed to policy differences related to Florida's growth management program.

II. Florida's Growth Management Program

The timeframe of the research presented in this paper, 1982 – 1997, covers the final years of the 1975 Local Government Comprehensive Planning Act, the 1985 adoption of the Florida State Comprehensive Plan and Growth Management Act, and an additional 12 years after the more rigorous revised program was put into effect. Table 1 outlines this sequence of events, along with additional steps prior to, during, and just after the 15-year window of the study period.

As in other first wave growth management states, Florida's involvement in land use planning grew out of the environmental movement of the late 1960s and early 1970s. In 1972, an increased consciousness of land use issues led to the formation of the original Environmental Land Management Study Committee (ELMS I) and then to the adoption of the Environmental Land and Water Management Act, which protected state-designated critical areas and regulated developments of greater-than-local limpact. Next, in 1975, the second ELMS committee was formed and the Local Government Comprehensive Planning Act, which required local governments to develop land use plans, was adopted. This law was oriented toward process, not substance, however, so while plans were in place statewide by the end of the decade (DeGrove 1992) it was largely an inchoate response to rapid growth and extensive land consumption. Nearly 10 years later, in 1984, on the recommendation of ELMS II, the State and Regional Planning Act was adopted, creating an integrated framework for state, regional, and local planning. As an outgrowth of this step, in 1985, the State Comprehensive Plan was adopted along with the Growth Management Act, which established a formal requirement that local plans be in step with regional plans and, in turn, with the state plan. This tightly integrated framework, which requires horizontal, internal, and vertical consistency and mandates concurrency between infrastructure and land development led one pair of researchers to the conclusion that "Florida has literally put it all together" (Burby and May 1997).

The time periods analyzed in this study also coincide well with the important "carrot" and "stick" offerings to local governments mandated by the Growth Management Act of 1985. The carrot, which primarily consisted of both financial and technical support, included over $36 million in planning-specific funding for local governments between 1985 and 1993 (Burby and May 1997). The "stick" used by the State of Florida to persuade local governments to comply with statewide planning goals consists of withholding other sources of funding, such as shared-tax revenues provided by the state legislature. This sanction was implemented in 1989 and continues to be an essential bartering tool for the state (Burby and May 1997). Before those innovations, the previous growth policy, enacted in 1975, placed little emphasis on substance (DeGrove 1992), so it is possible that there were no spatial effects during the 1982-1987 time period. If the enhanced funding, technical support, and enforcement had an early effect, one might expect an impact on Florida growth patterns during the 1987-1992 time period. If, on the other hand, the enhanced funding, support, and enforcement had an effect that was realized with a lag, the growth pattern in Florida would most noticeably differ from the Atlantic Southeast in the last time period in our study, 1992-1997. Overall, we expect that any "Florida effect" in growth patterns would be more evident in later time periods in our data. The time pattern of changes in Florida's growth management regime provide an ability for both cross-sectional tests (Florida compared to the rest of the Atlantic Southeast) and time series comparisons of the adjustment model over the three five-year periods.

Finally, the 1990s witnessed the formation of ELMS III and several reevaluations of and minor adjustments to the state's growth management program, but no changes that have significantly altered the overall approach. Detailed expositions of the history summarized here are contained in DeGrove (1992), Bollens (1992, 1993), Gale (1992), and Burby and May (1997).

Despite the extensive effort put toward growth management in Florida, previous evaluations have revealed mixed results at best. For example, in a comparative analysis involving 14 states nationally, including five with state-based land use policy frameworks, Carruthers (2002) finds that that state's planning mandate may actually contribute to increased land consumption. This result is consistent with earlier research pointing to Florida's concurrency requirements, combined with a failure to increase road capacity that works as a cause of leapfrog development and urban sprawl (Porter 1997; Blanco 1998; Nichols and Steiner 2000). It may also be a consequence of the widespread variation in the degree to which local governments follow state mandated guidelines—and, ultimately, selective use of appropriate coercive mechanisms (Deyle and Smith 1998). Other studies, such as those by Nelson (1999) and Kline (2000), find that Florida has limited sprawl when compared to other non-growth management states, such as neighboring Georgia. For these reasons, the questions motivating the present analysis remain wide open.

III. Research Approach and Model

We use a lagged adjustment model of regional growth, fit on county data, to test the hypothesis that the Florida growth management plan changed the pattern of adjustment to equilibrium. The dependent variables are population density (persons per acre) and employment density (jobs per acre), where both density variables are defined based on developed land, using data on developed land from the U.S. Department of Agriculture's National Resources Inventory, which tracks developed land at five year intervals. The empirical model examines density changes across the five-year intervals, from 1982-1987, 1987-1992, and 1992-1997. Because the dependent variables are persons or jobs per acre of developed land, the empirical model examines the spatial pattern of development. In particular, we can test hypotheses about whether Florida's growth management program is associated with changes to higher or lower densities, the speed of such changes, and thus the association between the growth management program and the transition of undeveloped or agricultural land into urban uses controlling for population and employment growth.

Before proceeding to the full model, some discussion of urban growth theory is important. Broadly speaking, there are two perspectives on urban growth – a disequilibrium and an equilibrium perspective. Both perspectives can be based on models of individual actors, in this case residents and firms, maximizing (respectively) utility and profit in part by choosing their location in an urban area. In equilibrium, residents have equal utility at all locations and firms earn the same profit at all locations; the possibility of utility or profit increasing moves is not present in the long-run equilibrium, as all utility-increasing (for residents) or profit-increasing (for firms) moves have been made. If the metropolitan space-economy is in long-run equilibrium, a regression of, for example, population levels and employment levels on location-specific characteristics would be a common empirical framework. First differencing such a specification would lead to a model that regresses changes in the dependent variable on changes in the independent variables. If, on the other hand, the economy is in disequilibrium, and so counties adjust to (for example) population and employment densities slowly over time, regressing changes in the dependent variables on lagged levels of the independent variables is common. Both of these two types of specifications are grounded in theory, and for examples of the theory that underlies the equilibrium viewpoint, see e.g. Roback (1982), while for an example of the theoretical underpinnings of the disequilibrium model see, e.g., Carlino and Mills (1987) or Boarnet (1994a and 1994b). For a recent discussion of the two approaches, see, e.g., Henderson (2006).

We use a disequilibrium model of urban growth in this research, for two reasons. First, past research has found evidence that metropolitan population and employment patterns adjust to long-run equilibrium with a lag that, given available measures of adjustment speed, appears to be on the order of one to three decades. (For a summary of estimates of adjustment speed in regional adjustment models, see Boarnet, Chalermpong, and Geho, 2005, Table 1.) Second, the Florida growth management program, if it influenced growth patterns, would change either the equilibrium or the speed of adjustment to a pre-existing equilibrium, and so would be a disequilibrium phenomenon.

We also note that regional adjustment models incorporate elements of the equilibrium approach, since regional adjustment models can be specified to have both lagged levels and changes of some variables on the right-hand side. The change variables appear when the initial theoretical model posits interaction between units of geography. The interaction could be complementarities between county economies created through, for example, commuting patterns (see, e.g., Boarnet 1994a and 1994b) or more general patterns of complementarities or substitution through, for example, the geographic concepts of development spread or backwash (see, e.g., Henry, Barkley, and Bao, 1997). Such adaptations require a spatial econometric approach, and while we do not present results of spatial econometric regressions here, such extensions are possible and common with the regional adjustment framework.

Regional adjustment models were first developed by Steinnes and Fisher (1974), and popularized by Carlino and Mills (1987), with spatial econometric extensions developed by Boarnet (1994a and 1994b). Different versions of this modeling framework have been used for analyses of growth at the metropolitan (Steinnes and Fisher 1974; Mills and Price 1984; Boarnet 1994a, 1994b; Bollinger and Ihlanfeldt 1997; Boarnet et al. 2005), sub-national (Steinnes 1977; Duffy-Deno 1998; Vias 1999; Vias and Mulligan 1999; Henry et al. 1997, 1999, 2001; Carruthers and Vias 2003), and national (Carlino and

Mills 1987; Mills and Lubuele 1995; Clark and Murphy 1996; Deller et al. 2001; Glavac et al. 1999; Mulligan et al. 1999; Liechenko 2001; Carruthers and Mulligan 2004, 2005) scales. Regional adjustment models have been used for policy analysis on questions that include the impact of rail transit on employment growth (Bollinger and Ihlanfeldt, 1997), modeling sprawl in the Rocky Mountain region (Carruthers and Vias, 2005), the effect of military base closure on local economies (Poppert and Herzog, 2003), and the link between large plant location and employment growth (Edmiston, 2004).

