Institute for Federalism & Intergovernmental Relations

IFIR WORKING PAPER SERIES

MSA Location and the Impact of State Taxes on Employment and Population: A Comparison of Border and Interior MSA's*

William H. Hoyt
J. William Harden

IFIR Working Paper No. 2005-01

May 2005

*We thank participants at sessions at the Southern Economics Association Meetings (November 2004), the National Tax Association Meetings (November 2004) and workshops at the University of Kentucky and Syracuse University for comments on earlier drafts. Special thanks to Dan Black, James A. Schmitz, Jr., and Chris Bollinger for many helpful comments.

IFIR Working Papers are made available for purposes of academic discussion. The views expressed are those of the author(s), for which IFIR takes no responsibility.

(c) William H. Hoyt and J. William Harden. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission, provided that full credit, including (c) notice, is given to the source.

MSA Location and the Impact of State Taxes on Employment and Population: A Comparison of Border and Interior MSA's

Abstract

We examine the impact of state taxation on employment by focusing on county employment in metropolitan statistical areas (MSA). However, we make a distinction between the impacts of state taxation on employment in metropolitan areas that are wholly contained within a single state and metropolitan areas that consist of counties in more than a single state. We make this distinction because, as we argue in the paper, the impacts of state taxes on both employment and population may be very different in metropolitan areas that border states and those that do not. We expect there to be differences both because the cost of avoiding state taxes, that is, mobility costs, might be lower along borders and also because along borders employees need not reside in the same state in which they are employed. Thus, while in general we believe that employment should be more responsive to taxes in border MSA's, for some taxes, specifically taxes imposed on households, employment might be less responsive as households rather than firms can move to avoid these taxes. Because both the location of employment and residence are affected, and possibly differentially so, by state taxes, we jointly estimate the impacts that taxation may have on employment and population. Our results indicate that there are differences in the responsiveness of both employment and population to both tax and spending variables between border and interior jurisdictions. We also find that the impact of neighboring state taxes have differential effects on employment and population. That there are significant differences in the response to taxation and different type of taxes in border and interior counties suggests state-level estimates of the impacts of taxation may suffer from significant aggregation bias.

William H. Hoyt*
Department of Economics
Gatton School of Business and Economics
and
Martin School of Public Policy and Administration
University of Kentucky
Lexington, KY 40506-0034
whoyt@uky.edu

J. William Harden
Department of Accounting
Bryan School of Business and Economics
University of North Carolina at Greensboro
Greensboro, NC 27412-5001
jwharden@uncg.edu

*Corresponding author

1. Introduction

The impact of taxes on employment and business location has and continues to be a topic of public policy concern, particularly to state and, perhaps to a lesser extent, local governments. The effectiveness and wisdom of favorable tax treatment, tax "holidays" and abatements, to attract new business ventures and stimulate investment within a region or jurisdiction is often the topic of lively discussions in political arenas, the popular press, and academia. While some may argue that reductions in taxes by subnational governments will significantly increase business activity and employment within the relevant jurisdiction, others argue that the only "winners" in this competition among governments are the businesses receiving favorable tax treatment, with the competing governments forgoing tax revenues and, in essence, being the "losers". Taxation of mobile business capital and employment leads to "tax competition" among governments resulting in these government driving down taxes and underproviding public services and public infrastructure.[1]

Critical to understanding the efficacy of tax abatements for specific business ventures or, more generally, the appropriate level of more broadly applied taxes is how, in fact, employment and business activity do respond to state and local taxation. Whether and the extent to which economic activity, most generally employment, is affected by state and local taxes has been the topic of numerous empirical studies, beginning with Due *(1961).* That this research has continued for over forty years can probably be attributed to two factors: the importance of taxes in the planning of state economic development policies and the lack of any consensus by early studies on the impacts of state taxes on employment or other measures of economic activity. Our study adds to the existing state tax literature, discussed below, by including both a spatial and a neighboring policy component to the empirical estimation to account for the proximity of a taxing jurisdiction to its neighboring competitors.

While governors and other state officials have supported tax cuts as economic development and employment policies, economic studies on the impacts of state taxes on employment have produced mixed results. While many studies have found the expected negative impact of taxes on business activity and employment (Wasylenko and McGuire (1985), Mullen and Williams (1991), Crihfield (1989, 1990), Luce (1990), Mofidi and Stone (1990), Munnell (1990), Papke (1986, 1991, 1994), Carroll and Wasylenko (1994), Feld and Kirchgassner (2002), Harden and Hoyt (2003)), numerous studies have found essentially no impact of taxes on business activity or employment (Carlton (1979), Erickson and Wasylenko (1980), Dye (1980), Mills (1983), Bradbury (1982)). Likewise, the net benefit derived by local communities from large firms locating within a county or MSA are questionable (Fox and Murray (2004)). Some studies have even found that tax increases stimulate employment or production (Romans and Subabmanyam (1979), Deich (1989), Eberts (1991), Palumbo et.al. (1990)).[2]

Most of these studies, with some notable exceptions discussed later, have focused on the impacts of state taxation on employment aggregated to the state level. However, both the actual impacts of taxation on business activity and the public debate about it are certainly not distributed uniformly across states. Probably nowhere are the differences in taxes more apparent and more frequently the focus of media attention than in those metropolitan areas that cross state borders. While we address the issue of how state taxes affect employment, instead of examining aggregate employment in a state we focus our attention on county employment, considering two very distinct samples of counties. One sample is of counties that are either in MSA's that cross state lines or are counties that are adjacent to a state border. We refer to these as border counties even though not all the counties are necessarily on the border but are part of an MSA that is. Our other sample consists of counties that are not in interstate MSA's or along state borders.

Border MSA's are of special interest for several reasons. First, if state taxes are to have significant impacts on employment it should be in interstate *MSA's* because it should involve relatively lower cost for both business enterprises and households to locate in jurisdictions (states) with the lower taxes. Second, a number of these MSA's are major employment centers. In 1997, 26% of all employment and 31% of all private earnings in the contiguous states was located within these MSA's. If non-MSA border

---

1 For an excellent review of the tax competition literature see Wilson (1999).

counties are also considered, 38% of total employment and 34% of private earnings in the contiguous states are found on state borders. Given the large share of employment in these border *MSA's*, a general understanding of the impact of taxes on employment would seem to require an understanding of how employment is affected by taxes in these areas.

Table 1 provides a list of *interstate* MSA's and reports the statutory sales, individual income, and corporate income tax rate for each of the states in the MSA for 2003, the most recent year available.[3] For the individual income and corporate income tax rates, the table reports the rate for the highest bracket, though it is worth noting that 32 of the 48 states with a corporate income tax in 2003 had a flat tax rate. While the table suggests significant uniformity of tax rates across states in these interstate MSA's, there are some notable differences. For example, within the Boston Consolidated Metropolitan Statistical Area (CMSA) New Hampshire does not have either a state sales or income tax rate. In the Johnson City-Kingston-Bristol MSA, Tennessee only has an income tax on dividends and interest while Virginia's highest rate is 5.75; however, Tennessee has a 7% sales tax rate in contrast to Virginia's sales tax rate of 3.5%. Other MSA's with significant divergences in state tax rates include Las Vegas, Portland-Salem, Texarkana, St. Louis, and Washington, DC.

Focusing on employment in metropolitan areas provides an opportunity to control for some of the problems associated with estimating the impacts of taxes on employment and business activity. By definition, the MSA is a measure of a labor market. Thus we would expect underlying economic conditions to be very similar within these counties with the exception of government policies that are not determined by the market. If, then, the labor market's conditions are similar with the exception of government policies, we expect that differences in the growth of employment should be directly related to government policies. Then, by using panel data techniques we can attempt to control for these labor market conditions that may be difficult to include in our estimation.

---

[2] Bartik (1991) provides a comprehensive review and summary of this literature through the 1980's. More recent reviews include Phillips and Goss (1995) and Wasylenko (1997).

[3] The statutory rate comparison is provided for descriptive purposes. In our estimation, we employ "effective" rates, tax collections as a percentage of income, as described in *Section 3*.

As we discuss in *Section 2*, the impacts of taxes on employment and population in these interstate *MSA's* might be very different than what might be expected for states as a whole or within intrastate or "interior" MSA's. In contrast to interior MSA's, in these MSA's an individual can reside in one state and work in another state without bearing high commuting costs. As a consequence of this possibility, we predict that taxes collected from firms in these counties should influence employment but have less of an impact on population while the individual income tax should affect population but have a lesser impact on employment. In contrast, in interior MSA's for most workers, the state in which they work and the state in which they reside will be the same. As a consequence of this tighter link between employment and population, taxes on firms that reduce employment should also reduce population and, conversely, taxes on households that reduce population should reduce employment. In our estimation, we use the fact that the impact of taxes on employment and population should be related but not necessarily identical by estimating the impact of taxes on both employment and population jointly.

This contrast between the predicted effects of taxes on employment, as well as population in those counties along state borders may explain the rather limited and sometimes contradictory impact of taxes found in many studies. Specifically, aggregating revenues from different tax instruments (income, corporate, sales) to create an "effective" tax rate may be biasing the estimated effect of taxes on employment towards zero. In border counties and MSA's, while taxes on businesses may reduce employment, taxes on households, such as the individual income by making an area less attractive to households, lower land rents and make the location more attractive to businesses not needing to be located nearby their customer base. Aggregating the data is likely to reduce the estimated impact of taxes for similar reasons. While in interior counties we expect taxes on households such as the individual income tax to reduce employment, this need not be the case in a border county-- a household can avoid a tax by changing the state in which it resides without having any of its members change the state in which they are employed. If this is the case, an empirical model of data aggregated to the state is based on two theoretical models with very different predictions.

While our results suggest that aggregation of data both with respect to geographical unit and tax measures may explain some of the findings in the extensive literature on taxes and employment, it also has implications for tax policy. Similar to Holmes (1998), we find that taxes and public expenditures of bordering states have significant impacts on employment and population along borders. Unlike Holmes, our focus is not limited to the employment impacts along borders. While we find that taxes have significant impacts in interior MSA's as well, these impacts are sometime quite different than those found along borders.

While our use of county-level data and the focus on employment along borders departs from the focus of most studies of taxation and employment, we are not alone in our interest in employment along borders. Holmes (1998) focuses on manufacturing activity along state borders using the existence of a right-to-work law as a proxy for a "pro-business climate" in the state and finds that business is higher along the border in the state with the "pro-business" climate. Fox (1986) examines the impact of taxes on retail sales and on retail employment focusing on three metropolitan areas that cross state borders, finding evidence that sales tax differentials at the border areas had significant and expected impacts on sales but not employment. Finally, Mark et. al. (2000) examines employment and population growth in the Washington, D.C. MSA and did not find that taxes significantly affected population growth.

