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

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This paper examines a policy question that is of acute interest in the field of urban and regional economics: If a state government wanted to alter the spatial pattern of growth, could it? The analysis uses a neoclassical growth model to examine equilibrium densities of people and jobs throughout the Atlantic Southeast, which includes Florida—a state having one of the nation's best-known pieces of growth management legislation. The results suggest that Florida's policy has had two countervailing effects: (1) a lower population density at equilibrium; and (2) a slower

process of adjustment toward equilibrium. In short, Florida's growth management program may have produced more residential sprawl, even as it slowed the transition toward that outcome.

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1. Introduction

In the United States, state land use law—from the most basic form of enabling legislation to far more complex "growth management" and "smart growth" mandates—has a fundamental influence on urban economies, but, despite this, key questions regarding the actual effectiveness of various policy frameworks remain open to debate. This paper examines what is possibly the most basic policy question of all: If a state government wanted to alter the spatial pattern of urban growth, could it? There is little in the way of empirical evidence on the matter, and the evidence that does exist is mixed. The analysis that follows responds to this large gap in urban and regional economic research by using a neoclassical model of urban growth to specify straightforward, testable hypotheses about whether the State of Florida's growth management legislation has altered the path of development there. As such, the research presented in this paper is as much about how to study land use regulations in general as it is about Florida's unique circumstances.

The analysis reveals evidence that examining land use regulation within a spatial equilibrium framework is quite helpful, and that, on net, Florida's growth management program has changed population density, though not employment density. Specifically, Florida's statewide growth management effort has had two countervailing effects: (1) a lower population density at equilibrium; and (2) a slower process of adjustment toward that equilibrium. This combination of findings raises compelling questions related to whether or not the public at large notices the slowed adjustment but is unaware that growth management is also associated with a lower-density outcome, and what the mediating role of growth spillovers from tight to lax regulatory environments is. These and other issues are discussed in the conclusion, but it is noted upfront that, while the evidence that growth management has influenced population density in Florida seems clear, policy implications of this work are only tentative.

2. Background Discussion

The American system of land use governance is based on "home rule" authority, which means that local governments are the primary agents of regulation (Ulfarsson and Carruthers 2006). That having been said, an underappreciated wrinkle in this authority is that local land use regulation is always derived from state-level enabling legislation, much of which is based on the *Standard State Zoning Enabling Act* (SZEA) that was produced by the federal government for use by state

legislatures in 1924.[1] Though they are mostly free to do as they choose, local governments throughout the United States ultimately remain beholden to their state governments, which are the sole source of their ability to carry out zoning and other projections of the police power. While state growth management and smart growth efforts are commonly characterized as necessarily involving a greater degree of land use regulation, in some ways, the opposite is true because state efforts typically involve rolling back some of local governments' autonomy by setting policy parameters aimed at creating more consistency in the regulatory landscape (Burby and May 1997). The end result can be that a less volatile mix of regulations is at play.

State governments first began moving in this direction in the early 1970s. Before then, with the exception of Hawaii, local governments had basically unchecked authority to regulate land use and state governments were simply uninvolved. The earliest state attempts at growth management were generally focused on narrow environmental issues and/or developments of regional impact but, over time, the motivation broadened to include to a wide range of other land use concerns (see Bollens 1992; 1993). At approximately the same time as state growth management programs were developing, the local growth control movement materialized as a recognizable phenomenon and, so, the two concepts are often conflated with one another (see Carruthers 2002a). Glickfeld and Levine (1992) document several techniques used by California localities to restrict growth within their boundaries, but, unlike more comprehensive state-level growth management strategies, these have no ability to affect the overall tide of growth in the surrounding region (Downs 1999).

As the growth management and growth control movements evolved, the two became very different. On the one hand, growth controls were often a reaction to population growth—including growth in the region surrounding the growth controlling community—and the problem of maintaining appropriate levels of infrastructure and public services in the face of rapid growth. On the other hand, growth management evolved to focus more on accommodating growth via careful, coordinated land use planning, instead of just restricting it outright (Bollens 1992; 1993). While the two movements are not the same, both growth control and growth management raise the general question of whether or not land use regulation can, in fact, have a substantive impact on development patterns.

Early empirical research by members of the urban planning discipline focused mainly on the effects of growth control. For example, in a comparison of seven paired growth-control and "pro-growth" cities in California during the 1980s, Landis (1992) found little evidence that

[1] Specifically, the SZEA was developed by an advisory commission that was appointed by Herbert Hoover, the Secretary of Commerce (and eventual President) in 1921; a complete edition of the 1926 version of this document is available online at: *http://www.planning.org/growingsmart/enablingacts.htm.*

growth controls had an appreciable effect. In particular, the analysis revealed no convincing evidence that growth control cities had slower population growth, added new housing at slower rates, or had faster increases in house prices compared to pro-growth cities. In the end, Landis (1992) was led to conclude that the growth control regulations in the seven study cities were "…largely irrelevant to the management of urban growth." Similarly, Glickfeld and Levine (1992) found little evidence that local growth controls in California reduced residential or non-residential construction. On the other hand, Shen (1996) and Pendall (1999; 2000) have more recently found that locally implemented growth controls have a big influence on spatial patterns of development—but, mainly, by displacing it to outlying areas at the urban fringe. These findings are directly in line with the kind of price effects uncovered by economists during the 1970s and 1980s (see Fischel 1990; 1991 for thorough reviews) because they are the result of households getting displaced from highly regulated housing markets.

More recent economic research has examined the influence of land use regulation on both house prices and growth patterns, often using variation at either the metropolitan statistical area or state level. For example, Glaeser et al. (2005; 2006) found evidence that high regulation metropolitan areas have higher housing price appreciation in the presence of productivity shocks that include increases in labor demand and increases in the fraction of the populace with a bachelors degree.[2] Ihlanfeldt (2007) used a sample of home sales in Florida from 2000 – 2002 to show that more restrictive land use regulations are associated with higher house prices.[3] Carruthers (2002b), in a regression analysis of growth management in several states, found that growth management in Florida was associated with larger urbanized areas, or, in other words, more land consumption. Wassmer (2006) used a regression analysis to explain the size (land area) of 452 U.S. urbanized areas and found that the establishment of a statewide growth management program, other things being equal, is associated with urbanized areas that are 15.9 percent smaller in land area.

The motivations for the present analysis, which is focused on evaluating Florida's growth management legislation, are several. With the exception of Carruthers (2002b) and Wassmer (2006), recent research on land use regulation has dealt mainly with house or land prices. While those are important outcome variables, the intent of most land use regulation is to influence

[2] The interaction terms for labor demand and high regulation and for proportion with a bachelors degree and high regulation were both significantly positive in the regressions for housing price change in Glaeser et al. (2006), while the direct effects of labor demand and proportion with bachelors degree were not significant, suggesting that in metropolitan areas with high land use regulation the housing stock is less able to respond to those shocks.

[3] In both the Glaeser et al. (2006) and Ihlanfeldt (2007) studies, the measures of land use regulation were from indices of regulatory restrictiveness and from surveys of planning officials, which asked those officials to report on the use of regulation and to rate the restrictiveness of regulations.

development patterns and, for that reason, it is important to directly test the influence of growth management programs on urban growth itself. Florida's growth management program is a stable, long-lived, statewide effort that presents an excellent opportunity to do this. Moreover, there is some disagreement about whether land use regulation in general—and Florida's program in particular—leads to increased (Carruthers 2002b) or reduced (Wassmer 2006) land consumption. A reexamination of the impact of Florida's legislation on population and employment densities is needed in order to develop a clear understanding of the relationship. And, the measure of land use regulation used here is a measure of local compliance with the state growth management program—that is, a direct measure of the implementation of regulation, and a useful addition to a literature that has often been forced to rely upon coarse metrics to gauge restrictiveness. Last but not least, this paper examines Florida's program via a neoclassical growth model that enables testing of separate hypotheses about the effect of growth management on equilibrium population and employment density levels and the process of adjusting to those equilibrium levels.

Specifically, this paper evaluates growth management in Florida with an econometric analysis of changes in population and employment densities in the seven states located in the Atlantic Southeast region of the United States between 1982 and 1997. The analysis uses a regional adjustment model—a dynamic, two-equation model that accounts for interaction between population and employment in the growth process—to identify regional characteristics that act on equilibrium densities of people and jobs county-by-county in the 616 counties contained by Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee in the 1982 – 1987, 1987 – 1992, and 1992 – 1997 time periods. It includes spatially explicit measures of growth management compliance to determine whether or not the Florida program changed either the equilibrium densities or the speed of adjustment toward equilibrium. The study period covers three critical stages in the evolution of Florida's growth management program: (1) the trailing years of the original (1975) Local Government Comprehensive Planning Act; (2) the (1985) adoption of the Florida State Comprehensive Plan and Growth Management Act; and (3) an ensuing 12 years of implementation and revision of that legislation. The empirical model is used to determine whether or not the adjustment process worked differently in Florida than the region as a whole during these three stages of statewide planning. As described in the next section, the influence of growth management is expected to be most evident in the last five-year period because the Florida legislation was significantly strengthened in the late 1980s.

3. Florida's Growth Management Program

As in other so-called "first wave" growth management states (see DeGrove 2005 for a detailed accounting of the first, second, and third waves of the movement), Florida's involvement in land use planning grew out of the environmental activism 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 regional impact. Next, in 1975, a second committee (ELMS II) 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, so while plans were in place statewide by the end of the decade (DeGrove 2005), it was a rather rudimentary response to rapid growth and 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[4] was adopted along with the Growth Management Act. This legislation established a formal requirement that local plans be consistent with regional plans and, in turn, with the state plan and also mandated that infrastructure investment be concurrent with land development. Table 1 outlines this sequence of events, along with some additional steps prior to, during, and just after the 15-year window of the study period. The Florida Growth Management Act is generally considered an example of best practices in growth management (Burby and May 1997), so it provides an excellent case for testing the influence of state land use policy on growth patterns.

