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I am submitting herewith a dissertation written by Mary E. Howard entitled "Internet Usage and State Sales Tax Competition." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

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Internet Usage and State Sales Tax Competition

A Dissertation
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Mary E. Howard
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Dedication

This dissertation is dedicated to my parents, Bobby and Sarah Palmer, for always believing in me, inspiring me, and encouraging me to achieve my goals and to my husband, Jonathan Howard, for always believing in, encouraging, and supporting me.

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Abstract

This paper examines the influence of increasing access to the Internet and increasing online purchasing on sales tax competition among the states. Prior research indicates that the tax rates set by a state's geographical neighbors influence the tax rate set by the home state. As consumers gain access to the Internet and begin to participate in online shopping, their opportunity cost to participate in cross-border shopping decreases and their "mobility" may increase due to the ease of purchasing from vendors lacking nexus in the consumer's home state. Thus, states may begin to respond less to the sales tax changes of their geographic neighbors and may begin to define competitors differently. I find that increases in both the percentage of the population having Internet access and the percentage of the population making online purchases influence the response of a state to its neighbors' tax rates. Specifically, states with higher percentages of either of these measures have more positive response functions when examining the "effective Internet tax rate" definition of neighbor. States appear to respond only slightly to changes in the tax rates of their geographic neighbors.

This paper also examines the influence of Internet usage on the sales tax revenues of the states by separating the influences of cross-border shopping through traditional means and through the Internet. Research finds that consumers who live near physical borders are more responsive to tax differences than are consumers who live farther from physical borders. As more consumers access the Internet and begin to purchase goods online, all consumers may become as responsive to tax differences as are those who live near physical borders. Thus, both traditional means of cross-border shopping and cross-border shopping through use of the Internet would be expected to influence the sales tax revenues of a state. Surprisingly, I find that sales tax revenue per capita appears to increase with an increase in my measure of Internet-based cross-border shopping. This may indicate that online shopping does not act entirely as a substitute for local forms of shopping but rather represents an increase in consumption.

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1. Introduction

Cross-border shopping, in which consumers have the freedom to cross a border to purchase taxed goods in lower taxing jurisdictions, has been of increasing concern to state and local policymakers, as evidenced by the creation of the Streamlined Sales Tax Project (SSTP). Policymakers anticipate increased amounts of cross-border shopping due to the development of Internet commerce, which offers a way for consumers to purchase from out-of-state vendors without physically crossing the border. Many Internet vendors lack nexus in multiple states, allowing them to offer products without collecting the same taxes that local vendors are required to collect. The resulting tax differentials create cross-border shopping opportunities for consumers, whether or not they live near physical borders.

Previous studies have found evidence of a border tax effect in which consumers near geographic borders respond to differences in tax rates between jurisdictions by traveling across the border to purchase items in the lower taxing jurisdiction (Ferris 2000, Walsh and Jones 1988, Fox 1986, Mikesell 1970). However, as Goolsbee (2000a) points out, "perhaps the key issue that the Internet poses for tax policy is not so much its potential to create a world *without* borders but rather to create a world of *only* borders."[1] In other words, in the world of Internet commerce, all consumers may be as responsive to tax differences as are those who live near actual geographic borders.

Policymakers realize that cross-border shopping represents a loss of tax revenue to their jurisdictions. Thus, research also examines whether state and local governments consider the taxes of other state and local governments in setting their own tax rates,

[1] Goolsbee (2000a). Page 562.

known as horizontal tax competition. Empirical research on horizontal tax competition indicates that state and local governments *do* consider the taxes of their neighbors in setting their own tax rates (Conway and Rork 2004, Luna 2004, Rork 2003, Brueckner and Saavedra 2001, Buettner 2001, Hayashi and Boadway 2001, Heyndels and Vuchelen 1998). Brueckner and Saavedra (2001) and Heyndels and Vuchelen (1998) find evidence of property tax competition. Hayashi and Boadway (2001) find that governments respond to changes in their neighbors' business income tax rates. Conway and Rork (2004) show evidence of tax competition in estate, inheritance, and gift taxes, and Luna (2004) finds support for sales tax competition. Rork (2003) shows that tax rates on mobile tax bases experience positive responses to the corresponding tax rates set in neighboring jurisdictions.[2] He finds that jurisdictions respond to an increase in these tax rates by neighboring jurisdictions by increasing their own tax rate. Thus, research suggests that governments look at the tax rates of their neighbors when determining their own tax rates.

The rapid growth of e-commerce presents consumers with new opportunities to participate in cross-border shopping without leaving the comfort of their homes. In fact, The United States Census Bureau recently reported that retail e-commerce sales for the fourth quarter of 2005 were $22.9 billion. Although this total represents only 2.4 percent of the total retail sales for the quarter, the growth of online sales outpaces the overall growth of retail sales by a wide margin. While total retail sales grew 6.0 percent between the fourth quarter of 2004 and the fourth quarter of 2005, e-commerce sales grew by 23.0

[2] Tax base mobility refers to the ability of the tax base to move among taxing jurisdictions.

percent for that same period.[3] With such a rapid growth rate, Internet sales are likely to become an increasingly important part of the economy, with business-to-business (B2B) transactions constituting the large majority of e-commerce transactions. This rapid growth has fueled debate among policymakers and has prompted many states to join together to develop the Streamlined Sales Tax Project (SSTP). Thus, studies of cross-border shopping and the resulting sales tax revenue loss, as well as the related tax competition among state and local governments, should be of importance to state and local policymakers.

The swift expansion of e-commerce serves to increase the mobility of the tax base with respect to sales taxes and to decrease consumers' opportunity costs related to cross-border shopping. Thus, state officials may begin to respond differently to the sales tax rate changes of their geographic neighbors as consumers in their state gain access to the Internet and its increased opportunities for cross-border shopping. Further, policymakers may no longer be concerned only with the sales tax rates of their geographic neighbors, because the Internet makes physical location much less important. In this study, I examine horizontal sales tax competition on the state level and the influence of the Internet on sales tax competition. Specifically, I look at whether increasing use of the Internet by a state's residents changes the way a state defines its "neighbors" and changes the influence of the geographic neighbor's sales tax rate on the state's own sales tax rate. I employ a model of tax competition based on the theoretical model of Mintz and Tulkens (1986) and the empirical model in Rork (2003) and include additional fiscal measures

[3] In addition, e-commerce retail sales increased by 3.3 percent between the third and fourth quarters of 2005, while total retail sales increased by only 0.3 percent. Total e-commerce retail sales have increased from less than $5.4 billion in the fourth quarter of 1999 to $22.9 billion in the fourth quarter of 2005. Source: U.S. Census Bureau (http://www.census.gov/mrts/www/data/pdf/05Q4.pdf)

that might be expected to influence the state's sales tax rate. In addition, I incorporate a measure of Internet access and Internet purchasing using data from a period of increasing access to and usage of the Internet to look at the influence of the Internet on state sales tax competition. I also apply a new definition of a state's neighbors that incorporates the influence of online purchasing as a method of cross-border shopping. Finally, I examine the influence of online purchasing on a state's sales tax revenues by using measures of traditional methods of cross-border shopping as well as a measure of Internet purchasing to determine the impact of both forms of cross-border shopping on the resulting sales tax revenue for the state.

I cannot examine the influence of B2B e-commerce on sales tax competition and sales tax revenues due to the lack of data available for state-by-state measurement of B2B commerce.[4] Studies estimate that B2B e-commerce transactions make up a very large portion of e-commerce activity (Bruce and Fox 2004). However, many B2B transactions are typically tax exempt, and businesses tend to comply with the use tax at much higher rates than do consumers because they are much more likely than individual consumers to face sales tax audits (GAO 2000, Pedwell 2002). In fact, Bruce and Fox (2004) estimate compliance rates for B2B transactions at more than 70 percent, and Goolsbee and Zittrain (1999) assume that no revenue losses occur from B2B Internet sales. Although a portion of the estimated revenue loss related to electronic commerce comes from B2B transactions, I would expect this to bias against finding the expected results.

[4] Some B2B e-commerce may be picked up by the Internet measures used in the paper, particularly the Internet sales figures for the top 100 Internet retailers. However, these figures likely represent primarily B2C e-commerce and cannot be assumed to adequately represent B2B purchases.

I find that increases in both the percentage of the population having Internet access and the percentage of the population making online purchases influence the response of a state to its neighbors' tax rates. Specifically, states appear to respond to an increase in the "effective Internet tax rate" by increasing their own sales tax rate, and the increase is larger for states with higher percentages of Internet users. This may indicate that policymakers choose to raise their sales tax rate as a way to capture additional revenue from local purchases rather than attempting to curb online purchasing by lowering the sales tax rate. In contrast, states exhibit a much smaller response to changes in the tax rates of their geographic neighbors than to a change in the "effective Internet tax rate." As Internet usage increases and physical location matters less for commerce, states appear to respond to increases in the sales tax rates of their geographic neighbors with very small increases in their own sales tax rate. Thus, increases in the sales tax rates of bordering states seem to make it somewhat easier to raise sales tax rates in the home state, consistent with findings in several previous studies (e.g., Hill 2004, Luna 2004, Hewett and Stephenson 1983). However, the influence of these geographic neighbors appears to be quite small during this time period, possibly reflecting a change in the focus of policymakers from more traditional forms of fiscal competition to fiscal competition in which physical location is much less relevant for commerce. I also find that, contrary to expectations, sales tax revenue per capita appears to increase with an increase in my measure of Internet-based cross-border shopping. This finding may indicate that online shopping does not act entirely as a substitute for local forms of shopping but rather represents an increase in consumption. These findings suggest that electronic commerce

may not, at least to this point, represent the drain on sales tax revenues that policymakers have been concerned that it would.

The remainder of this paper is organized as follows. The second section provides theory and background and develops the hypotheses. The third section discusses the research design, including the data sources and research method. The fourth section describes the results, and the fifth section presents additional analyses. The final section discusses the contributions, limitations, and extensions of the study.

2. Theory and Prior Research

Cross-Border Shopping and Sales Tax Competition

Considerable research addresses the issues of cross-border shopping and tax competition among various taxing jurisdictions when the tax base is mobile. As described in Brueckner (2003), tax competition models use a resource-flow framework in which a tax is levied on a mobile resource that can move among jurisdictions. Thus, the tax rate in one jurisdiction influences the tax base of the other jurisdiction. If the neighboring state increases its tax rate, the tax base tends to migrate into the home state. The additional revenue related to such migration may lead the home state to increase its tax rate, decrease its tax rate, or leave its tax rate unchanged. The home state may decrease its tax rate and maintain its original level of tax revenues (and public services). If the home state's residents value public services more than private goods, the home state may leave its tax rate unchanged and use the additional revenues to increase public services, or the home state may choose to increase its tax rate and increase public services by a larger amount.[5] The theoretical frameworks developed by Mintz and Tulkens (1986) and Kanbur and Keen (1993) describe horizontal commodity tax competition and the cross-border shopping effect. These studies indicate that fiscal decisions made by one government typically have an impact on the tax revenues of other governments.