In *Section 2* we present a theoretical model of employment and population determination in border MSA's focusing on developing empirically testable predictions of state taxes on population and employment. We also briefly discuss, but do not develop, a model of the impact of taxes in a regional or "open" model we believe characterizes interior MSA's. Discussion of the empirical model and data follow in *Section 3*, results are in *Section 4*, and *Section 5* concludes.

2. A Model of Employment and Population Determination in MSA's

Our interest is in developing an equilibrium model of the simultaneous determination of both employment and population within a metropolitan area *(MSA)*. We consider two cases to contrast the differences between counties in border MSA's and those in the interior MSA's. Border MSA's are considered to be an example of a closed MSA. By "closed," we mean that, in the face of changes in policies that make a jurisdiction unattractive to either business or households, if firms or residents choose to leave the jurisdiction they migrate to another jurisdiction within the *MSA*. In contrast, if an *MSA* is "open" firms and residents have the option to migrate out of the metropolitan area. While it is certainly possible for border MSA's to be open, even if they are not, residents and businesses can still move between states in response to factors such as changes in taxes or public services without leaving the MSA. In contrast, residents and businesses in interior MSA's can only escape changes in state tax and public services policies by leaving the MSA. Alternatively, the distinction between types of *MSA's* can be thought of as being based on the cost of working in one county and residing in another county. In a closed *MSA*, this cost is relatively low, meaning that it is, at some cost, possible to live in one state and work in another. In an "open" *MSA*, this cost is high (the states are not in the same *MSA*) making it possible only to live and work in the same *MSA.*

While our empirical analysis incorporates differences in local tax and public service policies to keep the theoretical model as tractable as possible, here we only consider state policies and the decision by firms and residents of where, that is, in which state to locate. In addition, we assume there are only two states in the metropolitan area to further simplify and to reflect the fact that the majority of border MSA's encompass only two states.

2.1 A Model of Border MSA's

Each household has three decisions: where to reside; where to work; and where to shop. Then a household will live in state *j* and members of the household will work in state *k* and shop in state *m* if it is the case that the utility they receive exceeds the utility they can receive by residing or working elsewhere, that is, if

$$\begin{aligned} &V^{i}\left(w_{k}(1-\tau_{j}^{I})-\varphi_{kj},\, p(1+\tau_{m}^{S})+\theta_{mj},\, r_{j}\right) \geq \\ &V^{i}\left(w_{t}(1-\tau_{l}^{I})-\varphi_{tl},\, p(1+\tau_{z}^{S})+\theta_{zl},\, r_{l}\right) \;\; for\ l \neq j, t \neq k,\ or\ z \neq m \end{aligned} \qquad (2.1)$$

where τ_j^I is the individual income tax rate in state *j* and w_k is the wage rate in state *k*. The term φ_{kj} represents any commuting costs associated with living in state *j* and working in state *k* and equals zero when *k=j.* Then *p* is the price of consumer goods with τ_m^s being the sales tax rate in state *m* and θ_{mj} being the cost of shopping in state *m* when living in state *j*.[4] Finally, r_j is the cost of housing (land) in state *j*. Then given taxes, wage rates, the price of consumer goods and land rent in the two states we can represent the number of individuals desiring to live in state *j*, the number with utility higher in state *j* than in state *k*, by

$$N_j^D(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2), j=1,2^5 \quad (2.2)$$

where $\underline{\tau}_j = \left(\tau_j^I, \tau_j^C, \tau_j^S\right)$ where τ_j^c is the corporate income tax in state *j, j=1,2*. Then from *(2.1)* it follows that

$$\frac{\partial N_j^D}{\partial \tau_j^I} < 0, \frac{\partial N_j^D}{\partial \tau_j^S} < 0, \frac{\partial N_j^D}{\partial \tau_j^c} = 0, \frac{\partial N_j^D}{\partial w_j} \geq 0, \frac{\partial N_j^D}{\partial r_j} < 0, \quad (2.3a)$$

and

$$\frac{\partial N_j^D}{\partial \tau_k^I} > 0, \frac{\partial N_j^D}{\partial \tau_k^S} > 0, \frac{\partial N_j^D}{\partial \tau_k^c} = 0, \frac{\partial N_j^D}{\partial w_k} \leq 0, \frac{\partial N_j^D}{\partial r_k} > 0, \ k \neq j \quad (23.b)$$

Increases in state taxes with statutory incidence on households (individual income tax, and sales tax) should reduce the demand to live in that state. For the sales tax rate, this impact will depend on the costs associated with purchasing goods in one state while living in another state in the MSA. The corporate income tax rate, statutorily on firms, has no direct impact on the demand to reside in a state. We assume that an increase in the wage rate in a state makes it more attractive to live there. However, the magnitude of the change in demand for residence depends on the costs of commuting between the states. Since the choice of residing in state *j* is a choice not to reside in the other state(s), then it follows that

[4]We assume that the goods taxed by the sales tax are tradable. That is, we assume there is some constant producer price for the goods. This means that the sales tax is borne entirely by consumers. A more realistic and much more complicated model would have tradable and nontradable goods with the price of the nontradable goods being endogenous.

[5]We treat the population (and later employment) as continuous functions of taxes, wages, and rents. Of course, without the assumption of some continuity of the underlying differences in tastes and commuting costs in the population this is an approximation.

$\frac{\partial N_1^D}{\partial x} = -\frac{\partial N_2^D}{\partial x}$.[6]

Households also choose in which state to supply their labor. This decision depends on the choice of residence though the individuals within the households need not work and reside in the same state. Additional commuting costs if an individual works in one state and resides in another state in the MSA means that the wage rate alone will not determine the supply of labor. Then we can express the supply of labor in state *j* by

$$E_j^S(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2), j=1,2 \qquad (2.4)$$

We assume that

$$\frac{\partial E_j^s}{\partial \tau_j^I} \leq 0, \frac{\partial E_j^s}{\partial \tau_j^S} \leq 0, \frac{\partial E_j^s}{\partial \tau_j^c} = 0, \frac{\partial E_j^s}{\partial w_j} \geq 0, \frac{\partial E_j^s}{\partial r_j} \leq 0 \qquad (2.5)$$

Note that the supply of labor in state *j* is not necessarily the same as the supply of labor by the residents of state *j* as we allow households the option to live in one state and supply labor in the other state. Then the extent that costs associated with residing in state *j* affect the labor supply there depends on how costly it is to reside in one state and work in another state. With very low commuting costs, the impacts of changes in the sales tax rate, income tax rate, housing prices and other prices will have little impact on labor supply. Since we assume an inelastic labor supply for each household then any factor that increases the labor supply in state *1* will decrease the labor supply in state *2* and we do not report the impacts of changes in other state taxes, wages, and prices on labor supply in a state.

2.1.B The Decisions of Firms

We assume an open economy in which firms in the MSA produce goods sold in either a national market or metropolitan market. Firms, regardless of the product that they produce must choose to locate

---

[6] If the MSA were open this need not be true and we would expect $\left|\frac{\partial N_1^D}{\partial x}\right| > \left|\frac{\partial N_2^D}{\partial x}\right|$. With more than two states we

in one of the two states. Firm *i* will choose to locate in state *j* instead of state *k* if profits will be greater there or

$$\pi^i\left(\tau_j^c, w_j, r_j\right) > \pi^i\left(\tau_k^c, w_k, r_k\right),\ j \neq k \tag{2.6}$$

Then based on the firms' choice of where to locate, there is a derived demand for labor in each state with the demand for labor in state *j* given by

$$E_j^D(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2),\ j=1,2 \tag{2.7}$$

Then based on *(2.6)*, we have

$$\frac{\partial E_j^D}{\partial \tau_j^I} = 0, \frac{\partial E_j^D}{\partial \tau_j^S} = 0, \frac{\partial E_j^D}{\partial \tau_j^c} < 0, \frac{\partial E_j^D}{\partial w_j} < 0, \frac{\partial E_j^D}{\partial r_j} \leq 0, \tag{2.8}$$

Taxes statutorily not placed on firms (individual income and sales tax) do not affect the demand for labor. Increases in taxes collected from firms (here, the corporate income tax), wages, and rent increase the cost of operating in the state and reduce the number of firms that will find it profitable to locate there.

2.1.C Equilibrium Employment and Population Determination

Employment and population within the states in the MSA is determined by the equilibrium conditions. They include market clearing within each state in the *MSA* as well as market clearing conditions for the *MSA*. In the population (land) market the conditions are that

$$N_i h_i(r_i) + F_i l_i(r_i) = L_i \tag{2.9}$$

The demand for housing in each state in the MSA must equal the supply of housing in each state. Then total housing supply in the MSA must equal the total population to be housed in the MSA. We assume that the demand for land in housing in state *j* is given by $\phi_N N_j^D$ and the demand for land by businesses in state *j* is given by $\phi_E E_j^D$.[7] Then if L_j is the amount of land

---

would have $\left|\frac{\partial N_1^D}{\partial x}\right| = \left|\sum_{i \neq 1} \frac{\partial N_i^D}{\partial x}\right|$ in a closed model.

[7] A more general model would allow for the amount of land per residence or firm to vary with rent and other factors. Here we assumed fixed land demand per resident or firm to simplify the analysis.

in state *j* we have the equilibrium conditions,

$$\phi_N N_j^D + \phi_E E_j^D = L_j \;\; or \;\; N_j^D = \frac{L_j - \phi_E E_j^D}{\phi_N} \equiv N_j^S \;, j{=}1{,}2 \qquad (2.10a)$$

and

$$N_1 + N_2 = N. \qquad (2.10b)$$

Analogous conditions describe the market clearing for labor within the MSA. They are

$$E_j^D = E_j^S \,,\; j = 1,2 \qquad (2.11b)$$

and

$$E_1^D + E_2^D = E. \qquad (2.11c)$$

Again, we need to have the demand for labor equal to the supply of labor in each state within the *MSA* and the total demand for labor in the MSA equal to the total labor available in the *MSA*. Then by the nature of our problem, $N_2^D = N - N_1^D$ and $E_2^S = E - E_1^S$. Therefore, we can reduce the equilibrium conditions to:

$$f_1(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2) \equiv N_1^D - N_1^S = 0, \qquad (2.12a)$$
$$f_2(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2) \equiv N - N_1^D - N_2^S = 0, \qquad (2.12b)$$
$$f_3(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2) \equiv E_1^D - E_1^S = 0, \qquad (2.12c)$$
$$f_4(\underline{\tau}_1, \underline{\tau}_2, w_1, w_2, r_1, r_2) \equiv E - E_1^D - E_2^S = 0. \qquad (2.12d)$$

The key distinction between the equilibrium conditions in this model of a border MSA and those of a similar model of "regions" is that here we make no assumption that the population of any jurisdiction in the MSA be related to the employment in that jurisdiction. Unlike regional models where the condition that everyone live and work in the same jurisdiction is imposed, we allow the possibility of commuting between jurisdictions. This makes it possible for some jurisdictions (states) in the MSA to be employment centers and some to be "bedroom" communities. The extent that this is possible depends on the costs of commuting between the jurisdictions.