Following Carlino and Mills (1987) and Boarnet (1994a and 1994b), population and employment levels in counties are assumed to follow the equilibrium relationships shown below.

$$Pd_{i,t}^{*} = f(ICP_{i,t-1}, Ed_{i,t}^{*}) \quad (1a)$$

$$Ed_{i,t}^{*} = g(ICE_{i,t-1}, Pd_{i,t}^{*}) \quad (1b)$$

Where Pd = population density
Ed = employment density
ICP = initial conditions that influence county population density
ICE = initial conditions that influence county employment density

Note that the IC vector will vary across the population and employment density relationships, as reflected in the development of the model below.

* denotes equilibrium values, "i" indexes counties, "t" indexes time periods

Densities are assumed to adjust to their equilibrium levels with a lag, following the process shown below.

$$\Delta Pd_{i,t} = Pd_{i,t} - Pd_{i,t-1} = \lambda_p (Pd^*_{i,t} - Pd_{i,t-1}) \quad (2a)$$

$$\Delta Ed_{i,t} = Ed_{i,t} - Ed_{i,t-1} = \lambda_e (Ed^*_{i,t} - Ed_{i,t-1}) \quad (2b)$$

where,

$Pd_{i,t}$ = actual population in county *i* at time *t*;
$Pd_{i,t-1}$ = actual population density in county *i* at time *t-1*;
$Pd^*_{i,t}$ = equilibrium population density in county *i* at time *t-1;*

employment densities are defined in a similar fashion, and λ_p and λ_e represent the adjustment parameters with λ_p and $\lambda_e \in [0, 1]$. Substituting linear versions of (1a) and

(1b) into (2a) and (2b), and expanding the representation of initial conditions into different vectors of variables, yields[1]

$$\Delta Pd_{i,t} = Pd_{i,t} - Pd_{i,t-1} = \gamma_0 + X_t\gamma_1 + Y_t\gamma_2 + \gamma_3 Ed^*_t - \lambda_p Pd_{t-1} + u \qquad (3a)$$

$$\Delta Ed_{i,t} = Ed_{i,t} - Ed_{i,t-1} = \delta_0 + X_t\delta_1 + Z\delta_2 + \delta_3 Pd^*_t - \lambda_e Ed_{t-1} + v \qquad (3b)$$

The vectors are defined as follows:

X = a vector of characteristics that affect the equilibrium population and employment densities in Atlantic Southeast counties;

Y = a vector of characteristics that affect only population density in Atlantic Southeast counties;

Z = a vector of characteristics that affect only the equilibrium employment density in Atlantic Southeast counies;

u and v are error terms.

In the equations (3a) and (3b), population and employment equilibriums are not observable characteristics. Using algebraic manipulations of equations (2a) and (2b), however, it is possible to substitute these equilibriums with observable densities. Rearranging equations (2a) and (2b) yields:

$$Pd^*_{i,t} = Pd_{i,t-1} + \frac{1}{\lambda_p}(Pd_{i,t} - Pd_{i,t-1}), \qquad (4a)$$

$$Ed^*_{i,t} = Ed_{i,t-1} + \frac{1}{\lambda_e}(Ed_{i,t} - Ed_{i,t-1}), \qquad (4b)$$

Substitution of (4a) and (4b) into (3a) and (3b) yields the specification:

$$\Delta Pd_{i,t} = Pd_{i,t} - Pd_{i,t-1} = \gamma_0 + X_t\gamma_1 + Y\gamma_2 + \gamma_3\, Ed_{i,t-1} + \frac{\gamma_3}{\lambda_e}(Ed_{i,t} - Ed_{i,t-1})$$

$$- \lambda_p Pd_{t-1} + u \qquad (5a)$$

[1] For a more complete discussion of this model, see Boarnet (1994a and 1994b) or Boarnet, Chalermpong, and Geho (2005).

$$\Delta Ed_{i,t} = Ed_{i,t} - Ed_{i,t-1} = \delta_0 + X_t\delta_1 + Z\delta_2 + \delta_3\, Pd_{i,t-1} + \frac{\delta_3}{\lambda_p}(Pd_{i,t} - Pd_{i,t-1})$$

$$- \lambda_e Ed_{t-1} + v \qquad (5b)$$

Following the methodology of Carlino and Mills (1987) and Boarnet (1994), the final step is to lag all of the initial conditions and exogenous variables to the base year to assist with identifying the system, which gives the complete specification of:

$$\Delta Pd_{i,t} = \gamma_0 + X_{t-1}\gamma_1 + Y_{t-1}\gamma_2 + \gamma_3\, Ed_{i,t-1} + \frac{\gamma_3}{\lambda_e}(Ed_{i,t} - Ed_{i,t-1})$$

$$- \lambda_p Pd_{t-1} + u \qquad (6a)$$

$$\Delta Ed_{i,t} = \delta_0 + X_{t-1}\delta_1 + Z_{t-1}\delta_2 + \delta_3\, Pd_{i,t-1} + \frac{\delta_3}{\lambda_p}(Pd_{i,t} - Pd_{i,t-1})$$

$$- \lambda_e Ed_{t-1} + v. \qquad (6b)$$

The variables λ_p and λ_e are the fraction of the gap between equilibrium and actual levels that are closed in a time period, or a speed of adjustment.[2] (Give the availability of the NRI data, each time period is five-years in the empirical model.) Our hypothesis is that the Florida growth management regime changed the speed of adjustment, which we test by interacting dummy variables for Florida counties with the adjustment parameters, λ_p and λ_e. A test of the significance of that interaction term tests the hypothesis that the adjustment process in Florida differs from the rest of the Atlantic Southeast. We then expand the definition of the dummy variables to represent only Florida counties that were early and aggressive compliers with the growth management regime, to test the hypothesis that those counties' adjustment process differed from the Atlantic Southeast region.

IV. Data

The variables used to implement the model in equations (6a) and (6b) are listed in Table 2, with descriptive statistics. The dependent variables are population and employment density changes during the three time periods, 1982-1987, 1987-1992, and 1992-1997. The density variables are constructed from population and employment data, by county, available from the U.S. City and County Data Book and the U.S. Bureau of Economic Activity (BEA) County Business Patterns, and from measures of developed land area in the county from the National Resources Inventory (NRI).

[2] Note that we do not enforce the full parameter restrictions implied by the regression model, and instead only estimate the adjustment parameter from the coefficient on the lagged values of population and employment density. For a discussion of this issue, see Boarnet, Chalermpong, and Geho (2005).

The NRI data are based on a national survey of over 800,000 land use sample points, conducted in five year intervals in 1982, 1987, 1992, and 1997. For each sample point, land use characteristics were inferred from remote sensing data, aerial photographs, or site visits. The result yields information on developed land in each county, which is the denominator in the density variable. For more information on the NRI, see Nusser and Goebel (1997) and U.S. Department of Agriculture (2000).

Planning data for the State of Florida used in this paper was acquired from Mr. Ray Eubanks, the Plan Review Administrator for the Division of Community Planning of the Department of Community Affairs. The data set contains detailed information on the first round plan review outcomes, which includes dates of first submission and approval status, and the inclusion of optional plan elements for all cities and counties in the State of Florida.

Other data used in the analysis was acquired from publicly released data sets. County government fiscal variables can be obtained from the bi-decadal U.S. Census of Governments (COG) data sets, for the years 1982, 1987, and 1992. Criminal activity data can be acquired from the U.S. FBI yearly report on crime via the U.S. City and County Data Book. Employment data categorized by one-digit SIC codes are from County Business Patterns. The urban, suburban, exurban codes were constructed from U.S. Census Beale codes. The amenity score is from the U.S. Department of Agriculture, and is constructed by combining six measures of climate, typography, and water area that measure warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area. See http://www.ers.usda.gov/Data/NaturalAmenities/.