The Mintz and Tulkens (1986) model describes a two-region economy in which each region imposes an origin-based commodity tax on a private good, the proceeds of which are used to finance a local public good. Each region chooses the levels of its

[5] Both the resource-flow models and the spillover (e.g., yardstick competition) models lead to the same empirical specification, in which the tax rate for one jurisdiction depends on the tax rate choices of other jurisdictions.

domestic commodity tax and of its local public good by maximizing a representative resident's utility while balancing the budget and assuming a constant tax in the neighboring region. The consumers in each region allocate their purchases between purchases in the domestic region and purchases in the neighboring region based on the structure of relative prices, taxes, and transportation costs, creating a regional market equilibrium. If the tax-inclusive price of the domestic region's good is less than the tax-inclusive price of the neighboring region's good plus the transportation cost of traveling to the other region, consumers purchase only in the home region. If the tax-inclusive price of the domestic region's good is less than the tax-inclusive price of the neighboring region's good plus the transportation cost for only a portion of the home region's consumers, consumers in the domestic region purchase goods from both regions. Consumers purchase goods in the neighboring region until the marginal tax-inclusive price of the domestic good equals the marginal tax-inclusive price of the neighboring region's good plus the transportation costs.[6] Finally, if the tax-inclusive price of the good in the home region is strictly greater than the tax-inclusive price of the neighboring region's good plus the transportation costs, consumers purchase only in the neighboring region. Thus, fiscal competition between the two regions occurs because one region's choice of tax rates alters the tax base of the other. Further, states may respond to an

[6] The theoretical frameworks discussed here address the consumer's decision to make purchases in either the home region or the bordering region and show that transportation costs represent an important variable in the consumer's decision. Tax competition models, discussed below, model the policy decision of the region as a function of its own characteristics and the tax rates of its neighbors. Although transportation costs might be expected to influence a region's sales tax base, they would likely have no direct influence on the sales tax rate set by the region. Thus, models of the sales tax rate do not include the consumer's transportation cost. However, these models do control for the region's sales tax base. In addition, prior research indicates that transportation costs are difficult to measure adequately (e.g., Luna 2004).

increase in the neighboring region's tax rate by increasing rates, decreasing rates, or leaving rates the same.[7]

Kanbur and Keen (1993) also provide a framework for tax competition and cross-border shopping. Their model is a two-country model with a single taxed good. In this model, each government attempts to maximize its tax revenue, assuming that the tax rate of the neighboring country is constant. Origin based consumption taxes are enforced such that the store at which goods are purchased must charge the tax rate of the jurisdiction in which it is located. Further, border tax adjustments are not made on purchases made in either region by the residents of the other region.[8] The authors set producer prices to be equal in the two regions, so the net price charged in each region is equal to the tax imposed in that region. Consumers determine where to purchase goods by comparing the tax on the good in the home region to the tax on the good in the neighboring region plus the cost of traveling to the neighboring region (the transportation cost). Cross-border shopping occurs when the total of the tax in the neighboring region and the transportation cost is less than the tax in the home region. Kanbur and Keen find that the home country's response to the foreign country's tax rate depends on the relative size of the two countries. They show that in equilibrium, the small country will charge a

[7] Mintz and Tulkens (1986) find that the home region may increase, decrease, or leave its tax rate unchanged in response to an increase in the neighbor's tax rate depending on how much its residents prefer the public good or the private good. If residents prefer the public good, the home region may choose to increase the amount of the public good because of the increase in cross-border shopping revenues it receives after the neighbor's tax increase and leave the home tax rate unchanged. The home region may, on the other hand, choose to increase the amount of the public good provided by more than the amount of the additional cross-border shopping revenue, requiring it to increase its tax rate. Finally, the home region may choose to leave the amount of the public good unchanged or increase it by less than the additional cross-border shopping revenue, allowing it to decrease its tax rate.

[8] Kanbur and Keen (1993) refer to this type of tax as being levied on a destination basis. However, as Mintz and Tulkens (1986) point out, without government monitoring and border tax adjustments, "a destination-based tax becomes de facto an origin-based tax." Thus, the model, in effect, describes an origin tax.

lower tax rate than the large country because the small country stands to gain relatively more from cross-border shopping than does the large country. Due to the small size of one country, the large country finds that undercutting the tax rate of the small country provides insufficient revenue from cross-border shopping to offset the loss in revenue related to the lower tax rate. In contrast, depending on the level of the large country's tax rate, the small country may gain by undercutting the large country's tax rate. At this point, the revenue gained from cross-border shoppers from the large country exceeds the loss in revenue related to the lower tax rate. Thus, countries may compete for tax revenues differently depending on their relative size.

Several researchers have examined the occurrence of cross-border shopping effects. Among these studies, Mikesell (1970) looks at retail sales in central cities and finds that sales tax rate differentials exert a significant negative influence on per capita city retail sales. In other words, central cities that face an adverse sales tax rate differential have lower per capita retail sales. Fox (1986) analyzes the effect that differential tax structures have in altering the location of employment and retail sales along state borders. He examines three metropolitan areas along the Tennessee state border and finds that, for two of the three areas studied, an increase in the state and local sales tax rate reduces the level of retail activity on that side of the state border. In addition, Walsh and Jones (1988) examine the sensitivity of per capita grocery store sales in 46 West Virginia counties to changes in the state sales tax rate. They find that, as the sales tax was phased out, grocery store sales increased more rapidly in West Virginia counties that border other states than in interior counties. Thus, they find additional support for cross-border shopping effects. Ferris (2000) examines the choice by

Canadian consumers of whether to cross into the United States to shop. He finds that a major influence on the amount of cross-border shopping involves the relative tax levels of the two countries on goods. Finally, Luna (2004) looks at the local sales tax rates and bases in 95 Tennessee counties and finds that the sales tax rates of both the home county and competing counties influence the sales tax base of the home county due to cross-border shopping.

In related studies, empirical research on horizontal tax competition indicates that state and local governments consider the taxes of their neighbors in setting their own tax rates. (See Wilson (1999) and Brueckner (2003) for overviews of empirical research on tax competition and strategic interaction among governments.) For example, Brueckner and Saavedra (2001) examine property tax competition among cities in the Boston metropolitan area and find that local governments engage in property tax competition. Heyndels and Vuchelen (1998) analyze Belgian municipalities and find evidence of tax competition for both income and property taxes. Further, they find that these tax competition effects extend beyond the municipalities' immediate neighbors. Buettner (2001) looks at tax competition among local jurisdictions in Germany and finds that the local neighbors' tax rates have a positive effect on the home tax rate. Luna (2004) examines sales tax competition on the county level and finds that local governments consider the sales tax rates of neighboring counties when setting their sales tax rates in both the short run and the long run. In addition, research shows that horizontal tax competition occurs among states and provinces. For example, Hayashi and Boadway (2001) find evidence that some Canadian provinces increase their business income tax rates in response to increases in the business income tax rates of other provinces.

Conway and Rork (2004) find support for tax competition in the elimination and recent revival of state estate, inheritance, and gift (EIG) taxes. Omer and Shelley (2004) investigate apportionment formula changes among states and find that states respond to the tax policy changes of their neighbors by enacting conforming policy changes. Rork (2003) examines several types of state taxes and finds that state taxes with relatively mobile tax bases have positive response functions to the tax rates set in neighboring states. Thus, states increase their own tax rates in response to an increase in these tax rates by neighboring states. Specifically, state taxes on motor fuel, tobacco, and corporate income respond positively to the tax rates set in neighboring states. On the other hand, taxes with relatively less mobile bases, such as the personal income tax and the general sales tax, respond negatively to the tax rates set in neighboring states.

E-Commerce and Sales Taxes

Currently, states cannot require vendors that have no physical presence, or nexus, in a state to collect sales taxes for that state.[9] Therefore, vendors who operate by mail-order or through the Internet in a state can offer products without collecting the same taxes that local vendors are required to collect. Although these products are subject to the use tax in the state, governments rely largely on voluntary reporting by consumers due to the administrative costs of tracking individual consumer purchases and collecting the associated taxes.[10] Thus, many mail-order and Internet purchases remain effectively tax-free. Due (1967) noted this loophole in the sales tax structure as it related to mail-order

[9] See the Supreme Court rulings in *National Bellas Hess, Inc. v. Department of Revenue of the State of Illinois, 386 U.S. 753, 1967* and *Quill Corporation v. North Dakota, 112 S. Ct. 1904*, decided 26 May 1992.
[10] States cannot obtain data on Internet sales from vendors that lack nexus within that state. Thus, states must rely on voluntary reporting by consumers.

vendors. As Internet sales have expanded in recent years (see Figure 1), the effect of this loophole has increased.[11]

The growth in Internet sales has led to much debate among politicians and other policymakers. Because governments fail to collect taxes on many Internet transactions, the rapid increase in Internet sales erodes states' sales tax bases (Bruce and Fox 2000). Policymakers find the erosion of the sales tax base disturbing because sales taxes are one of the largest sources of tax revenue for state governments (Federation of Tax Administrators 2005) and because 45 states and about 7,600 state and local governments impose a sales tax of some type (GAO 2000). Thus, many states have joined together to develop the Streamlined Sales Tax Project (SSTP) in an effort to simplify the sales and use tax system and encourage Congress to require vendors to collect the appropriate taxes on sales regardless of whether they meet the current physical presence standard for nexus. Responding to the debate surrounding the taxation of Internet commerce, researchers in the areas of tax and economics have examined the theoretically appropriate sales tax framework, the impact of Internet shopping on sales tax revenues, and the impact of sales taxes on Internet shopping behavior.

Much of the literature related to taxation and the Internet has taken the form of theoretical arguments concerning the appropriateness of such taxation from an economic viewpoint (Zodrow 2006, Cooper 2004, Bruce et al. 2003, Mikesell 2001, Fox and Luna 2000, McLure 2000, Goolsbee and Zittrain 1999, McLure 1999, and Fox and Murray 1997). Additional research empirically addresses the effect of the Internet on sales tax revenues as well as the effect of sales tax rates on the decision to purchase goods online.

[11] All figures and tables are located in the Appendix.

Bruce and Fox (2000, 2001, 2004) look at the states' sales tax revenue losses as a result of electronic commerce and estimate that these losses will become substantial as use of the Internet to purchase goods grows in popularity, with the greatest losses occurring in states that rely most heavily on the sales tax for revenue. In their most recent estimates, they conclude that in a low-Internet-growth scenario, states would be expected to lose $21.5 billion in sales tax revenue by 2008. In a high-Internet-growth setting, states would lose up to $33.7 billion by 2008.[12,13] Goolsbee (2001) examines both the potential sales tax revenue losses related to electronic commerce and the effect of sales tax rates on consumers' decisions to purchase online and finds that the potential sales tax revenue losses are relatively modest when compared to total projected sales tax revenue, with losses estimated at $6.88 billion in 2004 (approximately 2.6 percent of the year's projected sales tax revenue). However, he finds that taxes have a sizable effect on the decision to purchase goods over the Internet. Goolsbee (2000a) uses data from a 1997 Forrester Research survey to look at the influence of local sales tax rates on Internet commerce.[14] He determines that consumers living in high sales tax jurisdictions are more likely than those living in low sales tax jurisdictions to purchase online and estimates that the number of consumers making online purchases could decrease by as much as 24 percent if existing sales taxes were applied to e-commerce. More recently, Alm and Melnik (2005) use data from a 2001 survey conducted by the Bureau of Labor Statistics

[12] The estimated *new* state and local sales tax revenue losses related to e-commerce for 2008 range from $11.8 billion in a "low-growth" scenario to $17.9 billion in a "high-growth" scenario.
[13] To the author's knowledge, information on the actual sales tax revenue losses related to e-commerce is unavailable.
[14] Forrester Research is a technology and market research company that provides research related to technology and its impact on business and consumers. The 1997 Forrester Research survey used in Goolsbee (2000a) was conducted as part of the company's *Technographics 98* program and asked respondents about their household characteristics and whether they have Internet access.

and the Department of Census to examine how state sales taxes affect the decision of a consumer to purchase online. They, too, find that a higher sales tax rate is associated with a higher probability of making online purchases. However, their findings indicate that the effect is approximately one-fourth the size estimated based on the Goolsbee (2000a) study. Finally, Ellison and Ellison (2006) examine data on Internet sales of memory modules and find that these online sales are significantly higher in states with high sales tax rates than in states with low sales tax rates. In addition, they find that sales in the retailer's home state, on which sales taxes would be collected, are significantly lower than those in comparable states.

Previous research finds that states face considerable losses in sales tax revenue related to Internet commerce (Bruce and Fox 2004, Goolsbee 2001, Bruce and Fox 2000) and that sales tax rates influence a consumer's decision to purchase goods online (Ellison and Ellison 2006, Alm and Melnik 2005, Goolsbee 2001, Goolsbee 2000a). This study extends these streams of research by examining whether the expansion of Internet commerce, which could increase the "mobility" of consumers with respect to the sales tax and decrease their opportunity cost related to cross-border shopping, impacts the way in which a state defines its competition and the manner in which states respond to their neighbors' tax rates. In addition, this study looks at the influence of Internet commerce on a state's sales tax revenues by measuring separately both traditional methods of cross-border shopping and a measure of Internet purchasing to determine the impact of both forms of cross-border shopping on the state's sales tax revenues.[15]

[15] My Internet measures cannot be assumed to adequately represent B2B purchases, which make up a large portion of e-commerce sales.