2.1.D The Impact of Taxes on Employment and Population

Our interest is in understanding how changes in state tax policies influence both employment and population within an MSA overlapping two or more state boundaries. In particular, we want to suggest how the impacts of state taxes may differ within an MSA in which households may avoid some state taxes, such as sales taxes or income, by choice of residence without affecting where they work. Analogously, firms may avoid some taxes placed on them by their choice of state without affecting their labor supply significantly (if commuting costs are low) or the demand for their products if the location of households is not tied too strongly to where households purchase goods in the MSA.

Comparative static analysis of the equilibrium conditions *(2.12)*, under reasonable conditions, gives

$$\frac{\partial w_j}{\partial \tau_j^I} > 0,\ \frac{\partial w_j}{\partial \tau_j^c} < 0\ and\ \frac{\partial w_j}{\partial \tau_k^I} < 0,\ \frac{\partial w_j}{\partial \tau_k^c} > 0,\ j = 1,2,\ k \neq j. \qquad (2.13a)$$

and

$$\frac{\partial r_1}{\partial \tau_1^I} < 0,\ \ \frac{\partial r_1}{\partial \tau_1^c} > 0\ and\ \frac{\partial r_1}{\partial \tau_2^I} > 0,\ \frac{\partial r_1}{\partial \tau_2^c} > 0. \qquad (2.13b)$$

More details on the derivation of the comparative static results are found in the *Appendix.* Our interest is not in predictions of the impact of taxes on wages and rents in these border communities but on their employment and population. Then changes in population in state 1 are given by

$$\frac{dN_1}{d\tau_1^I} = \frac{\partial N_1^D}{\partial \tau_1^I} + \frac{\partial N_1^D}{\partial w_1}\frac{\partial w_1}{\partial \tau_1^I} + \frac{\partial N_1^D}{\partial r_1}\frac{\partial r_1}{\partial \tau_1^I} < 0, \qquad (2.14a)$$

$$\frac{dN_1}{d\tau_1^S} = \frac{\partial N_1^D}{\partial \tau_1^s} + \frac{\partial N_1^D}{\partial w_1}\frac{\partial w_1}{\partial \tau_1^S} + \frac{\partial N_1^D}{\partial r_1}\frac{\partial r_1}{\partial \tau_1^S} <,=,> 0 \qquad (2.14b)$$

and

$$\frac{dN_1}{d\tau_1^c} = \frac{\partial N_1^D}{\partial w_1}\frac{\partial w_1}{\partial \tau_1^c} + \frac{\partial N_1^D}{\partial r_1}\frac{\partial r_1}{\partial \tau_1^c} <,=,> 0. \qquad (2.14c)$$

The effect of the individual income tax, a tax statutorily placed on residents is to reduce the population of the community in which the tax is placed. For the sales tax, the impact depends to the extent that cross-border shopping is possible and relatively low-cost. At one extreme if choice of residence has no bearing on choice of where a household purchases goods subject to the sales tax, we have no direct impact of the sales tax on the population of state *1* $\left(\frac{\partial N_1^D}{\partial \tau_1^s} = 0\right)$ but because the tax will reduce the wage rate and land rent there, two effects acting in opposite directions, its impact is ambiguous. If location of residence is relatively independent of location of employment (low commuting costs) then the reduction in rent as a result of the increase in the sales tax will increase the population. In a similarly way, the corporate income tax rate, statutorily borne by businesses, will affect population through its impacts on wages and land rents. The reduction in wages paid as a result of an increase in the corporate income tax rate should reduce the population; however the decrease in land rents as a result of the increase in the corporate income tax acts to increase the population. Again, if commuting costs are low, we might expect an increase in the corporate income tax to actually increase population.

Similarly for employment we have

$$\frac{dE_1}{d\tau_1^c} = \frac{\partial E_1^D}{\partial \tau_1^c} + \frac{\partial E_1^D}{\partial w_1}\frac{\partial w_1}{\partial \tau_1^c} + \frac{\partial E_1^D}{\partial r_1}\frac{\partial r_1}{\partial \tau_1^c} < 0, \qquad \textit{(2.15a)}$$

$$\frac{dE_1}{d\tau_1^S} = \frac{\partial E_1^D}{\partial \tau_1^s} + \frac{\partial E_1^D}{\partial w_1}\frac{\partial w_1}{\partial \tau_1^S} + \frac{\partial E_1^D}{\partial r_1}\frac{\partial r_1}{\partial \tau_1^S} <,=,> 0 \qquad \textit{(2.15b)}$$

and

$$\frac{dE_1}{d\tau_1^I} = \frac{\partial E_1^D}{\partial w_1}\frac{\partial w_1}{\partial \tau_1^I} + \frac{\partial E_1^D}{\partial r_1}\frac{\partial r_1}{\partial \tau_1^I} <,=,> 0. \qquad \textit{(2.15c)}$$

Again, increases in the taxes collected, which are based on the location of employment, such as the corporate income tax, will decrease employment. The income tax, a tax placed on residents, has an ambiguous impact on employment. If the link between location of employment and residence is high (high commuting costs), the reduction in population is linked with a reduction in employment. If this link is weak, that is, commuting costs are low, then the income tax has little impact on wages but a large change will reduce rents, making the community more attractive to firms. Finally, as there is a fixed population and employment, taxes in the other communities in the *MSA* will affect employment in a given community.

Tax changes in a community, in addition to affecting employment and population there, will affect employment and population levels in other communities in the MSA. With two communities in a closed MSA, any increase (decrease) in employment (population) in a community due to a change in its tax policy must lead to a decrease (increase) in employment in the other community. That is,

$$sign\left\{\frac{\partial E_2}{\partial \tau_1^i}\right\} = -sign\left\{\frac{\partial E_1}{\partial \tau_1^i}\right\},\ i = I, c, S \text{ and } sign\left\{\frac{\partial N_2}{\partial \tau_1^i}\right\} = -sign\left\{\frac{\partial N_1}{\partial \tau_1^i}\right\},\ i = I, c, S \qquad (2.16)$$

The impacts of taxes on employment and population depend on how costly it is to avoid taxes by commuting (to avoid the income tax or sales tax), cross-border shopping (to avoid the sales tax), and relocating businesses (to avoid corporate and business taxes and sales tax).

In an MSA along a border, this avoidance of state taxes through location may be possible, suggesting qualitatively different effects of taxes on population and employment. If an MSA were not on a border, to avoid any state tax, a household would be required to change both the location of its residence and the location of its employment. In the model of the "closed" MSA, the equilibrium conditions required the demand for labor within the MSA be equal to the supply of labor within the MSA but not in each taxing jurisdiction. In contrast, a regional or "open" model, in which labor markets are separated, requires that the labor demand equals labor supply in each taxing jurisdiction, in our case, each state/MSA. Harden and Hoyt (2003) provides an example of an regional model and provides comparative statics for it. Because employment and population must move together in the open model, any tax assessed to businesses that reduces employment will reduce population and any tax assessed to households that reduces population reduces employment. *Table 2* provides a summary of the comparative static predictions under alternative assumptions on the costs of commuting and cross-border shopping.

As the summary of comparative statics in *Table 2* suggests, we might expect very different predictions of the impacts of state taxes on both employment and population for counties along borders and counties interior to a state. For border counties, taxes that are statutorily assigned to businesses should affect employment but may have little impact on population. Taxes assigned to households may affect population but have little impact on employment in a state within the MSA. If MSA's are "closed" in the sense that intra-MSA mobility is much greater than mobility across MSA's we should also see substantial impacts of the neighboring states' taxes on employment and population of the counties of a state in the border MSA.

3. Empirical Model and Data

3.1 Empirical Model

Our theoretical model predicts that within an MSA the population and employment within a county is influenced by both the taxes and public services of the state in which it is located as well as the other states within the MSA. To test the predictions of our model, we estimate the specification described below for both population and employment using our entire sample of MSA counties and separately for border jurisdictions and interior counties. Our data is a panel, observations on county employment, population and fiscal policies for twenty-one years for all metropolitan counties.[8]

To characterize our model of employment determination, let employment in county *i* at time *t* for in *MSA j* be determined by

$$\begin{bmatrix} E_{1jt} \\ E_{2jt} \\ \dots \\ E_{n_j jt} \end{bmatrix} = \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & 0 & 0 \\ \dots & 0 & 1 & 0 \\ 0 & \dots & 0 & 1 \end{bmatrix} \begin{bmatrix} x_{1jt1} & x_{1jt2} & \cdots & x_{1jtk} \\ x_{2jt1} & x_{2jt2} & \cdots & x_{2jtk} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n_j jt1} & x_{n_j jt2} & \cdots & x_{n_j jtk} \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \dots \\ \beta_k \end{bmatrix}$$
$$+ \begin{bmatrix} 0 & \rho_{12jt} & \dots & \rho_{1n_j jt} \\ \rho_{21jt} & 0 & \dots & \rho_{2n_j jt} \\ \dots & \dots & 0 & \dots \\ \rho_{n_j 1jt} & \rho_{n_j 2jt} & \dots & 0 \end{bmatrix} \begin{bmatrix} x_{1jt1} & x_{1jt2} & \cdots & x_{1jtk} \\ x_{2jt1} & x_{2jt2} & \cdots & x_{2jtk} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n_j jt1} & x_{n_j jt2} & \cdots & x_{n_j jtk} \end{bmatrix} \begin{bmatrix} \beta_1^N \\ \beta_2^N \\ \dots \\ \beta_k^N \end{bmatrix} + \begin{bmatrix} \gamma_{1j} \\ \gamma_{2j} \\ \dots \\ \gamma_{n_j j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1jt} \\ \varepsilon_{2jt} \\ \dots \\ \varepsilon_{n_j jt} \end{bmatrix} \qquad (3.1)$$

where X_{ijtk} is the value of independent variable *k* for the same jurisdiction. Then *(3.1)* is stating that employment for any county in this MSA will depend on conditions in the other counties in the MSA as well. The relationships depend upon the weight given to each county in the determination of other counties' employment with ρ_{ikjt} being the weight given to county *k* in the determination of county *i's* employment in year *t*. We use a weighting matrix in which ρ_{iijt}=1 and $\rho_{ikjt} = \frac{E_{kjt}}{\sum_{i=1}^{n_j} E_{ijt}}$ for the determination of employment and $\rho_{ikjt} = \frac{N_{kjt}}{\sum_{i=1}^{n_j} N_{ijt}}$ for the determination of population. Then we simply have the tax rates

