Urban and Regional Analysis Group

LOCAL GOVERNMENT COMPETITION FOR ECONOMIC DEVELOPMENT

Kelly D. Edmiston
Geoffrey K. Turnbull

Working Paper No. 03-07
August 2003

Georgia State University
Andrew Young School of Policy Studies

Local Government Competition for Economic Development*

Kelly Edmiston
Department of Economics
Georgia State University

Geoffrey K. Turnbull**
Department of Economics
Georgia State University

September 2002
Revised: August 2003

Abstract

This paper examines the factors driving community tax incentives for industry recruitment. The empirical results show that spatial competition among Georgia counties is an important factor determining their propensity to use fiscal incentives. The proximity effect is robust and diminishes with distance. In addition, we find that county governments use fiscal incentives to compensate for higher taxes and that higher income jurisdictions do not tend to forestall nonresidential development (and its attendant externalities). Interestingly, neither economic diversification nor government form affects development policies. It also appears that fiscally troubled local governments cannot sustain the short term costs of aggressively recruiting industry in order to garner the long term benefits.

Keywords: interjurisdiction competition, tax abatement, firm location

JEL Codes: R58; R11; H7

***Mailing address:* Geoffrey K. Turnbull, Department of Economics; Georgia State University; University Plaza; Atlanta, GA 30303-3083

phone: 404-651-0419; *fax:* 404-651-2737; *email:* gturnbull@gsu.edu

*We thank three anonymous referees for their helpful comments. All errors remain our own.

1 Introduction

High profile examples of large plant relocations in the popular press reinforce the picture of state and local governments engaging in ruinous competition with their ever more lucrative offers of tax abatements and similar inducements to bring firms into their jurisdictions. But, do these highly publicized cases represent outliers or the norm for the lower profile day-to-day economic development efforts of state and local governments? While much of the theoretical literature views interjurisdiction tax competition as ruinous, targeted incentives like tax abatements may enhance the efficient sorting of investments among jurisdictions with differing location attributes (Black and Hoyt, 1989). In any case, tax abatements and related incentives are widely used–but with varying frequency–across local governments. And, independent of the extent to which they rely upon them, local government officials view these investment incentives as a valuable policy option in their economic development policy tool kit.[1]

This paper contributes to the newly emerging empirical literature studying the factors determining the role of tax abatements and similar investment incentives in community economic development policies. Empirical work on the topic has been hampered by the lack of data, so it is not surprising that the extensive theoretical literature has been primarily augmented by casual empiricism, reference to the highly publicized large relocation decisions featured prominently in the press, and only a handful of econometric studies (McHone, 1987; Coffin, 1982; Morse and Farmer, 1986; Wassmer, 1992, 1994; Anderson and Wassmer, 1995; Man, 1999; and Brett and Pinkse, 2000). A state government survey of local government development policies in Georgia, however, provides a unique opportunity to study the factors affecting whether or not local governments choose to include tax abatements and similar incentives in their policy arsenal. We exploit this data to examine the extent

[1] The effectiveness of investment incentives, however, is quite another question. With respect to tax abatements as an industry recruitment tool, the empirical evidence is mixed. This is not surprising given the similarly unsettled debate over how important local taxes are to firm's location decisions (Newman and Sullivan, 1988). Gurwitz (1977), Coffin (1982) and Rondinelli and Burpitt (2000) argue that tax abatements have little effect on firm's location decisions and Wassmer (1992; 1994) concludes that investment incentives can stimulate the local tax base but do not prevent economic decline. Morse and Farmer (1986), on the other hand, find that tax abatements and incentives do affect firms' investment decisions.

to which interjurisdiction competition for nonresidential capital really does drive the choice of incentives, while controlling for the potential influences of fiscal distress, residents' demand for growth controls, government form, and other relevant factors.

The idea of interjurisdiction competition as an important force in local fiscal policy is widely accepted in the theoretical literature. Early studies by Wilson (1986) and Turnbull and Niho (1986) assume a single uniform tax rate on all types of property (residential and nonresidential). Wilson (1986) shows that the overall effect of alternative jurisdictions when capital is mobile is to reduce tax rates and spending. Turnbull and Niho (1986) come to a similar conclusion using a different approach. Like Wilson (1986), Turnbull and Niho (1986) have no formal treatment of space or proximity. Nonetheless, the dynamic analysis in that paper shows that a faster adjustment speed for capital location (which we argue represents closer proximity of competing cities) tends to lower the tax rates and spending for both capital-losing and capital-gaining jurisdictions. Braid (1993) finds a similar result in a static Nash equilibrium framework: greater transportation costs between competing jurisdictions increases tax rates and spending as each jurisdiction treats its rival as a declining threat. The notion that mobile nonresidential capital leads to a lower tax rate and spending reappears in various forms throughout the theoretical literature.

What the early models of tax competition ignore, though, is the ability of locales to fashion different taxes for business than for residents and even to structure targeted special tax reductions for specific firms in the form of industrial revenue bonds, tax abatements, or providing specialized services or infrastructure. Later studies focusing on business-specific taxes tend to reinforce the view of interjurisdiction competition for mobile business capital as ruinous (see Braid, 1996, 1280), although public goods that benefit business can mediate that effect (Noiset and Oakland, 1995).

The important questions surrounding the role of industry recruitment in economic development policy, however, hinge on investment incentives that are targeted at specific firms rather than on the level of broadly applied business taxes per se. Research on this topic is more sparse. Gurwitz (1977) adopts a simple game theory approach and concludes that local jurisdictions will generally offer firms the maximum tax abatement allowed by law; in the tradition of the uniform tax rate competition models, tax abatements lead to destructive competition among jurisdictions. Black and Hoyt (1989) study how two competing jurisdictions bid for large firms by offering fiscal inducements. They conclude that competitive recruitment need not reduce welfare when the public service is produced under increasing returns to scale technology. With perfect information, the winning locale always promotes efficiency when smaller firms are immobile. Further, when smaller firms are mobile, it is optimal for the winning locale to bid more than the direct benefit of the larger firm, taking into account the multiplier effects that come from smaller firms following the large firm to the locale. Under uncertainty, however, interjurisdiction competitive bidding may not generate the efficient capital location, largely because the locale with location advantage for the firm ends up bidding too little to ensure getting the firm. Still, their research provides an alternative view, a setting in which interjurisdiction competition for business capital need not always reduce welfare.

This study is motivated in part by the observation that, even though most states in the US empower local governments to employ tax abatements or similar incentives to recruit industry, not all local jurisdictions use these incentives. This observation conflicts with Gurwitz's (1977) conclusion that local governments are compelled by competition to offer the maximum tax breaks allowed by state law. It is, however, consistent with Black and Hoyt's (1989) perspective in which heterogeneous communities structure their tax break offers to balance the inherent net location advantage of the locale to the firm against the fiscal cost of the incentives to the community; an optimal offer in this framework need not push the envelope of what is allowed by the state.

Regardless of how incentives affect firms' location choices, the existing empirical evidence broadly supports the notion of interjurisdiction competition suppressing tax rates.[2] Still, the evidence is not uniformly conclusive (Brett and Pinkse, 2000). Our concern, though, is more focused: does interjurisdiction competition drive the local decision to offer tax abatements or similar inducements to firms? The existing ev-

[2]See, for example, Buettner (2001), Eberts and Gronberg (1990), Schneider (1986), and Sjoquist (1982). In the broader context, however, it is useful to note that empirical evidence of interjurisdiction competition in many of these studies is just as likely capturing Tiebout effects of residential mobility as it is capturing the effects of competition for nonresidential capital.

idence on this point is scant, but tends to support the idea that competition plays a role. Although not focused on abatements, Man (1999) shows that fiscal distress, industrial composition, and tax competition each affect the extent to which cities rely on tax incremental financing in Indiana. In their study of cities in the Detroit metropolitan area, Anderson and Wassmer (1995) find that the adoption of tax incentives by a neighboring jurisdiction tends to hasten a city's adoption of similar incentives.