Hypotheses

Prior literature shows that state and local governments consider the taxes of their neighbors in setting their own tax rates (Conway and Rork 2004, Luna 2004, Rork 2003, Brueckner and Saavedra 2001, Buettner 2001, Hayashi and Boadway 2001, Heyndels and Vuchelen 1998). Rork (2003) finds that a state's response to changes in its neighbors' tax rates differs depending on the relative mobility of the tax base. For example, if one assumes that perfect (costless) mobility exists, a "race to the bottom" might be expected in which any positive rate chosen by one state would be met with a slightly lower rate by the state's neighbor. The resulting equilibrium would occur only when both states have tax rates equal to zero. Because of the costs of traveling to the other jurisdiction, perfect mobility does not exist, and both states can maintain positive tax rates. Rork notes that states may respond to the decrease in state tax revenues from revenue sources with high levels of mobility (e.g., excise taxes) by increasing the less responsive taxes. He finds a negative relationship between the geographic neighbor's general sales tax rate and a state's own sales tax rate and interprets this finding as an indication that the general sales tax base is relatively immobile.[16] However, the rapid expansion of e-commerce provides consumers with increased opportunities to take advantage of cross-border shopping without physically traveling to a different jurisdiction. Such a development may give the tax base increased "mobility" with respect to sales taxes and represents a decrease in the

[16] Rork (2003) points out that consumers would be less likely to consistently cross the border to make all of their purchases than they would be to cross the border to take advantage of the tax rate on a specific good. For less mobile tax bases, a decrease in the neighbor's tax rate would not necessarily result in a decrease in the home tax rate. Because the tax base is relatively immobile (transportation/relocation costs are high), the difference in the tax rates may not offset the costs incurred to take advantage of the neighbor's lower tax rate. Thus, states may increase rates of the less mobile taxes to recover revenues from taxes with higher mobility that are decreased by competition.

opportunity cost for consumers to cross-border shop. However, consumers are no longer constrained primarily to cross-border shopping in states that physically neighbor the home state. Rather, the Internet allows consumers to easily purchase from vendors located *anywhere* in the United States. Thus, as consumers in a state gain access to the Internet and increase their use of the Internet for making purchases, that state may begin to respond very little to the sales tax rate changes of its *geographic* neighbors.

States may adjust their sales tax rates differently in response to the "effective Internet tax rate" as more consumers in that state gain access to the Internet and begin to make online purchases.[17] States may choose to lower their own sales tax rates to compete with the Internet and its cross-border shopping opportunities. In contrast, states may choose to raise the sales tax rate to capture additional revenue from purchases made locally rather than attempting to compete with the Internet by lowering the sales tax rate. I expect states with a higher percentage of their population accessing the Internet and purchasing goods online to respond differently than those states with a smaller percentage of Internet users.[18] I examine Internet access and Internet purchasing separately to investigate whether states respond to the *potential* of increased cross-border shopping

[17] As discussed in the following section, the "effective Internet tax rate" represents the average sales tax rate a consumer in a given state might be expected to pay on a random Internet purchase. A consumer would not pay the "effective Internet tax rate" on any specific purchase because the sales tax rate charged on Internet purchases equals zero if the vendor lacks nexus and equals the state's sales tax rate if the vendor collects the sales tax within the given state. The "effective Internet tax rate" is calculated by determining the percentage of Internet purchases on which a consumer in a given state would be expected to pay the sales tax and multiplying this percentage by the state's tax rate. Thus, it represents a weighted average of the tax rate paid on purchases from vendors collecting the sales tax (the state's tax rate) and the tax rate paid on purchases from vendors lacking nexus in the consumer's state (zero). For example, if a consumer must pay the sales tax on half of the purchases he makes on the Internet, the average sales tax rate for Internet purchases equals half of the state's sales tax rate.

[18] The potential for online cross-border shopping is higher in states with a larger portion of Internet users. Thus, I expect these states to respond in a more extreme manner (i.e., with larger increases or larger decreases in the sales tax rate) than states with fewer Internet users as a portion of the population. In the extreme case, I expect that a state with no Internet users would not respond at all to a change in the "effective Internet sales tax rate."

represented by an increase in Internet access or to the actual online cross-border shopping represented by an increase in online purchasing. Stated formally, my hypotheses related to the state's sales tax rate are as follows:

> *H1a: The sales tax rate of states with a higher percentage of the population accessing the Internet will be influenced less by the sales tax rates of their geographical neighbors than will the sales tax rate of states with a smaller percentage of the population accessing the Internet, ceteris paribus.*
>
> *H1b: The sales tax rate of states with a higher percentage of the population accessing the Internet will be influenced differently by the "effective Internet sales tax rate" than will the sales tax rate of states with a smaller percentage of the population accessing the Internet, ceteris paribus.*
>
> *H2a: The sales tax rate of states with a higher percentage of the population making online purchases will be influenced less by the sales tax rates of their geographical neighbors than will the sales tax rate of states with a smaller percentage of the population making online purchases, ceteris paribus.*
>
> *H2b: The sales tax rate of states with a higher percentage of the population making online purchases will be influenced differently by the "effective Internet sales tax rate" than will the sales tax rate of states with a smaller percentage of the population making online purchases, ceteris paribus.*

Prior research finds that cross-border tax differentials affect retail sales, and thus sales tax revenues, in border areas (Walsh and Jones 1988, Fox 1986, Mikesell 1970). As use of the Internet expands, consumers may choose to purchase goods from vendors located in other jurisdictions whether or not they live near an actual geographic border.[19] Further, Bruce and Fox (2000) and Goolsbee (2001) find that Internet commerce results in sales tax revenue losses. Thus, as consumers in a state increase their use of the Internet

[19] Due (1967) points out the loophole in the sales tax structure that allows purchases from remote vendors to remain effectively "tax-free" as it relates to mail-order vendors. As the Internet expands, more consumers may take advantage of this loophole.

for making purchases, the state's sales tax revenue per capita will likely decline. Stated formally, the hypothesis related to the state's sales tax revenues is as follows:

> *H3: As the rate of Internet use for online purchasing increases in a state, the state's sales tax revenue per capita will decrease.*

3. Research Method

Sample Selection and Data Sources

The sample includes fiscal, political, and demographic information for all 50 states as well as information related to Internet access and online purchasing rates for these states.[20] I gather state financial data from the U.S. Census Bureau, Governments Division (State and Local Government Finances), and from various issues of *State Government Finances* (SGF). I compile demographic information for the states from the U.S. Census Bureau, Population Division; the Bureau of Labor Statistics; and the Bureau of Economic Analysis. I collect state political information from the National Governor's Association and the National Conference of State Legislatures. I compile Internet sales data from various issues of Internet Retailer's *Top 500 Guide* and collect Internet access and online purchasing data from the U.S. Census Bureau, CPS Computer Ownership Supplement (available for 1994, 1997, 1998, 2000, 2001, and 2003). Due to the availability of the Internet access and usage data, I estimate Internet access and usage for years in which the CPS Computer Ownership Supplement is unavailable. To estimate the missing data, I use separate time series regressions for each state and predict the values for years in which the surveys were not conducted. As a check on the robustness of my results, I examine these models by including only the years for which the Internet access and usage variables are available in addition to the primary analysis.[21]

[20] Research in the area of tax competition typically excludes Alaska and Hawaii because they have no geographic neighbors and differ from the other 48 states in various ways. Thus, I exclude Alaska and Hawaii in models in which the definition of a state's neighbors is based on geographic contiguity. I include Alaska and Hawaii in models that examine non-geographic definitions of neighbors.

[21] As noted in the results section, results appear similar for all models when using all years and when using only years in which Internet access and usage data are available.

Method

Defining Neighbors

In any model of tax or expenditure competition, one must begin by establishing which jurisdictions compete with one another, or consider themselves to be "neighbors." Geography represents one obvious candidate for determining a jurisdiction's competition due to the relative ease of movement of the tax base among geographic neighbors. Thus, much of the tax and expenditure competition research (Baicker 2005, Conway and Rork 2004, Luna 2004, Rork 2003, Brueckner and Saavedra 2001, Case et al. 1993, Hewett and Stephenson 1983) has examined geographic neighbors as a jurisdiction's competitors by using one or more of the following two types of geography-based weights: contiguity weights and population-based contiguity weights. Contiguity weights consider jurisdictions to be competitors if they share a geographic border, and each bordering jurisdiction receives equal weighting.[22] Jurisdictions that do not share a geographic border receive no weight. Thus, for example, Oregon would consider California, Idaho, Nevada, and Washington to be its neighbors, and each of these states would receive a weight of ¼. Michigan, on the other hand, would receive a weight of zero. Population-based contiguity weights also consider jurisdictions to be competitors only if they share a geographic border, but these bordering jurisdictions receive differing weights based on their population. Such a weighting scheme assumes that jurisdictions with a larger population exert a larger influence than do less populated jurisdictions. In the case of Oregon, California might exert a larger influence than does Idaho due to California's

[22] The contiguity weighting scheme does not account for differences such as the length of the border between jurisdictions. Contiguity weights give all bordering jurisdictions equal weighting regardless of the length of the border, population, or other characteristics.

larger population. Thus, each jurisdiction that shares a geographic border with the "home" jurisdiction receives a weight equal to that jurisdiction's population divided by the total population of all jurisdictions that share a geographic border with the "home" jurisdiction. Again, jurisdictions that do not share a geographic border receive no weight.

Research on tax and expenditure competition has examined other ways to define a jurisdiction's "neighbors," or competitors. Jurisdictions may consider other jurisdictions to be competitors based on demographic similarities, migration patterns, income similarities, or other relevant factors. For example, Conway and Rork (2004) use elderly migration measures to determine a state's neighbors when examining competition in estate and inheritance taxes. Case et al. (1993) examine per capita income and percentage of the population that is black as measures of neighborliness when looking at state expenditure competition.[23] Baicker (2005) adds a measure of interstate mobility to determine neighborliness when examining competition in state spending. Hill (2006) includes per capita income and industry diversity as measures of neighborliness in a study of tax competition among counties. Fletcher and Murray (2006) look at competition in the state sales tax base using an array of factors to determine neighborliness, including similarity in sales tax rates, state personal income, personal income tax burdens, total tax burdens, percentage of the population that is in poverty, the government share of employment, the service share of employment, and the manufacturing share of employment.

[23] Case et al. (1993) find that racial composition has an important influence on states' expenditure patterns, and that states with similar racial compositions tend to experience benefit spillovers. In addition, Craig and Inman (1986) find that racial composition significantly influences state spending.

To expand on these definitions of neighbors, I examine three measures of a state's "neighbors": contiguity, population-based contiguity, and an "Internet neighbor" measure. When examining state sales tax competition, the two geographic measures are appropriate because of the relative ease of consumers crossing the border to shop in a neighboring state (Baicker 2005, Conway and Rork 2004, Luna 2004, Rork 2003, Brueckner and Saavedra 2001, Case et al. 1993, Hewett and Stephenson 1983). Traditional forms of cross-border shopping rely on the ability of consumers to physically travel from one jurisdiction to another. Thus, most traditional cross-border shopping would likely occur between geographic neighbors. However, geography probably will matter less as the Internet grows as a channel for retail purchasing. Thus, I employ a measure for a state's neighbors that incorporates consumers' ability to purchase taxable goods and services from any state through the Internet. The Internet neighbor measure proxies for the "effective tax rate" a consumer in a given state might be expected to pay on a random Internet purchase.[24] I calculate this measure by multiplying the "home" state's sales tax rate by the percentage of Internet sales generated by Internet vendors having nexus in that state.[25,26] I measure the nexus percentage by determining in which states the top 100 Internet vendors for each year collect the sales tax as of October 2006.