V. Results

The key explanatory variables are the adjustment parameters, which, in the population density change regression, are the coefficients on lagged (or base year) population density and the coefficients on the interaction terms between base year population density and the Florida dummy variable, dummy variables for compliance status and status of the optional education element in the county, and a modified compliance variable. These variables are shown below:

Population Density Change Regression:

> Popdenp (base year population density): negative of the coefficient on this variable is the adjustment parameter, λ_p
>
> Florida: dummy variable, = 1 if county is in Florida, 0 otherwise
>
> Florida*Popdenp: coefficient on this variable plus coefficient on Popdenp is adjustment parameter for Florida counties

Compliance1: dummy variable, = 1 if county was in compliance with state growth management requirements (including growth management plan approved) by 1994

Florida*Popdenp*Compliance1: coefficient on this variable plus coefficients on Popdenp and Florida*Popdenp is adjustment parameter for complying counties in Florida

Education: dummy variable, = 1 if county was in compliance and filed an optional education element, as a proxy for planning that went beyond minimum state requirements

Florida*Popdenp*Education: coefficient on this variable plus coefficients on Popdenp and Florida*Popdenp is adjustment parameter for counties that filed optional educational element in Florida

Compliance2: the percentage of county population living in jurisdictions that complied (including approved growth management plan) by 1994

Compliance2 is an alternate measure of compliance, and is interacted in the same fashion as Compliance1

Note that the structure of the model in equations (6a) and (6b) implies that the negative of the coefficients on base year population (employment) density, plus the negative of the coefficients on the interaction terms, is the adjustment parameter. We did not mention this sign change in each step of the variable definitions above, but it is implied throughout. When examining the coefficients, a negative coefficient implies a positive adjustment parameter and vice versa. Negative adjustment parameters (i.e. positive coefficients on the lag parameter) are not consistent with a model that is dynamically stable, and so raise specification issues discussed in Boarnet, Chalermpong, and Geho (2005).[3] For those reasons, we will focus our attention on models that yield positive adjustment parameters.

These variables allow step-wise tests, first of the hypothesis that the adjustment process in Florida differs from the adjustment process in the Atlantic Southeast (a test of the significance of the coefficient on Florida*Popdenp) and then tests of the hypothesis that any Florida difference is due to counties that complied with the growth management plan, where compliance is measured by Compliance1, Compliance2, and Education. For examples of how these key variables are added sequentially to the model, see the regression results in Tables 3 – 8.

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[3] Technically, having at least one positive adjustment parameter in the two equation system is a necessary condition for dynamic stability. A formal test for dynamic stability requires solving for the roots of the characteristic equation resulting from reduced form regressions, see, e.g. Boarnet, Chalermpong, and Geho (2005) or Carlino and Mills (1987). To allow easier interpretation, common practice in this literature has been to focus on the necessary condition that at least one adjustment parameter should be positive, and to more generally focus on sign of all adjustment parameters.

A similar set of interaction variables is used for the employment density change equation, in that case interacting the variables with base year employment density. The Compliance1, Compliance2, and Education variables are from the Florida Department of Community Affairs, as described in Section IV.

Before going further, some discussion of the Compliance1 and Compliance2 variables is necessary. Compliance1 indicates whether the county government growth management plan was approved, but municipalities within a complying county may or may not have approved growth management plans. Compliance2 addresses that by taking a population weighted average of the compliance status of all jurisdictions in the county. We believe it is unclear which variable should be preferred. The key issue is compliance for jurisdictions that control developable or soon-to-be developed land. In some cases, that might be primarily the county government (if growth is mostly occurring in unincorporated areas), and in those cases Compliance1 would better measure the growth management program as it applies to new development. If, on the other hand, most new development is under municipal rather than county control, Compliance2 would be preferred. Because further analysis would be required to assess where developable land is in relation to jurisdictions, here we report tests with both variables. The Education variable only applies to the county.

Descriptive statistics for all variables are shown in Table 2. Regression results are shown in Tables 3-8, with summary results for the key adjustment parameters in Tables 9-13. Tables 9-13, which summarize the key variables of interest from the regressions shown in Tables 3-8, are our primary focus.

From looking at Tables 9-13, first note that that the adjustment process for the employment density equation gives ambiguous results – the adjustment parameters for employment are all statistically insignificant, and the interaction terms in the employment equation are also all statistically insignificant.[4] One possible conclusion is that the employment density adjustment process is not fully specified by the current regression model, and another conclusion is that no inference can be made about the equilibrium adjustment of employment densities.[5] In short, we cannot conclude that the growth management program changed employment density patterns. On the other hand, there is a clear pattern for population density. For that reason, we focus attention on population density. We note that a reasonable expectation is that growth management more likely affected population densities than employment densities; most growth management programs have their origins in concerns about population growth, not employment growth. Thus a focus only on population density can give insights into Florida's program.

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[4] The employment regression results reported in Tables 4, 6, and 8 use the number of multi-family building permits as an instrument for population change. Out of concern that the number of multi-family building permits in the base year is potentially endogenous, we also ran regressions without that variable as an instrument. The results, in terms of sign and significance, were unchanged.

[5] See Boarnet, Chalermpong, and Geho (2005) for evidence that adding independent variables can yield measurements of adjustment parameters that imply dynamic stability, while sparse models with fewer independent variables can suggest a dynamically instable adjustment process.

Looking at the summary tables, Tables 9-13, some patterns emerge. The adjustment parameter for the Atlantic Southeast (the coefficient on base year population density, labeled λ in Tables 9-13), is approximately 0.2. Approximately twenty percent of the gap between equilibrium and actual population densities is closed in each five-year period, implying a process that takes about 25 years to converge to equilibrium. This is consistent with past research, which has found convergence speeds of 10 to 30 years (Boarnet, Chalermpong, and Geho, 2005).

The Florida interaction variable is always significantly positive, in all time periods, implying that the adjustment process in Florida is slower than the Atlantic Southeast. There is a clear "Florida effect", but is that due to the growth management program or to other (unmeasured) factors? To address this question, we look at the models with interaction variables for Compliance1, Education, and Compliance2.

In the 1982-1987 time period, the interaction variables for Compliance1, Education, and Compliance2 are all insignificant, suggesting that whatever is causing Florida's population density adjustment process to differ from the Atlantic Southeast, it is not related to our measures of state growth management compliance. Note that we do not expect significant Compliance1, Education, and Compliance2 variables in the 1982-1987 time period, since those variables show compliance status as of the early 1990's. Including the variables in the 1982-1987 time period is a robustness test, to confirm that the variables do not proxy for time-invariant, unmeasured characteristics of the counties, but instead are associated with the planning process, and the insignificant results for those variables in 1982-1987 provide some assurance along those lines.

Looking at the last time period, 1992-1997, the Compliance1 interaction variable is significantly positive, but when the Education interaction variable is added the Compliance1 variables becomes insignificant while Education is significant. This suggests that independent of the "Florida effect", counties that complied with the state growth management plan had slower adjustment toward equilibrium, and the effect is driven by the counties that filed the optional education planning element. The Compliance2 variable is not significant.

Both compliance variables are insignificant in the 1987-1992 time period, but Education remains significant. If the significance of the Education variables in the 1987-1992 time period is meaningful, that would imply that the optional education element was indicative of a careful planning process, and that the counties that filed the optional education element were "early compliers" with the spirit of the enhanced growth management requirements of the 1984 ELMS II law and the 1985 State Comprehensive Planning Act. While this is possible, we note that the evidence on this question, based on the existing regression analysis reported in this paper, is indirect and not conclusive.

The Education variable becomes insignificant in the 1987-1992 time period when the number of multi-family building permits in 1987 is added to the population density model. We do not report those regression results, out of concern that with foresight on the part of local planners, multi-family building permits in the base year could be endogenous to later growth. Yet we note that the number of 1987 multi-family building permits is correlated with adopting the optional education element in the early 1990s (r = 0.83), a result that is not surprising. Places that have rapid population growth and strong planning appeared to both permit multi-family dwellings in the late 1980s and be early filers of the optional education element, which focuses on planning for school and school construction. While not unexpected, this does hint at some specification questions that we discuss more fully later.