This paper is organized as follows. Section 2 presents a simple model of local government industry recruitment efforts as a tournament, using the framework to motivate the empirical model specification. Section 3 presents the empirical specification. Section 4 discusses econometric issues and the estimation process and the empirical results are reported in Section 5. The final section presents our conclusions.

2 Recruitment as a Tournament

Viewed in its simplest terms, the process of industry recruiting resembles a rank order tournament.[3] Each jurisdiction incurs costs putting together a recruitment package (which itself obligates the community to certain costs if the recruitment is successful). The targeted firm compares the range of benefits offered by competing locales against the inherent economic advantages of each when making its investment decision. As in a simple tournament, the winning jurisdiction is determined at least to some degree by the range of recruitment efforts (i.e., the benefit packages) offered by competing jurisdictions as well as its inherent location advantages. The rank order tournament structure arises because the absolute level of effort expended by the "winning" jurisdiction does not matter; only *relative* effort matters. And only one jurisdiction ultimately wins the prize.

The tournament framework described here is simple, yet it shows two important aspects of industry recruitment behavior by local governments. Not only are the recruitment efforts of jurisdictions interdependent, they are interdependent in a pre-

[3]See Nalebuff and Stiglitz (1983) for the properties of rank-order tournaments in general. The derivations for the recruiting tournament model used here are available from the authors by request.

dictable way, with the efforts of nearer localities eliciting a stronger response than the efforts of localities farther away. The econometric estimation of the determinants of recruitment efforts must allow for this spatial pattern of interdependence.

Suppose there are just two jurisdictions competing for a particular firm.[4] Let e_i denote the amount of effort jurisdiction i expends to bring a certain firm into its jurisdiction (or to keep it there). The effectiveness of this effort depends upon many factors, but we can focus on a few broad categories. The jurisdiction's inherent net location advantage (or disadvantage) over jurisdiction j for the firm is summarized in the parameter α ($\alpha > 0$ indicates a net location advantage and $\alpha < 0$ a net disadvantage). The effective effort is actual recruitment effort expended net of inherent location advantages or disadvantages, $e_i - \alpha$. Other factors unrelated to the behavior of competing jurisdictions also matter in firms' location decisions; these external factors are captured in the stochastic term ξ, symmetrically distributed $F(\xi)$ with mean zero and finite variance. The targeted firm chooses to locate in jurisdiction i over the competing locale j if $e_i + \alpha + \xi > e_j$. The probability of this event is

$$P_i(e_i, e_j, \alpha) = \int_{e_j - e_i - \alpha} dF(\xi)$$

The gain to locale i from the firm is R_i, which is the direct benefit to the locale from the firm plus any multiplier or indirect benefits from the firm's arrival. The amount of tax abatement or targeted public spending offered to the company is $A(e_i)$, and is assumed to be an increasing strictly convex function of recruitment effort. In addition, the community's cost of preparing the offer is captured by the increasing convex function $c(e_i)$. This cost is incurred by the jurisdiction choosing to make an incentives offer to the firm whether or not the recruitment strategy is ultimately successful.

The expected returns to the rival locales i and j from their recruitment efforts are, respectively

$$\begin{aligned} EV_i &= P_i[R_i - A(e_i)] - c(e_i) \\ EV_j &= (1 - P_i)[R_j - A(e_j)] - c(e_j) \end{aligned}$$

[4] We follow convention and call governments' efforts to get firms' to locate some of their facilities within their borders as recruitment of "firms."

The first implication of tournaments is that not every jurisdiction will choose to compete.[5] For two that do, the Nash equilibrium satisfies the marginal conditions for recruitment efforts:

$$\frac{\partial EV_i}{\partial e_i} = \left(\frac{\partial P_i}{\partial e_i}\right)[R_i - A(e_i)] - P_i A'(e_i) - c'(e_i) = 0 \quad (1)$$

$$\frac{\partial EV_j}{\partial e_j} = -\left(\frac{\partial P_i}{\partial e_j}\right)[R_j - A(e_j)] - (1 - P_i)A'(e_j) - c'(e_j) = 0 \quad (2)$$

Solving (1) implicitly for jurisdiction i's best response to the other jurisdiction's effort reveals that recruitment efforts by competing jurisdictions are strategic complements. This is a standard tournament result; greater effort by one competitor tends to elicit greater effort by others. In the context of the empirical model below, this standard tournament relationship implies that one jurisdiction's recruitment effort is positively related to that of potentially competing jurisdictions.

Taking a closer look at the nature of this inter-relationship, consider how a relative location advantage affects the jurisdiction's recruitment effort. A location advantage (higher α) increases the probability of successful recruitment independent of recruitment effort for the jurisdiction, which leads to less recruitment effort. In a sense, the jurisdiction need not work as hard to recruit the firm, as the natural benefits of the jurisdiction to the firm serves as a draw regardless of recruitment effort expended. Since neighboring jurisdictions are more likely to have similar location characteristics for the targeted firm while distant jurisdictions are less likely to have similar location characteristics, the model provides the rationale for viewing interjurisdiction development competition as spatial, with stronger competition effects from nearby jurisdictions and weaker effects from those farther away. This notion of diminishing interdependence between local governments' recruitment efforts with greater distance motivates our choice of econometric method to take this spatial aspect into account.

The tournament model comparative statics also relate to other aspects of the

[5] It can be shown that a given jurisdiction i may choose to exert no recruitment effort when when the benefit R_i is sufficiently small or the difficulty is sufficiently great (i.e., α sufficiently negative). That is, as in other tournament models, potential competitors choose not to participate in contests with meaningless prizes or overwhelming rivals (Nalebuff and Stiglitz, 1983). Therefore, following the standard approach, the following results are derived in the neighborhood of the symmetric Nash equilibrium.

empirical model. The benefit of successful recruitment to the jurisdiction (R_i) might be in the form of anticipated accretion to the community tax base or growth in the employment base, depending on the goals of the locale. Or, it could also be associated with the perceived benefits from successfully diversifying the community's economic base by recruiting a firm in a new industry for the locale. A general characteristic of tournaments is that a greater prize from winning elicits greater effort, so it should not be surprising that the analogous result holds here, that a greater anticipated benefit prompts each competing jurisdiction to recruit harder.[6]

On the other hand, the riskiness of recruitment outcomes also matters. A mean-preserving increase in the ξ-distribution spread in the model means that the numerous unpredictable factors outside the jurisdictions' controls are more prominent in firms' investment decisions. Because greater riskiness of this sort lowers the marginal probability of successful recruitment from more effort, it reduces the optimal amount of community recruitment effort.[7] Roughly, the less important the inducements offered by communities are to firms, the less incentive communities have for offering them.

3 The Empirical Model and Data

This section explains the empirical model of jurisdictions' incentives choices used in the estimation. The data set covers 154 of the 159 total Georgia counties for which survey data was available. Population characteristics, income variables, and median house value are drawn from the 1990 *Census of Population*; the spending

[6]Increasing the number of contestants in a rank order tournament without increasing the number of prizes reduces the effort expended by each riva because the probability of an "unlucky" draw of the stochastic term that favors one of the other tournament participants increases as the number of contestants increases. Thus, the greater the number of competing jurisdictions for a firm, the lower the effort expended by each. In the limit, no jurisdiction will use fiscal inducements to recruit firms. Counties in our sample do engage in recruitment, however. This is not surprising. The spatial pattern of competition implied by the tournament also implies that the number of rival jurisdictions facing any one county are not that great. Only the nearest counties are the strongest competitors (in the sense of sharing the same location advantages) and the competitive effects of others fall off with distance. As a result, we expect any given county in our sample to have a relatively small number surrounding counties as its nearest potential competitors and a larger but still finite number of collar counties representing less potent potential rivals.