In implementing the Growth Management Act (GMA), the Florida Department of Community Affairs (DCA) included language and requirements that pushed localities to plan in ways that were intended to restrain sprawl, a low-density, spatially expansive mode of urbanization that is "ubiquitous" (Glaeser and Kahn 2004) throughout the United States. According to Chapin, (2007), the legislation developed by the DCA included three requirements of local plans: (1) language addressing urban redevelopment; (2) elements aimed at limiting sprawl; and (3) consistency with the plans of neighboring jurisdictions. From the start, a core goal of the GMA was to increase the density of growth.

[4] In the practice of land use planning, comprehensive plans are documents that spell out intended development patterns; they are "visioning" statements that are intended to guide the application of the regulations, like zoning, that actually act on growth.

The time periods covered by this analysis coincide with the important "carrot" and "stick" incentives to local governments mandated by the GMA (see Burby and May 1997). 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. The stick consisted of withholding certain sources of funding, such as shared tax revenues provided by the state legislature. This sanction was first implemented in 1989 and continues to be an essential bartering tool for the state. Before those innovations, the previous growth policy, enacted in 1975, placed little emphasis on substance (DeGrove 2005), so it is likely that there were no spatial effects during the 1982 – 1987 time period. The GMA greatly strengthened Florida's statewide growth management regime, but Chapin (2007) argues that the legislation was not ready for implementation until 1990—a sentiment that concurs with other research (see, for example various chapters in Connerly et al. 2007). If the enhanced funding, technical support, and enforcement associated with the program had an early influence, the GMA may be observed to take hold as early as the 1987 – 1992 time period—but, overall, its effects, if any, are most likely to be observed in the 1992 – 1997 time period, because the program was not fully operational until then.

4. Research Approach

4.1 Modeling Framework

The analysis that follows uses a regional adjustment model, specified with data for the 616 counties located in seven states of the Atlantic Southeast, to test the hypothesis that the Florida GMA changed the equilibrium pattern of growth and the speed of adjustment toward equilibrium. The dependent variables are population density (people per acre) and employment density (jobs per acre), both of which are calculated using estimates of developed land given by the USDA's National Resources Inventory. The empirical model examines density changes across three five-year intervals, 1982 – 1987, 1987 – 1992, and 1992 – 1997. Because the dependent variables are people and jobs per acre of developed land—as opposed to county land area, which is commonly (and inappropriately) used as a measure of land use—the empirical model directly addresses the spatial pattern of growth. The model can be used to examine whether Florida's growth management program is associated with changes to higher or lower densities, the speed of those changes, and, ultimately, the connection between the growth management program and the transition of undeveloped land into urban uses. Because the data set only contains information on growth management for the State of Florida, state fixed-effects are used to control for other

unobserved characteristics—regulatory and otherwise—that might be common among counties within each state.[5]

Regional adjustment models were first developed by Steinnes and Fisher (1974), and then popularized by Carlino and Mills (1987), with spatial econometric extensions developed by Boarnet (1994a; 1994b). Over time, variations on this general modeling framework have been productively used to analyze growth at the metropolitan, sub-national, and national levels (Steinnes and Fisher 1974; Steinnes 1977; Mills and Price 1984; Carlino and Mills 1987; Boarnet 1994a, 1994b; Mills and Lubuele 1995; Clark and Murphy 1996; Bollinger and Ihlanfeldt 1997; Henry et al. 1997, 1999, 2001; Duffy-Deno 1998; Glavac et al. 1999; Mulligan et al. 1999; Vias 1999; Vias and Mulligan 1999; Deller et al. 2001; Liechenko 2001; Boarnet et al. 2005; Carruthers and Vias 2005; Carruthers and Mulligan 2007; 2008). Among other things, regional adjustment models have been widely applied to policy questions that include, for example, the impact of rail transit on employment growth (Bollinger and Ihlanfeldt 1997); the proliferation of sprawl in the Rocky Mountain West region (Carruthers and Vias 2005); the effect of military base closure on local economies (Poppert and Herzog 2003); and the link between plant location and employment growth (Edmiston 2004).

Following Carlino and Mills (1987) and Boarnet (1994a; 1994b), population and employment levels are assumed have the following equilibrium relationships:

$$\begin{aligned} PD^*_{i,t} &= f\ (ICP_{i,t-1},\ ED^*_{i,t}) \\ ED^*_{i,t} &= g\ (ICE_{i,t-1},\ PD^*_{i,t}) \end{aligned} \tag{1}$$

where * denotes unobserved equilibrium values; i indexes counties; and t indexes time periods. In these functions, PD represents population density; ED represents employment density; ICP represents initial conditions that influence population density; and ICE represents initial conditions that influence employment density. Note here that the IC vectors vary between the population and employment density relationships, as reflected in the development of the model below. Within this framework, densities are assumed to adjust to their equilibrium levels via a dynamic process:

$$\begin{aligned} \Delta PD_{i,t} &= PD_{i,t} - PD_{i,t\text{-}1} = \lambda_p(PD^*_{i,t} - PD_{i,t\text{-}1}) \\ \Delta ED_{i,t} &= ED_{i,t} - ED_{i,t\text{-}1} = \lambda_e(ED^*_{i,t} - ED_{i,t\text{-}1}) \end{aligned} \tag{2}$$

Here, all notation is identical, except that the absence of * denotes actual, observed population and employment densities at times t and t-1; and λ_p and λ_e represent the adjustment parameters

[5] Tennessee has since adopted growth management legislation, but that did not happen until 1998, one year after the close of time period coved by this analysis.

with both parameters being $\in [0,1]$. Substituting linear versions of equation set (1) into equation set (2), expanding the representation of initial conditions into different vectors of variables, and simplifying the notation a bit by dropping the *i* subscripts yields:[6]

$$\begin{aligned} \Delta PD_t &= \alpha_p + X_{t\text{-}1}B_p + V_{t\text{-}1}\Gamma_p + \eta_p ED_t^* - \lambda_p PD_{t\text{-}1} + \varepsilon_p \\ \Delta \mathrm{ED}_t &= \alpha_e + X_{t\text{-}1}B_e + Z_{t\text{-}1}\Gamma_e + \eta_e PD_t^* - \lambda_e ED_{t\text{-}1} + \varepsilon_e \end{aligned} \tag{3}$$

In these equations, *X* represents a vector of characteristics that affect both equilibrium population and employment densities; *V* represents a vector of characteristics that affect only equilibrium population density; *Z* represents a vector of characteristics that affect only equilibrium employment density; α, η, and λ are estimable parameters that differ between the two equations; B and Γ are vectors of estimable parameters that differ between the two equations; and ε represents a stochastic error term that differs between the two equations.

In equation set (3) population and employment equilibriums are not observable characteristics. After some algebraic manipulation of equation set (2), though, it is possible to replace these equilibrium values with observable densities. Specifically, rearranging equation set (2) yields:

$$\begin{aligned} PD_{i,t}^* &= PD_{i,t\text{-}1} + \frac{1}{\lambda_p}(PD_{i,t} - PD_{i,t\text{-}1}) \\ ED_{i,t}^* &= ED_{i,t\text{-}1} + \frac{1}{\lambda_e}(ED_{i,t} - ED_{i,t\text{-}1}) \end{aligned} \tag{4}$$

Finally, substitution of equation set (4) into equation set (3) produces the operational specification:

$$\begin{aligned} \Delta PD_t &= \alpha_p + X_{t\text{-}1}B_p + V_{t\text{-}1}\Gamma_p + \eta_p ED_{t-1} + \frac{\eta_p}{\lambda_e}(ED_t - ED_{t\text{-}1}) - \lambda_p PD_{t\text{-}1} + \varepsilon_p \\ \Delta \mathrm{ED}_t &= \alpha_e + X_{t\text{-}1}B_e + Z_{t\text{-}1}\Gamma_e + \eta_e PD_{t-1} + \frac{\eta_e}{\lambda_p}(PD_t - PD_{t\text{-}1}) - \lambda_e ED_{t\text{-}1} + \varepsilon_e \end{aligned} \tag{5}$$

These are estimable equations, in which λ_p and λ_e give the fraction of the gap between equilibrium and actual levels that is closed during each five-year time period, or the speed of adjustment toward a spatial equilibrium in the distribution of people and jobs.[7] The model shown in equation set (5) represents the basis of the upcoming empirical tests.

The regional adjustment model framework is ideal for examining the kind of policy questions presented by Florida's growth management program. As Boarnet (1994a) notes,

[6] For a more complete discussion of this model, see Boarnet (1994a; 1994b) or Boarnet, et al.(2005).

[7] Note that the analysis does not enforce the full parameter restrictions implied by the regression model, and instead only estimates the adjustment parameter from the coefficient on the lagged values of population and employment density. For a discussion of this issue, see Boarnet et al Geho (2005).

because the model is really a free market, equilibrating model it is likely to be highly sensitive to regulatory factors that disrupt the adjustment process. The hypothesis tests that follow measure these regulatory factors directly. Plus, the simultaneous model in equation set (5) is a realistic representation of how growth and change occur within the contemporary space economy—jobs increasingly follow people, in addition to the other way around, so the framework is highly appropriate for applied policy analysis. And, as previous research (Carruthers and Mulligan 2008) has noted, regional adjustment models highlight the need for urban policymakers to better understand the nature of the development process itself, especially when forming regulatory frameworks for managing growth.

4.2 Growth Management Variables

Because measuring "growth management" can be tricky, it is necessary to describe the construction of the two variables used here in some detail. The units of analysis are counties, but land use regulation at the sub-state level in Florida rests with municipal governments or, for unincorporated areas, county governments. In order to accommodate this, two measures of local land use regulation are aggregated up to the county level.