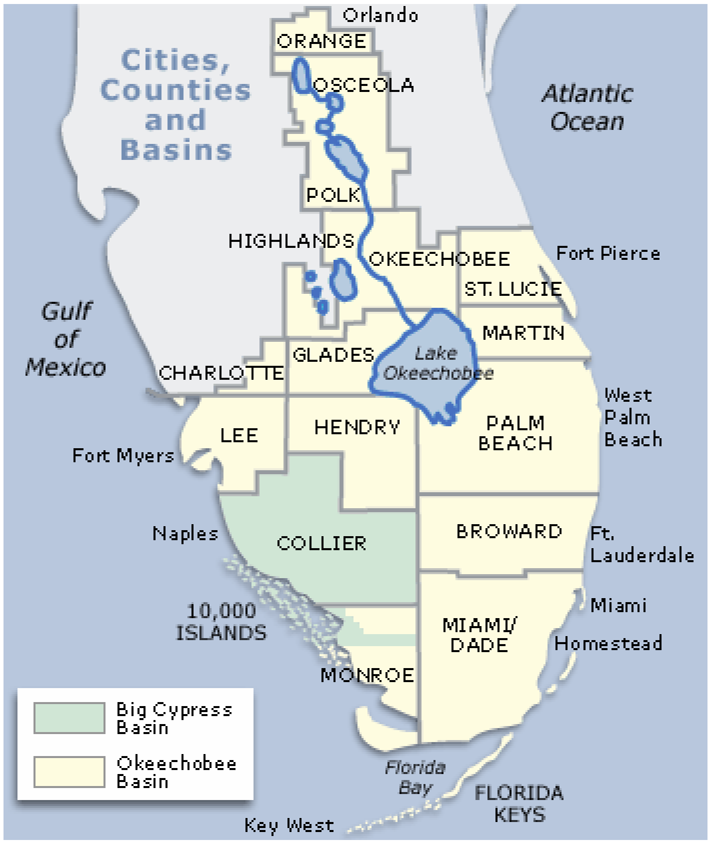
The results are in some ways driven by counties that filed optional education elements. Only four counties filed those elements, suggesting that the evidence on the effect of the growth management plan is in part driven by outliers. Yet an examination of those outliers gives an intriguing result. The four counties that filed education elements are listed in Table 14.

Table 14
Counties in Okeechobee Basin, sorted by 1997 population

County	pop97	Education Element
DADE	2,158,352	yes
BROWARD	1,522,179	yes
PALM BEACH	1,069,718	yes
ORANGE	829,072	yes
POLK	463,519	no
LEE	410,841	no
COLLIER	220,923	no
ST. LUCIE	184,633	no
OSCEOLA	153,082	no
CHARLOTTE	134,959	no
MARTIN	120,279	no
HIGHLANDS	84,334	no
MONROE	80,925	no
OKEECHOBEE	34,030	no
HENDRY	33,962	no
GLADES	9,789	no

The four counties that filed the education element – Dade (or Miami/Dade), Broward, Palm Beach, and Orange, are the four largest counties in the environmentally sensitive Okeechobee Basin. The Okeechobee Basin is shown in Figure 1, below.

Figure 1: Counties in Okeechobee Basin



Source: South Florida Water Management District, http://www.sfwmd.gov/site/index.php?id=777.

One interpretation is that the four counties that drive the growth management portion of the "Florida effect" are the counties that were large, urbanized, growing, and in key environmentally sensitive areas that would have, in part, inspired the Florida growth management program. There is some evidence that the population density adjustment process slowed in Broward, Dade, Orange, and Palm Beach Counties. Whether that slowing is due to the growth management regime or other factors is still unclear. Our interpretation is that currently the results are consistent with the hypothesis that the growth management regime had an impact, but there are currently too many unresolved specification issues to draw a firm conclusion.

Lastly, we note that in the 1992-1997 time period, 78 percent of Florida's population lived in counties that were adjusting to a lower population density equilibrium.[6] Thus a slower adjustment process is a slower change to lower densities. If the evidence suggests

[6] The gap between equilibrium and observed population density is derived by calculating the equilibrium population density for each county using equation 4a, and subtracting the observed population density in 1992. Note that, given that λ_p is positive, the sign of the gap between equilibrium and actual population density is the same as the sign of the gap between 1997 (observed) and 1992 (observed) population density.

that Florida's growth management program influenced population densities, that influence was to slow what was, for 78 percent of persons living in Florida in 1992-1997, a trend toward population deconcentration. The evidence does not suggest that absolute population densities increased in Florida, but instead that the move toward lower densities slowed in ways that might be associated with the growth management program.

VI. Conclusion and Directions for Future Research

The evidence suggests a clear "Florida effect". Population deconcentration (measured by changes in densities) was slower in Florida than the rest of the Atlantic Southeast. Was that due to the growth management legislation? Here the evidence is suggestive but not conclusive. Complying counties showed an even slower adjustment speed than other Florida counties (for population density), but questions about measurement and specification require additional research.

Below we list key areas for future research.

- Measuring growth management compliance: Complying with both the letter and the spirit of the state's growth management legislation is a key concept. We have suggested variables that can measure compliance, but further research is needed to understand how well those variables correspond to local planning activity. Another measurement issue, also vital, is to better assess planning activity that applies to developable and re-developable land, as that is the planning that is most relevant for changes in density.

- Quality of the instruments: A fundamental issue for regional adjustment models is the validity of the instruments for the endogenous variables, in this case population and employment density. All variables other than population and employment density were lagged to the base year of each time period, but questions of foresight, and hence instrument validity, remain. Past research has used overidentification tests of instrument validity (e.g. Boarnet, Chalermpong, and Geho, 2005 and Boarnet, 1994a and 1994b), and we suggest using similar tests here.

- Measuring land supply: Land supply would, presumably, be a constraining factor related to density change, and one might imagine that counties with little available land could also be counties with careful planning. We included the number of acres in agriculture in each county as a control variable in early research, but that variable was always insignificant and did not change other results, so those specifications are not report here. Future research should include better measures of the supply of developable land.

- Better tests of whether growth management protected environmentally sensitive lands: The dependent variables in this study were population and employment densities, which can address the broad question of whether growth patterns changed. Yet future research should examine more directly whether environmentally sensitive lands were protected. In concept, lower density growth could be consistent with protection of environmentally sensitive land. Stated differently, not all land is the same when the goal is environmental protection. Future research should examine methods for classifying land based on environmental impacts from development, and then examine how growth management influences development on environmentally sensitive land.

Overall, there is a need for much additional research on this topic. Planners' tools have long been suggested as methods for environmental protection, and many land use controls have their roots in concepts of environmental regulation. Yet we still know little about the effectiveness of land use regulation in changing growth patterns and protecting environmentally sensitive land from development. A key difficulty is determining the counter-factual – what would have happened absent land use regulation? This paper argues that one method for determining that counter-factual, and hence for researching land use controls, is to adapt regional adjustment models as has been done here. Certainly that is not the only possible empirical approach, but the results suggest that adjustment models can play a role in studying the impacts of land use regulation.

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Table 1: Timeline of State Growth Management in Florida

1972	ELMS I – adoption of the *Environmental Land and Water Management Act*
1975	ELMS II – adoption of the *Local Government Comprehensive Planning Act*
1984	Adoption of the *State and Regional Planning Act*
1985	Adoption of the *Florida State Comprehensive Plan* and *Growth Management Act*
1991	ELMS III – Growth Management added to the *Florida State Comprehensive Plan*
1994	Evaluation of the *Florida State Comprehensive Plan*
1998	Re-evaluation of the *Florida State Comprehensive Plan*

Source: Growth Management Study Commission, http://www.floridagrowth.org.