[7]Notice that this result does not reflect risk aversion, since EV_i assumes risk neutrality in the tournament model.

and tax variables are from the *Census of Governments*; and the fiscal capacity data are drawn from calculations by the Georgia State University Policy Research Center (1996). We construct the investment incentives choice variable using information from a state government survey of county governments, as explained below. Table 1 reports the definitions, means and standard deviations of variables used in the study.

Following the implications of the tournament model, the jurisdiction's recruitment effort depends on the recruitment effort of the $N-1$ other counties in the relevant region, represented by the vector $\mathbf{h}(\mathbf{e})$. In addition, recruitment effort is affected by the effective property tax rate of jurisdiction i[8] and other variables included to capture residents' demands for growth constraints or avoiding unwanted land uses, government fiscal distress, diversification development goals, government form, and related factors identified later. Let $\mathbf{Z}$ be the vector of exogenous variables influencing recruitment effort. The empirical model is compactly written as

$$e_i = f(\mathbf{h}(\mathbf{e}), \mathbf{Z}_i) \tag{3}$$

The greater the recruitment effort, the more extensive the tax or service benefits offered to targeted firms. We do not observe recruitment effort directly, but only whether or not the local government offers tax abatements or related incentives. Taking the usual approach in such situations, we assume that an offered benefit package includes property tax abatement or similar benefits for efforts above the effort threshold e^*. Defining an incentives choice variable C, where $C = 1$ if abatement or similar incentives is used and $C = 0$ otherwise, the jurisdiction's observable abatement or incentives behavior is determined by the level of its latent recruitment effort e_i:

$$\begin{aligned} C_i &= 1 \text{ for } e_i \geq e^* \\ C_i &= 0 \text{ for } e_i < e^* \end{aligned}$$

The dependent variable in the incentives choice equation is constructed from a 1999 survey of counties conducted by the Georgia Department of Community Affairs.

[8] We initially allowed recruitment effort to depend upon the (spatially weighted) effective property tax rates of the other $N-1$ counties in the sample. However, the estimates revealed that this set of tax rates are statistically unrelated to recruitment effort. Therefore, we dropped these variables from the models reported here.

The survey instrument identified degrees of reliance upon tax abatements and related policies: offering to targeted firms subsidies, tax incentives, additional government services, or fee reductions.[9] The survey asks whether the county uses these incentives "never," "sometimes," "most of the time," or "always" to recruit new industry to the jurisdiction. The responses across the different types of incentives were almost perfectly correlated; a given county that "never" used abatements also "never" used subsidies, additional services, etc.

We estimate the model for the dependent variable defined as $C = 0$ for counties who report "never" using these tools and $C = 1$ for counties who report using these investment incentives "sometimes," "most of the time" or "always."[10]

Interjurisdiction competition. This study focuses on spatial competition among jurisdictions for economic development. Following the typical format for spatial econometric models, the incentives choice equation includes variables measuring the distance-weighted incentives choices of other counties. Several specifications are used; the precise specifications are explained with the estimating technique below. Generally, the tournament model shows that greater effort by surrounding jurisdictions elicits greater recruitment effort by the jurisdiction. Further, the greater the distance between jurisdictions the less homogeneous the competing jurisdictions from the firm's perspective, which leads to a lower recruitment effort in response to more distant counties. In addition, it is reasonable to expect that a firm seriously comparing mutually distant potential locations is footloose and therefore affected more strongly by the numerous factors that are outside the county government's control. This corresponds a mean-preserving increase in the recruitment risk in the tournament model, which, as explained above, also reduces the community's recruitment

[9] In Georgia, local governments can effectively create property tax abatements by tying an interim property title transfer to the issuance of industrial revenue bonds. Therefore, in the survey of county governments, "industrial revenue bonds" are interpreted as county tax abatements.

[10] Although the ordinality of the allowed responses in the survey suggests that an ordered probablity model is appropriate, the subjective nature of the survey responses leaves us unable to assert that one respondent's answer of "sometimes" must indicate a lower frequency of incentives use than another respondent's answer "most of the time." The distinction between "never" and "not never," however, is unambiguous, so we use these as the categorical responses. Recall that we did not design the survey, but were only able to obtain the survey results.

effort. In sum, under the spatial competition hypothesis, the coefficients on surrounding jurisdictions' incentives choice variables are positive and declining with distance. These coefficients are zero when interjurisdiction competition is absent.

The states surrounding Georgia place different restrictions on the ability of local governments to offer tax abatements and other incentives to industry. We include in the incentives choice equation dummy variables for counties bordering on Alabama (AL), Tennessee (TN), South Carolina (SC), and Florida (FL) to pick up any proximity effects of local government competition across state borders. Alabama, South Carolina, and Tennessee in particular have histories of liberal tax abatement rules for their local governments (Gurwitz, 1977). Any cross-border competitive effects will yield positive coefficients for these state dummy variables.

County property tax rate. If the county is providing a high level of public services and if the services in the mix are oriented toward residents rather than industry, then higher levels of county spending and the associated higher taxes to support the spending are associated with a smaller α term in our model. As argued above, this disadvantage leads to greater recruitment effort. Thus, we anticipate a positive coefficient estimate on the county property tax rate variable, $TAXRATE$.

Residents' demand for growth control. The static models of strategic growth control in Brueckner (1995) and Helsley and Strange (1995) show that successful development can reduce the community's willingness to accept further development.[11] In addition, residents living in counties undergoing rapid growth may find the increasing congestion, rising infrastructure costs, or other factors unpleasant and may push their local governments to curtail rapid growth. We use several variables to measure internal growth pressures on the county's incentives choice. The 1990 county population (POP) and percentage population growth over 1990-2000 (ΔPOP) together measure current population pressures. We expect negative coefficients on these variables when rapid population growth increases the demand for slower development by residents. The equation also includes the amount of agricultural land as proportion

[11] That is, communities that have gotten to be large enough to affect the interjurisdictional terms of trade have incentives to engage in strategic growth controls.

of total area in the county ($AGLAND$) to measure the overall level of development. The coefficient on this variable will be positive under our growth-control demand hypothesis.

Fischel (2001) argues that higher income jurisdictions are more inclined to foreclose development by industry or other land uses that generate significant negative externalities. To allow for this effect, the incentives choice equation includes several variables: average household income ($AVEINC$), the percentage of population below poverty level ($POVERTY$), and the percentage of population with at least BA degree (BA). Under Fischel's hypothesis, the coefficients on income and education level are expected to be negative while that on poverty is expected to be positive.

Of course, the underlying ideology of the population concerning the appropriate role for government may also matter. To control for this, we include the percentage democratic vote in the 1988 presidential election ($DEMO$). We have no expectation regarding the sign of the coefficient on this variable.

Local benefits from economic development. $UNEMPL$ and $\Delta UNEMPL$ are the 1990 county unemployment rate and the 1989-90 change in the unemployment rate, respectively. Counties with greater unemployment or rising unemployment can benefit more from industry recruitment than can their better placed counterparts. Such locales value economic development more highly (greater R_i) which leads to greater recruitment effort. We expect to find positive coefficients on these variables.