[24] The Internet neighbor measure ranges from zero to the state's own sales tax rate, depending on the percentage of Internet sales that would be taxable in the given state. If no Internet vendor maintains nexus in a given state, that state's Internet neighbor tax rate equals zero. If all Internet vendors maintain nexus in a given state, that state's Internet neighbor tax rate equals the state's own sales tax rate. In other cases, the Internet neighbor tax rate falls between these two extremes. If, for example, 50 percent of the Internet sales in a particular year are made by vendors who collect sales tax in a given state, the "effective Internet tax rate" equals half of the state's sales tax rate.

[25] I obtain the Internet sales figures from "Top 500 Guide," published by Internet Retailer. I use the Internet sales from the largest 100 Internet vendors in a given year and determine in which states these vendors maintain nexus. I use this information to calculate the percentage of Internet sales generated in a given state by Internet vendors with nexus in that state.

[26] The top 100 Internet retailers account for 52.6 percent to 54.5 percent of total web sales in the given year.

For each vendor that collects sales tax in a given state, I assign the total of that company's Internet sales as taxable in the given state. I then add the total Internet sales for all companies that collect the sales tax in a given state and divide this total by the total Internet sales for all of the top 100 Internet vendors to find the nexus percentage for that state. The percentage of sales on which taxes would be collected in a given state varies over time because different vendors make up the top 100 Internet vendors for different years and because the sales among the top 100 Internet vendors may be distributed differently in each year.[27,28] Thus, changes in the nexus percentage result from changes in Internet sales distribution and not from changes over time in the states in which individual companies collect the sales tax. Data ranking the top Internet vendors is available only for the most recent four years in the sample. Thus, I estimate the nexus percentage for earlier years in the dataset using separate time series regressions for each state. The use of the top 100 Internet vendors and the inability to capture changes over time in the states in which a given vendor collects the sales tax likely bias my estimation of the nexus percentage upward. Thus, my estimation of nexus is likely higher than the true percentage of Internet sales on which sales tax is collected for a given state. However, the relative distribution of the nexus percentage among states should not be biased by these issues. Thus, the t-statistics and related conclusions regarding the statistical significance of my results should not be affected. However, the magnitude of

[27] For example, KB Toys falls out of the top 100 Internet vendors in recent years, and Gateway's Internet sales make up 0.93 percent of the top 100 vendors' Internet sales for 2003 but only 0.50 percent of the top 100 vendors' Internet sales for 2005.

[28] The mean nexus percentage by year decreases steadily and ranges from 79.79 percent in 1993 to 59.61 percent in 2005. The minimum nexus percentage among states that levy a sales tax ranges from 67.16 percent in 1993 to 54.49 percent in 2005, and the maximum nexus percentage ranges from 100 percent in 1993 to 81.94 percent in 2005.

the coefficient on the "effective Internet tax rate" would likely be larger than the true value.

Model

Prior research indicates that a government's funding needs and sources of revenue, the tax rates of its neighbors, and the preferences of its residents may influence the sales tax rate the government chooses (Luna 2004, Rork 2003). In addition, policymakers' ability to adjust sales tax rates may depend on political factors. Thus, I consider the influence of fiscal, demographic, and political factors on a state's choice of sales tax rate. I examine separately the influence of Internet access and Internet purchases on the state's sales tax rate because states may respond to the *potential* of increased cross-border shopping represented by an increase in Internet access, or they may respond only to actual online cross-border shopping represented by an increase in online purchasing. In addition, differences may exist between consumers who access the Internet and those who actually make online purchases.

Competition Model 1

I base my model on the theoretical findings of Mintz and Tulkens (1986) and Kanbur and Keen (1993), in which governments consider their neighbors' tax rates when determining their own tax rates. Following the Mintz and Tulkens (1986) framework, the model assumes that governments maximize the utility of the representative resident while balancing the budget. Thus, a state may respond to an increase in its neighbor's tax rate by increasing its tax rate, decreasing its tax rate, or leaving its tax rate unchanged,

depending on whether its residents prefer the public good to the private good and by how much.

I follow the empirical models of Case, Hines, and Rosen (1993) and Rork (2003) by assuming that each state's sales tax rate is a function of that state's characteristics as well as the sales tax rate of its neighbors.[29] Thus, the model controls for fiscal, political, and demographic factors that may influence the state's sales tax rate. I also include the Internet access rate and the rate of online purchasing as proxies for the increased "mobility" of consumers related to e-commerce and the decreased opportunity cost consumers face to participate in cross-border shopping. The percentage of the population using the Internet may influence the sales tax rate through the opportunity it presents for cross-border shopping. In addition, the percentage of the population using the Internet may affect the manner in which a state responds to changes in its *geographic* neighbors' sales tax rates and may change the way in which a state defines its "neighbors." Therefore, I also include an interaction between the neighbor's sales tax rate and the percentage of the population using the Internet (defined by Internet access and by Internet purchasing). Thus, I use the following model to examine the influence of Internet access on state sales tax rates:

$$TAX_{it} = \alpha_0 + \beta_1 NEIGHBOR_{it-1} + \beta_2 INTACCESS_{it-1} + \beta_3 NEIGH_{it-1} * INTACCESS_{it-1} + \beta_4 BASE_{it-1} + \beta_5 FOOD_{it-1} + \beta_6 DEBT_{it-1} + \beta_7 TRANS_{it-1} + \beta_8 PINCTAX_{it-1} + \beta_9 CINCTAX_{it-1} + \beta_{10} PROPTAX_{it-1} + \beta_{11} SELTAX_{it-1} + \beta_{12} EXPEND_{it-1} + \beta_{13} ELECT_{it-1} + \beta_{14} REP_{it-1} + \beta_{15} DEM_{it-1} + \beta_{16} UNEMPLOY_{it-1} + \beta_{17} PCINCOME_{it-1} + \beta_{18} OVER65_{it-1} + \beta_{19\text{-}65} STATE + \beta_{66\text{-}74} YEAR + \varepsilon_{it}$$

[29] Denoting the home state's characteristics at time *t* as X_{it} and the tax rate for the home state as T_{it}, the linear relationship will be: $T_{it} = \beta X_{it} + \theta w T_{jt}$ + state fixed effects + year fixed effects + u_{it}, where w represents the weighting of the home state's neighbors and u_{it} represents a normally distributed, mean zero random error term. The home state's neighbors are weighted using contiguity weights, population-based contiguity weights, and an "effective Internet tax rate," as discussed previously.

where:
TAX_{it} = sales tax rate for state *i* in year *t*;
$NEIGHBOR_{it-1}$ = weighted average sales tax rate for state *i*'s neighbors in year *t-1*;
$INTACCESS_{it-1}$ = percentage of the population with Internet access for state *i* in year *t-1*;
$NEIGH_{it-1}*INTACCESS_{it-1}$ = interaction of the weighted average neighbor's sales tax rate and the percentage of the population with Internet access for state *i* in year *t-1*;
$BASE_{it-1}$ = per capita sales tax base for state *i* in year *t-1*;
$FOOD_{it-1}$ = indicator set to 1 if state *i* exempts food from the sales tax in year *t-1*, zero otherwise;
$DEBT_{it-1}$ = per capita outstanding debt for state *i* in year *t-1*;
$TRANS_{it-1}$ = per capita federal transfers to state *i* in year *t-1*;
$PINCTAX_{it-1}$ = per capita personal income tax revenue for state *i* in year *t-1*;
$CINCTAX_{it-1}$ = per capita corporate income tax revenue for state *i* in year *t-1*;
$PROPTAX_{it-1}$ = per capita property tax revenue for state *i* in year *t-1*;
$SELTAX_{it-1}$ = per capita selective sales tax revenue for state *i* in year *t-1*;
$EXPEND_{it-1}$ = per capita expenditures for state *i* in year *t-1*;
$ELECT_{it-1}$ = indicator set to 1 if an election year for state *i* in year *t-1*, zero otherwise;
REP_{it-1} = indicator set to 1 if a Republican governor and majority in state *i*'s legislature in year *t-1*, zero otherwise;
DEM_{it-1} = indicator set to 1 if a Democratic governor and majority in state *i*'s legislature in year *t-1*, zero otherwise;
$UNEMPLOY_{it-1}$ = unemployment rate for state *i* in year *t-1*;
$PCINCOME_{it-1}$ = per capita income for state *i* in year *t-1*;
$OVER65_{it-1}$ = percentage of the population over age 65 for state *i* in year *t-1*;
STATE = state fixed effects;
YEAR = year fixed effects.

Competition Model 2

Goolsbee (2000b) finds that consumers in high sales tax locations are not more likely than those in low sales tax locations to have Internet access, but they are more likely to make purchases online.[30] Further, Goolsbee (2000a) and Alm and Melnik (2005) find that consumers living in high sales tax locations are more likely than those living in low sales tax locations to make online purchases. These findings indicate that

[30] Based on information from a 1997 Forrester Research survey, Goolsbee (2000b) finds that consumers in high-tax locations are not more likely to have Internet access than those in low-tax jurisdictions. Further, consumers in high-tax jurisdictions do not have more computer experience, use the Internet more frequently, or own more consumer electronics than similar consumers in low-tax locations. However, Goolsbee (2000b) finds that those consumers in high-tax jurisdictions make more online purchases than do those in low-tax areas.

differences may arise between consumers who have Internet access and consumers who actually make online purchases. Thus, I use the following model to examine the influence of online purchasing on state sales tax rates:

$$TAX_{it} = \alpha_0 + \beta_1 NEIGHBOR_{it-1} + \beta_2 INTPURCH_{it-1} + \beta_3 NEIGH_{it-1} * INTPURCH_{it-1} + \beta_4 BASE_{it-1} + \beta_5 FOOD_{it-1} + \beta_6 DEBT_{it-1} + \beta_7 TRANS_{it-1} + \beta_8 PINCTAX_{it-1} + \beta_9 CINCTAX_{it-1} + \beta_{10} PROPTAX_{it-1} + \beta_{11} SELTAX_{it-1} + \beta_{12} EXPEND_{it-1} + \beta_{13} ELECT_{it-1} + \beta_{14} REP_{it-1} + \beta_{15} DEM_{it-1} + \beta_{16} UNEMPLOY_{it-1} + \beta_{17} PCINCOME_{it-1} + \beta_{18} OVER65_{it-1} + \beta_{19-65} STATE + \beta_{66-74} YEAR + \varepsilon_{it}$$

where:
$INTPURCH_{it-1}$ = percentage of the population that used the Internet to purchase products or services for state *i* in year *t-1*;
$NEIGH_{it-1} * INTPURCH_{it-1}$ = interaction of the weighted average neighbor's sales tax rate and the percentage of the population that used the Internet to purchase products or services for state *i* in year *t-1*;
and all other variables are as defined previously.

The state's sales tax rate represents the dependent variable.[31] The weighted-average sales tax rate for a state's neighbors (NEIGHBOR), as described in the section above, measures the amount of interstate tax competition that exists (Rork 2003).[32] I lag the weighted-average neighbor's tax rate by one year because a delay probably occurs between when neighboring states enact tax rate changes and when the home state can respond by enacting its own tax rate change.[33] Further, using the lagged neighbor's tax rate eliminates the endogeneity between the neighbor's tax rate and the home state's tax

[31] I examine the state's sales tax rate using two measures for the tax rate. The first measure considers only the state sales tax rate and does not include any local sales tax rates. The second measure incorporates a measure of the state and local sales tax rate for each state.
[32] Only the "neighbor" variable and the interaction of the "neighbor" variable with the Internet access variable change based on the definition of neighbors used in the model.
[33] I also test the neighbor's tax rate with two lags and with three lags. With two lags, results appear similar to the results using a single lag. With three lags, results appear mainly insignificant.

rate (Brueckner 2003, Hayashi and Boadway 2001).[34] I include the home state's sales tax base (BASE) because theory indicates that changes in the tax base can influence the tax rate, and changes in the tax rate can influence the tax base (Kanbur and Keen 1993, Hettich and Winer 1988, Mintz and Tulkens 1986).[35] I also include an indicator variable to represent whether the state exempts food items from the sales tax (FOOD).[36] States that exempt food items from the sales tax may increase the sales tax rate on other items to compensate for the revenue foregone on food purchases. The Internet access rate (INTACCESS) and the percentage of the population using the Internet for online purchasing (INTPURCH) measure the influence of increased access to and usage of the Internet, and thus potential increases in the mobility of the tax base, on the state's sales tax rate.[37,38] Goolsbee (2000a) and Alm and Melnik (2005) find that consumers living in

[34] If sales tax competition occurs among states, the neighbor's sales tax rate is endogenous. A state will determine its sales tax policies simultaneously with its neighbors. For example, Tennessee's sales tax policies will influence the sales tax policies of Kentucky, and, at the same time, Kentucky's sales tax policies will influence the sales tax policies of Tennessee. Using the lagged value of the neighbors' tax rate eliminates this endogeneity, allowing ordinary least squares (OLS) estimation to yield consistent estimates (Gujarati 2004, Brueckner 2003).