Table 2: Descriptive Statistics

1982-1987

Variable	Obs	Mean	Std. Dev.	Min	Max
PopDenChange (persons/developed acres)	616	-0.19	0.38	-3.79	0.89
EmpDenChange (employees/developed acres)	616	0.00	0.17	-1.16	0.76
EmpDen T-1	616	0.93	0.70	0.10	10.39
PopDen T-1	616	2.26	1.15	0.41	12.06
Amenity	616	0.46	1.42	-2.93	6.05
Urban	616	0.29	0.46	0	1
Suburban	616	0.29	0.45	0	1
Exurban	616	0.30	0.46	0	1
Expenditure/Pupil ($1,000)	615	2.10	0.84	0.24	15.17
GenRevenue/Person (dollars)	616	818.44	264.88	65.00	4323.00
DirectExpen/Person (dollars)	616	797.96	0.09	55.00	4957.00
TotTax/Person ($1,000)	616	0.20	0.09	0.02	0.73
PropertyTax/Person ($1,000)	616	0.15	0.08	0.01	0.67
ViolentCrm/Person (incidents/Persons)	590	2.81E-03	2.70E-03	0	0.02
PropertyCrm/Person (incidents/persons)	590	0.02	0.02	0.00	0.09
Income/Person (dollars)	616	8022.18	1551.10	4851.00	15440.00
Percent Black	616	0.25	0.19	0.00	0.84
Percent White	616	0.75	0.19	0.15	1.00
Percent Manufacturing	581	0.43	0.18	0.02	0.88
Percent FIRE	524	0.05	0.02	0.01	0.28
Percent Retail	603	0.20	0.07	0.01	0.56
Percent Services	614	0.15	0.08	0	0.64

1987-1992

Variable	Obs	Mean	Std. Dev.	Min	Max
PopDenChange (persons/developed acres)	616	-0.16	0.30	-4.41	0.92
EmpDenChange (employees/developed acres)	616	-0.05	0.26	-5.81	0.48
EmpDen T-1	616	0.93	0.72	0.10	10.83
PopDen T-1	616	2.07	0.99	0.33	9.09
Amenity	616	0.46	1.42	-2.93	6.05
Urban	616	0.29	0.46	0	1
Suburban	616	0.29	0.45	0	1
Exurban	616	0.30	0.46	0	1
Expenditure/Pupil ($1,000)	616	3.08	0.92	0.62	10.61
GenRevenue/Person (dollars)	616	1175.42	423.16	130.00	5639.00
DirectExpen/Person (dollars)	616	1125.98	446.68	119.00	6736.00
TotTax/Person ($1,000)	616	0.30	0.14	0.04	1.31
PropertyTax/Person ($1,000)	616	0.22	0.12	0.01	1.12
ViolentCrm/Person (incidents/Persons)	586	3.20E-03	3.05E-03	0	0.02

PropertyCrm/Person (incidents/persons)	586	0.03	0.02	0.00	0.11
Income/Person (dollars)	616	11222.05	2343.35	6504.00	23111.00
Percent Black	616	0.24	0.19	0.00	0.85
Percent White	616	0.75	0.19	0.14	1.00
Percent Manufacturing	581	0.39	0.17	0.02	0.91
Percent FIRE	563	0.05	0.03	0.01	0.49
Percent Retail	612	0.21	0.07	0.00	0.49
Percent Services	616	0.17	0.08	0	0.56

1992-1997

Variable	Obs	Mean	Std. Dev.	Min	Max
PopDenChange (persons/developed acres)	616	-0.18	0.21	-1.53	0.54
EmpDenChange (employees/developed acres)	616	-0.04	0.15	-1.97	1.61
EmpDen T-1	616	0.88	0.58	0.08	5.02
PopDen T-1	616	1.91	0.86	0.33	7.86
Amenity	616	0.46	1.42	-2.93	6.05
Urban	616	0.29	0.46	0	1
Suburban	616	0.29	0.45	0	1
Exurban	616	0.30	0.46	0	1
Expenditure/Pupil ($1,000)	615	4.53	3.74	0.20	86.72
GenRevenue/Person (dollars)	616	1614.96	554.92	218.00	6096.00
DirectExpen/Person (dollars)	616	1574.70	558.09	221.00	5766.00
TotTax/Person ($1,000)	616	0.45	0.21	0.07	1.70
PropertyTax/Person ($1,000)	616	0.32	0.19	0.02	1.55
ViolentCrm/Person (incidents/Persons)	590	4.52E-03	3.98E-03	0	0.02
PropertyCrm/Person (incidents/persons)	590	0.03	0.02	0.00	0.11
Income/Person (dollars)	616	14824.32	2868.21	9346.00	31406.00
Percent Black	616	0.29	0.68	0.00	15.60
Percent White	616	0.91	2.18	0.01	44.22
Percent Manufacturing	581	0.37	0.17	0.02	0.89
Percent FIRE	524	0.04	0.02	0.01	0.14
Percent Retail	612	0.22	0.07	0.02	0.48
Percent Services	616	0.21	0.10	0	0.74

Table 3: Regression Results for County Population Density Change, 1982-1987

Variable	FL Dummy	Fl Dummy Compliance1	Fl Comp1 + Education	FL + Compliance2	Fl + Comp2+Education
EmpDenChange*	1.182151 (6.67)	1.195034 (6.66)	1.168836 (6.85)	1.19472 (6.79)	1.182827 (7.19)
EmpDen T-1	.0546106 (1.55)	.0528088 (1.49)	.048618 (1.35)	.054889 (1.57)	.0518664 (1.47)
Amenity	-.0095134 (-1.22)	-.0093634 (-1.18)	-.0094406 (-1.20)	-.0097797 (-1.24)	-.0095372 (-1.23)
Urban	.0111181 (0.30)	.0095434 (0.26)	.0107244 (0.29)	.0106172 (0.29)	.0118862 (0.32)
Suburban	-.0186212 (-0.54)	-.018496 (-0.53)	-.0196822 (-0.56)	-.0184353 (-0.53)	-.0184268 (-0.53)
Exurban	-.0147238 (-0.44)	-.0145085 (-0.44)	-.0152794 (-0.46)	-.0144051 (-0.44)	-.0143499 (-0.43)
Expenditure/Pupil	-.001297 (-0.09)	-.0011931 (-0.08)	-.000713 (-0.05)	-.0009353 (-0.07)	-.0004456 (-0.03)
GenRevenue/Person	-.0000225 (-0.45)	-.0000229 (-0.45)	-.0000237 (-0.47)	-.0000239 (-0.48)	-.0000247 (-0.49)
DirectExpen/Person	.0000232 (0.67)	.0000228 (0.66)	.000023 (0.66)	.0000236 (0.69)	.0000241 (0.70)
TotTax/Person	-.5098588 (-2.14)	-.5026785 (-2.08)	-.5114328 (-2.10)	-.5033024 (-2.11)	-.5188447 (-2.16)
PropertyTax/Person	.4174213 (1.79)	.4083642 (1.74)	.4140014 (1.75)	.4068658 (1.75)	.4163575 (1.78)
ViolentCrm/Person	-3.749445 (-0.81)	-3.8654 (-0.84)	-4.2882 (-0.92)	-3.719318 (-0.81)	-4.061666 (-0.88)
PropertyCrm/Person	.840073 (1.03)	.8255967 (1.02)	.9645368 (1.17)	.8320178 (1.03)	.9479272 (1.15)
Income/Person	.0000224 (2.51)	.0000225 (2.48)	.0000234 (2.58)	.0000218 (2.46)	.0000222 (2.52)
Percent Black	.3814266 (1.16)	.3843619 (1.17)	.3820782 (1.15)	.3849268 (1.17)	.3835171 (1.16)
Percent White	.179784 (0.55)	.1805398 (0.55)	.1791706 (0.54)	.183099 (0.56)	.1827208 (0.56)
Pop Den T-1	-.1952269 (-10.11)	-.1931859 (-10.18)	-.1940987 (-10.27)	-.193912 (-10.11)	-.1944937 (-10.27)
FL*PopDen T-1	.0648634 (4.65)	.0667705 (4.08)	.0630727 (3.71)	.071449 (4.30)	.066724 (3.81)
FL*PopDen T-1*Comply	-	-.0187892 (-0.46)	-.0252459 (-0.62)	-	-
FL*PopDen T-1*Education	-	-	.028048 (0.91)	-	.0257518 (0.84)
FL*PopDen T-1*Comply2	-	-	-	-.0342489 (-0.95)	-.0348305 (-0.96)
R^2	0.8347	0.8361	0.8337	0.8363	0.8354
adj R^2	0.8284	0.8295	0.8267	0.8297	0.8284
N	492	492	492	492	492
*Denotes Endogenous Variable					
Percent employment in manufacturing, FIRE, retail, and services are used as instruments.					