The initial variable, *GM1*, is a population-weighted measure of compliance in each of Florida's 67 counties:

$$GM1_i = \frac{\sum_{j=1}^{n_i} POP_j}{POP_i} \tag{6}$$

This variable is calculated by summing the population of all complying local governments, *j*, located within each county, *i*, and then dividing that number by the total population of each county. The index measures the proportion of each county's population that is subject to a land use plan judged by the Florida DCA to be compliant with the state's GMA. The first decisions were made between 1992 and 1994 timeframe, although some plans were either submitted later or were not compliant with the state program on first submission. A map of the variable *GM1* by county is given in Figure 1.

The next variable, *GM2*, measures the average number of days within the 1992 – 1997 time period (the last panel used in the analysis) that that growth management plans were in place:

$$GM2_i = \frac{\sum_{j=1}^{n_i} \frac{DAYS\ \ 1992 \rightarrow 1997_j}{DAYS\ \ 1992 \rightarrow 1997}}{n_i} \tag{7}$$

This variable is calculated by finding the percentage of the total number of days between 1992 and 1997 that each local government, *j*, located within each county, *i*, was subject to a state-approved land use plan and then dividing that number by the total number of local governments in each county. This index registers the average proportion of the 1,825 days between 1992 and 1997 that local governments within each county were subject to a land use plan judged by the Florida DCA to be compliant with the state's GMA. A map of the variable *GM2* by county is given in Figure 2.

A remaining point is that adopting a land use plan is not the same as being judged compliant with the state's land use legislation. Local governments were required to adopt growth management plans and, upon verification that the plan included all elements required by Florida state law, those plans were submitted to the DCA for evaluation and a final determination regarding compliance. Thus, *GM1* and *GM2* differ in two important ways: (1) *GM1* measures the effect of land use plans that were judged compliant on first submission, while *GM2* measures the amount of time that land use plans were adopted and submitted to the state, regardless of whether those plans were compliant on first submission; and (2) *GM1* is a population weighted average, while *GM2* is a straight average.

4.3 Hypothesis Testing

Within the context of the modeling framework outlined in the preceding paragraphs, the Florida growth management program could act on either the equilibrium density level or the speed of adjustment to that level. The goal here is to test for both effects. The variables *GM1* and *GM2* are entered into the regressions as part of the *X* vector in equation set (5) and this tests the hypothesis that the growth management program influenced equilibrium population and employment densities. The *GM1* and *GM2* variables are also interacted with, respectively, the base year population density in the population equation of (5) and the base year employment density in the employment equation of (5) and this tests the hypothesis that two adjustment speeds, λ_p and λ_e, differed in Florida from the rest of the Atlantic Southeast in ways associated with the growth management program. Florida-unique effects that are not related to the growth management program are also controlled for by entering a Florida dummy variable both as part of the *X* vector (along with other state dummy variables) and by interacting the Florida dummy with base year population density and base year employment density in the two respective equations.

Several extensions and diagnostic tests follow the estimation of the base equations shown in (5). In order to test for spillover effects, the base model is extended via the inclusion of averages of neighbor-county *GM1* and *GM2* variables in both the *X* vectors and the interaction

terms. The base model results are reported in Tables 3 and 4, and the spillover model results are reported in Tables 5 and 6. The regressions in equation set (5) are simultaneous in population and employment density changes, and so all specifications are estimated using instrumental variables. Each of the tables reports over-identification tests of instrument validity, following the approach described and applied in Angrist and Krueger (1989; 1994), plus tests for weak instruments (see, for example, Stock and Yogo 2002). Last, the tables also report tests (described by Anselin et al. 1996) for spatial correlation, either in the form of spatial correlation in the stochastic error terms or in the form that implies a spatially correlated dependent variable should be included in the model.

4.4 Data

The variables used to implement the empirical model are listed in Table 2, along 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 were constructed from population and employment data, by county, available from the Bureau of Economic Analysis and from measures of developed land area from the USDA's National Resources Inventory (NRI). 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. The authors have been in touch with NRI officials at the USDA multiple times to assess the appropriateness of using the data for this research. These discussions led to the conclusion that the NRI is the best data source available for this study, though it is willingly acknowledged that it is subject to some sampling error.[8] The NRI is a consistent data set, for multiple states, available for four time periods that correspond to crucial periods in Florida's growth management regulation, which is a considerable advantage over other sources of land use data in the context of this research. A more complete discussion of the NRI data and alternative sources of land cover data, are available in the appendix of the working version of this paper, which is available upon request of from the corresponding author (see also Irwin and Bockstael 2006).

The planning data for the State of Florida was acquired from Mr. Ray Eubanks, the Plan Review Administrator for the Division of Community Planning of the DCA. The data set he provided 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. Other data required for the analysis were acquired from publicly

[8] Comparisons with state error ranges suggest that, in very large, sparsely populated counties, this error can be as much as 10 – 20 percent, but there are no counties of this type in Florida.

released data sets: (1) county-level government fiscal data were obtained from the Census of Governments; (2) criminal activity data were obtained from the FBI's yearly report on crime via the City and County Data Book; (3) employment data categorized by two-digit SIC codes were obtaiuned from County Business Patterns; (4) the urban, suburban, exurban codes were constructed from USDA Economic Research Service's Beale code; and (5) the amenity score, a combination of six measures of climate, typography, and water area that measure warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area, was obtained from the USDA.

5. Estimation Results

As discussed, Tables 3 and 4 report the results from the base model with only own-county growth management variables. The two growth management variables, *GM1* and *GM2*, are entered both as levels and as interaction terms with base year population density and employment density. The other independent variables in those tables are either required by the structure of the model or are amenity, fiscal, or industrial structure variables that may be to be linked to population and employment growth patterns and, therefore, to population and employment density changes. Those control variables are not the focus of this study, so the discussion here is limited to interpreting the results from the two growth management variables.

The results listed in Tables 3 and 4 are estimated with instrumental variables. The instruments for the endogenous employment density change variable in Table 3 are the four excluded industrial structure variables: Percent of employment in the county in (1) manufacturing; (2) FIRE; (3) retail; and (4) services. The instruments for the endogenous population density change variable in Table 4 are the two excluded racial composition variables: Percent (1) black; and (2) white in the county. (Due to excluded categories, percent black and percent white are not perfectly collinear.) In Tables 3 and 4, the same regression is estimated for each of the three time periods—which is necessary for hypothesis testing purposes and because other research on these same time periods (Carruthers and Mulligan 2008) has uncovered evidence of significant structural differences among them. Visual inspection of the coefficients suggests that some parameter estimates are not stable across time periods, and it is hypothesized that the growth management variables will only be significant in the last two time periods. For those reasons, the three panels are estimated separately instead of as a pool. In general, the growth management variables only are significant in the population density regressions; there is no evidence, in Tables 4 or 6, that growth management influenced employment densities. Note, though, that most growth management efforts focus more on population growth than on

employment growth, and so that is not at all surprising. The following paragraphs elaborate on the hypothesis tests for the growth management variables in Tables 3 and 5.

To begin, in Table 3, note that, as expected, the growth management variables are insignificant in the 1982 – 1987 time period. In the 1987 – 1992 and 1992 – 1997 time periods, counties with jurisdictions that, on average, had adopted state growth management plans for a longer part of the 1992 – 1997 period had a smaller population density change—a result that corresponds to a smaller equilibrium population density, or more sprawl. The effect of the *GM2* (time adopted) variable in Table 3 indicates that as a county's jurisdictions filed growth management plans earlier in the 1992 – 1997 time period, ceteris paribus, that county's population density equilibrium is lower. The effect begins to emerge in the 1987 – 1992 panel, but grows in strength—in terms of both statistical significance and, as important, magnitude—in the 1992 – 1997 panel. This result directly counters expectations that growth management acts to promote less land consumption and hence, ceteris paribus, higher density equilibria. It raises the possibility that, in counties with some early complying jurisdictions, population growth might have spilled over into less dense jurisdictions in the same county, lowering the equilibrium population density (and therefore the change in population density) in the county. This is consistent with some previous evidence, such as findings presented by Carruthers (2002) and Song (2007).

Moving on, the adjustment parameters reported in Table 3, which are the coefficients on $PD_{t\text{-}1}$ and the interactions with $PD_{t\text{-}1}$, also have an interesting interpretation. In particular, the adjustment parameter, λ_p, is the negative of the coefficient on $PD_{t\text{-}1}$, implying a process of spatial convergence (Arbia 2006). For 1992 – 1997, that parameter is 0.2070, meaning that 20.70 percent of the gap between equilibrium and actual population density values was closed over the five-year period. This estimate of adjustment speed is similar to what has been found in other studies (Boarnet et al. 2005). The significantly positive coefficient on $FL \cdot PD_{t\text{-}1} \cdot GM2$ implies that the adjustment speed is smaller in counties with jurisdictions that had an adopted growth management plan during longer portions of the 1992 – 1997 time period. And, critically, the effect is observed to increase dramatically in magnitude between the two panels where it is statistically significant. Evaluating the adjustment parameter, λ_p, for the latter time period at the sample mean for *GM2*, produces a value of 0.08, or less than half the value of λ_p in counties

located outside of Florida.[9] This implies that the growth management program was associated with a slower adjustment toward equilibrium population density levels.