Government fiscal distress. Budgetary pressures may provide another motive for aggressive industry recruitment. Assuming that budgetary pressures make counties value economic development more highly, greater fiscal distress increases the probability of adopting abatements or related incentives. We measure fiscal distress with a variable measuring the 1994 fiscal capacity ($FISCAP$). A negative coefficient on this variable indicates that Georgia counties attempt to relieve their fiscal distress by more aggressively pursuing economic development, as implied by the tournament framework. On the other hand, a positive coefficient indicates that distressed counties are less likely to aggressively pursue economic development. This result is consistent with the tournament framework if it means that fiscally constrained governments are unable to sustain the short term cost of the offered incentives (or recruitment effort) that are needed to obtain the longer term development benefits.[12]

Industrial diversification. State and local officials often state that economic diversification is a policy goal. Man (1999) finds that the mix of existing industry in a city affects its willingness to structure investment incentives in the form of TIFs. Our model includes a Herfindahl-Hirschman index for employment concentration across industry groups to measure the extent to which the diversity of the existing economic base affects recruitment aggressiveness. The index (HI) used here is based on employment in the following categories: (i) agriculture, (ii) manufacturing, (iii) wholesale and retail trade, (iv) finance, insurance, and real estate, (v) health services, (vi) transportation, communication, and public utilities, and (vii) public administration. A positive coefficient on this variable in the incentive choice equation indicates that counties with a less diversified industry are more aggressive recruiters, possibly reflecting diversification as a goal of development officials.

Government form. Different county government organizational forms divide executive and legislative duties differently. Forms that rely upon independent professional managers for executive functions may enjoy greater technical knowledge or professionalism than those relying upon elected officials to fill these roles. Even though there is little evidence that the form of government systematically affects spending decisions (Deno and Mehay, 1987; Hayes and Chang, 1992; Campbell and Turnbull, 2003), we nonetheless wish to allow for the possibility that different government forms may lead to different development policies, reflected in industry recruitment efforts. We include a set of dummy variables to control for these possible effects on policy: the traditional council-commission form (TC), elected executive and sole commissioner forms (EE), the commission-administrator form (CA) and the council-manager form (CM). Elected officials conduct management oversight duties in the elected executive and council-commission forms of government. In the commission-administrator and council-manager forms, on the other hand, the elected commission or council hires

[12] The greater short term cost is reflected in greater cost of recruitment effort in the tournament model, which can be show to reduce recruitment effort.

a professional administrator to oversee executive functions. The various forms also differ with respect to separation-of-powers. The elected executive forms separate the executive and legislative functions while the others exhibit unified executive-legislative structures.

We have no expectation about how the form of government affects the choice of industry incentives. While it seems reasonable to expect that professional managers have the knowledge and expertise to direct more aggressive industry recruitment programs, it is not clear how the lack of independent executive powers associated with these forms of government affects their freedom to follow through.

4 The Estimation Method

We propose a spatial autoregressive structure to capture the spatial interaction reflected in the incentive choice. Let $\mathbf{h}(\mathbf{C}) = \mathbf{WC}$, where $\mathbf{W}$ is an $N \times N$ spatial weight matrix based on distance or proximity, reflect the spatial underactivity between counties in the state. In addition to the structural spatial dependencies in $\mathbf{W}$, we also allow for heteroscedasticity. The incentives choice estimating equation is [13]

$$\begin{aligned} &\mathbf{C}\left(\mathbf{I} - \rho\mathbf{W}\right) = \mathbf{Z}\boldsymbol{\theta} + \boldsymbol{\varepsilon} \qquad (4)\\ &\boldsymbol{\varepsilon} \,\tilde{}\, N\left(\mathbf{0}, \sigma^2\mathbf{V}\right), \quad \mathbf{V} = diag\left(v_1, v_2, \ldots, v_N\right) \end{aligned}$$

Heteroscedastic spatial autoregressive models with discrete dependent variables generally are not estimated directly by maximum likelihood because N-dimensional integrals would have to be evaluated to determine marginal distributions (McMillen, 1992). To estimate the incentives choice equation we utilize a Bayesian approach and rely on conditional distributions. In particular, we employ Gibbs sampling to calculate Bayesian marginal posterior densities utilizing knowledge of the conditional

[13] We initially allowed for spatial autocorrelation in the errors as well. Using an LM procedure discussed in Pinkse and Slade (1998), we calculated $LM = \{\boldsymbol{v}_i'\mathbf{W}\boldsymbol{v}_i\}^2 / tr\left(\mathbf{W}^2 + \mathbf{W}'\mathbf{W}\right)$ where v_i is the ith "generalized residual corrected for heteroscedasticity" given by Pinkse and Slade (1998, 130). Based on this test, we conclude that there is no spatial autocorrelation in the model, and we proceed accordingly.

distributions of the parameters.[14] That is, rather than directly computing (or approximating) the marginal density, say $f(x)$, the Gibbs sampler allows us to generate a sample $x_1, x_{2,} \ldots, x_P$ ~ $f(x)$ without requiring knowledge of the actual $f(x)$. This methodology was pioneered for the probit case by Albert and Chib (1993) and extended to the case of limited dependent variable spatial autoregressive models by LeSage (2000).

McMillen (1992) proposes an EM algorithm to estimate similar models. The Bayesian approach used here is conceptually similar to the EM method, but as discussed in LeSage (2000), it overcomes the inherent bias in the EM algorithm that arises from its use of conditional distributions to calculate the standard errors.[15] Even though the Gibbs sampler samples from conditional distributions for the parameters, Gelfand and Smith (1990) demonstrate that Gibbs sampling from the set of complete conditional distributions (for all parameters) renders a set of estimates converging to the true joint posterior distribution of the parameters. As discussed in more detail below, an additional advantage of our approach is that we do not have to specify a functional form for the heteroscedastic disturbances.[16]

4.1 Procedure

All Bayesian methodologies in econometrics follow the same general approach: the initial beliefs of the researcher, represented by prior probabilities, are combined by means of Bayes' theorem with information in the data, which is incorporated in a likelihood function, to yield posterior probabilities.

Let prior information about the parameters be represented by $\pi(\rho, \boldsymbol{\theta}, \sigma, \mathbf{V})$, and let the available data generate a likelihood $p(\mathbf{C} \,|\, \mathbf{Z}, \mathbf{W}; \rho, \boldsymbol{\theta}, \sigma, \mathbf{V})$. Applying Bayes' theorem brings the prior information and the data together to produce the posterior distribution:

$$p(\rho, \boldsymbol{\theta}, \sigma, \mathbf{V} \,|\, \mathbf{C}, \mathbf{Z}, \mathbf{W}) = \frac{\pi(\rho, \boldsymbol{\theta}, \sigma, \mathbf{V})\, p(\mathbf{C} \,|\, \mathbf{Z}, \mathbf{W}; \rho, \boldsymbol{\theta}, \sigma, \mathbf{V})}{p(\mathbf{C})} \tag{5}$$

[14] See Casella and George (1992) for a straight-forward introduction to the Gibbs sampler.

[15] This problem may also be solved using bootstrap methods. See McMillen and McDonald (2002).