[35] Because the sales tax base can influence the sales tax rate and the sales tax rate can influence the sales tax base, contemporaneous measures of the sales tax rate and the sales tax base would be endogenous. However, policymakers likely make decisions regarding tax rate changes based on tax base information from previous periods. The sales tax rate and the lagged sales tax base would not exhibit an endogenous relationship.

[36] I include an indicator variable representing the food exemption because this exemption is one of the more widely used exemptions. I expect the overall breadth of the base to be reflected by the tax base measure included in the models.

[37] The Internet access rate and the percentage of the population that have made online purchases within the last year represent the percent of the population who potentially purchase items over the Internet from vendors in other states and likely avoid paying sales or use tax on these purchases. Thus, these variables represent the potential for consumers to take advantage of cross-border shopping opportunities without the need to physically travel to the out-of-state vendor, increasing the "mobility" of these consumers. Ellison and Ellison (2006) examine online purchases from two websites located in California and find that the vendors sell much less in California than they do in comparable states. This finding provides some evidence that consumers are less likely to purchase from online vendors within their home state. However, to the extent that consumers purchase from online vendors within their home state, I am less likely to find that changes in the Internet access rate or the percent of the population making online purchases influence state tax competition.

high sales tax locations are more likely than those living in low sales tax locations to make online purchases.[39] Thus, if Internet purchasing influences a state's sales tax rate at the same time that sales tax rates influence the decision to purchase online, the Internet access and purchase rate is endogenous. Thus, I lag the Internet access and Internet purchasing variables by one year to eliminate this endogeneity.

The remaining independent variables in the model can be grouped into three general types. The first group represents the fiscal condition of the state, including the fiscal stress of the state, the state's spending level, and the other sources of revenue available to the state. Variables included to control for the fiscal stress of a state include the state's per capita outstanding debt (DEBT) and the per capita federal transfers or grants (TRANS) (Alm et al. 1993, Rork 2003).[40] A high level of debt may indicate fiscal stress because the state may need to raise additional revenue to repay the debt or to avoid a downgrade of its bond ranking. If a state experiences a decrease in federal transfers, it may need to raise taxes to generate enough revenue to offset the loss. In addition, federal transfers represent a source of revenue for states that could act as a substitute for increasing the sales tax rate. The state's per capita expenditures (EXPEND) are included to measure the quantity of services that need to be financed (Luna 2004). States that provide more services may need higher sales tax rates to raise the revenue needed to provide those services. In addition, I include other taxes levied by many states to control for the other sources of revenue available to a state (Luna 2004). Higher levels of

[38] These measures of Internet commerce capture only business-to-consumer (B2C) purchases and cannot accurately capture the influence of business-to-business (B2B) purchases.
[39] Interestingly, Bruce et al. (2004) find that states with higher sales tax rates are associated with lower Internet access rates.
[40] Alm et al. (1993) note that the level of government debt may be an indication of fiscal pressure. Short-term debt, in particular, may signal that an unforeseen shortfall in the operating budget has occurred.

revenue generated from other sources may allow a state to maintain a lower sales tax rate. Thus, I include per capita measures of the state's personal income tax revenue (PINCTAX), corporate income tax revenue (CINCTAX), property tax revenue (PROPTAX), and selective sales tax revenue (SELTAX) to control for these other revenue sources.[41] Per capita measures of the fiscal variables are used to scale for the state's size and to reduce potential problems of heteroskedasticity. In addition, I lag the policy variables by one year because a delay occurs between when legislators receive information and when they can enact tax rate changes (Luna 2004).

The second group of variables represents the state's political environment. These variables include an indicator variable representing whether or not the year is an election year for the state (ELECT) (Rork 2003) and variables that indicate whether the governor and the majority in the state legislature come from the same political party (REP and DEM) (Rork 2003). In an election year, politicians may be reluctant to increase a tax rate. In contrast, when both the governor and the majority in the state legislature come from the same political party, politicians may be inclined to pass tax changes. The political variables are lagged by one year because a delay may exist between when elections occur and when tax policy changes can be enacted.

The third group of variables represents demographic variables. The state's unemployment rate (UNEMPLOY) is included because states may adjust tax rates to persuade firms to relocate to their state if the unemployment rate is high (Rork 2003).

[41] The other revenue sources included in the model account for the major categories of tax collections. However, these sources do not represent 100 percent of the revenues collected by the states. Miscellaneous additional sources of revenue, including items such as licenses, fees, death and gift taxes, and other taxes account for the remaining revenue collections. For 2005, these "other" sources of revenue account for a minimum of 3.5 percent of total state revenue (Arizona) to a maximum of 55.6 percent of total state revenue (Alaska) (FTA 2005).

The per capita income for the state (PCINCOME) measures the general welfare of the state's residents (Rork 2003). In addition, because the sales tax is regressive in nature, states with higher per capita income levels may prefer sales tax increases to increases in other tax rates (Luna 2004). The percentage of the population that is 65 years of age or older (OVER65) is included because this population group tends to spend a relatively large portion of its income on typically untaxed services (Luna 2004). Again, I lag these variables because of the potential delay between gathering demographic information and enacting associated tax rate changes.

Finally, both state and year fixed effects are included to account for unmeasured state and time factors that influence the sales tax rate.[42] Although fixed effects always yield consistent results, random effects are more efficient when the individual-specific error is not correlated with the independent variables. Thus, I test the model using the Hausman (1978) specification test to determine whether systematic differences exist between the fixed effects model and the random effects model. Results of the Hausman test indicate that systematic differences do exist between the random and fixed effects models in several specifications of the tax competition model. This indicates that random effects are not consistent in several cases, and fixed effects appear more appropriate. Thus, I use fixed effects throughout the paper to provide consistency among models and to facilitate comparisons among specifications. The state fixed effects (STATE) control for unseen state characteristics and historical tendencies (Rork 2003). The year fixed effects (YEAR) control for factors such as federal tax changes and business cycles that affect all the states in a particular year (Rork 2003).

[42] Results using random effects models appear quite similar to those presented using fixed effects.

Revenue Model

Previous research indicates that cross-border tax differentials affect retail sales, and thus sales tax revenues, in border areas (Walsh and Jones 1988, Fox 1986, Mikesell 1970). In addition, Bruce and Fox (2000) and Goolsbee (2001) use early data on Internet commerce to estimate the sales tax revenue losses that can be attributed to online purchases. These findings indicate that both traditional methods of cross-border shopping and Internet commerce may impact a state's sales tax revenues. Thus, I use the following model to examine the influence of traditional methods of cross-border shopping as well as online purchasing on per capita state sales tax revenue:

$$SALESREV_{it} = \alpha_0 + \beta_1 TAX_{it} + \beta_2 INRATE_{it} + \beta_3 OUTRATE_{it} + \beta_4 INTERRATE_{it} + \beta_5 INTPURCH_{it} + \beta_6 FOOD_{it} + \beta_7 DEBT_{it} + \beta_8 TRANS_{it} + \beta_9 LOTTERY_{it-1} + \beta_{10} ELECT_{it} + \beta_{11} REP_{it} + \beta_{12} DEM_{it} + \beta_{13} UNEMPLOY_{it} + \beta_{14} PCINCOME_{it} + \beta_{15} OVER65_{it} + \beta_{16} SCHOOLAGE_{it} + \beta_{17} COLLEGE_{it} + \beta_{18\text{-}64} STATE + \beta_{65\text{-}73} YEAR + \varepsilon_{it}$$

where:
$SALESREV_{it}$ = per capita sales tax revenue for state i in year t;
TAX_{it} = the sales tax rate for state i in year t;
$INRATE_{it}$ = the traditional cross-border shopping effect representing additional sales tax revenues for state i in year t;
$OUTRATE_{it}$ = the traditional cross-border shopping effect representing lost sales tax revenues for state i in year t;
$INTERRATE_{it}$ = the Internet cross-border shopping effect for state i in year t;
$LOTTERY_{it-1}$ = per capita lottery revenue for state i in year $t-1$;
$SCHOOLAGE_{it}$ = percentage of the population between the ages of 5 and 17 for state i in year t;
$COLLEGE_{it}$ = percentage of the population with a bachelor's degree or higher for state i in year t;
and all other variables are as defined previously.

The state's per capita sales tax revenue represents the dependent variable. I expect the state's own sales tax rate (TAX) to influence the sales tax revenues in the state

based on the assumption that sales tax revenues can be stated as the product of the sales tax rate and sales tax base (Borg et al. 1993, Friedlaender et al. 1973, Legler and Shapiro 1968).[43] The influence of the neighbor's sales tax rate on the state's sales tax revenue is measured by examining traditional cross-border shopping, in which consumers physically travel to neighboring states to purchase taxed goods, and Internet cross-border shopping, in which consumers purchase items from online vendors that lack nexus in the consumer's home state, separately. The influence of traditional cross-border shopping is evaluated by examining the flow of goods purchased in the home state by consumers from neighboring states and the flow of goods purchased in neighboring states by consumers from the home state. In the case in which a state's sales tax rate is less than its neighbor's sales tax rate, I expect consumers from neighboring states to purchase taxable goods in the home state, thus generating additional sales tax revenues for the home state. I measure the influence of this cross-border shopping into the home state by calculating the difference between the neighbor's sales tax rate and the home state's sales tax rate. I then weight this difference by determining the number of consumers from the neighboring state that would likely benefit from crossing the border to purchase taxed goods as a percentage of the home state's population.[44] Thus, I calculate INRATE as follows:[45]

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[43] The state's sales tax base is calculated by dividing the state's sales tax revenues by the state's sales tax rate. Thus, including both the sales tax base and the sales tax rate as independent variables in the sales tax revenue equation would result in an identity. The dependent variable would function as a linear combination of these independent variables.

[44] I use the number of potential cross-border shoppers as a percentage of the *home* state's population because the home state would likely be concerned with the impact of cross-border shopping on its sales tax revenues as it relates to its own population.

[45] I do not include transportation cost in these measures. Because I include only the population in counties that immediately border the given neighboring state in the POPWEIGHT measure, transportation cost should be rather minimal.

*INRATE = (RATEDIFF1) * POPWEIGHT1*

where RATEDIFF1 corresponds to the difference in the neighbor's sales tax rate and the home state's sales tax rate and POPWEIGHT1 represents the population of the counties in neighboring states with higher sales tax rates that border the home state divided by the total population in the home state.

In the case in which a state's sales tax rate exceeds its neighbor's sales tax rate, consumers from the home state would likely cross the border to purchase taxable goods in the neighboring state, thus decreasing the sales tax revenues for the home state. I measure the influence of this loss of revenue to the home state by calculating the difference between the home state's sales tax rate and the neighbor's sales tax rate and weighting this difference by estimating the number of consumers in the home state that would be expected to gain from crossing the border as a percentage of the home state's population. Thus, I calculate OUTRATE as follows:

*OUTRATE = (RATEDIFF2) * POPWEIGHT2*

where RATEDIFF2 represents the difference in the home state's sales tax rate and the neighbor's sales tax rate and POPWEIGHT2 corresponds to the population of the counties in the home state that border neighboring states with lower sales tax rates divided by the total population in the home state.