The diagnostic statistics shown in Tables 3 and 4 give little cause for concern: The over-identification test for instrument validity does not reject the null of valid instruments (see Angrist and Krueger 1989; 1994 for a description and application); the first-stage F-statistic test for weak instruments is generally larger than or near the rule of thumb of 10 (see Stock and Yogo 2002 for a discussion); and tests for spatial correlation, either in the error term or a need for a spatial lag model, suggest no need for spatial econometric specifications in the important 1992 – 1997 time period.[10]

The growth management variables themselves, *GM1* and *GM2*, measure, respectively, the fraction of a county's population that lived in jurisdictions with growth management plans that were approved on first submission and the average (over all county jurisdictions) of the fraction of the 1992 – 1997 time period that county jurisdictions had state approved growth management plans in place. These approvals were, for the most part, in the early part of the 1992 – 1997 time period. As such, *GM1* and *GM2* are really just "phantom" variables in the 1982 – 1987 time period and the role of *GM1* and *GM2* in the 1987 – 1992 time period depends critically on the amount of advance planning that occurred during that period. If the effect is indeed due to the growth management plans, the *GM1* and *GM2* variables should not be statistically significant in the 1982 – 1987 period, because the compliance that the two variables measure had not yet occurred. If, on the other hand, the *GM1* and *GM2* variables are picking up other characteristics of counties that are correlated with growth management compliance but that are not due directly to compliance, those variables might be significant in the early time period. Thus, it is reassuring that the *GM1* and *GM2* variables are not significant in the first panel and that they take a progressively stronger hold over the course of the letter two.

Tables 5 and 6 report the results for models that include neighbors' *GM1* and *GM2* variables to test for spillover effects both in the equilibrium level and the adjustment to equilibrium. For any county, its neighbor variables, $\boldsymbol{W} \cdot GM1$ and $\boldsymbol{W} \cdot GM2$, are an average of the *GM1* and *GM2* variables in all counties whose centroids are within 60 miles of each other. (To

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[9] The value of λ_p for a county with the average value of *GM2* is derived by adding the coefficients on PD_{t-1} and the coefficient on $FL \cdot PD_{t-1} \cdot GM2$ evaluated at the sample average *GM2* value, and recalling that λ_p is the negative of the sum of those coefficients.

[10] The tests for spatial dependence use a neighbor matrix whose elements equal one if counties are within 60 miles, zero otherwise. The 60-mile distance band was chosen because it ensures that contiguous counties are neighbors and because the distance is approximately the scale of metropolitan areas in Florida. While most of the tests imply no spatial dependence, the tests reported in Tables 3 – 6 do suggest both a spatial lag and spatial error model would be desirable in the 1987 – 1992 time period for population.

use the terminology of spatial econometrics, those neighbor variables are constructed based on an $n \times n$, or, in the present case, a 616 × 616, matrix, $\boldsymbol{W}$, having elements equal one if counties i and j are located within 60 miles and which has been normalized so that rows sum to one.) The sixty-mile distance band gives neighbor definitions that approximate the spatial scale of Florida metropolitan areas, with the advantage that it also captures spillovers from exurban regions within metropolitan areas to counties outside of the metropolitan area. A simpler contiguity neighbor matrix was also tested for 1992 – 1997, but this did not change the results reported in Tables 5 and 6. Note that under the assumption that *GM1* and *GM2* are exogenous, the neighbor variables, $\boldsymbol{W} \cdot GM1$ and $\boldsymbol{W} \cdot GM2$, are also exogenous.

First consider the growth management variables and spatial lags of those variables that are entered in levels as part of the X vector from equation set (5) and recall that the variables entered in levels illustrate influences on county equilibrium population density. The own-county *GM1* variable in Table 5, which measures the percentage of the county population living in first-round compliant growth management jurisdictions, is not statistically significant. But the spatial lag of that variable, the average value of *GM1* in neighboring counties, is significantly negative in the 1992 – 1997 time period, suggesting a cross-county spillover effect. If a given county's neighbors had larger fractions of their population living in first-round compliant jurisdictions, ceteris paribus, it had a lower population density at equilibrium. Again, this is consistent with a growth spillover from complying jurisdictions to locations outside those jurisdictions.

The own-county *GM2* variable, which measures the average of the length of time from 1992 – 1997 that the county's jurisdictions had adopted state growth management plans, is also negative—a finding that is consistent with a within-county spillover of growth from early-complying to other jurisdictions. In the final panel, the spatially lagged *GM2* variable, which measures the length of time that jurisdictions in neighboring counties had adopted growth management plans, is significantly positive. This implies that, as a county's neighbors are, ceteris paribus, more early compliers with growth management, that county's population density equilibrium is higher. This is an anomalous result that is not consistent with the spatial spillover explanation indicated by the other results in this paper. There is no direct interpretation for this result except to note that it indicates that growth management may have highly complex spatial effects.

Last, moving on to the interaction variables listed in Table 5, the results for adjustment speed, λ_p, are essentially the same as before. The spatially lagged growth management variables do not come in significant when interacted with $PD_{t\text{-}1}$. As in Table 3, the only significant growth management interaction variable is the positive interaction with *GM2* and, yet again, the

magnitude of the coefficient doubles between the 1987 – 1992 and 1992 – 1997 time periods. Working again with the sample means, λ_p is 0.20 in the 1992 – 1997 panel, but λ_p drops to 0.07 when adjusting for the growth management program as measured by *GM2*. This implies slower adjustment toward the population density equilibrium as a result of the Florida growth management program. As before, the growth management variables, whether own-county or neighbor, are not statistically significant, in levels or in interaction terms, in the employment density change regression in Table 6.

As a final validating check, the *GM1* and *GM2* variables are tested for exogeneity to changes in population and employment density—this step is carried out even though there are good reasons to believe upfront those variables are exogenous. While the jurisdictions located in a given county might anticipate future growth and therefore decide to comply more quickly or less quickly with Florida's growth management plan, the dependent variable in Tables 3 – 6 is not the amount of growth, but density measured as the number of people and jobs per acre of developed land. If *GM1* and *GM2* were endogenous, it would imply that counties anticipate not just the amount of population and employment growth, but, also, the density of that growth over a five-year window. Furthermore, the fact that the *GM1* and *GM2* variables are not significant in the 1982 – 1987 time period and that growth management has a progressively stronger influence over the latter two time periods indicates that causality flows from growth management compliance to changes in density, rather than the other way around. Lastly, local governments did not have full discretion about their timeline for compliance; the Florida DCA focused on compliance in stages that emphasized earlier compliance in counties that were more prone to flood-related natural hazards or had significant environmentally sensitive wetlands (Florida Statutes Part II 1985). That emphasis on early compliance for counties based in part on geography provides an opportunity to construct instruments for the *GM1* and *GM2* variables, and so the reminder of this section considers those results.

The *GM1* and *GM2* variables were each regressed on three instruments: (1) the percentage of the county's area that is water; (2) the acres of water in a county; and (3) a dummy variable for coastal counties. This produced predicted values of the *GM1* and *GM2* variables,[11] which are orthogonal to factors other than the geographic characteristics that proxy for the state's compliance schedule. The predicted values of *GM1* and *GM2* were then used in place of own-county *GM1* and *GM2* in the models reported in Tables 3 – 6, enabling the comparison of results

[11] All three of the variables, percent water, acres of water, and coast dummy, were statistically insignificant when included in the structural models for population density and employment density in all time periods except that coast was significant in the population density regression for 1987 – 1992.

(for the population density equations) shown in Table 7. As with the earlier estimates, no growth management variables were statistically significant for the employment equations. In order to conserve space, only the growth management variables and the variables needed to construct the estimates of λ_p are shown in Table 7.

The table shows the following changes when the predicted values of own-county *GM1* and *GM2* are used in the 1992 – 1997 panel: (1) the coefficient on $FL \cdot PD_{t\text{-}1} \cdot GM1$ is significantly negative at the 99 percent level in the model without neighbor variables, and the adjustment parameter, λ_p, implied by evaluating significant coefficients for 1992 – 1997 at sample means is 0.06, a value similar to the estimated λ_p of 0.08 when actual, rather than predicted, growth management variables are used; and (2) the anomalous result of a positive coefficient on neighbor counties' *GM2* variable is not significant at the five percent level. Otherwise, the pattern of results does not change when predicted rather than actual *GM1* and *GM2* variables are used and the basic result—that compliance with Florida's state growth management program is associated with a lower population density equilibrium and slower adjustment toward equilibrium—stands whether actual or predicted values of growth management variables are used.

6. Summary and Conclusion

This paper began by articulating an important research question: If a state government wanted to alter the spatial pattern of urban growth, could it? The evidence indicates that it can, though maybe not in the way that was intended. Specifically, the growth management program in Florida is associated with two countervailing effects. First, growth management is associated with a lower population density at equilibrium, a finding that is remarkably similar to other research on this topic. A detailed explanation of this finding is beyond the scope of this paper, but possible explanations include growth spillovers from early-complying to later-complying jurisdictions and/or the movement of growth to outlying areas due to the state growth management plan's infrastructure concurrency requirements (see, for example, Carruthers 2002; Song 2007). Second, growth management slows the speed of adjustment toward equilibrium: Florida counties have adjusted to the new, lower density equilibrium more slowly than they would have in the absence of growth management.[12] These results apply to population density only; there is no evidence of a

[12] Note that the equilibrium for population density in Florida during the key 1992 – 1997 time period was toward lower density. During the 1992 – 1997 time period, 55 of the 67 Florida counties had decreases in population density, and 78 percent of Florida's 1992 population lived in counties that moved to lower population densities (measured for the full

connection between the growth management program and employment density. This finding is also reasonable, since many growth management regulations are motivated by, and target concerns about, population growth and population density. Planning practice that applies similar motivations and concepts to employment growth is considerably less common. On net, this paper represents another piece of evidence that, instead of limiting residential sprawl, Florida's GMA may have contributed to it—with the added dimension that the program may have simultaneously slowed the transition toward that outcome.