8 Of course, the extent and existence of MSA's has changed in the twenty-five years of our data. We define an MSA based upon the MSA status as of 1997. Thus some counties not in MSA's in 1977, for example, but which are in MSA's in 1997 are treated as being in the MSA throughout the entire period.

of neighboring counties weighted by their share of the metropolitan population. The error term is composed of two elements. We assume that there is a component specific to each county that does not vary over time (γ_{ij}) and a component specific to each county that does vary over time (ε_{ijt}). We make no assumptions regarding the exogeneity of the term γ_{ij} and allow for the possibility that it is correlated with X_{itj}. We do, however, assume that $E(\varepsilon_{ijt}|X_{ijt}) = 0$. In our estimation we allow for serial correlation in the error terms, $E(\varepsilon_{ijt'}|\varepsilon_{ijt''}) \neq 0$. Note that in *(3.1)* we restrict the cross-county impacts to the set of independent variables (X_{jt}) and do not assume that other factors influencing the employment in a county, specifically γ_{ij} and ε_{itj}, do not affect employment in other counties. We can rewrite the equation describing the determination of employment for county *i* in *MSA j* using *(3.1)* to obtain

$$E_{ijt} = \sum_{k=1}^{K} \beta_k x_{ijtk} + \sum_{k=1}^{K} \beta_k^N \sum_{l \neq i} \rho_{ljt} x_{ljtk} + \gamma_{ij} + \varepsilon_{ijt} \qquad (3.2)$$

Analogously, the population in county *i* located in MSA_j at time *t* is determined by

$$N_{ijt} = \sum_{k=1}^{K} \delta_k x_{ijtk} + \sum_{k=1}^{K} \delta_k^N \sum_{l \neq i} \rho_{ljt} x_{ljtk} + \sigma_{ij} + \nu_{ijt} \qquad (3.3)$$

where we make the same assumptions for σ_{ij} and ν_{ijt} as we have done for $\gamma_{ij,}$ and $\varepsilon_{ijt.}$. Of course, it is possible, and likely, that we have correlation in the error terms across the population and employment equations, that is, $E(\nu_{ij}, \sigma_{ij}) \neq 0 \ \textit{and} \ E(\varepsilon_{ijt}, \gamma_{ijt}) \neq 0$. For this reason we estimate *(3.2)* and *(3.3)* as a system of equations.

Given our assumption that the error term consists of a component specific to the county that is invariant over time we employ fixed effect estimation with a county-specific fixed effect.[9]

[9] Our interest in the interjurisdictional impacts of fiscal policies is shared by studies examining the tendency of jurisdictions to "copycat" (Case (1993), Case, Hines, and Rosen (1993), Heyndels and Vuchelen (1998), Conway and Rork (2001), Rork (2003)) or studies examining policy competition among jurisdictions (Brueckner (1998), Brueckner and Saavedra (2001)). The underlying structural model in these studies has as a dependent variable in one jurisdiction a fiscal measure for that jurisdiction. These studies also include as explanatory variables the same fiscal measures in other jurisdictions adjusted by a weighting matrix. The typical structure of the models employed in these studies might be represented by

3.1.B Modeling Employment and Population Growth

To further motivate the estimation we adopt the partial adjustment model used by Helms (1985) and Carroll and Wasylenko (1994). In this model, the equilibrium, or steady-state, level of employment is given by

$$E_{it}^{*} \;=\; E(X_{ijt}, X_{-ijt}) \tag{3.5}$$

where E_{it}^{*} is the equilibrium or steady-state employment in county *i* in MSA *j* at time *t* and X_{ijt} denotes the vector of fiscal (and other) variables for county *i* and X_{-ijt} represents those for the other counties in *MSA j*. Following Helms (1985) and Carroll and Wasylenko (1994) equilibrium is not obtained instantaneously so that the actual growth rate in employment in time *t* in state *i* is given by

$$E_{ijt} = (1-\lambda)E_{ij,t-1} + \lambda\left(\sum_{k=1}^{K}\beta_k X_{ijtk} + \sum_{l\neq i}^{K}\beta_k^N X_{ljtk}\right) + \gamma_{ij} + \eta_{jt} + \varepsilon_{ijt}\,. \tag{3.6}$$

where λ denotes the speed of adjustment. An analogous equation for population is also estimated. To reduce potential endogeneity, the current levels of the fiscal variables (taxes and public expenditures) are replaced by lagged values. The use of lagged dependent variables in a panel will lead to inconsistent estimates of coefficients (Nickell, 1981; Hsiao, 1986; Holtz-Eakin et.al., 1988). While Hsiao (1986) shows that the bias associated with the use a lagged dependent variable in a panel is on the order of 1/T, with T being the number of years in the panel and while our panel is relatively long (20 years) our estimate of the coefficient on the both the lags of (natural logarithm of) employment and population are both extremely close to one. As Hsiao (1986) also shows the closer the coefficient on the lagged dependent variable is to unity, the greater the bias. For this reason, we only report the results of *Three-Stage Least Squares (3SLS)* estimation in which we use two year lags of the tax and government

---

$$\begin{bmatrix} y_{1jt} \\ y_{2jt} \\ \dots \\ y_{n_j jt} \end{bmatrix} = \beta_1 \begin{bmatrix} 0 & \rho_{12jt} & \dots & \rho_{1n_j jt} \\ \rho_{21jt} & 0 & \dots & \rho_{2n_j jt} \\ \dots & \dots & 0 & \dots \\ \rho_{n_j 1jt} & \rho_{n_j 2jt} & \dots & 0 \end{bmatrix} \begin{bmatrix} y_{1jt} \\ y_{2jt} \\ \dots \\ y_{n_j jt} \end{bmatrix} + \sum_{k=2}^{K}\beta_k x_{ijtk} + \begin{bmatrix} 1 & \theta_{12jt} & \dots & \theta_{1n_j jt} \\ \theta_{21jt} & 1 & \dots & \theta_{2n_j jt} \\ \dots & \dots & 1 & \dots \\ \theta_{n_j 1jt} & \theta_{n_j 2jt} & \dots & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{1jt} \\ \varepsilon_{2jt} \\ \dots \\ \varepsilon_{n_j jt} \end{bmatrix}.$$

.

expenditure policies, our other independent variables, as instruments for the lagged dependent variables. In general, the use of *3SLS* results in coefficient estimates that are similar to, but less statistically significant, than those obtained with OLS.

3.2 Data

Our sample includes counties located in MSA's from 1977 to 1997. Border counties are from MSA's that contain counties in more than a single state or are in an MSA and on a border. While we estimate equation *(3.6)* and an analogous one for population using one-year lags for all explanatory variables, we use two years of data because we use the two-year lags for the fiscal policies as an instrument for the one-year lag of employment or population. Given a long panel and our focus on the impacts of state fiscal policy on employment and population determination, we have a parsimonious specification of independent variables, primarily the fiscal variables and measures of earnings. In addition, in the estimation of both the employment and population equations primarily to control for labor supply within the county we include variables measuring the fraction of the population that was African-American or other minority, under the age of 19, over the age of 65, and male between the ages of 20 and 65. County-fixed effects are used to control for county-specific variables that do not vary significantly over time. Year-fixed effects (dummies) are also used. The employment and population data come from *Regional Economic Information System (REIS).* The *Bureau of Census,* Government Division, provided data on tax revenues and personal income used to construct the tax rates and our measures of government expenditures. State tax revenues and expenditures are obtained annually from the *Annual Survey of State Government Finances.* However, local tax and expenditure information, aggregated to the county level, is available every five years from the *Census of Governments* (1977, 1982, 1987, 1992, 1997). For non-census years we estimate values by simply using a time-weighted average.[10] The *Bureau of Census* also provided the data on demographic characteristics based on county-level annual estimates.

Table 3 provides summary statistics for the entire sample, the sample of border MSA counties, and the sample of interior MSA counties as well as descriptions of the variables. Our measures of tax rates are constructed as percentages of state income thereby creating an "effective" or average tax rate rather than using a statutory marginal tax rate. As mentioned earlier, Following Helms (1985) and Carrol and Wasylenko (1994) among others, our tax measures are lagged. There are two reasons for lagging these tax instruments. First, it is a means for controlling for the obvious endogeneity of current tax rates given they are constructed from tax revenues themselves. Second, firms and residents are likely to have based current employment and location decisions on past rather than current taxes because of the time required to relocate and change employment levels. Since we are constructing these measures based on total state taxes and total state income rather than on state tax collections in the county or MSA in our data set we further reduce any issues regarding endogeneity. Tax rates we include are the major sources of state tax revenue: the individual income tax *(Income Tax);* the corporate income tax *(Corporate Tax);* the sum of general and selective state sales taxes *(Sales Taxes).* In the case of states such as Tennessee and New Hampshire, which tax only a few types of personal income, the effective rate is constructed for these states using collections from these types of income. Since residents of these states would be forced to pay these taxes, their inclusion is necessary to model the cost facing the potential resident. We also include state property taxes *(Property Tax)* and other taxes *(Other Taxes).* Local taxes *(Local Taxes)* are aggregated to the county level as this is our unit of observation as well as the way in which data obtained from the *Bureau of Census* was aggregated.

As measures of the public services residents receive and public inputs from the state we include

[10] For example let TR_t be the tax rate for non-Census of Governments year t. Then our estimate of TR_t is $\frac{(t-T_{C_1})TR_{C_1}+(T_{C_2}-t)TR_{C_2}}{5}$ where TR_{C_1} and TR_{C_2} are the tax rates for the Census of Government year C_1 that precedes time t and year C_2 that follows t.

per capita ($97) state public expenditures on higher education, hospitals, and highways. Unfortunately, these measures are at the state level and therefore we try to limit use or interpretation of our results with them. We also include local primary and secondary educational expenditures, measured at the county level, as well. Following our specification of the empirical model, *(3.1)*, we also include the weighted-average of the neighboring counties tax rates.[11]

4. Results

Summary of the *3SLS* for employment are found in *Table 4* with the results for population given in *Table 5.* For both population and employment, the dependent variable is the logarithm of the level. In column (a) of both tables we estimate an equation for the entire sample, similar to the approach generally undertaken in studies using state-level data. Here, in contrast to earlier studies, we use county-level data and incorporate neighboring county and state effects. We then estimate the same equations separately for counties in border MSA's (column (b)) and those in interior MSA's (column (c)).