The Internet offers consumers additional opportunities to participate in cross-border shopping, whether or not they live near a physical border. Thus, I measure the influence of Internet commerce on a state's sales tax revenues.[46] Because Internet

[46] As noted previously, the measure of Internet purchasing used represents the percentage of respondents to the CPS Computer Ownership Supplement who responded that they have made online purchases during the

vendors collect sales taxes only for purchases made by consumers located in states in which they have nexus, the sales tax charged by an Internet vendor will be either the consumer's home sales tax rate or zero. If the Internet vendor lacks nexus in the consumer's home state, the consumer will pay zero sales tax on the purchase, and the home state loses revenue equal to the purchase price of the taxable goods multiplied by the home state's sales tax rate. I measure the influence of this loss of revenue to the home state by calculating the difference between the home state's tax rate and the zero tax rate applied to the purchase and weighting this difference by determining the percentage of consumers in the home state that make online purchases. Thus, I calculate INTERRATE as follows:

*INTERRATE = (TAX - 0) * INTPURCH*

where TAX and INTPURCH are as previously defined. Because INTERRATE is effectively an interaction between the state's sales tax rate and the percentage of the population making online purchases, I also include the main effect for Internet purchases in the model.[47] I examine Internet purchases rather than Internet access for the sales tax revenue model because only the actual purchase of items through the Internet would be expected to affect the state's sales tax revenue. Internet access alone would not be anticipated to influence the state's sales tax revenue.

The remaining independent variables in the model can be classified as fiscal variables, political variables, and demographic variables. Fiscal variables include the state's per capita outstanding debt (DEBT) and the per capita federal transfers or grants

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past year. These responses likely represent primarily B2C e-commerce and cannot be assumed to adequately represent B2B purchases.

[47] I include the main effect for the state's tax rate in the model as well, as discussed previously.

(TRANS) (Alm et al. 1993, Rork 2003, Fink et al. 2004). A state may increase tax revenues to repay high debt levels. In contrast, a state may have high debt levels as a result of low revenues (Fink et al. 2004). Higher amounts transferred from the federal government to the state's government may indicate that the state government can rely less on revenues generated from its residents (Fink et al. 2004). I also include an indicator variable to represent whether the state exempts food items from the sales tax (FOOD). States that exempt food items from the sales tax may experience lower sales tax revenues than would states that do not use such an exemption. Further, the food exemption measure may serve as a proxy for the breadth of the state's tax base. In addition, previous research indicates that lottery revenues are associated with a decrease in revenues from general sales and excise taxes (Fink et al. 2004, Borg et al. 1993). Thus, I include per capita lottery revenues for the state (LOTTERY) to control for this effect. Because simultaneity may exist between sales tax revenue and lottery revenue, I use the lottery revenues from the previous year to proxy for the state's current year lottery revenues (Fink et al. 2004).[48]

Political factors may affect the level of per capita sales tax revenues a state collects. I include an indicator variable for whether or not the year is an election year for the state (ELECT) because politicians may act differently with respect to making tax changes in an election year than they would in non-election years (Fink et al. 2004, Rork 2003). In addition, I include indicator variables that denote whether the governor and the majority in the state legislature come from the same political party (REP and DEM).

[48] Fink et al. 2004 find that the correlation between current year lottery revenues and previous year lottery revenues equals 0.97. Thus, they conclude that the previous year's lottery revenues may serve as a good proxy for current year lottery revenues.

Politicians may find it easier to enact tax changes if both branches of government are controlled by the same party (Fink et al. 2004, Rork 2003). Further, ideological preferences, indicated by party affiliation, may influence the tax revenues of a state (Merrifield 2000).

Demographic factors may influence the per capita sales tax revenues collected in a state. I include the state's unemployment rate (UNEMPLOY) because consumers may spend less on sales taxable items in times of higher unemployment (Fink et al. 2004). I include per capita income (PCINCOME) as a measure of the average wealth in a state (Fink et al. 2004, Friedlaender et al. 1973). I would expect a higher per capita income to be associated with higher per capita sales tax revenues. I control for the percentage of the population that is 65 years of age or older (OVER65) because these residents tend to spend a relatively larger portion of their income on services that are less often taxed (Fink et al. 2004, Luna 2004). In addition, I control for the percentage of the population between the ages of 5 and 17 (SCHOOLAGE) because states with a higher percentage of school age children may spend more on educational services than would a state with a lower percentage of school age children (Fink et al. 2004, Luna 2004). Additionally, I include the percentage of the population that holds at least a bachelor's degree (COLLEGE) because voters with higher education levels may prefer a different tax structure than those with less education (Fink et al. 2004).[49]

[49] Voters with higher education levels may choose a different portfolio of taxes than would voters with less education. Fink et al. (2004) find that an increase in the percentage of population with a college degree is associated with a decrease in aggregate tax revenue.

Finally, I include state and year fixed effects.[50] The state fixed effects (STATE) control for unobservable state characteristics that could influence the per capita sales tax revenues (Fink et al. 2004, Rork 2003). The year fixed effects (YEAR) control for changes in business cycles as well as federal tax changes that would influence all states in a particular year (Fink et al. 2004, Rork 2003).

[50] As with the tax competition model, I test the sales tax revenue model using the Hausman (1978) specification test to determine whether systematic differences exist between the fixed effects model and the random effects model. Results of the Hausman test indicate that systematic differences exist between the random and fixed effects models in one specification of the sales tax revenue model. Thus, I use fixed effects throughout the paper to provide consistency. Results using random effects models appear quite similar to those presented using fixed effects.

4. Results

Descriptive Statistics

Table 1 describes the variables used in the models, and Table 2 shows the descriptive statistics for the data. Table 3 presents the correlation coefficients for primary variables used in the models. The mean state sales tax rate during the period equals 4.67 percent, with a range from 0.00 percent to 7.00 percent, and the weighted average state and local sales tax rate for the period ranges from 0.00 percent to 8.92 percent, with a mean of 5.52 percent.[51] The mean of the neighbor's sales tax rate as defined using contiguity weights equals 4.11 percent when considering only the state sales tax rate and equals 4.97 percent when using the weighted average state and local sales tax rate. When defining neighbors using population-based contiguity weights, the mean of the neighbor's state sales tax rate equals 4.45 percent and the mean of the weighted average state and local sales tax rate equals 5.55 percent. The mean Internet neighbor measure equals 3.62 percent when including only the state sales tax rate and equals 4.33 percent when considering the weighted average state and local sales tax rate.

An increasing percentage of the population maintains Internet access and makes purchases using the Internet. Table 4 shows that the percentage of the population both maintaining Internet access and making Internet purchases has increased substantially between the earliest years examined and more recent years (also see Figure 2). The percentage of the population with Internet access has increased from 10.97 percent in

[51] Weighted average local sales tax rates are calculated by dividing the local sales tax revenue collections for the state by the state sales tax base for a given year (i.e., Wtd. Avg. Local $Rate_{it}$ = Local $Collections_{it}$ / State Sales Tax $Base_{it}$). These local rates are then added to the state sales tax rate to obtain the weighted average state and local sales tax rate.

1994 to 71.41 percent in 2004. During the same time period the percentage of the population making online purchases has increased from 1.62 percent to 31.69 percent.

Table 5 presents the mean percentage of Internet vendors that collect sales tax in each state based on Internet sales from the top Internet vendors. Five states levy no sales tax on consumer purchases and, thus, Internet vendors collect no sales tax in these states.[52] Among states that levy a sales tax, the mean nexus percentage ranges from 60.79 percent in Vermont to 92.59 percent in Washington. Table 6 provides detail related to the nexus percentage and the calculation of the "effective Internet tax rate" for each state based on a ranking of the top Internet vendors during 2003. Among states that levy a sales tax, the effective tax rate a consumer might be expected to pay on a random Internet purchase during 2003 ranges from 2.06 percent in Colorado to 5.64 percent in Washington when only the state sales tax rate is considered. When the weighted average state and local sales tax rate is included, the effective tax rate on Internet purchases for 2003 ranges from 2.28 percent in Hawaii to 6.67 percent in California.

Tax Competition Model – Internet Access

Table 7 presents the results of the tax competition models including a measure for Internet access.[53] The results support the notion that Internet access influences the

[52] Vendors may maintain nexus in the states that do not levy a sales tax. However, because the state chooses not to levy a sales tax, I cannot measure whether or not the vendors maintain nexus in these states.
[53] Models using only years for which Internet access data were collected in the CPS Computer Supplement yield results similar to those reported in table 5. In addition, models using random effects rather than fixed effects yield results very similar to those reported in table 5. As noted previously, results of the Hausman specification test indicate that random effects are not consistent in several cases, and fixed effects appear more appropriate. Thus, I use fixed effects throughout the paper to provide consistency among models and facilitate comparisons among specifications.

response of a state to its neighbors' tax rates. I discuss these results in more detail in the following section.

Internet Neighbor

The interaction of the "effective Internet tax rate" and the percentage of the population having Internet access is positive and significant, indicating that states with a higher proportion of Internet users have a larger positive response to an increase in the "effective Internet tax rate" than states with a smaller share of Internet users (consistent with H1b).[54] These states may recognize that, barring elimination of the sales tax in the state or requiring all Internet vendors to collect the sales tax in the state, the state's sales tax rate will always exceed the "effective Internet tax rate." Thus, these states may choose to raise their sales tax rate to capture additional revenue from purchases made locally rather than attempting to compete with the Internet by lowering the sales tax rate.

The overall effect of the "effective Internet tax rate" on the sales tax rate appears positive and significant, indicating that an increase in the previous year's "effective Internet tax rate" is associated with an increase in the home state's sales tax rate. This overall effect must account for both the main effect and the interaction effect, creating a linear function represented by $\beta_1 + \beta_3$*(Internet Access Percentage). Thus, the overall effect of the "effective Internet tax rate" on the state sales tax rate equals 0.5767 + 0.0021*(Internet Access Percentage). As shown in Figure 3, this overall effect suggests that a one percentage point increase in the previous year's "effective Internet tax rate" would be, ceteris paribus, associated with an increase in the state sales tax rate ranging

[54] Unless otherwise noted, the p-values used to determine significance are two-tailed p-values.

from 0.5886 to 0.7518 percentage point, depending on the level of Internet access. For example, 42.06 percent of the population in Tennessee had Internet access in 2000. Thus, holding all else constant, a one percentage point increase in Tennessee's 2000 "effective Internet access rate" from 4.48 percent to 5.48 percent would be associated with an increase in Tennessee's 2001 state sales tax rate of 0.665 percentage point (from 6 percent to 6.665 percent). The increase would vary from 0.5211 to 0.6532 percentage point when including the weighted average state and local sales tax rate. Thus, when examining the "effective Internet tax rate" as a state's competition, states appear to have a positive reaction function. Such a positive reaction function is consistent with findings from previous literature (e.g., Hill 2004, Luna 2004) that examine geographical neighbors as competitors. This positive reaction function is also consistent with the framework of Mintz and Tulkens (1986) in the case in which the representative resident prefers the public good to the private good and with the framework of Kanbur and Keen (1993), in which governments aim to maximize tax revenue. Thus, in the case of sales taxes, the states appear to be revenue maximizing. The finding differs from the negative response Rork (2003) finds using geographical neighbors.

The positive association between the previous year's "effective Internet tax rate" and the home state's sales tax rate indicates that, all else equal, states respond to an increase in the "effective Internet tax rate" by increasing their own sales tax rate. An increase in the previous year's "effective Internet tax rate" may result from an increase in the previous year's home sales tax rate or from an increase in the percentage of Internet purchases on which the sales tax would be collected in that state during the previous year. Because states tend to change their sales tax rates relatively infrequently, a positive

relation would be expected between the previous year's sales tax rate and the current year's sales tax rate for a given state. In addition, as a higher portion of the top Internet vendors begin to collect the sales tax in a given state, consumers are likely less able to avoid paying the sales tax through Internet purchases. Thus, the state can increase its tax rate with less concern about losing its tax base to online shopping. Further, as more consumers in a state gain Internet access, the positive relation between the "effective Internet tax rate" and the state's sales tax rate becomes larger, indicating that policymakers in states with large percentages of Internet users respond to changes in the "effective Internet tax rate" with larger increases than do policymakers in states with a smaller portion of Internet users. Thus, as more Internet vendors collect sales tax in a state, policymakers, especially those in states with a large portion of Internet users, can take advantage of the increased collection by remote vendors to increase tax revenues by raising the sales tax rate. Because more Internet vendors are collecting the sales tax in that state, consumers who purchase online are more likely to pay sales tax on their purchases, increasing revenue to the state.