These results highlight some general issues that merit further investigation. Foremost, note that it might be easier for residents and policymakers to observe changes in the adjustment process, since those would be observed as changes in the speed of development. Thus, people might more easily notice the slowed adjustment toward a lower-density equilibrium, and might have failed to realize that the lower density equilibrium itself may be due, in part, to the growth management program. In other words, for those who are concerned with increasing the density of development, the favorable evidence related to Florida's growth management (slowed adjustment) might be more easily observed than the unfavorable evidence (lower population density equilibrium). The findings of this paper suggest that the spatial impacts of the growth management program are complex and a full analysis of the program, or, by extension, of land use regulation more generally, is best pursued within the context of a theoretical model that can illuminate the complexity of those impacts. Second, there is evidence, albeit indirect, of population growth spillovers that contribute to lower density equilibria. One of the motivations for a statewide program is to coordinate local land use regulation in a way that reduces the possibility of leapfrog and/or spillover growth from one jurisdiction to another. The fact that this paper and others have independently detected evidence consistent with spillover growth in Florida suggests that, even under statewide programs, the problem of coordinating local action remains. This conclusion does not imply a judgment about the desirability or undesirability of the Florida growth pattern—the authors are agnostic on this—but, simply, that the results suggest the possibility of spillovers and, hence, non-localized effects from land use regulation, even in the context of a statewide program. Finally, there is, of course, a need for additional research on the matter explored in this paper. A key difficulty in this research area is determining the counterfactual—what would have happened absent land use regulation? This paper argues that one method for determining that counterfactual, and for researching land use controls, is to adapt

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county) from 1992 – 1997. Recall that the adjustment model posits that the change in actual density has the same sign as the gap between the equilibrium and beginning period density, and one can infer that 78 percent of Florida residents lived in counties where the equilibrium density was below the actual density in 1992.

regional adjustment models as has been done here. The results of the analysis suggest that adjustment models can play a useful role in studying the impacts of land use regulation.

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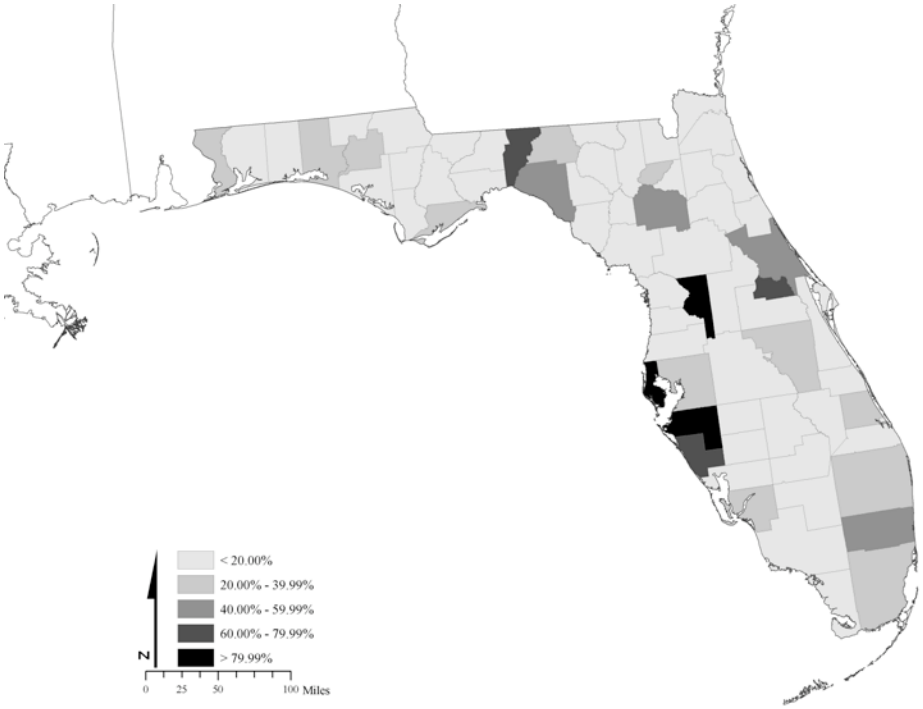

Figure 1. Spatial Distribution of *GM1*

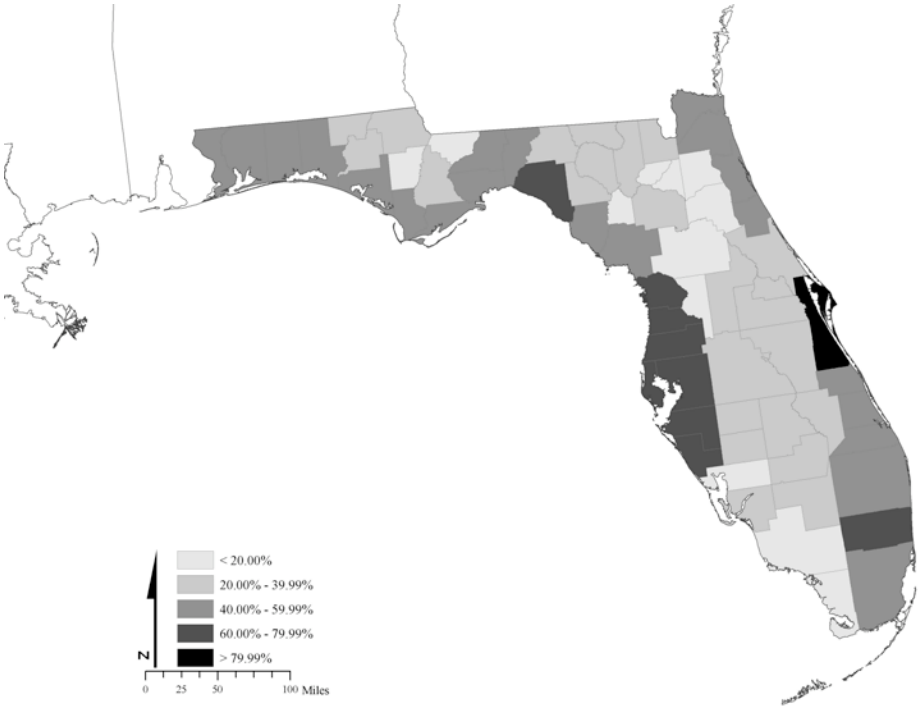

Figure 2. Spatial Distribution of *GM2*

Table 1. Timeline of State Growth Management in Florida

Year	Event
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				1987 – 1992				1992 – 1997			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
ΔPD	–0.19	0.38	–3.8	0.89	–0.16	0.30	–4.40	0.92	–0.18	0.21	–1.50	0.54
ΔED	0.00	0.17	–1.20	0.76	–0.05	0.26	–5.80	0.48	–0.04	0.15	–2.00	1.61
$PD_{t\text{-}1}$	0.93	0.70	0.10	10.39	0.93	0.72	0.10	10.83	0.88	0.58	0.08	5.02
$ED_{t\text{-}1}$	2.26	1.15	0.41	12.06	2.07	0.99	0.33	9.09	1.91	0.86	0.33	7.86
Natural Amenity Score	0.46	1.42	–2.90	6.05	0.46	1.42	–2.90	6.05	0.46	1.42	–2.90	6.05
Urban	0.29	0.46	0.00	1.00	0.29	0.46	0.00	1.00	0.29	0.46	0.00	1.00
Suburban	0.29	0.45	0.00	1.00	0.29	0.45	0.00	1.00	0.29	0.45	0.00	1.00
Exurban	0.30	0.46	0.00	1.00	0.30	0.46	0.00	1.00	0.30	0.46	0.00	1.00
Expenditure Per Student ($1,000)	2.10	0.84	0.24	15.17	3.08	0.92	0.62	10.61	4.53	3.74	0.20	86.72
General Revenue Per Person ($1,000)	0.82	0.03	0.07	4.32	1.18	0.42	0.13	5.64	1.61	0.55	0.22	6.10
Total Direct Exp. Per Person ($1,000)	0.80	0.09	0.06	4.96	1.13	0.45	0.12	6.74	1.57	0.56	0.22	0.58
Total Taxes Per Person ($1,000)	0.20	0.09	0.02	0.73	0.30	0.14	0.04	1.31	0.45	0.21	0.07	1.70
Property Tax Per Person ($1,000)	0.15	0.08	0.01	0.67	0.22	0.12	0.01	1.12	0.32	0.19	0.02	1.55
Violent Crime Incidents Per Person	2.81E–03	2.70E–03	0.00	0.02	3.20E–03	3.05E–03	0.00	0.02	4.52E–03	3.98E–03	0.00	0.02
Property Crime Incidents Per Person	0.02	0.02	0.00	0.09	0.03	0.02	0.00	0.11	0.03	0.02	0.00	0.11
Per Capita Income ($1,000)	8.02	1.51	4.85	15.44	11.22	2.34	6.50	23.11	14.82	2.87	9.35	31.41
Percent Black	0.25	0.19	0.00	0.84	0.24	0.19	0.00	0.85	0.24	0.19	0.00	0.85
Percent White	0.75	0.19	0.15	1.00	0.75	0.19	0.14	1.00	0.72	0.20	0.01	1.00
Percent Manufacturing	0.43	0.18	0.02	0.88	0.39	0.17	0.02	0.91	0.37	0.17	0.02	0.89
Percent FIRE	0.05	0.02	0.01	0.28	0.05	0.03	0.01	0.49	0.04	0.02	0.01	0.14
Percent Retail	0.20	0.07	0.01	0.56	0.21	0.07	0.00	0.49	0.22	0.07	0.02	0.48
Percent Services	0.15	0.08	0.00	0.64	0.17	0.08	0.00	0.56	0.21	0.10	0.00	0.74
GM1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.18	0.24	0.00	0.91
GM2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.40	0.19	0.00	0.85

Notes: *PD* represents population density; *ED* represents employment density; GM1 represents the first growth management variable (see equation 6); GM2 represents the second growth management variable (see equation 7); and n/a denotes not applicable. Variables that are in levels are measured at the beginning of each five-year time period.