One of the most striking findings is the significant degree of state-dependence, or equivalently, the very slow adjustment process for both employment and population with the coefficients on the lag of the *LN(Employment)* in all specifications in *Table 4* and the lag of *LN(Population)* in *Table 5* almost equal to one. While these coefficients are extremely close to unity, they are statistically-different from it. Thus while the equations are stationary, that the coefficients on the lags of the dependent variable are close to one emphasizes concerns about biases and the need to use instruments.

4.1 Employment Results

Examining the results for the IV (instrumental variables) estimation of the employment equation using the entire sample (Table 4, column (a)) over our tax variables only the coefficient on *Income Tax* was negative and significant though the coefficients on *Local Taxes* and *Sales Tax* were both negative. The coefficients on *Corporate Tax, Property Tax,* and *Other Taxes* were positive and, in the case of the

[11] We do not include measures of neighboring counties' expenditure measures in our estimation though we might reasonably expect these, too, to matter in the determination of employment and population within an MSA. Our reason for exclusion was to keep our focus on taxes. The coefficients on the tax variables when measures of neighboring counties' expenditures were included were not very different.

Other Taxes, statistically significant. With respect to the neighboring taxes, the coefficients on neighboring local and sales taxes have positive, significant signs. Local educational expenditures *(Primary/Secondary)* have statistically significant positive impact on employment as do expenditures on local highways and roads. In contrast, state health and highway expenditures have significant, negative impacts on employment.

When models using samples of counties in border MSA's (column (b)) and interior MSA's (column (c)) are estimated separately, results change significantly. For both samples, *Income Tax* has a significant, negative impact on employment with similar coefficients. The coefficients on the other own-tax variables for the sample of border counties are negative with the exception of the coefficients on *Property Tax* and *Other Taxes.* However only the coefficient on *Corporate Tax* is statistically significant though the coefficient on *Sales Tax* is close *(p=.16).* For the interior counties, the coefficients on *Local Taxes, Property Taxes,* and *Other Taxes* are negative and significant while the coefficients on *Sales Tax* and *Corporate Tax* are positive and, in the case of the *Corporate Tax,* statistically significant.

Since by construction the state tax rates of neighboring counties are the same as the state tax rates for the county when the county is in an interior MSA, neighboring tax rates were not included when estimating the employment and population equations for interior MSA's. For the border MSA's sample only the coefficients on the neighboring local taxes and the corporate tax are positive and significant with the coefficients on *Neighboring Other Tax* and *Neighboring Income Tax* were negative and significant. For the interior counties, the coefficient on neighboring local taxes was negative but statistically insignificant.

As discussed earlier, we are somewhat cautious about interpreting coefficients on the expenditure measures, particularly state expenditures as these variables are based on expenditures at the state level and not on how much the county might actually receive of the state expenditures. For primary and secondary education, the coefficient for both samples was positive and significant. *Local Health* had a positive and significant coefficient in the border sample but negative and significant in the interior sample while *Local Highway* was positive in both samples but only significant for the sample of interior counties. *Higher*

Education had a positive coefficient in both samples but obtained strong significance only for the interior sample.

4.2 Population Results

Table 5 reports the results for the population equation. For the entire sample (column (a)) the coefficients on *Local Taxes, Sales Tax, Income Tax,* and *Other Taxes* are negative and statistically significant with the exception of the coefficient on the *Sales Tax*. The coefficients on both *Property Tax* and *Corporate Tax* are positive and significant. Consistent with the results on own-taxes, the coefficients on *Neighboring Local Taxes, Neighboring Sales Tax* are positive while the coefficients on *Neighboring Corporate Tax* and *Neighboring Other Tax* are negative. In contrast, the coefficient on *Neighboring Income Tax* is the same sign (negative) as the coefficient on *Income Tax.*

Results for the separate estimates of the samples of border and interior counties are found in columns (b) and (c). For the sample of border counties, all of the own-tax coefficients are negative and significant with the exception of the coefficient on *Sales Tax* which is negative but insignificant and *Property Tax* which is positive and significant. For the sample of interior counties, all coefficients on own-taxes are negative with the exception of the coefficient on *Corporate Tax* which is positive but insignificant. For the sample of border counties, *Neighboring Local Taxes* had a positive and significant coefficient and *Neighboring Other Tax* was negative and significant.

Coefficients on the expenditure variables for the two subsamples are qualitatively identical to the results with employment but coefficients are almost all statistically-significant.

Table 6 provides two distinct tests of equality of coefficients. Columns (a) reports the ratio of coefficients from the estimates of the employment equation for the two subsamples reported in columns (b) and (c) of *Table 4;* column (b) provides the same measure for the population estimation reported in columns (b) and (c) of *Table 5.* Then looking at column (a) we can see that the coefficient on *Local Tax* in the employment equation for the border sample is 15% of the magnitude of the coefficient obtained with the interior sample while the coefficient on *Corporate Income Tax* with the border sample is 283% greater in magnitude than for the interior sample and opposite in sign. From the table we can see that while the coefficients on *Local Taxes* were the same sign for both samples for both employment and population, the coefficients obtained with the sample of interior counties were much larger and statistically different from those obtained with the border counties. In contrast the coefficients on *Income Tax* were very similar and not statistically different.[12] The coefficients on *Corporate Tax* were statistically different as well as being different in sign between the samples for both employment and population as were the coefficients on *Property Tax*. The coefficient on *Neighboring Local Tax* was statistically different between the two samples for the employment equation as was the coefficient on *Other Taxes.*

Columns *(c) – (e)* of *Table 6* make a different comparison of coefficients, this time between the coefficient obtained in the employment equation to that obtained in the population equation from our three estimates using the coefficients reported in *Tables 4* and *5.* Since the dependent variable in both cases is a natural logarithm we believe this is a meaningful coefficient as it can be interpreted as the percentage change in the variable. If population and employment moved together, that is, there is the same percentage change in each, we should report 1 for the ratio of coefficients. We can see that for many of the coefficients we cannot reject the hypothesis that the coefficients are equal in both the estimates of employment and population equations. One obvious exception for both samples and the entire sample is the smaller response by employment to changes in local taxes. Not surprisingly, for all three samples, income taxation causes a greater (percentage) change in population than in employment but only for the interior county sample is it significant. Note that for the border MSA's population and employment are affected about equally by changes in the corporate tax and neighboring local and sales taxes. While the magnitude of the coefficients on *Sales Tax* and *Neighboring Sales Tax* are significantly greater for employment for the border sample, these differences are not statistically significant. Also note that in the cases in which the signs for the coefficient on policy are not the same from employment and population estimates (denoted by a negative sign), the differences are statistically significant.

5. Conclusions, Policy Implications, and Extensions

The impact of state taxes on employment has been addressed in numerous studies in the past

[12] The test-statistic was formed assuming the two samples, border counties and interior counties, were independent.

twenty-five years with conflicting and ambiguous results. Here we examine the impact of state taxes not on state employment, but instead on county employment within MSA's and make a comparison between those counties in border MSA's and those in interior MSA's. While a number of studies have focused on the impact of taxes and other policies on borders, we are the first of which we are aware, that compares the impacts in border regions (counties) to the impact in the interior of a state. This approach has also enabled us to consider, for the border counties, the impact of taxes in neighboring states, something only a few other studies have done. Also unlike previous studies of the impact of taxes on employment we consider, both theoretically and empirically, the determination of employment jointly with population. While it might be reasonable to expect employment in border counties to be more responsive to changes in taxation than employment in interior counties, here we argue that may not be the case. The reason, as developed in *Section 2,* is that in border counties it is possible for households to escape income or consumption taxation in a state by moving their residence to the another state in the MSA without changing employment. Analogously, firms can escape "business" taxes without forcing employees to move or hire new employees by relocating in another state within the MSA. Thus, we might expect very different responses for both employment and population for interior and border counties. It is also not unreasonable for the impact of some taxes on employment or population to be positive in border MSA's as we might find, for example, employment negatively impacted by business taxes in a county but population positively impacted because of reduction in demand by firms for land in the county.

The results of estimating the impact of state taxes on both employment and population indicates that there are some important differences in the way in which taxes affect both employment and population in border and interior counties. Comparisons of the results of estimation using the entire sample to our subsamples of border and interior counties, for both employment and population, suggest that aggregation bias may explain small and statistically insignificant impacts of taxes on employment. Specifically, we find no statistical significance of the impact of the corporate tax on employment and a positive impact on population when using the entire sample. However, when we divide the sample into border and interior counties we find very strong negative impacts of the corporate tax on both employment and population in border MSA's. Similarly statistically insignificant coefficients on sales tax using the entire sample seem to mask a stronger negative impact of the sales tax on employment in border counties and on population in the population equation. Similarly, while the impact of local taxes is negative and significant on population in samples, its impact on employment is only significant (and negative) for interior MSA's. For both employment and population with all three samples, the coefficient on the state individual income tax is negative and significant.

For the entire sample and sample of border counties we include measures of the taxes in the neighboring states, that is the taxes in the other states in the MSA. We find that a number of these taxes do have significant impacts on employment and population. Positive coefficients in the employment equations for neighboring local and corporate taxes may suggest some substitution and relocation in employment between counties within the MSA as a result of increases in these taxes. The negative coefficients in both the employment and population equations on the individual income tax in the neighboring counties suggest a complimentary relationship – increases in the individual income tax in part of the MSA reduce the attractiveness of the entire MSA.

We believe a contribution of this paper is to seriously consider the simultaneous determination of population and employment and to not necessarily assume that they will move together with respect to taxes. As discussed earlier, within border MSA's we could have very different impacts of taxes on population and employment. From formal testing of whether the coefficients on a given tax measure are equal in both the employment and population equations, the results indicate that for a number of taxes the impact of the tax (percentage change in dependent variable) is not equal. However, we do not find it more likely for differences in responses to taxation by employment and population to occur in border counties, where we expect them to occur, than in interior MSA's, where we would expect the impacts on employment and population to be similar.