Table 4: Regression Results for County Employment Density Change, 1982-1987

Variable	FL Dummy	Fl Dummy Compliance1	Fl Comp1 + Education	FL + Compliance2	Fl + Comp2+Education
PopDenChange*	.3605493 (4.01)	.3699133 (4.07)	.3904178 (3.47)	.3594068 (3.95)	.3725658 (2.73)
PopDen T-1	-.074683 (-0.34)	-.0231858 (-0.14)	-.1076548 (-0.57)	-.0887424 (-0.39)	-.2232645 (-0.80)
Amenity	-.0022456 (-0.24)	-.0035955 (-0.60)	7.66e-06 (0.00)	-.001746 (-0.19)	.0036962 (0.36)
Urban	.0433561 (0.47)	.0225379 (0.32)	.0584677 (0.74)	.0488765 (0.52)	.1036603 (0.90)
Suburban	-.0226351 (-0.52)	-.0304833 (-0.97)	-.0133777 (-0.38)	-.0203521 (-0.47)	.0040334 (0.08)
Exurban	-.0303957 (-1.19)	-.0326525 (-1.52)	-.0265243 (-1.05)	-.0297137 (-1.14)	-.0215068 (-0.63)
Expenditure/Pupil	-.0114498 (-1.11)	-.0107475 (-1.12)	-.0122512 (-1.07)	-.0116469 (-1.08)	-.0128021 (-0.86)
GenRevenue/Person	.0000171 (0.33)	.0000247 (0.62)	.0000126 (0.27)	.0000151 (0.29)	-7.27e-06 (-0.11)
DirectExpen/Person	-.0000376 (-1.57)	-.0000359 (-1.75)	-.0000403 (-1.66)	-.0000382 (-1.55)	-.0000448 (-1.36)
TotTax/Person	.0533564 (0.09)	.1907902 (0.41)	-.0454053 (-0.09)	.0148788 (0.02)	-.3527539 (-0.46)
PropertyTax/Person	-.0658489 (-0.17)	-.1527628 (-0.48)	-.0124536 (-0.03)	-.0417975 (-0.10)	.1771115 (0.34)
ViolentCrm/Person	-7.238112 (-0.83)	-5.504542 (-0.92)	-8.413037 (-1.24)	-7.735211 (-0.87)	-12.824 (-1.19)
PropertyCrm/Person	-.2577758 (-0.16)	.0574003 (0.05)	-.6253673 (-0.53)	-.352048 (-0.22)	-1.324512 (-0.74)
Income/Person	-3.28e-06 (-0.18)	5.44e-07 (0.04)	-8.11e-06 (-0.61)	-4.26e-06 (-0.24)	-.0000156 (-0.81)
Percent Manufacturing	-.1256996 (-0.89)	-.0939108 (-0.76)	-.1492767 (-1.06)	-.1340412 (-0.90)	-.2103895 (-1.11)
Percent FIRE	.2353575 (0.31)	.3706864 (0.73)	.070353 (0.13)	.197487 (0.26)	-.2380146 (-0.28)
Percent Retail	-.2250486 (-1.09)	-.2506601 (-1.83)	-.2030191 (-1.28)	-.2167319 (-1.06)	-.1158344 (-0.46)
Percent Services	-.0021433 (-0.01)	.0303582 (0.21)	-.0288761 (-0.18)	-.0110064 (-0.06)	-.0996545 (-0.43)
Emp Den T-1	.1278918 (0.57)	.2244222 (0.78)	.2697372 (0.94)	.1644735 (0.67)	.2137794 (0.85)
FL*EmpDen T-1	.025622 (0.68)	.0324169 (0.78)	.0421876 (0.95)	.0269027 (0.71)	.0390204 (0.92)
FL*EmpDen T-1*Comply	-	.0632466 (1.12)	.0609948 (1.02)	-	-
FL*EmpDen T-1*Education	-	-	'-.0256195 (-0.74)	-	-.0262254 (-0.78)
FL*EmpDen T-1*Comply2	-	-	-	.0310303 (0.61)	.0169663 (0.28)
R^2	0.7003	0.755	0.6493	0.6809	0.38
Adj R^2	0.6866	0.7432	0.6315	0.6654	0.3485
N	456	456	456	456	456
*Denotes Endogenous Variable					
Percent Black population, percent White population, and number of mulitfamily building permits are used as instruments.					

Table 5: Regression Results for County Population Density Change, 1987-1992

Variable	FL Dummy	Fl Dummy Compliance1	Fl Comp1 + Education	FL + Compliance2	Fl + Comp2+Education
EmpDenChange*	1.413966 (5.69)	1.407431 (5.69)	1.253807 (4.98)	1.419236 (5.73)	1.245827 (4.91)
EmpDen T-1	.1499449 (5.42)	.1518426 (5.53)	.1355281 (4.87)	.1501776 (5.43)	.1333067 (4.75)
Amenity	.0003565 (0.07)	.0003435 (0.07)	.0009279 (0.18)	.0003975 (0.08)	.0008993 (0.18)
Urban	.0419666 (1.53)	.0428333 (1.56)	.0517767 (1.89)	.0417378 (1.52)	.0517057 (1.88)
Suburban	.016126 (0.69)	.0164149 (0.71)	.0212735 (0.92)	.0159989 (0.69)	.0213691 (0.92)
Exurban	.0128695 (0.57)	.0130371 (0.58)	'.0166814 (0.74)	.0127941 (0.57)	.0167609 (0.74)
Expenditure/Pupil	-.0050235 (-0.44)	-.0051653 (-0.45)	-.0083319 (-0.73)	-.0048749 (-0.43)	-.0085939 (-0.75)
GenRevenue/Person	.0000113 (0.44)	.0000111 (0.44)	7.41e-06 (0.29)	.0000115 (0.45)	7.02e-06 (0.28)
DirectExpen/Person	.0000257 (1.30)	.000026 (1.31)	.0000277 (1.40)	.0000257 (1.29)	.0000276 (1.40)
TotTax/Person	-.1680436 (-1.60)	-.1755686 (-1.67)	-.2150338 (-2.04)	-.1690784 (-1.60)	-.209228 (-1.98)
PropertyTax/Person	.1594475 (1.45)	.1672344 (1.51)	.2000391 (1.80)	.1600608 (1.45)	.194954 (1.76)
ViolentCrm/Person	2.347987 (0.73)	2.425807 (0.75)	1.814173 (0.57)	2.339578 (0.73)	1.742198 (0.54)
PropertyCrm/Person	-.3974438 (-0.67)	-.3888223 (-0.65)	-.0471086 (-0.08)	-.3962195 (-0.66)	-.0458917 (-0.08)
Income/Person	.0000116 (2.89)	.0000114 (2.86)	.0000119 (2.98)	.0000116 (2.89)	.000012 (2.99)
Percent Black	-.1951808 (-0.79)	-.1991148 (-0.81)	-.2523064 (-1.03)	-.1937954 (-0.79)	-.2534598 (-1.03)
Percent White	-.23559 (-0.96)	-.237642 (-0.97)	-.2832875 (-1.16)	-.2341537 (-0.95)	-.2856697 (-1.17)
Pop Den T-1	-.1645833 (-9.09)	-.1665268 (-8.99)	-.1737802 (-9.34)	-.1643961 (-9.11)	-.1728813 (-9.51)
FL*PopDen T-1	.0440958 (4.54)	.0415363 (4.19)	.0290103 (2.77)	.0434301 (3.82)	.0312394 (2.66)
FL*PopDen T-1*Comply	-	.0095131 (0.75)	.0071638 (0.57)	-	-
FL*PopDen T-1*Education	-	-	0.040849 (3.30)	-	.0417067 (3.35)
FL*PopDen T-1*Comply2	-	-	-	.0027474 (0.11)	-.0019053 (-0.08)
R^2	0.7812	0.7815	0.7844	0.7811	0.7839
adj R^2	0.7733	0.7732	0.7757	0.7727	0.7752
N	517	517	517	517	517
*Denotes Endogenous Variable					
Percent employment in manufacturing, FIRE, retail, and services are used as instruments.					