Table 3. IV Estimates of Base Model Population Equations

	1982 – 1987		1987 – 1992		1992 – 1997	
	Est. par.	t-value	Est. par.	t-value	Est. par.	t-value
Constant	0.6507 $^{n/s}$	1.2393	0.6655 ***	2.3070	0.1344 *	1.9318
ΔED	0.1714 $^{n/s}$	0.3881	0.6848 ***	4.7275	0.6141 ***	2.8025
$ED_{t\text{-}1}$	–0.0233 $^{n/s}$	–0.4737	0.0957 $^{n/s}$	1.2677	0.1317 ***	2.6553
Natural Amenity Score	–0.0278 **	–2.3159	–0.0034 $^{n/s}$	–0.5562	–0.0122 **	–2.2839
Urban	0.0744 $^{n/s}$	1.3350	0.0380 $^{n/s}$	1.3638	–0.0120 $^{n/s}$	–0.5106
Suburban	–0.0375 $^{n/s}$	–0.9663	0.0125 $^{n/s}$	0.5528	–0.0150 $^{n/s}$	–0.7000
Exurban	–0.0054 $^{n/s}$	–0.1587	0.0038 $^{n/s}$	0.1788	–0.0241 $^{n/s}$	–1.2689
Expenditure Per Student	0.0014 $^{n/s}$	0.1604	–0.0096 $^{n/s}$	–1.4778	0.0007 $^{n/s}$	0.6692
General Revenue Per Person	–0.0254 $^{n/s}$	–0.7607	–0.0284 *	–1.6523	–0.0339 $^{n/s}$	–1.4563
Total Direct Expenditure Per	0.0162 $^{n/s}$	0.6896	0.0238 $^{n/s}$	1.5917	0.0262 $^{n/s}$	1.1892
Total Taxes Per Person	–0.3353 $^{n/s}$	–1.4270	0.0523 $^{n/s}$	0.4679	–0.1160 $^{n/s}$	–1.3974
Property Tax Per Person	0.3674 $^{n/s}$	1.4882	0.0315 $^{n/s}$	0.2689	0.1730 **	2.0077
Violent Crime Inc. Per Person	0.5604 $^{n/s}$	0.1595	2.2806 $^{n/s}$	1.1257	–1.5169 $^{n/s}$	–0.9514
Property Crime Inc. Per Person	3.0415 ***	3.0138	–0.2389 $^{n/s}$	–0.3225	0.3205 $^{n/s}$	0.5274
Per Capita Income	0.0265 ***	3.6023	0.0040 $^{n/s}$	1.2233	–0.0003 $^{n/s}$	–0.1067
Percent Black	–0.6093 $^{n/s}$	–1.1400	–0.6528 **	–2.2039	0.0665 $^{n/s}$	1.0543
Percent White	–0.7096 $^{n/s}$	–1.3523	–0.5977 **	–2.0284	0.0580 $^{n/s}$	1.0137
GM1	0.2116 $^{n/s}$	0.7323	0.0569 $^{n/s}$	0.3119	0.2094 $^{n/s}$	1.6459
GM2	0.0569 $^{n/s}$	0.1528	–0.4366 *	–1.8055	–0.6326 ***	–3.0526
$PD_{t\text{-}1}$	–0.2446 ***	–5.2738	–0.1821 ***	–7.7153	–0.2070 ***	–12.9418
$FL \cdot PD_{t\text{-}1}$	0.2226 ***	2.5240	–0.0033 $^{n/s}$	–0.0848	–0.0397 $^{n/s}$	–1.0387
$FL \cdot PD_{t\text{-}1} \cdot GM1$	–0.0726 $^{n/s}$	–0.7511	–0.0173 $^{n/s}$	–0.2908	–0.0924 $^{n/s}$	–1.7045
$FL \cdot PD_{t\text{-}1} \cdot GM2$	–0.0854 $^{n/s}$	–0.5564	0.1462 *	1.7155	0.3244 ***	4.1091
AL	–0.0816 *	–1.7500	0.0480 *	1.6860	–0.0221 $^{n/s}$	–0.8663
FL	–0.3621 **	–1.9724	0.1548 $^{n/s}$	1.4972	0.0699 $^{n/s}$	0.7623
GA	–0.0373 $^{n/s}$	–1.0362	0.0252 $^{n/s}$	0.7172	–0.1033 ***	–3.3859
MS	0.0039 $^{n/s}$	0.0754	0.0826 ***	2.6824	–0.0618 **	–2.2351
NC	–0.2204 ***	–3.0997	–0.0055 $^{n/s}$	–0.1692	–0.0033 $^{n/s}$	–0.1417
SC	–0.1184 *	–1.7496	0.0530 $^{n/s}$	1.4153	–0.0905 ***	–2.6409
Adjusted R^2		0.62		0.76		0.62
n		616		616		616
Over-ID Test – Dist. χ^2	0.25		1.29		1.97	
Over-ID Test – CV	9.49		9.49		9.49	
Instrument F-Statistic	9.52		47.65		8.48	
	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
Spatial Error – Moran's I Test	2.33	0.02	4.20	0.00	1.79	0.07
Spatial Error – LM Test	2.82	0.09	12.19	0.00	1.42	0.23
Spatial Error – Robust LM Test	0.81	0.37	1.47	0.23	0.01	0.94
	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
Spatial Lag – LM Test	2.09	0.79	14.25	0.00	2.63	0.11
Spatial Lag – Robust LM Test	0.07	0.79	3.53	0.60	1.22	0.27

Notes: Dependent variable is change in county population density; *PD* represents population density; *ED* represents employment density; GM1 represents the first growth management variable (see equation 6); GM2 represents the second growth management variable (see equation 7); all hypothesis tests are two-tailed; *** denotes significant at $p < 0.01$; ** denotes significant at $p < 0.05$; * denotes significant at $p < 0.10$; $^{n/s}$ denotes not significant; CV is for Critical Value; and LM is for Lagrange Multiplier.

Table 4. IV Estimates of Base Model Employment Equations

	1982 – 1987		1987 – 1992		1992 – 1997	
	Est. par.	t-value	Est. par.	t-value	Est. par.	t-value
Constant	–0.0333 n/s	–0.5969	–0.1582 ★★★	–3.3585	–0.0829 n/s	–0.8104
ΔPD	0.0614 n/s	0.2259	0.4746 ★★★	2.6958	0.3632 n/s	0.6835
PD_{t-1}	–0.0696 n/s	–0.9986	0.1558 ★★★	7.2814	0.0903 n/s	0.9078
Natural Amenity Score	–0.0150 n/s	–1.3442	–0.0015 n/s	–0.3990	–0.0012 n/s	–0.1241
Urban	0.0680 ★★	1.9758	–0.0367 ★★	–2.1105	–0.0133 n/s	–0.5769
Suburban	–0.0280 n/s	–1.1604	–0.0059 n/s	–0.4067	–0.0151 n/s	–0.6691
Exurban	–0.0042 n/s	–0.2147	0.0078 n/s	0.5721	0.0018 n/s	0.0891
Expenditure Per Student	0.0007 n/s	0.1448	0.0076 ★	1.7603	0.0000 n/s	0.0117
General Revenue Per Person	–0.0029 n/s	–0.1409	0.0169 n/s	1.4570	0.0200 n/s	0.8404
Total Direct Expenditure Per	–0.0081 n/s	–0.5671	–0.0088 n/s	–0.8630	–0.0140 n/s	–0.6435
Total Taxes Per Person	–0.2366 n/s	–1.5147	0.2194 ★★★	2.7102	0.1549 ★★	2.4884
Property Tax Per Person	0.2055 n/s	1.2071	–0.2350 ★★★	–3.1104	–0.1606 ★	–1.8358
Violent Crime Inc. Per	1.0866 n/s	0.5375	–0.8606 n/s	–0.6592	–0.3914 n/s	–0.2371
Property Crime Inc. Per	0.2945 n/s	0.2869	2.2514 ★★★	4.6748	1.1409 n/s	1.5362
Per Capita Income	0.0096 n/s	1.2952	0.0066 ★★	2.3187	0.0045 ★	1.8929
Percent Manufacturing	0.7678 ★★★	3.0103	–1.1537 ★★★	–3.9160	0.9542 ★★★	3.0124
Percent FIRE	0.0257 n/s	0.6912	0.0219 n/s	0.6491	–0.0818 n/s	–1.3235
Percent Retail	0.1835 n/s	–0.4065	0.1892 n/s	–0.3638	0.0064 n/s	–1.2866
Percent Services	–0.0380 ★	1.8174	–0.0291 ★★★	2.6057	–0.1100 n/s	0.0969
GM1	0.1046 n/s	0.7782	0.0162 n/s	0.1712	–0.0706 n/s	–0.4060
GM2	0.0895 n/s	0.5507	0.0025 n/s	0.0190	0.0531 n/s	0.2571
ED_{t-1}	0.0583 ★★★	2.7847	–0.3375 ★★★	–9.1173	–0.2157 ★★★	–10.7110
$FL \cdot ED_{t-1}$	0.1868 ★	1.6465	0.0479 n/s	1.2695	0.0588 n/s	1.3239
$FL \cdot ED_{t-1} \cdot GM1$	–0.0374 n/s	–0.3613	–0.0621 n/s	–0.9607	0.1246 n/s	0.6368
$FL \cdot ED_{t-1} \cdot GM2$	–0.1863 n/s	–1.2736	–0.0270 n/s	–0.2883	–0.0942 n/s	–0.4028
AL	–0.0384 n/s	–1.2723	–0.0438 ★★★	–2.5653	–0.0207 n/s	–0.7534
FL	–0.1337 ★★	–1.5502	–0.1656 ★★★	–3.2376	–0.1050 ★	–1.7022
GA	–0.0055 n/s	–0.2869	–0.1170 ★★★	–5.4222	–0.0405 n/s	–0.4580
MS	–0.0607 ★★	–2.2176	0.0092 n/s	0.3391	0.0509 ★	1.7281
NC	–0.1105 ★	–1.7732	–0.0746 ★★★	–3.2533	–0.0057 n/s	–0.3222
SC	–0.0763 ★	–1.8039	–0.0582 ★★★	–2.6390	–0.0046 n/s	–0.0685
Adjusted R^2		0.41		0.88		0.56
n		616		616		616
Over-ID Test – Dist. χ^2	7.39		0.00		0.62	
Over-ID Test – CV	5.99		5.99		5.99	
Instrument F-Statistic	24.75		22.27		13.66	
	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
Spatial Error – Moran's I	2.64	0.01	0.22	0.83	-0.77	1.65
Spatial Error – LM Test	4.04	0.04	0.13	0.72	1.72	0.19
Spatial Error – Robust LM	2.03	0.15	0.15	0.70	0.36	0.55
	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
Spatial Lag – LM Test	8.90	0.003	0.002	0.97	5.71	0.02
Spatial Lag – Robust LM	6.89	0.01	0.03	0.87	4.36	0.04