The overall effect of Internet access is a linear function represented by $\beta_2 + \beta_3$*(Neighbor Tax Rate). As shown in Figure 4, this overall effect indicates that a one percentage point increase in the percentage of the population having Internet access would be, ceteris paribus, associated with a decrease ranging from 0.0005 to 0.0142 percentage point in the state sales tax rate, depending on the "effective Internet tax

rate."[55] The decrease ranges from 0.0065 to 0.0194 percentage point in the weighted average state and local sales tax rate.[56] Thus, states seem to lower the sales tax rate somewhat with an increase in Internet access, though this response is dampened by a higher "effective Internet tax rate."

The negative association between the percentage of the population accessing the Internet during the previous year and the home sales tax rate indicates that, all else equal, states respond to an increase in the percentage of the population having Internet access by decreasing the state's sales tax rate. This appears consistent with the negative association between sales tax rates and Internet access found in Bruce et al. (2004). In addition, as the "effective Internet tax rate" becomes larger, the association between the percentage of the population accessing the Internet and the state's sales tax rate becomes less negative. Thus, states with higher sales tax rates during the previous year or states in which taxes are collected on a larger portion of Internet sales tend to decrease the sales tax rate with an increase in Internet users by a smaller amount than do other states. In contrast, states with lower sales tax rates and states in which taxes are collected on a smaller portion of Internet sales tend to respond to an increase in the percentage of the population accessing the Internet by decreasing the sales tax rate by more than other states. It is likely that states with low sales tax rates rely less on sales tax revenues than do states with higher sales tax rates, so policymakers in these states may be more willing to decrease sales tax rates. In addition, states in which a smaller percentage of Internet vendors collect sales

[55] This finding indicates that Internet access may affect revenues in two ways. First, revenues would be influenced by the lower tax rate. Second, revenues tend to decrease from existing consumption if consumers purchase goods online and avoid paying the sales tax.

[56] I find that the "effective Internet tax rate" required for Internet access to have zero effect on the sales tax rate equals 6.76 percent when using the state sales tax rate and 11.41 percent when using the weighted average state and local sales tax rate.

tax are likely not collecting sales tax revenue on Internet purchases, so as more consumers access the Internet, these states likely lose sales tax revenues regardless of their sales tax rate, and policymakers may be more willing to decrease sales tax rates as a way to curb the loss in the sales tax base to online purchasing.

The results for the control variables are generally as expected. I find a significantly positive relation between the presence of a food tax exemption during the previous year and the weighted average state and local sales tax, consistent with the expectation that governments may increase the sales tax rate to offset some of the loss of revenue related to exempting food items from the sales tax. I find a significantly positive association between the previous year's unemployment rate and the sales tax rate, consistent with the findings in Rork (2003). This finding may indicate that states adjust tax rates to attract businesses in times of high unemployment. In addition, I find a significantly negative relation between the percentage of the population that is 65 years of age or older in the previous year and the sales tax rate, indicating that states with older populations may choose to rely on other forms of taxation to raise needed revenues rather than relying on higher sales tax rates.[57] I find a statistically significant but economically small negative relation between the previous year's per capita income and the state sales tax rate, consistent with the findings in Rork (2003). Because higher per capita income likely results in higher consumption of taxable goods, states with high per capita income may be able to raise the same level of sales tax revenue using a lower rate than those states with lower per capita income. Contrary to expectations, I find a significantly

[57] Rork (2003) finds the percentage of the population that is 65 years of age or older to be negative but insignificant.

positive association between the previous year's per capita personal income tax, property tax, and selective sales tax revenues and the state sales tax rate. In addition, I find a significantly positive relation between the previous year's federal transfers or grants and the weighted average state and local sales tax rate. Thus, these other revenue sources do not appear to act as substitutes for the general sales tax in the form of a lower sales tax rate and may indicate that some states generally prefer to collect higher overall levels of revenue.

The rho statistic describes the portion of the variation in the model that is explained by the state fixed effects. I find that these state characteristics explain around 97 percent of the variation in the model. This finding seems reasonable because many factors unique to each state and its historical tendencies could be expected to influence the state's choice of sales tax rates in addition to the factors controlled for specifically in the model.

Geographic Neighbors

The interaction of the geographic neighbor's sales tax rate and the percentage of the population having Internet access is positive and significant, suggesting that states with a larger share of Internet users have a more positive response to an increase in the sales tax rates of their geographic neighbors than do states with a smaller percentage of Internet users. The overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate appears significant but much smaller than that of the "effective Internet tax rate." As shown in Figure 3, this overall effect indicates that a one percentage point increase in the geographic neighbor's tax rate during the previous year

would be, ceteris paribus, associated with a range of effects from a decrease of 0.1831 percentage point to an increase of 0.1084 percentage point in the home state's sales tax rate, depending on the level of Internet access and the way in which geographic neighbors are weighted.[58] The effect would vary from an increase of 0.0074 percentage point to 0.1751 percentage point when including the weighted average state and local sales tax rate. Taken together, these results indicate that states appear to respond to the sales tax rates of their geographic neighbors with only slight changes in their own sales tax rates.

In the contiguity model using only state tax rates, the overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate is negative, consistent with the negative response function Rork (2003) finds related to the general sales tax and consistent with the Mintz and Tulkens (1986) framework in the case in which the private good is preferred to the public good. In this case, as the percentage of the population accessing the Internet increases, the overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate becomes less negative (consistent with H1a). This is consistent with the notion that as physical location becomes a less important determinant of cross-border shopping, the importance of fiscal competition among *geographic* neighbors decreases. If an increase in Internet access proxies for increased mobility, the positive interaction effect is also consistent with the

[58] The overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate is a linear function represented by: $\beta_1 + \beta_3$*(Internet Access Percentage). However, in three out of four cases, the β_1 coefficient does not differ significantly from zero. Therefore, in these cases, the only influence the geographic neighbor's sales tax rate has on the home state's sales tax rate comes through its interaction with Internet Access.

Rork (2003) finding that more mobile tax bases have more positive response functions than do less mobile tax bases.

In three out of the four models that examine geographic neighbors, the main effect of the geographic neighbors is not significant. The overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate, however, is positive but quite small. The overall positive response function in these cases is consistent with the findings of Hill (2004) and Luna (2004) related to counties and is consistent with the case in which the representative resident prefers the public good to the private good in the Mintz and Tulkens (1986) framework. As in the model using the "effective Internet tax rate," the positive response is also consistent with states maximizing revenue, as described in the Kanbur and Keen (1993) framework. In these cases, as the percentage of the population accessing the Internet increases, the overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate becomes more positive (not consistent with H1a) but remains quite small. The remaining influence that geographic neighbors' sales tax rates exhibit on the home state's sales tax rate may be related to yardstick competition, in which an increase in the tax rates of neighboring states makes it politically more feasible to increase the tax rate in the home state. Further, as a higher portion of the state's population gains Internet access, policymakers may believe that citizens become more informed about the tax increases of their neighbors. In addition, if Internet access proxies for tax base mobility, the positive interaction effect again is consistent with Rork's (2003) finding that more mobile tax bases exhibit more positive reaction functions than do less mobile tax bases.

Overall, these findings indicate that the home state's response to sales tax changes of its geographic neighbors may be either negative or positive, consistent with the framework of Mintz and Tulkens (1986), and that states with a higher portion of Internet users exhibit more positive (or less negative) response functions. The influence of the geographic neighbors' sales tax rates appears to be much smaller than that of the "effective Internet tax rate," indicating that geographic neighbors may have little influence on the home state's sales tax rate in an environment in which physical location is becoming less important for commerce. Rather, policymakers likely define their "neighbors" and approach fiscal competition differently in the era of e-commerce than in previous eras.

As shown in Figure 4, the overall effect of Internet access on the sales tax rate suggests that a one percentage point increase in the percentage of the population having Internet access would be, ceteris paribus, associated with a decrease in the state sales tax rate ranging from 0.0075 to 0.0181 percentage point, depending on the geographic neighbor's sales tax rate and the manner in which geographic neighbors are defined.[59] The effect ranges from a decrease of 0.0074 to 0.0236 percentage point in the weighted average state and local sales tax rate.[60] Thus, consistent with the finding using the "effective Internet tax rate" as the definition of a state's neighbor, states with a larger share of Internet users appear to have a slightly lower sales tax rate. Using geographic neighbors, the negative association is slightly larger in magnitude than that found when using the "effective Internet tax rate." The positive interaction effect indicates that the

[59] The overall effect of Internet access is a linear function represented by $\beta_2 + \beta_3$*(Neighbor Tax Rate).
[60] I find that the geographic neighbor's sales tax rate required for Internet access to have zero effect on the sales tax rate ranges from 10.65 percent to 16.92 percent.

association between the percentage of the population accessing the Internet and the state's sales tax rate becomes less negative when the geographic neighbor's sales tax rate is larger. This indicates that states with geographic neighbors that maintain high sales tax rates respond to an increase in the percentage of the population that accesses the Internet with smaller decreases in the sales tax rate than do states with lower-taxing geographic neighbors. As in the models using the "effective Internet tax rate," the finding of a negative overall association in these models seems consistent with the negative association Bruce et al. (2004) finds between sales tax rates and Internet access.

Again, the results for the control variables are mostly as expected. As in the Internet neighbor model, I find that governments, particularly at the local level, may increase the sales tax rate to compensate for some of the revenue loss related to the food tax exemption. I also continue to find that higher unemployment rates during the previous year are associated with higher state sales tax rates, consistent with Rork (2003), and that an older population is associated with lower sales tax rates. As in the Internet neighbor model and contrary to expectations, the positive coefficients on the per capita personal income tax revenue, per capita property tax revenue, per capita selective sales tax revenue, and per capita federal transfers or grants indicate that other revenue sources do not appear to substitute for the general sales tax in the form of a lower sales tax rate. Thus, some states may prefer higher overall revenue levels. In one case, I find a significantly negative association between the previous year's tax base and the weighted average state and local sales tax rate, indicating that a higher tax base in the previous year may lead to a decrease in the tax rate. Contrary to findings in the Internet neighbor model and contrary to expectations, I find a significantly negative relation between the

previous year's expenditures and the state sales tax rate. This may indicate that states with higher sales tax rates tend to spend less than other states, all else equal. Consistent with the findings in the Internet neighbor model, I find that the state fixed effects explain a large portion of the variation in the model, with a rho statistic of around 99 percent.

Tax Competition Model - Internet Purchases

Table 8 describes the results of the tax competition models including a measure for Internet purchasing.[61] The results support the idea that Internet purchasing by consumers influences the response of a state to its neighbors' tax rates. I discuss these results in more detail in the following section.

Internet Neighbor

Consistent with the findings when examining Internet access, the interaction of the "effective Internet tax rate" and the percentage of the population making Internet purchases is positive and significant (consistent with H2b). This suggests that states with a larger portion of Internet purchasers exhibit larger positive responses to an increase in the "effective Internet tax rate" than do states with a smaller percentage of Internet purchasers. Thus, it further supports the notion that states may increase the sales tax rate to capture extra revenue from local purchases rather than competing with the Internet by lowering the sales tax rate.

[61] Models using only years for which Internet purchasing data were collected in the CPS Computer Supplement yield results generally similar to those reported in table 6. In addition, models using random effects rather than fixed effects yield results very similar to those reported in table 6.