Table 6: Regression Results for County Employment Density Change, 1987-1992

Variable	FL Dummy	Fl Dummy Compliance1	Fl Comp1 + Education	FL + Compliance2	Fl + Comp2+Education
PopDenChange*	.3605493 (4.01)	.3699133 (4.07)	0.3904178 (3.47)	.3594068 (3.95)	.3725658 (2.73)
PopDen T-1	-.074683 (-0.34)	-.0231858 (-0.14)	-.1076548 (-0.57)	-.0887424 (-0.39)	-.2232645 (-0.80)
Amenity	-.0022456 (-0.24)	-.0035955 (-0.60)	7.66e-06 (0.00)	-.001746 (-0.19)	.0036962 (0.36)
Urban	.0433561 (0.47)	.0225379 (0.32)	.0584677 (0.74)	.0488765 (0.52)	.1036603 (0.90)
Suburban	-.0226351 (-0.52)	-.0304833 (-0.97)	-.0133777 (-0.38)	-.0203521 (-0.47)	.0040334 (0.08)
Exurban	-.0303957 (-1.19)	-.0326525 (-1.52)	-.0265243 (-1.05)	-.0297137 (-1.14)	-.0215068 (-0.63)
Expenditure/Pupil	-.0114498 (-1.11)	-.0107475 (-1.12)	-.0122512 (-1.07)	-.0116469 (-1.08)	-.0128021 (-0.86)
GenRevenue/Person	.0000171 (0.33)	.0000247 (0.62)	.0000126 (0.27)	.0000151 (0.29)	-7.27e-06 (-0.11)
DirectExpen/Person	-.0000376 (-1.57)	-.0000359 (-1.75)	-.0000403 (-1.66)	-.0000382 (-1.55)	-.0000448 (-1.36)
TotTax/Person	.0533564 (0.09)	.1907902 (0.41)	-.0454053 (-0.09)	.0148788 (0.02)	-.3527539 (-0.46)
PropertyTax/Person	-.0658489 (-0.17)	-.1527628 (-0.48)	-.0124536 (-0.03)	-.0417975 (-0.10)	.1771115 (0.34)
ViolentCrm/Person	-7.238112 (-0.83)	-5.504542 (-0.92)	-8.413037 (-1.24)	-7.735211 (-0.87)	-12.824 (-1.19)
PropertyCrm/Person	-.2577758 (-0.16)	.0574003 (0.05)	-.6253673 (-0.53)	-.352048 (-0.22)	-1.324512 (-0.74)
Income/Person	-3.28e-06 (-0.18)	5.44e-07 (0.04)	-8.11e-06 (-0.61)	-4.26e-06 (-0.24)	-.0000156 (-0.81)
Percent Manufacturing	-.1256996 (-0.89)	-.0939108 (-0.76)	-.1492767 (-1.06)	-.1340412 (-0.90)	-.2103895 (-1.11)
Percent FIRE	.2353575 (0.31)	.3706864 (0.73)	.070353 (0.13)	.197487 (0.26)	-.2380146 (-0.28)
Percent Retail	-.2250486 (-1.09)	-.2506601 (-1.83)	-.2030191 (-1.28)	-.2167319 (-1.06)	-.1158344 (-0.46)
Percent Services	-.0021433 (-0.01)	.0303582 (0.21)	-.0288761 (-0.18)	-.0110064 (-0.06)	-.0996545 (-0.43)
Emp Den T-1	.0590685 (0.55)	.1653027 (0.83)	.1314844 (0.73)	.056046 (0.50)	.0273824 (0.27)
FL*EmpDen T-1	.008087 (0.44)	.0161626 (0.62)	.0143795 (0.61)	.0094167 (0.51)	.0087584 (0.50)
FL*EmpDen T-1*Comply	-	.0161626 (0.62)	.051713 (1.14)	-	-
FL*EmpDen T-1*Education	-	-	-.0114029 (-0.60)	-	-.0158909 (-1.01)
FL*EmpDen T-1*Comply2	-	-	-	-.0106522 (-0.29)	-.0148512 (-0.42)
R^2	0.7003	0.755	0.6493	0.6809	0.38
adj R^2	0.6866	0.7432	0.6315	0.6654	0.3485
N	456	456	456	456	456

*Denotes Endogenous Variable. Percent Black population, percent White population, and number of mulitfamily building permits are used as instruments.

Table 7: Regression Results for County Population Density Change, 1992-1997

Variable	FL Dummy	Fl Dummy Compliance1	Fl Comp1 + Education	FL + Compliance2	Fl + Comp2+Education
EmpDenChange*	1.429924 (11.99)	1.409743 (11.86)	1.353438 (11.27)	1.414042 (11.68)	1.353982 (10.99)
EmpDen T-1	.2242538 (9.54)	.2303728 (9.77)	.2313389 (9.97)	.2247709 (9.58)	.2317609 (10.04)
Amenity	-.0095614 (-2.16)	-.0096743 (-2.20)	-.0088945 (-2.06)	-.0095912 (-2.17)	-.0089219 (-2.07)
Urban	.0067853 (0.31)	.007486 (0.34)	.0101857 (0.47)	.0071884 (0.33)	.0102907 (0.48)
Suburban	.0208446 (1.01)	.0199311 (0.97)	.0183987 (0.91)	.020659 (1.00)	.0185735 (0.92)
Exurban	-.0002771 (-0.01)	-.0010622 (-0.05)	-.0020408 (-0.10)	-.0002124 (-0.01)	-.0018394 (-0.09)
Expenditure/Pupil	.0005557 (0.46)	.000706 (0.59)	.0006526 (0.55)	.0006151 (0.51)	.0006843 (0.58)
GenRevenue/Person	-.0000716 (-2.55)	-.0000719 (-2.57)	-.0000677 (-2.46)	-.000072 (-2.56)	-.0000681 (-2.47)
DirectExpen/Person	.0000551 (2.05)	.0000553 (2.07)	.0000502 (1.90)	.0000558 (2.07)	.0000506 (1.92)
TotTax/Person	-.1399696 (-2.19)	-.1516242 (-2.38)	-.1567711 (-2.49)	-.1445612 (-2.26)	-.1588041 (-2.53)
PropertyTax/Person	.1135317 (1.71)	.1259105 (1.90)	.1294949 (1.98)	.1219419 (1.83)	.1330642 (2.03)
ViolentCrm/Person	-2.733091 (-1.39)	-2.711688 (-1.39)	-2.277076 (-1.19)	-2.866498 (-1.46)	-2.338478 (-1.22)
PropertyCrm/Person	-.4909514 (-1.11)	-.4416133 (-1.00)	-.4158933 (-0.95)	-.4781717 (-1.08)	-.414132 (-0.95)
Income/Person	-2.50e-06 (-0.94)	-2.61e-06 (-0.99)	-2.55e-06 (-0.98)	-2.30e-06 (-0.87)	-2.50e-06 (-0.96)
Percent Black	-.0031197 (-0.17)	-.0059042 (-0.33)	-.0070367 (-0.40)	-.0042984 (-0.24)	-.0076632 (-0.44)
Percent White	.0011462 (0.19)	.0021408 (0.36)	.0022664 (0.38)	.0017077 (0.28)	.0025627 (0.43)
Pop Den T-1	-.2091478 (-13.22)	-.2153285 (-13.16)	-.2212418 (-13.59)	-.210937 (-13.24)	-.2216641 (-13.69)
FL*PopDen T-1	.0408026 (4.30)	.0348773 (3.79)	.0352845 (3.89)	.0356307 (3.58)	.0327577 (3.39)
FL*PopDen T-1*Comply	-	.0256675 (2.06)	-.0027569 (-0.20)	-	-
FL*PopDen T-1*Education	-	-	.0719254 (3.67)	-	.0679427 (3.93)
FL*PopDen T-1*Comply2	-	-	-	.0301669 (1.25)	.0118505 (0.50)
R^2	0.7578	0.7609	0.7687	0.7591	0.7688
adj R^2	0.7492	0.7519	0.7595	0.75	0.7596
N	524	524	524	524	524
*Denotes Endogenous Variable					
Percent employment in manufacturing, FIRE, retail, and services are used as instruments.					