Notes: Dependent variable is change in county employment density; *PD* represents population density; *ED* represents employment density; GM1 represents the first growth management variable (see equation 6); GM2 represents the second growth management variable (see equation 7); all hypothesis tests are two-tailed; ★★★ denotes significant at $p < 0.01$; ★★ denotes significant at $p < 0.05$; ★ denotes significant at $p < 0.10$; n/s denotes not significant; CV is for Critical Value; and LM is for Lagrange Multiplier.

Table 5. IV Estimates of Spillover Model Population Equations

	1982 – 1987		1987 – 1992		1992 – 1997	
	Est. par.	t-value	Est. par.	t-value	Est. par.	t-value
Constant	0.6846 $^{n/s}$	1.2810	0.6529 **	2.2746	0.1244 *	1.7632
ΔED	0.1526 $^{n/s}$	0.3343	0.6944 ***	4.8069	0.5999 ***	2.6979
ED_{t-1}	–0.0194 $^{n/s}$	–0.3838	0.1005 $^{n/s}$	1.3327	0.1269 ***	2.5256
Natural Amenity Score	–0.0315 ***	–2.4723	–0.0034 $^{n/s}$	–0.5598	–0.0130 ***	–2.4037
Urban	0.0780 $^{n/s}$	1.3542	0.0387 $^{n/s}$	1.3847	–0.0143 $^{n/s}$	–0.6046
Suburban	–0.0421 $^{n/s}$	–1.0727	0.0116 $^{n/s}$	0.5109	–0.0201 $^{n/s}$	–0.9271
Exurban	–0.0079 $^{n/s}$	–0.2300	0.0031 $^{n/s}$	0.1460	–0.0266 $^{n/s}$	–1.3973
Expenditure Per Student	0.0013 $^{n/s}$	0.1518	–0.0094 $^{n/s}$	–1.4495	0.0009 $^{n/s}$	0.8293
General Revenue Per Person	–0.0222 $^{n/s}$	–0.6636	–0.0265 $^{n/s}$	–1.5206	–0.0310 $^{n/s}$	–1.3302
Total Direct Expenditure Per Person	0.0163 $^{n/s}$	0.6910	0.0215 $^{n/s}$	1.4104	0.0243 $^{n/s}$	1.1054
Total Taxes Per Person	–0.3471 $^{n/s}$	–1.4614	0.0555 $^{n/s}$	0.4958	–0.0962 $^{n/s}$	–1.1444
Property Tax Per Person	0.3435 $^{n/s}$	1.3817	0.0252 $^{n/s}$	0.2153	0.1439 $^{n/s}$	1.6365
Violent Crime Inc. Per Person	0.7978 $^{n/s}$	0.2250	2.2752 $^{n/s}$	1.1261	–1.5411 $^{n/s}$	–0.9635
Property Crime Inc. Per Person	2.9342 ***	2.9284	–0.3331 $^{n/s}$	–0.4499	0.3297 $^{n/s}$	0.5371
Per Capita Income	0.0273 ***	3.6858	0.0040 $^{n/s}$	1.2026	0.0001 $^{n/s}$	0.0250
Percent Black	–0.6350 $^{n/s}$	–1.1698	–0.6391 **	–2.1694	0.0703 $^{n/s}$	1.0840
Percent White	–0.7466 $^{n/s}$	–1.4003	–0.5860 **	–1.9992	0.0587 $^{n/s}$	0.9770
GM1	0.2268 $^{n/s}$	0.6610	0.0120 $^{n/s}$	0.0602	0.1613 $^{n/s}$	1.1364
$\boldsymbol{W} \cdot GM1$	–0.4000 $^{n/s}$	–0.7115	–0.0112 $^{n/s}$	–0.0316	–0.6926 **	–2.1637
GM2	–0.0623 $^{n/s}$	–0.1658	–0.4292 *	–1.7615	–0.5974 ***	–2.7994
$\boldsymbol{W} \cdot GM2$	0.5717 $^{n/s}$	1.2919	0.3491 $^{n/s}$	1.2518	0.6384 ***	2.5644
PD_{t-1}	–0.2469 ***	–5.1640	–0.1826 ***	–7.7250	–0.2048 ***	–12.7842
$FL \cdot PD_{t-1}$	0.1738 **	1.9643	0.0416 $^{n/s}$	0.8299	–0.0012 $^{n/s}$	–0.0234
$FL \cdot PD_{t-1} \cdot GM1$	–0.0963 $^{n/s}$	–0.7326	–0.0043 $^{n/s}$	–0.0612	–0.0661 $^{n/s}$	–0.9627
$\boldsymbol{W} \cdot FL \cdot PD_{t-1} \cdot GM1$	0.3696 $^{n/s}$	1.6005	–0.1247 $^{n/s}$	–0.9224	0.1236 $^{n/s}$	0.9619
$FL \cdot PD_{t-1} \cdot GM2$	–0.1053 $^{n/s}$	–0.6791	0.1563 *	1.8165	0.3215 ***	3.9948
$\boldsymbol{W} \cdot FL \cdot PD_{t-1} \cdot GM2$	–0.0061 $^{n/s}$	–0.0325	–0.0796 $^{n/s}$	–0.7650	–0.1630 $^{n/s}$	–1.5015
AL	–0.0924 *	–1.9443	0.0454 $^{n/s}$	1.5876	–0.0281 $^{n/s}$	–1.0892
FL	–0.4347 **	–2.0137	0.0381 $^{n/s}$	0.2968	–0.0521 $^{n/s}$	–0.4645
GA	–0.0393 $^{n/s}$	–1.0844	0.0246 $^{n/s}$	0.7003	–0.1077 ***	–3.5028
MS	–0.0028 $^{n/s}$	–0.0532	0.0827 ***	2.6851	–0.0590 **	–2.1272
NC	–0.2229 ***	–3.0740	–0.0043 $^{n/s}$	–0.1310	–0.0032 $^{n/s}$	–0.1394
SC	–0.1200 *	–1.7547	0.0557 $^{n/s}$	1.4944	–0.0861 ***	–2.5226
Adjusted R^2		0.61		0.76		0.63
n		616		616		616
Over-ID Test – Dist. χ^2	0.37		1.54		1.36	
Over-ID Test – CV	9.49		9.49		9.49	
Instrument F-Statistic	8.75		42.2		7.56	
	Test stat.	p–value	Test stat.	p–value	Test stat.	p–value
Spatial Error – Moran's I Test –Moran's I Test	1.99	0.05	4.13	0.00	1.81	0.07
Spatial Error – LM Test	1.72	0.19	11.48	0.001	1.38	0.24
Spatial Error – Robust LM Test	0.43	0.51	1.65	0.20	0.01	0.91
	Test stat.	p–value	Test stat.	p–value	Test stat.	p–value
Spatial Lag – LM Test	1.36	0.24	12.60	0.00	2.69	0.10
Spatial Lag – Robust LM Test	0.07	0.79	2.78	0.10	1.33	0.25

Notes: Dependent variable is change in county population density; *PD* represents population density; *ED* represents employment density; GM1 represents the first growth management variable (see equation 6); GM2 represents the second growth management variable (see equation 7); all hypothesis tests are two-tailed; *** denotes significant at $p < 0.01$; ** denotes significant at $p < 0.05$; * denotes significant at $p < 0.10$; $^{n/s}$ denotes not significant; CV is for Critical Value; and LM is for Lagrange Multiplier.