We believe that this line of research can proceed in a number of directions. One obvious extension would be to more rigorously link the impact of the taxes with the geographical location of the county. While, as discussed briefly earlier, we think our results may offer some evidence of how much of employment and population gains and losses in border areas are due to intra-metropolitan versus inter-metropolitan mobility, this issue merits further attention as well. Also of interest would be research on whether differences in taxes within metropolitan areas, both state and local, promote sorting into "work" communities and into "bedroom" communities. Finally, along the lines of models developed by Kanbur and Keen (1993) and given evidence of different impacts of the different taxes on employment and population areas in border and interior regions of states, it would be interesting to see if there is evidence that states, when setting tax rates, consider the distribution of their population within the state and whether states with more of their population along borders do appear to set lower tax rates, particularly on corporations.[13]

References

Bartik, Timothy. "Who Benefits From State and Local Economic Development Policies?" W.E. UpJohn Institute for Employment Research, Kalamazoo, MI (1991).

Bradbury, Katharine L. "Fiscal Distress in Large U.S. Cities," *New England Economic Review,* November-December (1982): 3 3-44.

Brueckner, Jan. "Testing for Strategic Interaction among Local Governments: The Case of Growth Controls, *Journal of Urban Economics,* 44, (November 1998): 438-467.

Brueckner, Jan and Liz Saavedra. "Do Local Governments Engage in Strategic Property-Tax Competition." *National Tax Journal*, 54 No. 2 (June, 2001): 203-229.

Carlton, Dennis W. "Why do Firms Locate Where They do: An Econometric Model," in *Interregional Movements and Regional Growth,* ed. William C. Wheaton, Urban Institute, Washington, DC. (1979).

Carroll, Robert and Michael Wasylenko. "Do State Business Climates Still Matter? Evidence of a Structural Change." *National Tax Journal,* 47 No. 1 (March, 1994): 19-37.

Case, Anne. "Interstate Tax Competition After TRA86." *Journal of Policy Analysis and Management* 12 No. 1 (Winter, 1993): 136-148.

Case, Anne, C., Rosen, Harvey S. and Hines, James R., Jr. "Budget Spillovers and Fiscal Policy Interdependence: Evidence from the States." *Journal of Public Economics* 52 No. 3 (October, 1993): 285-307.

[13] While there have been a number of recent empirical studies of interjurisdictional tax or other fiscal competition including Brueckner (1998), Brueckner and Saavedra (2001), Omer and Shelley (2004), Luna (2004), Case (1993), and Case et. al. (1993) what we propose would be similar analysis to these studies but also taking into account how the population and employment in a state is distributed within the state.

Crihfield, John B. “A Structural Analysis of Metropolitan Labor Demand,” *Journal of Regional Science,* (1989): 347-371

__________. “Manufacturing Supply,” *Regional Science and Urban Economics,* (l990):327-349.

Conway, Karen Smith and Jonathan C. Rork. “The Death of State Death Taxes—How Quick and How Painless?,” *Economic Inquiry*, 42(4) (2001):537-559.

Deich, Michael. “State Taxes and Manufacturing Plant Location,” *Proceeding of the Eighty-Second Annual Conference on Taxation,* Atlanta, GA (1989).

Due, John F. “Studies of State-Local Tax Influence on Location of Industry,” *National Tax Journal 6* (1961): 163-173.

Dye, T. “Taxing, Spending, and Economic Growth in the American States.” *The Journal of Politics,* 42 (1980): 1085-1 107.

Eberts, Randall W. “Some Empirical Evidence on the Linkage between Public Infrastructure and Local Economic Development,” in *Industry Location and Public Policy* eds. Henry Herzog and Alan Schlottman, University of Tennessee Press, Knoxville, TN (1991).

Erickson, Rodney A. and Michael Wasylenko. “Firm Relocation and Site Selection in Suburban Municipalities,” *Journal of Urban Economics* 8, (1980): 69-85.

Feld, Lars P. and Gebhard Kirchgassner “The Impact of Corporate and Personal Income Taxes on the Location of Firms and on Employment: Some Pane Evidence for the Swiss Cantons.” *Journal of Public Economics* 87 (2002):129-155.

Fox, William F. “Tax Structure and the Location of Economic Activity along State Borders,” *National Tax Journal,* 39 No. 4 (December 1986):387-401.

Fox, William F. and Matthew N. Murray. “Do Economic Effects Justify the Use of Fiscal Incentives?” *Southern Economic Journal,* 71:1 (2004):78-92.

Harden, J. William and William H. Hoyt. “Do States Choose Their Mix of Taxes to Minimize Employment Losses?” *National Tax Journal* 56, No. 1 (March, 2003): 7-26.

Helms, L. “The Effect of State and Local Taxes on Economic Growth: A Time Series-Cross Section Approach.” *The Review of Economics and Statistics.* (November, 1985): *574-582.*

Heyndels, Bruno and Jeff Vuchelen. “Tax Mimicking among Belgian Municipalities,” *National Tax Journal,* 51 No. 1 (March 1998): 89-101.

Holmes, Thomas J. “The Effect of State Policies on the Location of Manufacturing: Evidence from State Borders,” *Journal of Political Economy,* 106 No. 4 (August 1998):667-705.

Holtz-Eakin, Douglas, Whitney Newey, and Harvey S. Rosen. “Estimating Vector Autoregressions with Panel Data.” *Econometrica* 56, No. 6 (November, 1988): 1371-95.

Hsaio, Cheng. *Analysis of Panel Data*. Cambridge, UK: Cambridge University Press, 1986.

Kanbur, Ravi and Michael Keen. "Jeux Sans Frontieres: Tax Competition and Tax Coordination When Countries Differ in Size," *American Economic Review,* 83 (1993): 877-92.

Luce, Thomas F., Jr. "The Determinants of Metropolitan Area Growth Disparities in High-Technology and Low-Technology Industries, working paper, Department of Public Administration, Pennsylvania State University (1990).

Luna, LeAnn. "Local Sales Tax Competition and the Effect on County Governments' Tax Rates and Tax Bases." *The Journal of the American Taxation Association*, 26 No. 1 (Spring, 2004): 43-61.

Mark, Stephen T., Therese J. McGuire, and Leslie E. Papke. "The Influence of Taxes on Employment and Population Growth: Evidence from the Washington, D.C. Metropolitan Area." *National Tax Journal*, 53 No. 1 (March, 2000): 105-23.

Mills, Edwin S. "Metropolitan Central City Population and Employment Growth during the '70's," Working Paper No. 83-7. Federal Reserve Bank of Philadelphia (1983).

Mofidi, Alaeddin, and Joe A. Stone. "Do State and Local Taxes Affect Economic Growth?" *The Review of Economics and Statistics.* 72 (November, 1990): 686-691.

Mullen, John K. and Martin Williams. "Supply-Side Effects and State Economic Growth," presented at *37th North American Meetings of the Regional Science Association International,* Boston (1991).

Munnell, Alicia H. "How Does Public Infrastructure affect Regional Economic Performance?" *New England Economic Review,* (1990): 11-33.

Nickell, Stephen. "Biases in Dynamic Models with Fixed Effects." *Econometrica* 49 No. 6 (November, 1981): 1417-26.

Omer, Thomas C. and Marjorie K. Shelley. "Competitive, Political, and Economic Factors Influencing State Policy Changes." *The Journal of the American Taxation Association*. 26 Supplement (2004): 103-126.

Palumbo, George, Seymour Sacks, and Michael Wasylenko. "Population Decentralization within Metropolitan Areas: 1970-1980," *Journal of Urban Economics,* 27 No. 2 (1990): 151-167.

Papke, Leslie E. "The Location of New Manufacturing Plants and State Business Taxes: Evidence from Panel Data," in *Proceedings of the Seventy-Ninth Annual Conference on Taxation,* National Tax Association, Hartford, CT (1986).

_________. "Interstate Business Tax Differentials and New Firm Location: Evidence from Panel Data," *Journal of Public Economics;* 45 No. 1, (June, 1991):47-68.

_____________"Tax Policy and Urban Development: Evidence from the Indiana Enterprise Zone Program," *Journal-of Public-Economics* ; 54 No. 1 (May, 1994): 37-49.

Phillips, Joseph M. and Ernest P. Goss. "The Effect of State and Local Taxes on Economic Development: A Meta-Analysis." *Southern Economic Journal.* 62 (1995): 320-333.

Romans, T., and G. Subrahmanyam. "State and Local Taxes, Transfers, and Regional Economic Growth." *Southern Economic Journal,* 50 (October, 1979): 435-444.

Rork, Jonathan C. "Coveting Thy Neighbors Taxation." *National Tax Journal*, 56 No. 4 (December, 2003): 775-787.

Wasylenko, Michael. "Taxation and Economic Development: The State of the Economic Literature." *New England Economic Review, Proceedings of a Symposium on the Effects of State and Local Public Policies on Economic Development.* (March/April, 1997): 3 7-52.

______________ and Theresa McGuire. "Jobs and Taxes: The Effect of Business Climate on States' Employment Growth Rates." *National Tax Journal,* 38 No. 4 (December, 1985): 497-511.

Wilson, John D. "Theories of Tax Competition," *National Tax Journal,* 52 No. 2 (June, 1999): 269-304.

Table 1: A Comparison of State Tax Rates within Inter-State MSA's

MSA	State	Sales	Income[1]	Corporate[1]
Augusta-Aiken, GA-SC	Georgia	4	6	6
	South Carolina	5	7	5
Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH-ME-CT	Connecticut	6	5	7.5
	Massachusetts	5	5.3	9.5
	Maine	5	8.5	8.93
	New Hampshire	0	0	8.5
Charlotte-Gastonia-Rock Hill, NC-SC	North Carolina	4.5	8.25	6.9
	South Carolina	5	7	5
Chattanooga, TN-GA	Tennessee	7	(a)	6.5
	Georgia	4	6	6
Chicago-Gary-Kenosha, IL-IN-WI	Illinois	6.25	3	7.3
	Indiana	6	3.4	8.5
	Wisconsin	5	6.75	7.9
Cincinnati-Hamilton, OH-KY-IN	Indiana	6	3.4	8.5
	Kentucky	6	6	8.25
	Ohio	6	7.5	8.5
Clarksville-Hopkinsville, TN-KY	Kentucky	6	6	8.25
	Tennessee	7	(a)	6.5
Columbus, GA-AL	Alabama	4	5	6.5
	Georgia	4	6	6
Cumberland, MD-WV	Maryland	5	4.75	7
	West Virginia	6	6.5	9
Davenport-Moline-Rock Island, IA-IL	Illinois	6.25	3	7.3
	Iowa	5	8.98	12
Duluth-Superior; La Crosse; Minneapolis-St. Paul MN-WI	Minnesota	6.5	7.85	9.8
	Wisconsin	5	6.75	7.9
Evansville-Henderson; Louisville IN-KY	Indiana	6	3.4	8.5
	Kentucky	6	6	8.25
Fargo-Moorhead; Grand Forks; ND-MN	Minnesota	6.5	7.85	9.8
	North Dakota	5	5.54	10.5
Flagstaff, AZ-UT	Arizona	5.6	5.04	6.968
	Utah	4.75	7	5
Fort Smith, AR-OK	Arkansas	5.125	7	6.5
	Oklahoma	4.5	6.75	6

Notes: Source: The Federation of Tax Administrators for 2003. [1]The reported individual income and corporate income tax rates are the rates for the highest tax bracket though for the corporate income tax rate, 32 of the 48 states with a corporate income tax in 2003 had a flat rate. (a) Income tax on dividend and interest income only. (b) Income tax is 25% of federal liability.