[16] Another alternative estimation strategy for limited dependent variable spatial autoregressive models is provided by Case (1992). The restricted set of cases for which this methodology could apply (block diagonal spatial weight matrices) rendered it unsuitable for our purposes.

$$\propto \pi(\rho, \boldsymbol{\theta}, \sigma, \mathbf{V}) \, p(\mathbf{C} \,|\, \mathbf{Z}, \mathbf{W}; \rho, \boldsymbol{\theta}, \sigma, \mathbf{V})$$

The advantage of using the Gibbs sampler is that we are able to get around the technical difficulty associated with calculating the marginal posterior densities necessary for (5). Briefly, in implementing the Gibbs sampler, we derive the complete conditional distributions for each of the parameters in the model and then proceed to sample sequentially from these distributions for parameter values. Using the saved values of the parameters from each pass of the Gibbs sampler, which can be viewed as *i.i.d.* random draws from the full joint posterior distribution of $(\rho, \boldsymbol{\theta}, \sigma, \mathbf{V})$, we are able to compute the relevant moments (*e.g.*, the sample means are used as point estimates of the parameters of the model).

The Gibbs sampling proceeds as follows. Having specified the priors and conditional distributions, which are described below, we first set initial values $\rho^0, \boldsymbol{\theta}^0, \sigma^0$, and $\mathbf{V}^0$ for the parameter vector. Next we calculate $p\left(\sigma \,|\, \rho^0, \boldsymbol{\theta}^0, \mathbf{V}^0\right)$ to determine σ^1 and sample a vector $\mathbf{y}$ of (continuous) latent variables described by (7) below (using initial parameter values). We then generate random draws in the following sequence from the conditional posterior distributions:

$$\begin{aligned} \boldsymbol{\theta}^1 &\sim p\left(\boldsymbol{\theta} \,|\, \sigma^1, \rho^0, \mathbf{V}^0\right) \\ v_i^1 &\sim p\left(v_i \,|\, \sigma^1, \rho^0, \boldsymbol{\theta}^1\right) \\ \rho^1 &\sim p\left(\rho \,|\, \sigma^1, \boldsymbol{\theta}^1, \mathbf{V}^1\right) \end{aligned} \tag{6}$$

The final step is to sample new (continuous) latent variable observations from

$$p(y_i \,|\, \rho, \boldsymbol{\theta}, \sigma, \mathbf{V}) \sim N\left(C_i, \sigma_i^2\right) \tag{7}$$

where the distribution is truncated at the left by zero if $C_i = 1$ and truncated at the right by zero if $C_i = 0$. This process is repeated until the desired level of accuracy in the cumulative posterior density is achieved.[17]

[17] We make 10,700 passes of the Gibbs sampler and discard the first 700 vectors of parameters to avoid dependence on initial values. LeSage (1997) suggests that 1,100 passes of the Gibbs sampler (discarding the first 100 vectors) generally is sufficient in most spatial autoregressive probit models.

4.2 Specification of Priors

Following the common approach for linear models, we use the normal-gamma prior distributions (Geweke, 1993; LeSage, 2000)

$$\boldsymbol{\theta} \sim N(\mathbf{d}, \mathbf{T}) \tag{8}$$

$$r/v_i \sim i.d.\ \chi^2(r) \tag{9}$$

$$1/\sigma^2 \sim \Gamma(\alpha, \delta) \tag{10}$$

$$\rho \sim U(1/\lambda_{\min}, 1/\lambda_{\max}) \tag{11}$$

where $\lambda_{\min}$ and $\lambda_{\max}$ are the minimum and maximum eigenvalues of $\mathbf{W}$. These priors are very flexible in that they can be made very precise or very diffuse by the settings employed; that is, in the choice of hyperparameters d, T, r, α, and δ (see Hepple, 1995). We assign $\boldsymbol{\theta}$ an "almost diffuse" prior by setting $\mathbf{d} = \mathbf{0}$ and $\mathbf{T} = \mathbf{I} * 10^{12}$ (or generally, a diagonal matrix with large diagonal elements. Similarly, we set $\alpha = \delta = 0$. Again following Geweke (1993) and LeSage (2000), we assign independent priors $\pi(v_i)$ for the v_i of the form

$$\pi(v_i|\, r) = (r/2)^{r/2} \left[\Gamma(r/2)\right]^{-1} v_i^{-(r+2)/2} \exp(-r/2v_i) \tag{12}$$

and thus $\pi(v_i^{-1}|\, r) \sim id\ \chi^2(r)/r$. The magnitude of r determines the degree to which the v_i estimates are allowed to deviate from their prior means of unity. Note that $\mathbf{V} \rightarrow \mathbf{I}_N$ as $r \longrightarrow \infty$. Large values of r thus indicate prior beliefs that the errors are homoscedastic. Thus, we are able to estimate the N parameters of $\mathbf{V}$ while adding only a single parameter to the model. LeSage (2000) suggests that an optimal strategy for setting r is to use small values in the range of 2 to 7, allowing the v_i estimates to vary substantially from unity while including homoscedastic disturbances as a possibility. Following this strategy, we choose a prior $r = 4$.

4.3 Specification of Conditional Distributions

The product of the kernel densities of the independent priors given in (8) - (11) and the likelihood function yields the posterior density kernel (see LeSage, 1997)

$$(\rho, \boldsymbol{\theta}, \sigma, \mathbf{V}) \ \propto\ \frac{1}{n} \prod\nolimits_{i=1}^{n} (1 - \rho\mu_i) \sum\nolimits_{i=1}^{n} v_i^{(r+3)/2} \exp(-r/2v_i)$$

$$\cdot\sigma^{-(n+1)}\exp\left[\sum\nolimits_{i=1}^{n}\left(\frac{\varepsilon_i^2}{\sigma^2}+r\right)/2v_i\right] \quad (13)$$

Given ρ, $\boldsymbol{\theta}$, and $\mathbf{V}$, the terms in the first line of (13) are known and can be subsumed in the constant of proportionality, thereby leaving the expression in the second line, which in turn can be shown to produce a conditional posterior distribution for σ of the form (LeSage, 1997)

$$p(\sigma|\rho,\boldsymbol{\theta},\mathbf{V}) \propto \sigma^{-(n+1)}\exp\left[-\sum\nolimits_{i=1}^{n}\left(\frac{\varepsilon_i^2}{2\sigma^2 v_i}\right)\right] \quad (14)$$

Because σ and $\boldsymbol{\theta}$ cannot be separately identified, we set $\sigma = 1$ and do not sample from this conditional distribution.

The conditional distribution for $\boldsymbol{\theta}$ is multivariate normal:

$$p(\boldsymbol{\theta}\,|\,\sigma,\rho,\mathbf{V}) \;\tilde{}\; N\left[\left(\mathbf{Z}'\mathbf{V}^{-1}\mathbf{Z}\right)^{-1}\mathbf{Z}'\mathbf{V}^{-1}(\mathbf{I}-\rho\mathbf{W})\,\mathbf{y}\;,\;\boldsymbol{\sigma}^2\left(\mathbf{Z}'\mathbf{V}^{-1}\mathbf{Z}\right)^{-1}\right] \quad (15)$$

For the elements of $\mathbf{V}$, we have (as in Geweke,1993; LeSage, 2000):

$$\frac{\varepsilon_i^2/\sigma^2+r}{v_i} \;\tilde{}\; \chi^2(r+1)$$

The conditional distribution for the spatial lag parameter ρ is nonstandard (LeSage, 2000), and is given by:

$$p(\rho\,|\,\sigma,\boldsymbol{\theta},\mathbf{V}) \propto |(\mathbf{I}-\rho\mathbf{W})|\exp\left[-\left(1/2\sigma^2\right)\left(\boldsymbol{\varepsilon}'\mathbf{V}^{-1}\boldsymbol{\varepsilon}\right)\right]$$

In order to obtain a random sample from the distribution at this stage, we use the Metropolis sampling technique.[18]