Table 6. IV Estimates of Spillover Model Employment Equations

	1982 – 1987		1987 – 1992		1992 – 1997	
	Est. par.	t-value	Est. par.	t-value	Est. par.	t-value
Constant	–0.0295 $^{n/s}$	–0.5164	–0.1565 ***	–3.2344	–0.1094 $^{n/s}$	–1.0075
ΔPD	0.0413 $^{n/s}$	0.1582	0.4779 ***	2.6524	0.5382 $^{n/s}$	0.7804
PD_{t-1}	–0.0747 $^{n/s}$	–1.1111	0.1566 ***	7.2431	0.1226 $^{n/s}$	0.9567
Natural Amenity Score	–0.0172 $^{n/s}$	–1.4732	–0.0010 $^{n/s}$	–0.2663	0.0023 $^{n/s}$	0.1826
Urban	0.0727 **	2.0997	–0.0378 **	–2.1716	–0.0070 $^{n/s}$	–0.2522
Suburban	–0.0295 $^{n/s}$	–1.1777	–0.0056 $^{n/s}$	–0.3846	–0.0080 $^{n/s}$	–0.2618
Exurban	–0.0048 $^{n/s}$	–0.2345	0.0080 $^{n/s}$	0.5887	0.0077 $^{n/s}$	0.2856
Expenditure Per Student	0.0007 $^{n/s}$	0.1428	0.0074 *	1.7263	–0.0002 $^{n/s}$	–0.2070
General Revenue Per Person	–0.0013 $^{n/s}$	–0.0619	0.0144 $^{n/s}$	1.2440	0.0251 $^{n/s}$	0.9855
Total Direct Expenditure Per	–0.0077 $^{n/s}$	–0.5324	–0.0066 $^{n/s}$	–0.6481	–0.0181 $^{n/s}$	–0.7634
Total Taxes Per Person	–0.2458 $^{n/s}$	–1.5617	0.2191 ***	2.6478	0.1560 ***	2.4319
Property Tax Per Person	0.2132 $^{n/s}$	1.2802	–0.2326 ***	–3.0051	–0.1691 **	–2.0543
Violent Crime Inc. Per Person	1.1570 $^{n/s}$	0.5572	–0.9257 $^{n/s}$	–0.6986	–0.0548 $^{n/s}$	–0.0281
Property Crime Inc. Per Person	0.2913 $^{n/s}$	0.2913	2.2808 ***	4.7418	0.9300 $^{n/s}$	0.8716
Per Capita Income	0.0097 $^{n/s}$	1.3297	0.0066 **	2.2236	0.0036 $^{n/s}$	0.8679
Percent Manufacturing	0.7476 ***	2.8529	–1.1415 ***	–3.8538	0.8199 **	2.0893
Percent FIRE	0.0257 $^{n/s}$	0.6694	0.0194 $^{n/s}$	0.5567	–0.0666 $^{n/s}$	–0.9287
Percent Retail	0.1890 *	1.8188	0.1850 ***	2.4985	0.0073 $^{n/s}$	0.1084
Percent Services	–0.0351 $^{n/s}$	–0.3662	–0.0304 $^{n/s}$	–0.3832	–0.1061 $^{n/s}$	–1.2230
GM1	0.2132 $^{n/s}$	1.4369	0.0280 $^{n/s}$	0.2543	0.0164 $^{n/s}$	0.1413
$\boldsymbol{W} \cdot GM1$	–0.0942 $^{n/s}$	–0.3465	–0.0670 $^{n/s}$	–0.3471	0.2357 $^{n/s}$	0.4350
GM2	–0.0085 $^{n/s}$	–0.0459	0.0294 $^{n/s}$	0.2232	0.0719 $^{n/s}$	0.4087
$\boldsymbol{W} \cdot GM2$	0.0742 $^{n/s}$	0.2471	–0.1416 $^{n/s}$	–0.7219	–0.1104 $^{n/s}$	–0.4361
ED_{t-1}	0.0590 ***	2.7697	–0.3379 ***	–8.9014	–0.2133 ***	–9.1597
$FL \cdot ED_{t-1}$	0.0647 $^{n/s}$	0.5387	0.0326 $^{n/s}$	0.4918	0.0614 $^{n/s}$	0.4942
$FL \cdot ED_{t-1} \cdot GM1$	–0.2022 $^{n/s}$	–1.5625	–0.0628 $^{n/s}$	–0.7407	0.0150 $^{n/s}$	0.1477
$\boldsymbol{W} \cdot FL \cdot ED_{t-1} \cdot GM1$	0.1515 $^{n/s}$	0.5835	0.0546 $^{n/s}$	0.4007	–0.0561 $^{n/s}$	–0.6033
$FL \cdot ED_{t-1} \cdot GM2$	–0.1333 $^{n/s}$	–0.8878	–0.0336 $^{n/s}$	–0.3663	–0.1402 $^{n/s}$	–0.6436
$\boldsymbol{W} \cdot FL \cdot ED_{t-1} \cdot GM2$	0.3209 $^{n/s}$	1.6060	0.0231 $^{n/s}$	0.1642	0.0295 $^{n/s}$	0.6889
AL	–0.0398 $^{n/s}$	–1.2427	–0.0425 ***	–2.4920	–0.0122 $^{n/s}$	–0.3121
FL	–0.1211 $^{n/s}$	–0.9520	–0.1203 *	–1.6767	–0.0888 $^{n/s}$	–1.3090
GA	–0.0053 $^{n/s}$	–0.2688	–0.1158 ***	–5.2349	–0.0117 $^{n/s}$	–0.1013
MS	–0.0622 **	–2.2270	0.0091 $^{n/s}$	0.3251	0.0569 *	1.8304
NC	–0.1138 *	–1.8973	–0.0741 ***	–3.2195	–0.0042 $^{n/s}$	–0.2016
SC	–0.0770 *	–1.8412	–0.0588 ***	–2.6580	0.0144 $^{n/s}$	0.1724
Adjusted R^2		0.41		0.89		0.59
n		616		616		616
Over-ID Test – Dist. χ^2	6.9608		0.000		0.924	
Over-ID Test – CV	5.991		5.991		5.991	
Instrument F-Statistic	22.3		18.96		13.21	
	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
Spatial Error – Moran's I Test	2.48	0.01	0.30	0.77	0.01	0.995
Spatial Error – LM Test	3.35	0.07	0.09	0.76	0.33	0.57
Spatial Error – Robust LM Test	2.04	0.15	0.10	0.76	1.28	0.26
	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
Spatial Lag – LM Test	7.45	0.01	0.01	0.94	3.92	0.05
Spatial Lag – Robust LM Test	6.14	0.01	0.01	0.93	4.88	0.03

Notes: Dependent variable is change in county employment density; *PD* represents population density; *ED* represents employment density; GM1 represents the first growth management variable (see equation 6); GM2 represents the second growth management variable (see equation 7); all hypothesis tests are two-tailed; *** denotes significant at $p < 0.01$; ** denotes significant at $p < 0.05$; * denotes significant at $p < 0.10$; $^{n/s}$ denotes not significant; CV is for Critical Value; and LM is for Lagrange Multiplier.

Table 7. Selected Coefficients from Models Using Instrumented Versions of the *GM1* and *GM2* Variables

Base Model Population Equations – Compare to Corresponding Parameter Estimates in Table 3						
	1982 – 1987		1987 – 1992		1992 – 1997	
	Est. par.	t-value	Est. par.	t-value	Est. par.	t-value
GM1	0.3776 $^{n/s}$	0.2395	0.3413 $^{n/s}$	0.3465	1.6067 *	1.7969
GM2	–0.1022 $^{n/s}$	-0.0994	–0.5824 $^{n/s}$	-0.9163	–1.3937 **	-2.3677
PD_{t-1}	–0.2443 ***	-5.3386	–0.1877 ***	-8.3710	–0.2060 ***	-12.5553
$FL \cdot PD_{t-1}$	0.2536 ***	2.3181	–0.0559 $^{n/s}$	-1.1317	–0.0522 $^{n/s}$	-1.0315
$FL \cdot PD_{t-1} \cdot GM1$	–0.0190 $^{n/s}$	-0.0599	–0.1977 $^{n/s}$	-1.0343	–0.4803 ***	-2.6545
$FL \cdot PD_{t-1} \cdot GM2$	–0.2014 $^{n/s}$	-0.6773	0.3487 ***	2.1467	0.5948 ***	3.7545
Spillover Model Population Equations – Compare to Corresponding Parameter Estimates in Table 5						
	1982 – 1987		1987 – 1992		1992 – 1997	
	Est. par.	t-value	Est. par.	t-value	Est. par.	t-value
GM1	0.0496 $^{n/s}$	0.0293	0.4305 $^{n/s}$	0.4069	1.0169 $^{n/s}$	1.0386
$\boldsymbol{W} \cdot GM1$	–0.3475 $^{n/s}$	–0.5735	0.0406 $^{n/s}$	0.1076	–0.7240 **	–2.0745
GM2	–0.1073 $^{n/s}$	–0.1006	–0.5526 $^{n/s}$	–0.8389	–1.0556 *	–1.7160
$\boldsymbol{W} \cdot GM2$	0.6994 $^{n/s}$	1.4029	0.1196 $^{n/s}$	0.3885	0.4802 *	1.6890
PD_{t-1}	–0.2462 ***	–5.2632	–0.1884 ***	–8.2394	–0.2047 ***	–12.4873
$FL \cdot PD_{t-1}$	0.2157 *	1.8287	–0.0356 $^{n/s}$	–0.5711	–0.0585 $^{n/s}$	–0.9213
$FL \cdot PD_{t-1} \cdot GM1$	0.0546 $^{n/s}$	0.1352	–0.3179 $^{n/s}$	–1.2711	–0.4023 $^{n/s}$	–1.6357
$\boldsymbol{W} \cdot FL \cdot PD_{t-1} \cdot GM1$	0.3035 $^{n/s}$	1.1440	–0.1646 $^{n/s}$	–1.0831	0.1805 $^{n/s}$	1.2407
$FL \cdot PD_{t-1} \cdot GM2$	–0.1896 $^{n/s}$	–0.6261	0.3568 **	2.1095	0.5268 ***	3.1342
$\boldsymbol{W} \cdot FL \cdot PD_{t-1} \cdot GM2$	–0.1140 $^{n/s}$	–0.4701	0.0823 $^{n/s}$	0.5630	–0.0362 $^{n/s}$	–0.2518

Notes: Dependent variable is change in county population density; complete results for these models are available upon request from the corresponding author; *PD* represents population density; *ED* represents employment density; GM1 represents the first growth management variable (see equation 6); GM2 represents the second growth management variable (see equation 7); all hypothesis tests are two–tailed; *** denotes significant at $p < 0.01$; ** denotes significant at $p < 0.05$; * denotes significant at $p < 0.10$; and $^{n/s}$ denotes not significant.