Table 1 (continued)

MSA	State	Sales	Income	Corporate
Huntington-Ashland, WV-KY-OH	Kentucky	6	6	8.25
	Ohio	6	7.5	8.5
	West Virginia	6	6.5	9
Johnson City-Kingsport-Bristol, TN-VA	Tennessee	7	(a)	6.5
	Virginia	3.5	5.75	6
Kansas City, MO-KS	Kansas	5.3	6.45	4
	Missouri	4.225	6	6.25
Las Vegas, NV-AZ	Arizona	5.6	5.04	6.968
	Nevada	6.5	(a)	0
Memphis, TN-AR-MS	Arkansas	5.125	7	6.5
	Mississippi	7	5	5
	Tennessee	7	(a)	6.5
New York-Northern New Jersey-Long Island, NY-NJ-CT-PA	Connecticut	6	5	7.5
	New Jersey	6	6.37	9
	New York	4.25	7.7	7.5
	Pennsylvania	6	(b)	9.99
Norfolk-Virginia Beach-Newport News, VA-NC	North Carolina	4.5	8.25	6.9
	Virginia	3.5	5.75	6
Omaha, NE-IA	Iowa	5	8.98	12
	Nebraska	5.5	6.84	7.81
Parkersburg-Marietta; Steubenville-Weirton; Wheeling, WV-OH	Ohio	6	7.5	8.5
	West Virginia	6	6.5	9
Philadelphia-Wilmington-Atlantic City, PA-NJ	New Jersey	6	6.37	9
	Pennsylvania	6	(b)	9.99
Portland-Salem, OR-WA	Oregon	0	9	6.6
	Washington	6.5	0	0
St. Louis, MO-IL	Illinois	6.25	3	7.3
	Missouri	4.225	6	6.25
Sioux City, IA-NE	Iowa	5	8.98	12
	Nebraska	5.5	6.84	7.81
Texarkana, TX-Texarkana, AR	Arkansas	5.125	7	6.5
	Texas	6.25	0	0
Washington-Baltimore, DC-MD-VA-WV	District of Columbia	5.75	9.5	9.975
	Maryland	5	4.75	7
	Virginia	3.5	5.75	6
	West Virginia	6	6.5	9

Table 2: Impact of State Tax Changes on Intra-MSA
Employment and Population

High Commuting and Cross-Border Shopping Costs		
Impact of an Increase in:	Employment	Population
Own Taxes		
Individual Income Tax	-	-
Sales Tax	-	-
Corporate Income Tax	-	-
Property Tax	-	-
Neighboring Taxes		
Individual Income Tax	0/+	0/+
Sales Tax	0/+	0/+
Corporate Income Tax	0/+	0/+
Property Tax	0/+	0/+
Low Commuting Costs		
Own Taxes		
Individual Income Tax	+	-
Corporate Income Tax	-	+
Property Tax	?	?
Neighboring Taxes		
Individual Income Tax	-	+
Corporate Income Tax	+	-
Property Tax	?	?
Low Commuting Costs and Low Cross-Border Shopping Costs		
Own Sales Tax	- (locally traded, taxed goods) + (exported goods, non taxed)	0/+(weak)
Neighboring Sales Tax	+ (locally traded, taxed goods) - (exported goods, non taxed)	0/-(weak)
Low Commuting Costs and High Cross-Border Shopping Costs		
Own Sales Tax	- (locally traded, taxed goods) + (exported goods, non taxed)	-
Neighboring Sales Tax	+ (locally traded, taxed goods) - (exported goods, non taxed)	+

Table 3: Means and Description of Variables by type of county

Variable Name	All Counties	Border Counties	Interior Counties	Variable Description
Employment	129,039	147,493	112,060	Total County Employment
Population	233,847	284,355	187,375	County Population
Local Taxes	3.53	3.74	3.34	Local Taxes (all) as % of income
Sales Taxes	1.98	2.02	1.95	State General and Selective Sales Taxes as % of Income
Income Tax	1.77	1.75	1.78	State Individual Income Taxes as % of Income
Corporate Tax	0.43	0.45	0.41	State Corporate Income Taxes as % of Income
Property Taxes	0.10	0.10	0.10	State Property Taxes as % of Income
Other Taxes	0.59	0.59	0.59	All other state taxes as % of Income
Primary/Secondary	1004	1027	984	Per Capita Primary & Secondary Spending in County, $97
Local Health	165	164	166	Per Capita Health Spending in County, $97
Local Highway	117	119	115	Per Capita Local Highway and Road Spending, $97
Higher Education	330	315	343	Per Capita State Spending on Higher Education per Capita, $97
State Health	180	183	177	Per Capita State Health Spending, $97
State Highway	208	206	209	Per Capita State Highway Spending, $97
African-American	0.10	0.09	0.11	Fraction of the population that is African-American in county
Other Minority	0.02	0.02	0.02	Fraction of the population that is neither African-American nor White in county
Under 19	0.33	0.33	0.33	Fraction of the population under 19 years of age in county
Over 64	0.12	0.13	0.12	Fraction of the population over 64 years of age in county
Male, 20 - 64	0.31	0.30	0.31	Fraction of the population that is male and betwee 20 and 64 years of age in county

Table 4: Results of 3 Stage Least Squares Estimation of LN(Employment)

	(a)		(b)		(c)	
	Entire Sample		Border MSA Only		Interior MSA Only	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
LN(Employment)$_{t-1}$	0.9904015	564.11	0.9907346	364.53	0.9949906	504.33
Local Taxes	-0.0003382	-1.07	-0.0003837	-1.01	-0.0025614	-3.66
Sales Tax	-0.0009484	-1.23	-0.0012125	-1.40	0.0006594	0.84
Income Tax	-0.0023364	-3.72	-0.0024568	-3.36	-0.0024007	-4.36
Corporate Tax	0.0005809	0.29	-0.0088431	-2.60	0.0031225	2.08
Property Tax	0.001817	1.49	0.0057121	3.34	-0.006162	-3.20
Other Taxes	0.0009038	2.30	0.0002313	0.46	-0.0007415	-2.44
Neighboring Local Tax	0.0007086	2.59	0.0011084	2.82	-0.0001868	-0.39
Neighboring Sales Tax	0.0027387	3.14	0.0004237	0.38		
Neighboring Income Tax	-0.000897	-1.37	-0.0019128	-2.34		
Neighboring Corporate Tax	0.001887	0.82	0.0108606	2.27		
Neighboring Other Tax	-0.0016969	-5.39	-0.001469	-3.58		
Primary/Secondary	0.0000055	5.07	0.0000028	1.97	0.0000128	6.80
Local Health	-0.0000014	-1.18	0.0000072	3.42	-0.0000069	-3.97
Local Highway	0.0000104	2.20	0.0000074	0.82	0.0000153	2.29
Higher Education	0.0000017	0.36	0.0000066	0.87	0.0000152	2.70
State Health	-0.0000334	-6.61	-0.0000312	-4.65	-0.0000341	-3.89
State Highway	-0.0000402	-5.88	-0.0000506	-5.32	-0.0000075	-0.88
African American	-0.0048729	-1.19	-0.0084698	-1.39	-0.0138872	-2.43
Other Race	0.0723902	4.70	0.1349888	3.54	0.0354632	2.33
Age, Under 19	-0.4056934	-9.98	-0.3798885	-6.34	-0.2842599	-5.90
Age, Over 65	-0.4115339	-13.04	-0.2625835	-6.72	-0.4736540	-11.87
Male, Ages 20-64	-0.2874596	-9.44	-0.1799796	-5.40	-0.2234054	-4.81
Observations	14733		7039		7694	
Root Mean Square Error	0.0298511		0.0293746		0.0277521	
R^2	0.9995		0.9995		0.9996	
X^2	15,400,000		94,000,000		160,000,000	

Table 5: Results of 3-Stage Least Squares Estimation of LN(Population)

	(a)		(b)		(c)	
	Entire Sample		Border MSA Only		Interior MSA Only	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$LN(Population)_{t-1}$	0.9975434	963.40	0.9997163	688.04	0.9960058	730.73
Local Taxes	-0.0020947	-12.18	-0.0014465	-7.24	-0.0051788	-13.52
Sales Tax	-0.0003276	-0.74	-0.0003233	-0.70	-0.0008753	-1.91
Income Tax	-0.0029885	-8.30	-0.0031331	-7.98	-0.0035709	-11.04
Corporate Tax	0.0022919	2.01	-0.0080301	-4.39	0.0001359	0.15
Property Tax	0.0011599	1.69	0.0034463	3.74	-0.0057259	-5.06
Other Taxes	-0.0009289	-4.23	-0.0013558	-5.18	-0.0012593	-6.79
Neighboring Local Tax	0.0009259	5.72	0.0009099	4.04	0.0009339	3.52
Neighboring Sales Tax	0.0007526	1.51	0.0004615	0.78		
Neighboring Income Tax	-0.0008685	-2.31	-0.0006247	-1.40		
Neighboring Corporate Tax	-0.006907	-5.30	-0.0029626	-1.17		
Neighboring Other Tax	-0.0007791	-4.36	-0.0006201	-2.79		
Primary/Secondary	0.0000106	17.04	0.0000057	7.46	0.0000217	19.16
Local Health	0.00000021	0.30	0.0000053	4.86	-0.0000048	-4.60
Local Highway	0.00000718	2.43	0.0000197	3.82	0.0000105	2.53
Higher Education	0.0000115	3.97	0.0000216	5.01	0.0000160	4.66
State Health	-0.0000131	-4.70	-0.0000120	-3.32	-0.0000269	-5.36
State Highway	-9.48E-06	-2.28	-0.0000074	-1.38	-0.0000065	-1.18
African American	-0.0103659	-5.15	-0.0158140	-5.60	-0.0063479	-2.08
Other Race	0.043455	5.10	0.0444578	2.37	0.060861	6.49
Age, Under 19	-0.1285885	-6.27	-0.1035898	-3.53	-0.129822	-4.94
Age, Over 65	-0.1590677	-9.01	-0.0529348	-2.50	-0.2819086	-11.31
Male, Ages 20-64	-0.0769938	-4.06	-0.0351026	-1.73	-0.0865084	-3.06
Observations	14733		7039		7694	
Root Mean Square Error	0.01707		0.01584		0.01634	
R^2	0.9998		0.9998		0.9998	
X^2	34,200,000		3,910,000,000		3,840,000,000	