Finally, we note that computing marginal impacts on the fitted probabilities (the marginal effects reported in Table 2) requires transforming the estimates according to the underlying distributions. In our case, following Albert and Chib (1993), the probabilities are $p_k = \Phi\left(\rho W_k v_k^{-1/2}C + v_k^{-1/2}Z_k'\theta\right)$, where k indexes observations, and the associated density estimate is

$$\widehat{\pi}(p_k) = (1/m)\sum\nolimits_{i=1}^{m}\phi\left[\Phi^{-1}\left(p_k;\mu_k^i,\omega_k^i\right)\right]/\phi\left[\Phi^{-1}(p_k;0,1)\right]$$

[18] Metropolis (1953) sampling proceeds as follows. Consider the value x_0 drawn from $f(\cdot)$, our density of interest. We let a candidate $y = x_0 + bZ$, where b is a known constant and Z is drawn from a standard normal distribution. An acceptance probability is computed: $q = \min\{1, f(y)/f(x_0)\}$, and we draw a value U from a uniform distribution. If $q > U$, the next draw from $f(\cdot)$ is taken to be $x_1 = y$. If $q \leq U$, the draw is taken to be the current value $x_1 = x_0$. See LeSage (2000, 24).

where i indexes the draws

$$\begin{aligned} \mu_k^i &= \rho^i W_k C / \sqrt{v_k^i} + Z_k' \theta^i / \sqrt{v_k^i} \\ \omega^i &= \left(1/\sqrt{v_i^k}\right) Z_k' \left[\mathbf{Z}' \left(V^i\right)^{-1} \mathbf{Z}\right]^{-1} Z_k' \end{aligned}$$

4.4 Spatial Weight Matrix Specification

Finally, we consider the spatial weight matrix specification. Several alternatives exist for choosing a spatial weighting scheme (Dubin, 1998). We use two different formulations in our estimation. The first version of the weighting matrix $\mathbf{W}$ is a distance-based binary matrix in which

$$W_{ij} = \left\{ \begin{array}{cc} \omega_i & d_{ij} < 50 \text{ miles and } i \neq j \\ 0 & d_{ij} \geq 50 \text{ miles or } i = j \end{array} \right\} \tag{16}$$

where $\omega_i > 0$ reflects the normalization below and d_{ij} is the arc distance between the geographic centers of counties i and j measured in nautical miles. Because the form of $\mathbf{W}$ can sometimes affect the results (Dubin, 1998), we also estimate the model using an alternative specification based on the inverse distance weight defined as

$$W_{ij} = \left\{ \begin{array}{cc} \omega_i / d_{ij}^2 & i \neq j \\ 0 & i = j \end{array} \right\}$$

In both cases we normalize the weight matrix so that each row sums to one. Our results are robust with respect to these forms of $\mathbf{W}$, so Table 2 only reports the estimates based on the specification given by (16).

5 Empirical Results

The empirical estimates are reported in Table 2 along with computed marginal effects. Given the presence of spatial competition effects, the spatial Baysian model represents our preferred results. Nonetheless, we also report the nonspatial MLE probit model estimates for comparison. We note that the main difference between the two sets of estimates lies in the level of significance (or insignificance); the magnitudes of the coefficients themselves are remarkably stable across the two empirical formats.

The table reveals that *TAXRATE* has a positive effect on the likelihood of using investment incentives at the 10% level. Higher property taxes by themselves turn away firms, thereby increasing county recruitment effort in the tournament framework. Since sufficiently greater effort entails using tax abatements or similar incentives, we expect a positive coefficient on this variable, as observed here. We also note in passing that, since we expect that higher tax rates are associated with greater county government spending, our positive *TAXRATE* coefficient contradicts Wassmer's (1992) negative effect of spending on city property tax abatements in the Detroit MSA.

Now consider the variables that we identified as related to residents' demands for growth control. The *POP* and ΔPOP variables show no stable effect on the adoption of development incentives. The coefficient on *AGLAND*, however, is clearly positive for both cases. This is consistent with the hypothesis that residents of more fully developed counties would likely exhibit stronger demands for growth controls.

On the other hand, recall that Fischel's (2001) hypothesis of growth controls as a normal good implies a negative *AVEINC* coefficient. Man (1999) finds a negative income effect on the adoption of TIFs, although the rationale for that outcome differs from Fischel's. In contrast, we find a positive coefficient on the income variable, although it is not significant. The coefficients on *POVERTY* and *BA* are also not significantly different from zero in our model. The estimates for all three of these variables are not consistent with Fischel's hypothesis. Thus, while county residents' demand for growth control appears to affect the government's propensity to offer tax abatements or similar inducements, this propensity is not related to residents' incomes.

On the other hand, communities with a higher unemployment rates will probably benefit more from recruiting a firm than will communities with tighter local labor markets. We expect the *UNEMPL* and Δ*UNEMPL* variables to have positive coefficients. As observed in Table 2, *UNEMPL* has a significantly positive coefficient estimate, while that of Δ*UNEMPL* is positive but insignificant. We also include the *CENCITY* variable in the model to see if counties in the core of urban areas have a different tendency to rely on recruitment incentives. The coefficient on this variable positive but insignificant. Overall, these estimates are consistent with the notion that counties with higher unemployment rates perceive greater benefit from industry recruitment and therefore pursue firms more aggressively, although counties containing core urban areas appear to be no more likely to use incentives.

The significant positive *FISCAP* coefficient shows that communities with greater fiscal distress (lower fiscal capacity) are less likely to rely on tax abatements or other incentives to recruit firms. Apparently, fiscally troubled counties in Georgia cannot or will not sustain the short term costs of industry recruitment incentives to enjoy the potential long term benefits.

Man (1999) finds that the mix of existing industry affects a city's use of TIFs. In contrast, the coefficient on our Herfindahl-Hirschman index for employment concentration across industry groups is not significant. It appears that the diversity of the existing economic base does not affect the propensity to offer investment incentives in our sample.

Looking at how government form affects incentives, we observe a result reminiscent of the empirical literature concerned with how government form affects spending. Although each of the coefficients differs from zero, we find that none of the government form variables significantly differs from the others (recall that there is no constant in the equation); government form does not appear to affect the propensity to pursue abatements or similar incentives.

Finally, consider the main focus of our study: the effect of spatial competition among counties. Our estimate of ρ is significantly greater than zero. This implies spatial competition among counties when offering investment incentives, with a diminishing effect with greater distance between competing jurisdictions, a result consistent with the tournament view of competition among counties. The marginal effect is 0.413, which may be interpreted (in the case of a normalized binary spatial weight matrix) as the (level) increase in probability of using investment incentives if all of the county's neighbors employ incentives, relative to the case where none of the neighboring counties use investment incentives. The effect of any individual neighbor on the probability of using investment incentives will depend on the number of neighbors. Consistent with the results from the tournament model, the fewer the number of neighbors, the larger the effect of any single one of them using incentives on the probability.

Turning to the behavior of border counties, the dummy variables for counties bordering on surrounding states are significant and positive for South Carolina, Tennessee, and Florida and not significant for counties bordering Alabama. This pattern is somewhat puzzling. South Carolina and Tennessee have long histories of allowing their local governments latitude in industry recruitment incentives, so the coefficients on those dummy variables are expected. Alabama has a similar history, though, and yet we find that counties bordering Alabama tend to rely no more heavily on incentives than do counties in the interior of Georgia. The Florida dummy variable result is also surprising, but less so. Border counties apparently behave as if they, too, were bordering a state with more proactive local governments. What this coefficient is apparently picking up is the attempts by Georgia counties to counteract inherent advantages to firms locating in Florida–perhaps state policy effects not identified here. In any event, even though the specific pattern is not clear-cut, there is evidence of spatial competition with local governments across state borders.