Table 8: Regression Results for County Employment Density Change, 1992-1997

Variable	FL Dummy	Fl Dummy Compliance1	Fl Comp1 + Education	FL + Compliance2	Fl + Comp2+Education
PopDenChange*	.5894038 (6.46)	.5863347 (6.04)	.6620122 (4.86)	.5922427 (6.16)	.6739998 (5.06)
PopDen T-1	-.0598225 (-0.43)	-.1264308 (-0.69)	-.1443448 (-0.79)	-.0842014 (-0.55)	-.1038381 (-0.66)
Amenity	-.0024863 (-0.65)	-.0039707 (-0.82)	-.0037537 (-0.69)	-.0028174 (-0.69)	-.0025908 (-0.55)
Urban	.0278407 (0.71)	.0422173 (0.86)	.049931 (0.99)	.0335188 (0.78)	.0419047 (0.93)
Suburban	-.0110837 (-0.62)	-.0089249 (-0.42)	-.0064551 (-0.28)	-.0099025 (-0.51)	-.0073166 (-0.33)
Exurban	-.0081685 (-0.49)	-.0090094 (-0.47)	-.0073335 (-0.33)	-.0080318 (-0.46)	-.0063119 (-0.31)
Expenditure/Pupil	-.0002319 (-0.24)	-.0000665 (-0.06)	-.0001739 (-0.13)	-.0002042 (-0.20)	-.0003173 (-0.26)
GenRevenue/Person	4.15e-06 (0.12)	-8.44e-06 (-0.20)	-.0000112 (-0.25)	-4.72e-07 (-0.01)	-3.35e-06 (-0.08)
DirectExpen/Person	-.000021 (-0.93)	-.000017 (-0.63)	-.000018 (-0.59)	-.0000195 (-0.81)	-.0000208 (-0.74)
TotTax/Person	-.0438059 (-0.38)	-.0974373 (-0.64)	-.1052739 (-0.68)	-.0632322 (-0.49)	-.0718879 (-0.54)
PropertyTax/Person	.0561895 (0.44)	.1126761 (0.68)	.1286994 (0.76)	.0789917 (0.56)	.0954444 (0.65)
ViolentCrm/Person	.6775111 (0.43)	.5476979 (0.30)	.9089072 (0.42)	.6125181 (0.36)	1.027038 (0.51)
PropertyCrm/Person	-.5450334 (-0.59)	-.809544 (-0.74)	-1.092515 (-0.95)	-.679006 (-0.67)	-.9793438 (-0.91)
Income/Person	-3.64e-06 (-0.65)	-5.70e-06 (-0.82)	-7.51e-06 (-1.04)	-4.32e-06 (-0.72)	-6.32e-06 (-0.98)
Percent Manufacturing	-.0968645 (-1.57)	-.108326 (-1.47)	-.1081419 (-1.30)	-.0983868 (-1.49)	-.0985315 (-1.30)
Percent FIRE	.1024586 (0.25)	-.0018301 (-0.00)	-.1028813 (-0.20)	.0535758 (0.12)	-.0549267 (-0.11)
Percent Retail	.2287338 (0.82)	.32003 (0.95)	.3834467 (1.11)	.2691104 (0.89)	.3378929 (1.07)
Percent Services	-.1327116 (-1.21)	-.1660139 (-1.24)	-.1948425 (-1.35)	-.1432866 (-1.22)	-.1749319 (-1.35)
Emp Den T-1	.1278918 (0.57)	.2244222 (0.78)	.2697372 (0.94)	.1644735 (0.67)	.2137794 (0.85)
FL*EmpDen T-1	.025622 (0.68)	.0324169 (0.78)	.0421876 (0.95)	.0269027 (0.71)	.0390204 (0.92)
FL*EmpDen T-1*Comply	-	.0632466 (1.12)	.0609948 (1.02)	-	-
FL*EmpDen T-1*Education	-	-	-.0256195 (-0.74)	-	-.0262254 (-0.78)
FL*EmpDen T-1*Comply2	-	-	-	.0310303 (0.61)	.0169663 (0.28)
R^2	0.4462	0.2484	0.0365	0.3722	0.1659
adj R^2	0.4237	0.2164	-0.0066	0.3454	0.1286
N	515	515	515	515	515

*Denotes Endogenous Variable, Percent Black population, percent White population, and number of mulitfamily building permits are used as instruments.

Table 9: Summary of Adjustment Parameters, Florida interaction variable

	1982-1987		1987-1992		1992-1997	
Coefficient	Pop	Emp	Pop	Emp	Pop	Emp
λ	-.195227 (-10.11)	.1278918 (0.57)	-.164583 (-9.09)	.0590685 (0.55)	-.209149 (-13.22)	.1278918 (0.57)
FL interaction	.0648634 (4.65)	.025622 (0.68)	.0440958 (4.54)	.008087 (0.44)	.0408026 (4.30)	.025622 (0.68)
Comply interaction						
Educ interaction						
Comply (2) interaction						
Educ /w Comply (2) interaction						

t-statistics below coefficients in parentheses

Table 10: Summary of Adjustment Parameters, Florida interaction variable and Compliance interaction variable

	1982-1987		1987-1992		1992-1997	
Coefficient	Pop	Emp	Pop	Emp	Pop	Emp
λ	-.193186 (-10.18)	.2244222 (0.78)	-.166527 (-8.99)	.1653027 (0.83)	-.215329 (-13.16)	.2244222 (0.78)
FL interaction	.0667705 (4.08)	.0324169 (0.78)	.0415363 (4.19)	.0161626 (0.62)	.0348773 (3.79)	.0324169 (0.78)
Comply interaction	-.018789 (-0.46)	.0632466 (1.12)	.0095131 (0.75)	.0161626 (0.62)	.0256675 (2.06)	.0632466 (1.12)
Educ interaction						
Comply (2) interaction						
Educ /w Comply (2) interaction						

t-statistics below coefficients in parentheses

Table 11: Summary of Adjustment Parameters, Florida interaction variable, Compliance interaction variable (measured for county), and Education element interaction variable

	1982-1987		1987-1992		1992-1997	
Coefficient	Pop	Emp	Pop	Emp	Pop	Emp
λ	-.194099 (-10.27)	.2697372 (0.94)	-.173780 (-9.34)	.1314844 (0.73)	-.221242 (-13.59)	.2697372 (0.94)
FL interaction	.0630727 (3.71)	.0421876 (0.95)	.0290103 (2.77)	.0143795 (0.61)	.0352845 (3.89)	.0421876 (0.95)
Comply interaction	-.025246 (-0.62)	.0609948 (1.02)	.0071638 (0.57)	.051713 (1.14)	-.002757 (-0.20)	.0609948 (1.02)
Educ interaction	.028048 (0.91)	'-.025620 (-0.74)	0.040849 (3.30)	-.011403 (-0.60)	.0719254 (3.67)	-.025619 (-0.74)
Comply (2) interaction						
Educ /w Comply (2) interaction						

t-statistics below coefficients in parentheses

Table 12: Summary of Adjustment Parameters, Florida interaction variable and Compliance interaction variable as percent of county population living in complying jurisdictions

	1982-1987		1987-1992		1992-1997	
Coefficient	Pop	Emp	Pop	Emp	Pop	Emp
λ	-.193912 (-10.11)	.1644735 (0.67)	-.164396 (-9.11)	.056046 (0.50)	-.210937 (-13.24)	.1644735 (0.67)
FL interaction	.071449 (4.30)	.0269027 (0.71)	.0434301 (3.82)	.0094167 (0.51)	.0356307 (3.58)	.0269027 (0.71)
Comply interaction						
Educ interaction						
Comply (2) interaction	-.034249 (-0.95)	.0310303 (0.61)	.0027474 (0.11)	-.010652 (-0.29)	.0301669 (1.25)	.0310303 (0.61)
Educ /w Comply (2) interaction						

t-statistics below coefficients in parentheses

Table 13: Summary of Adjustment Parameters, Florida interaction variable, Compliance interaction variable (as percent of county population living in complying jurisdictions) and Education element interaction variable

	1982-1987		1987-1992		1992-1997	
Coefficient	Pop	Emp	Pop	Emp	Pop	Emp
λ	-.194494 (-10.27)	.2137794 (0.85)	-.172881 (-9.51)	.0273824 (0.27)	-.221664 (-13.69)	.2137794 (0.85)
FL interaction	.066724 (3.81)	.0390204 (0.92)	.0312394 (2.66)	.0087584 (0.50)	.0327577 (3.39)	.0390204 (0.92)
Comply interaction						
Educ interaction						
Comply (2) interaction	.0257518 (0.84)	-.026225 (-0.78)	-.001905 (-0.08)	-.015891 (-1.01)	.0118505 (0.50)	.0169663 (0.28)
Educ /w Comply (2) interaction	-.034831 (-0.96)	.0169663 (0.28)	.0417067 (3.35)	-.014851 (-0.42)	.0679427 (3.93)	-.026225 (-0.78)

t-statistics below coefficients in parentheses