Table 6: A Comparison of Coefficients, Border to Interior Counties and Employment to Population

	Ratio of Coefficients, Border to Interior Counties		Ratio of Coefficients, Employment to Population		
	Employment (a)	Population (b)	Entire Sample (c)	Border MSA Only (d)	Interior MSA Only (e)
Local Taxes	0.15***	0.28***	0.16***	0.27***	0.49***
Sales Tax	-1.84	0.37	2.89	3.75	-0.75**
Income Tax	1.02	0.88	0.78	0.78	0.67**
Corporate Tax	-2.83***	-59.09***	0.25	1.10	22.98**
Property Tax	-0.93***	-0.60***	1.57	1.66	1.08
Other Taxes	-0.31*	1.08	-0.97***	-0.17***	0.59*
Neighboring Local Tax	-5.93**	0.97	0.77	1.22	-0.20***
Neighboring Sales Tax			3.64**	0.92	
Neighboring Income Tax			1.03	3.06	
Neighboring Corporate Tax			-0.27**	-3.67**	
Neighboring Other Tax			2.18***	2.37**	
*** Difference significant at 1% level; ** Significant at 5% level; and * significant at 10% level.					

Appendix: Comparative Static Analysis of Tax Impacts

Totally differentiating the system of equations *(2.12)* with respect to tax τ_j^i, $i = 1,2; j = I, C, S$ gives

$$\underbrace{\begin{bmatrix} f_{r_1}^1 & f_{r_2}^1 & f_{w_1}^1 & f_{r_2}^1 \\ f_{r_1}^2 & f_{r_2}^2 & f_{w_1}^2 & f_{w_2}^2 \\ f_{r_1}^3 & f_{r_1}^3 & f_{w_1}^3 & f_{w_2}^3 \\ f_{r_1}^4 & f_{r_2}^4 & f_{w_1}^4 & f_{w_2}^4 \end{bmatrix}}_{(f)} \begin{bmatrix} dr_1 \\ dr_2 \\ dw_1 \\ dw_2 \end{bmatrix} = -\begin{bmatrix} f_{\tau_x}^1 \\ f_{\tau_x}^2 \\ f_{\tau_x}^3 \\ f_{\tau_x}^4 \end{bmatrix} \qquad \textit{(A.1)}$$

where we expect:

$$f_{r_1}^1 = \frac{\partial N_1^D}{\partial r_1} - \frac{\partial N_1^S}{\partial r_1} < 0; f_{r_2}^1 = \frac{\partial N_1^D}{\partial r_2} > 0; f_{w_1}^1 = \frac{\partial N_1^D}{\partial w_1} > 0; f_{w_2}^1 = \frac{\partial N_1^D}{\partial w_2} < 0; \qquad \textit{(A.2a)}$$

$$f_{r_1}^2 = -\frac{\partial N_1^D}{\partial r_1} > 0; f_{r_2}^2 = -\frac{\partial N_2^S}{\partial r_2} < 0; f_{w_1}^2 = -\frac{\partial N_1^D}{\partial w_1} < 0; f_{w_2}^2 = -\frac{\partial N_1^D}{\partial w_2} > 0; \qquad \textit{(A.2b)}$$

$$f_{r_1}^3 = \frac{\partial E_1^D}{\partial r_1} - \frac{\partial E_1^S}{\partial r_1} = (<)(>)0; f_{r_2}^3 = \frac{\partial E_1^D}{\partial r_2} - \frac{\partial E_1^S}{\partial r_2} > 0; f_{w_1}^3 = \frac{\partial E_1^D}{\partial w_1} - \frac{\partial E_1^S}{\partial w_1} < 0; f_{w_2}^3 = \frac{\partial E_1^D}{\partial w_2} - \frac{\partial E_1^S}{\partial w_s} > 0; \qquad \textit{(A.2c)}$$

$$f_{r_1}^4 = -\frac{\partial E_1^D}{\partial r_1} > 0; f_{r_2}^3 = -\frac{\partial E_1^D}{\partial r_2} - \frac{\partial E_2^S}{\partial r_2} < 0; f_{w_1}^4 = -\frac{\partial E_1^D}{\partial w_1} > 0; \textit{and } f_{w_2}^4 = -\frac{\partial E_1^D}{\partial w_2} < 0. \qquad \textit{(A.2d)}$$

Then *(A.2)* can be summarized by

$$\begin{bmatrix} - & + & + & - \\ + & - & - & + \\ ? & + & - & + \\ + & - & + & - \end{bmatrix}_{(f)} \begin{bmatrix} dr_1 \\ dr_2 \\ dw_1 \\ dw_2 \end{bmatrix} = - \begin{bmatrix} f^1_{\tau_x} \\ f^2_{\tau_x} \\ f^3_{\tau_x} \\ f^4_{\tau_x} \end{bmatrix} \qquad (A.3)$$

The direct impacts of the income tax on the equilibrium conditions are given by

$$f^1_{\tau_1^I} = \frac{\partial N_1^D}{\partial \tau_1^I} < 0; f^2_{\tau_1^I} = 0; f^3_{\tau_1^I} = -\frac{\partial E_1^S}{\partial \tau_1^I} > 0; f^4_{\tau_1^I} = 0 \qquad (A.4a)$$

and the corporate income tax is given by

$$f^1_{\tau_1^C} = -\frac{\partial N_1^S}{\partial \tau_1^C} = (<)\ 0; f^2_{\tau_1^C} = 0; f^3_{\tau_1^C} = \frac{\partial E_1^D}{\partial \tau_1^C} < 0; f^4_{\tau_1^I} = \frac{\partial E_1^D}{\partial \tau_1^C} + \frac{\partial E_2^D}{\partial \tau_1^C} < 0 \qquad (A.4b)$$

with the impact of the

$$f^1_{\tau_1^S} = \frac{\partial N_1^D}{\partial \tau_1^S} < 0; f^2_{\tau_1^S} = 0; f^3_{\tau_1^I} = -\frac{\partial E_1^S}{\partial \tau_1^S} > 0; f^4_{\tau_1^I} = 0 \qquad (A.4c)$$

The applying Cramer's rule to determine the impacts of the income tax gives

$$\frac{dr_1}{d\tau_1^I} = \frac{-f^1_{\tau_1^I}|M_{11}| - f^3_{\tau_1^I}|M_{31}|}{|f|}; \ \frac{dr_2}{d\tau_1^I} = \frac{f^1_{\tau_1^I}|M_{12}| + f^3_{\tau_1^I}|M_{32}|}{|f|}; \ \frac{dw_1}{d\tau_1^I} = \frac{-f^1_{\tau_1^I}|M_{13}| - f^3_{\tau_1^I}|M_{33}|}{|f|} \text{ and}$$

$$\frac{dw_2}{d\tau_1^I} = \frac{f^1_{\tau_1^I}|M_{14}| + f^3_{\tau_1^I}|M_{34}|}{|f|} \qquad (A.5)$$

where $M_{ij} = \begin{bmatrix} f_{11} & .f_{1,j-1} & f_{1,j+1} & f_{1n} \\ f_{i-1,1} & f_{i-1,j-1} & f_{i-1,j-1} & f_{i-1,n} \\ f_{i+1,1} & f_{i+1,j-1} & f_{i+1,j+1} & f_{i+1,n} \\ f_{n1} & f_{nj-1} & f_{nj+1} & f_{nn} \end{bmatrix}$, the minor for cell ij. Stability requires that

$|f_{11}| < 0, \begin{vmatrix} f_{11} & f_{12} \\ f_{21} & f_{22} \end{vmatrix} > 0, \begin{vmatrix} f_{11} & f_{12} & f_{13} \\ f_{21} & f_{22} & f_{23} \\ f_{31} & f_{32} & f_{33} \end{vmatrix} < 0, \ and \ |f| > 0$ and by symmetry $|M_{11}| < 0, \ |M_{22}| < 0,$

$and \ |M_{33}| < 0$ .Then, for example, from *(A.4A)* the "direct" impact of the income tax in region 1 on land rents there, $\frac{-f^1_{\tau_1^I}|M_{11}|}{|f|}$ is negative. The secondary impact through reductions in the supply of employees $\frac{-f^3_{\tau_1^I}|M_{31}|}{|f|}$ is less clear given difficulty in signing $|M_{31}|$. Analogously, the direct impact of the income tax in state 1 on the wage there, $\frac{-f^3_{\tau_1^I}|M_{33}|}{|f|}$ is positive but the indirect effect through the land market, $\frac{-f^1_{\tau_1^I}|M_{13}|}{|f|}$, is less clear though unlikely to predominate.

The IFIR Working Papers Series

Other titles in the series:

No. 2005-01: “MSA Location and the Impact of State Taxes on Employment and Population: A Comparison of Border and Interior MSA’s,” William H. Hoyt and J. William Harden.

No. 2005-02: “Estimating the Effect of Elite Communications on Public Opinion Using Instrumental Variables,” Matthew Gabel and Kenneth Scheve.

No. 2005-03: “The Dynamics of Municipal Fiscal Adjustment,” Thiess Buettner and David E. Wildasin.

No. 2005-04: “National Party Politics and Supranational Politics in the European Union: New Evidence from the European Parliament,” Clifford J. Carrubba, Matthew Gabel, Lacey Murrah, Ryan Clough, Elizabeth Montgomery and Rebecca Schambach

No. 2005-05: “Fiscal Competition,” David E. Wildasin.

No. 2005-06: “Do Governments Sway European Court of Justice Decision-making?: Evidence from Government Court Briefs,” Clifford J. Carrubba and Matthew Gabel.

IFIR Working Papers contain original research contributed by scholars affiliated with the Institute for Federalism and Intergovernmental Relations at the Martin School of Public Policy and Administration at the University of Kentucky, Lexington, Kentucky. Visit the IFIR web site at http://www.ifigr.org to download IFIR Working Papers and for other information about IFIR.