Table 3 provides the predicted posterior probabilities for counties responding with each possible survey answer on the incentives question, which gives some indication of the efficacy of our model. For the average county that "never" uses investment incentives ($C = 0$), the model predicts that county will use incentives with a probability of 0.4026. For the average county using investment incentives at least "sometimes" ($C = 1$), the respective predicted probability is 0.7018. The model does not predict significantly different probabilities for those using incentives "sometimes" versus "most of the time" versus "never," which again suggests that respondents have differing cardinal interpretations of these responses. The binary probit model used here (rather than an ordered probit) negates this issue.

6 Conclusion

This paper examined the spatial consequences of local government competition for economic development. Viewing the industry recruitment process as a tournament between competing jurisdictions exposes factors likely to affect a locale's reliance on development incentives to bring firms within its borders. The framework implies a spatial relationship in interjurisdiction competition, with neighboring jurisdictions competing more vigorously with each other than with more distant locales.

We use data from a state government survey of Georgia counties to test for the presence of spatial competition effects in local economic development policies. Interjurisdiction competition is an important factor determining whether or not a given county uses fiscal incentives in our sample. While there is no evidence of spatial autocorrelation, we do find a robust proximity effect; the decision by nearby governments to offer firms tax abatements or similar fiscal inducements prompts a given county to also follow this strategy. The policies adopted by more distant governments have a diminishing effect on a given county's economic development policy.

Other empirical results are also consistent with the tournament framework. Higher county property taxes increase the tendency to use fiscal incentives to recruit firms; counties apparently use fiscal inducements to compensate firms for higher taxes levied to support resident-oriented services. The state of county economic development, as measured by the proportion of land in agricultural use, and the county's capacity to benefit from new jobs both affect development incentives choice. Residents of more fully developed counties are less enamored with industry recruitment while counties with high unemployment rates tend to exhibit greater development efforts. Interestingly, the diversification of a county's economy does not appear to affect development effort, nor does the government form. It appears that counties do not use fiscal incentives to diversify their economies and that professional county managers are no more likely to rely upon abatements or similar inducements in their range of development policies than are elected chief executives.

Finally, we find no evidence that fiscal distress drives more aggressive firm recruitment efforts by Georgia counties. In fact, we find an opposite result: greater fiscal distress significantly lowers the county's propensity to use tax abatements or similar inducements to recruit firms. We surmise from this that fiscally troubled local governments cannot sustain or are not willing to incur the short term costs of aggressive industry recruitment in order to garner the longer term benefits as multiplier effects wind out over time. One argument that sometimes arises in policy discussions is that states like Georgia should widen the range of industrial development policy options open to local governments in order to allow the most fiscally distressed to stimulate new economic development. Our estimates, however, imply that such arguments are misplaced.

References

[1] Albert, James H. and Siddhartha Chib (1993). "Bayesian Analysis of Binary and Polychotomous Response Data," *Journal of the American Statistical Association*, 88 (422), 669-679.

[2] Anderson, John E., and Robert W. Wassmer (1995). "The Decision to 'Bid' for Business: Municipal Behavior in Granting Property Tax Abatements," *Regional Science and Urban Economics* 25, 739-757.

[3] Black, Dan A., and William H. Hoyt (1989). "Bidding for Firms," *American Economic Review*, 79 (5), 1249-1256.

[4] Braid, Ralph M. (1996). "Symmetric Tax Competition with Multiple Jurisdictions in Each Metropolitan Area," *American Economic Review*, 86 (5), 1279-1290.

[5] Brett, Craig, and Joris Pinkse (2000). "The Determinants of Municipal Tax Rates in British Columbia," *Canadian Journal of Economics*, 33 (3), 695-714.

[6] Brueckner, Jan K. (1995). "Strategic Control of Growth in a System of Cities," *Journal of Public Economics*, 57, 393-416.

[7] Buettner, Thiess (2001). "Local Business Taxation and Competition for Capital: The Choice of the Tax Rate," *Regional Science and Urban Economics*, 31 (2-3), 215-245.

[8] Campbell, Rebecca J., and Geoffrey K. Turnbull (2003). "On Government Structure and Spending: The Effects of Management Form and Separation-of-Powers," *Urban Studies*, 40 (1), 23-34.

[9] Case, Anne (1992). "Neighborhood Influence and Technological Change," *Regional Science and Urban Economics*, 22 (3), 491-508.

[10] Casella, George and Edward J. George (1992). "Explaining the Gibbs Sampler," *The American Statistician*, 46 (3), 167-174.

[11] Coffin, Donald A. (1982). "Property Tax Abatement and Economic Development in Indianapolis," *Growth and Change*, 13 (2), 18-23.

[12] Deno, Kevin T., and Stephan L. Mehay (1987). "Municipal Management Structure and Fiscal Performance: Do City Managers Make a Difference?" *Southern Economic Journal*, 53 (3), 627-672.

[13] Dubin, Robin A. (1998). "Spatial Autocorrelation: A Primer," *Journal of Housing Economics*, 7 (4), 304-327.

[14] Eberts, R. W., and T. J. Gronberg (1990). "Structure, Conduct, and Performance in the Local Public Sector," *National Tax Journal*, 43 (2), 165-173.

[15] Fischel, William A. (2001). *The Homevoter Hypothesis.* Cambridge: Harvard Univ. Press.

[16] Gelfand, Allan E. and Adrian F. M. Smith (1990). "Sampling-Based Approaches to Calculating Marginal Densities," *Journal of the American Statistical Association*, 85 (410), 398-409.

[17] Gelman, Andrew, John B. Carlin, Hal S. Stern, and Donald B. Rubin (1995). *Bayesian Data Analysis.* London, UK: CRC Press.

[18] Geweke, John (1993). "Bayesian Treatment of the Independent Student t Linear Model," *Journal of Applied Econometrics*, 8 (Supp.), S19-S40.

[19] Gurwitz, Aarron (1977). "The Economic Effects of Property Tax Abatement for Industry," *NTA-TIA Proceedings*, 1977.

[20] Hayes, Kathy J., and Semoon Chang (1990). "The Relative Efficiency of City Manager and Mayor-Council Forms of Government," *Southern Economic Journal*, 51 (1), 167-177.

[21] Helsley Robert W., and William C. Strange (1995). "Strategic Growth Controls," *Regional Science and Urban Economics*, 25, 435-460.

[22] Hepple, L. W. (1995). "Bayesian Techniques in Spatial and Network Econometrics: 2. Computational Methods and Algorithms," *Environment and Planning A*, 27 (4), 615-644.

[23] LeSage, James P. (1997). "Bayesian Estimation of Spatial Autoregressive Models," *International Regional Science Review*, 20 (1-2), 113-129.

[24] LeSage, James P. (2000). "Bayesian Estimation of Limited Dependent Variable Spatial Autoregressive Models," *Geographical Analysis*, 32 (1), 19-35.

[25] *Local Government Fiscal Viability*, Policy Research Center, College of Business Administration, Georgia State University (1996).

[26] Man, Joyce Y. (1999). "Fiscal Pressure, Tax Competition, and the Adoption of Tax Increment Financing," *Urban Studies*, 36 (7), 1151-67.

[27] McMillen, Daniel P. (1992). "Probit with Spatial Autocorrelation," *Journal of Regional Science*, 32 (3), 335-348.

[28] McMillen, Daniel P. and John F. McDonald (2002). "Land Values in a Newly Zoned City," *Review of Economics and Statistics*, 84 (1), 62-72.

[29] Metropolis, Nicholas C., Arianna Rosenbluth, Marshall Rosenbluth, Augusta Teller, and Edward Teller (1953). "Equation of State Calculations by Fast Computing Machines," *Journal of Chemical Physics*, 21 (6), 1087-1092.

[30] Morse, George W., and Michael C. Farmer (1986). "Location and Investment Effects of a Tax Abatement Program," *National Tax Journal*, 39 (2), 229-36.

[31] Nalebuff, Barry, and Joseph Stiglitz (1983). "Prizes and Incentives: Towards a General Theory of Compensation," *Bell Journal of Economics*, 14, 21-43.

[32] Newman, Robert J., and Dennis H. Sullivan (1988). "Econometric Analysis of Business Tax Impacts on Location: What Do We Know and How Do We Know It?" *Journal of Urban Economics*, 23, 215-234.

[33] Noiset, Luc, and William Oakland (1995). "The Taxation of Mobile Capital by Central Cities," *Journal of Public Economics*, 52 (2), 297-316.

[34] Pace, Kelley, Ronald Barry, John Clapp, and M. Rodriguez (1998). "Spatiotemporal Autoregressive Models of Neighborhood Effects," *Journal of Real Estate Finance and Economics*, 17 (1), 15-33.

[35] Pinkse, Joris and Margaret E. Slade (1998). "Contracting in Space: An Application of Spatial Statistics to Discrete-Choice Models," *Journal of Econometrics*, 85 (1), 125-154.

[36] Raftery, Adrian (1986). "Choosing Models for Cross-Classification," *American Sociological Review*, 51 (1), 145-146.

[37] Rondinelli, Dennis A., and William J. Burpitt (2000). "Do Government Incentives Attract and Retain International Investment? A Study of Foreign-Owned Firms in North Carolina," *Policy Sciences*, 33 (3), 181-205.

[38] Schneider, M. (1986). "Fragmentation and the Growth of Government," *Public Choice*, 48, 255-263.

[39] Sjoquist, David L. (1982). "The Effect of the Number of Local Governments on Central City Expenditures," *National Tax Journal*, 35 (1), 79-87.

[40] Turnbull, Geoffrey K., and Yoshio Niho (1986). "The Optimal Property Tax with Mobile Nonresidential Capital," *Journal of Public Economics*, 29 (2), 223-239.

[41] Wassmer, Robert W. (1992). "Property Tax Abatement and the Simultaneous Determination of Local Fiscal Variables in a Metropolitan Area," *Land Economics*, 68 (3), 263-282.

[42] Wassmer, Robert W. (1994). "Can Local Incentives Alter a Metropolitan City's Economic Development?" *Urban Studies*, 31 (8), 1251-1278.

[43] Wilson, John D. (1986). "A Theory of Interregional Tax Competition," *Journal of Urban Economics*, 19 (3), 296-315.

TABLES

Table 1
Variable Definitions, Means, and Standard Deviations

Variable	Description	Mean (Std. Deviation)
C	Use incentives	0.571
TAXRATE	Effective county property tax rate (1990)	0.438 (0.370)
POP	Population (1990)	38,970 (83,235)
ΔPOP	Percentage change in population (1980 – 1990)	13.5 (23.6)
AGLAND	Proportion of land in the county that is agricultural	18.9 (11.1)
CENCITY	County contains central city of an MSA	0.039
AVEINC	Average household income (1990)	$28,846 ($6,323)
FISCAP	Fiscal capacity index (1994)	80.9 (25.0)
UNEMPL	Unemployment rate (1990)	6.2 (1.5)
ΔUNEMPL	Change in unemployment rate (1989 – 1990)	- 0.155 (1.420)
POVERTY	Percent of population below the poverty line	19.3 (7.3)
BA	Share of adult (25+) population with a BA or higher	10.7 (5.3)
DEMO	Percent voting Democrat in 1988 presidential election	44.6 (9.1)
TC	Traditional council government	0.591
EE	Elected executive government	0.131
CA	Councilor-Administrator government	0.214
CM	Council-Mayor government	0.117
HHI	Herfindahl-Hirschman industry concentration	1,265 (369)
AL	County borders the State of Alabama	0.104
FL	County borders the State of Florida	0.071
SC	County borders the State of South Carolina	0.078
TN	County borders the State of Tennessee	0.058

Table 2
Empirical Results

Variable	Bayesian Probit SAR Model			ML Probit Model		
	Coefficient (Std. Error)	p-level	Marginal Effect	Coefficient (Std. Error)	t-probability	Marginal Effect
TAXRATE	0.529 (0.317)	0.041	0.506	0.375 (0.249)	0.135	0.266
POP	- 1.0E-6 (5.0E-6)	0.437	- 4.0E-7	4.0E-6 (6.0E-6)	0.508	3.0E-6
ΔPOP	0.006 (0.012)	0.317	0.006	0.009 (0.010)	0.392	0.006
AGLAND	0.023 (0.017)	0.079	0.022	0.021 (0.013)	0.121	0.015
CENCITY	0.461 (1.349)	0.378	0.115	- 0.623 (0.846)	0.472	- 0.244
AVEINC	8.6E-5 (8.3E-5)	0.144	7.5E-5	1.0E-4 (6.7E-5)	0.117	7.4E-5
FISCAP	0.017 (0.010)	0.028	0.016	0.018 (0.008)	0.036	0.013
UNEMPL	0.191 (0.135)	0.073	0.179	0.199 (0.110)	0.072	0.141
ΔUNEMPL	0.055 (0.082)	0.245	0.052	0.067 (0.065)	0.307	0.047
POVERTY	0.012 (0.056)	0.414	0.008	0.006 (0.044)	0.888	0.004
BA	0.019 (0.061)	0.378	0.019	0.002 (0.049)	0.968	0.001
DEMO	- 0.011 (0.026)	0.333	- 0.010	- 0.002 (0.021)	0.936	- 0.001
TC	- 7.048 (3.440)	0.015	- 0.940	- 7.289 (2.794)	0.010	- 0.996
EE	- 7.233 (3.404)	0.011	- 0.749	- 7.411 (2.754)	0.008	- 0.826
CA	- 6.851 (3.494)	0.017	- 0.895	- 7.310 (2.859)	0.012	- 0.973
CM	- 6.986 (3.571)	0.018	- 0.789	- 7.455 (2.899)	0.011	- 0.891
HHI	9.9E-5 (5.6E-4)	0.436	9.4E-5	1.2E-4 (4.0E-4)	0.765	8.7E-5
AL	- 0.121 (0.525)	0.411	- 0.031	- 0.045 (0.421)	0.915	- 0.017
FL	0.951 (0.623)	0.061	0.214	0.893 (0.518)	0.087	0.267
SC	1.069 (0.705)	0.049	0.236	0.694 (0.519)	0.184	0.221
TN	1.169 (0.768)	0.058	0.245	0.882 (0.584)	0.134	0.262
RHO	0.427 (0.167)	0.006	0.413			

Notes: All standard errors are heteroscedasticity robust. See Gelman et al. (1995) for a description of p-levels.

Table 3

Posterior Probabilities Predicted for Incentives Choice

Survey Answer	Predicted Posterior Probability	Count (Proportion)
Never	0.4026	66 (42.9)
Not Never	0.7018	88 (57.1)
Never	0.4026	66 (42.9)
Sometimes	0.7198	57 (37.0)
Most of the time	0.6747	21 (13.6)
Always	0.6562	10 (6.5)

Notes: Probability that the survey answer is “always,” “most of the time,” or “sometimes,” *versus* “never.” Calculated using estimates from the Bayesian Heteroscedastic Spatial Autoregressive Probit Model. Counts refer to number of counties.