The overall influence of the "effective Internet tax rate" on the sales tax rate appears quite similar to the findings from the model measuring Internet access. As shown in Figure 5, this overall influence indicates that a one percentage point increase in the previous year's "effective Internet tax rate" would be, ceteris paribus, associated with an increase in the state sales tax rate ranging from 0.6061 to 0.7897 percentage point, depending on the level of Internet purchases.[62] The increase would vary from 0.5198 to 0.6947 percentage point when including the weighted average state and local sales tax rate. Thus, consistent with findings from the Internet access model, states appear to have a positive reaction function when examining the "effective Internet tax rate" as a state's competition. Again, this positive reaction function differs from the negative response Rork (2003) finds using geographical neighbors but is consistent with findings from Hill (2004) and Luna (2004). The positive reaction function is also compatible with the Mintz and Tulkens (1986) framework when the public good is preferred over the private good. As with the Internet access model, the positive reaction function indicates that the states appear to be revenue maximizing, consistent with Kanbur and Keen (1993).

As in the Internet access model, states appear to respond to an increase in the "effective Internet tax rate" by increasing their own sales tax rate. This finding indicates that an increase in either the previous year's home sales tax rate or in the percentage of Internet purchases on which the sales tax would be collected in that state during the previous year would be associated with a higher home sales tax rate in the current year. As noted previously, a positive association would be expected between the previous

[62] The overall effect of the Internet neighbor is a linear function represented by $\beta_1 + \beta_3$*(Internet Purchase Percentage).

year's sales tax rate and the current year's sales tax rate due to the fairly infrequent changes in a state's sales tax rate. In addition, collection of the sales tax on a larger portion of Internet purchases would indicate that consumers in a given state will likely be required to pay the sales tax on a higher percentage of their Internet purchases. Thus, the state can increase its tax rate without losing as much of its tax base to online shopping. Again consistent with findings in the Internet access model, a higher percentage of online purchasers in a state is associated with a larger positive relation between the "effective Internet tax rate" and the state's sales tax rate. Thus, policymakers in states with large percentages of online purchasers appear to respond to changes in the "effective Internet tax rate" with larger increases than do policymakers in states with a smaller portion of online purchasers.

The overall effect of Internet purchases on the sales tax rate appears somewhat consistent with the findings related to Internet access but is shifted upward. As shown in Figure 6, an increase of one percentage point in the percentage of the population making Internet purchases would be, ceteris paribus, associated with range of effects from a decrease of 0.0143 percentage point to an increase of 0.013 percentage point in the state sales tax rate, depending on the "effective Internet tax rate."[63] At the median "effective Internet tax rate" of 3.77 percent, a one percentage point increase in Internet purchasers would be associated with an increase in the state sales tax rate of 0.0016 percentage point. The effect ranges from a decrease of 0.0184 percentage point to an increase of 0.0119 percentage point in the weighted average state and local sales tax rate, with no

[63] The overall effect of Internet purchasing is a linear function represented by $\beta_2 + \beta_3$*(Neighbor Tax Rate).

change in the sales tax rate at the median "effective Internet tax rate" of 4.59 percent.[64] Thus, states may choose to lower or to raise the sales tax rate slightly as online purchasing increases, depending on the "effective Internet tax rate." Consistent with findings from the Internet access model, states with a lower sales tax rate or a smaller percentage of Internet vendors collecting the sales tax, and thus a lower "effective Internet tax rate," appear to decrease the sales tax rate slightly as the percent of the population making online purchases increases. These states likely rely less on revenues from the sales tax and may be more willing to decrease sales tax rates. In contrast, states with a higher sales tax rate or a larger percentage of Internet vendors collecting the sales tax tend to increase the sales tax rate somewhat as a larger percentage of the population begins to make online purchases. These states may rely more heavily on sales tax revenues and choose to increase the sales tax as a way to collect additional revenues on local purchases as well as on those online purchases for which Internet vendors collect the sales tax. This finding differs somewhat from the results in the Internet access model, in which increasing Internet access is associated with a decrease in the sales tax rate at all observed "neighbor" rates.

The results for the control variables are primarily as expected and are quite consistent with the findings from the model measuring Internet access. I find that when measuring Internet purchases, the significantly positive relation between the presence of a food tax exemption during the previous year and the sales tax rate holds for the state sales tax rate in addition to the weighted average state and local sales tax rate. Thus,

[64] I find that the "effective Internet tax rate" required for Internet purchasing to have zero effect on the sales tax rate equals 3.4 percent when using the state sales tax rate and 4.6 percent when using the weighted average state and local sales tax rate.

governments appear to increase the sales tax rate as a way to compensate for lost revenue related to exempting food items from the sales tax. I also find no significant association between the previous year's unemployment rate and the sales tax rate and between the previous year's federal transfers or grants and the sales tax rate. I continue to find a significantly negative relation between the percentage of the population that is 65 years of age or older in the previous year and the sales tax rate. Consistent with Rork (2003) and with the Internet access model, I find a statistically significant but economically small negative relation between the previous year's per capita income and the state sales tax rate, indicating that states with a higher per capita income may be able to raise the needed amounts of sales tax revenues at lower sales tax rates than those states with lower per capita income. Similar to the Internet access model and contrary to expectations, I find a significantly positive association between the previous year's per capita personal income tax, property tax, and selective sales tax and the state sales tax rate. As in the Internet access model, I find that the unique state characteristics controlled for by the state fixed effects explain a large portion of the variation in the model, with rho statistics of 97 to 98 percent.

Geographic Neighbors

Consistent with the findings from the Internet access model and the Internet purchases model using the "effective Internet tax rate" definition of neighbor, I find a significantly positive interaction between the geographic neighbor's sales tax rate and the percentage of the population making Internet purchases. I find an insignificant main

effect of the geographic neighbor's sales tax rate on the home state's sales tax rate.[65] Thus, as in the Internet access model, the overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate appears positive and significant but much smaller than that of the "effective Internet tax rate." As shown in Figure 5, a one percentage point increase in the geographic neighbor's sales tax rate during the previous year would be, ceteris paribus, associated with an increase in the home state's sales tax rate ranging from 0.0008 to 0.1322 percentage point, depending on the level of Internet purchasing and the measure used for geographic neighbors. The increase varies from 0.001 to 0.2247 percentage point when including the weighted average state and local sales tax rate. These results suggest that states appear to respond to the sales tax rates of their geographic neighbors with slight increases in their own sales tax rates.

Consistent with three of the four Internet access models, the overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate is positive but quite small. As noted previously, these findings are consistent with the positive response functions Hill (2004) and Luna (2004) find related to counties. These findings are also consistent with Mintz and Tulkens (1986) as well as with Kanbur and Keen (1993), in which governments aim to maximize tax revenues. Further, as the percentage of the population making online purchases increases, the overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate becomes larger (not consistent with H2a) but continues to be rather small, especially in comparison to the effect associated with the "effective Internet tax rate." Again, the influence that geographic

[65] The overall effect of the geographic neighbor's sales tax rate on the home state's sales tax rate is a linear function represented by: $\beta_1 + \beta_3$*(Internet Purchase Percentage). However, the β_1 coefficient does not differ significantly from zero, so the only influence the geographic neighbor's sales tax rate has on the home state's sales tax rate comes through its interaction with Internet Purchase.

neighbors' sales tax rates exhibit on the home state's sales tax rate after controlling for Internet purchasing may be related to yardstick competition. Further, if Internet purchasing proxies for an increase in the mobility of the general sales tax base, the positive interaction effect is consistent with the notion in Rork (2003) that the response of a state to its neighbors' tax rates differs depending on the mobility of the related tax base.

As in the Internet access models, the geographic neighbors' sales tax rates appear to have a much smaller influence on the home state's sales tax rate than that of the "effective Internet tax rate." Thus, as physical location becomes a less important factor in commerce, fiscal competition among the states likely changes as policymakers begin to define the competition differently, and geographic neighbors may have only a small influence on the home state's sales tax rate.

As shown in Figure 6, the overall effect of Internet purchases on the sales tax rate may be either negative or positive, depending on the geographic neighbor's sales tax rate. The effect size of a one percentage point increase in the percentage of the population making Internet purchases ranges from a decrease of 0.012 percentage point to an increase of 0.0068 percentage point in the state sales tax rate, all else constant.[66] When using the weighted average state and local sales tax rate, the effect varies from a decrease of 0.0147 percentage point to an increase of 0.0245 percentage point.[67] In each of these models, the overall effect at the median geographic neighbor's sales tax rate would be positive. Unlike the findings in the Internet access model, states may either increase or decrease the sales tax rate with an increase in online purchasers, depending on the sales

[66] The overall effect of Internet purchases is a linear function represented by $\beta_2 + \beta_3$*(Neighbor Tax Rate).
[67] I find that the geographic neighbor's sales tax rate required for Internet purchasing to have zero effect on the sales tax rate ranges from 2.88 percent to 4.39 percent.

tax rates of their geographic neighbors. Using geographic neighbors, the effect of Internet purchasing on the sales tax rate appears fairly similar in magnitude to the effect using the "effective Internet tax rate." The positive interaction effect indicates that the association between the percentage of the population making online purchases and the state's sales tax rate becomes less negative (or more positive) when the geographic neighbor's sales tax rate is larger. Thus, states with geographic neighbors that maintain high sales tax rates respond to an increase in the percentage of the population that makes online purchases with small increases in the sales tax rate, while states with lower-taxing geographic neighbors appear to respond with slight decreases in the sales tax rate.

The results for the control variables are again mainly as expected and are consistent with the findings from the model measuring Internet access with only minor exceptions. When measuring Internet purchases, I find that the food tax exemption appears to be related to higher sales tax rates for both the state and local governments, again indicating that policymakers may choose to increase the sales tax rate slightly to recover revenues that would be lost due to exempting food items from the sales tax. I also find a statistically significant but economically small negative relation between the previous year's per capita income and the sales tax rate in three cases, consistent with Rork (2003). Contrary to findings in the Internet neighbor models but consistent with previous models using geographic neighbors, I find a significantly negative relation between the previous year's expenditures and the state sales tax rate, possibly indicating that states with higher sales tax rates tend to spend less than other states, all else equal. Similar to previous models, I find that older populations tend to have lower sales tax rates and that higher unemployment rates during the previous year are associated with higher

state sales tax rates, consistent with Rork (2003). As in previous models, I find a positive relation between the per capita personal income tax revenue, per capita property tax revenue, and per capita selective sales tax revenue and the state sales tax rate. I also find a positive association between per capita federal transfers or grants and the sales tax rate in three models. Thus, higher levels of other revenue sources do not appear to substitute for a higher general sales tax rate. Consistent with previous models, the state fixed effects explain around 99 percent of the model's variation.

Sales Tax Revenue Model

Table 9 presents the results of the sales tax revenue model using the state sales tax rate and using the weighted average state and local sales tax rate.[68,69] Although the main effect of Internet purchasing on per capita sales tax revenue is negative and highly significant, the overall effect of Internet purchasing on per capita sales tax revenue appears generally positive, contrary to expectations. The overall effect of Internet purchasing is a linear function represented by $\beta_5 + \beta_4$*(Tax Rate). As shown in Figure 7, this overall effect suggests that a one percentage point increase in the percentage of the population making online purchases would be, ceteris paribus, associated with a range of effects from a decrease of 3.8 dollars to an increase of 199.2 dollars in per capita state sales tax revenue and with a range from a decrease of 4.4 dollars to an increase of 193.55

[68] Models using only years for which Internet purchasing data were collected in the CPS Computer Supplement yield results similar to those reported in table 7. In addition, models using random effects rather than fixed effects yield results very similar to those reported in table 7.

[69] I also run a version of the sales tax revenue model using the per capita sales tax base as the dependent variable. The results of this model yield the same conclusions as those presented using revenue as the dependent variable.

dollars in per capita state and local sales tax revenue, depending on the sales tax rate.[70] This finding contradicts the hypothesis that increasing cross-border shopping through Internet commerce would result in lower sales tax revenue per capita (not consistent with H3) and may indicate that online shopping represents an increase in consumption rather than acting entirely as a substitute for local forms of shopping.[71] This suggests that electronic commerce may not, at least to this point, result in the significant loss in sales tax revenues about which policymakers have been concerned.

As expected and consistent with Friedlaender et al. (1973), the sales tax rate significantly influences per capita sales tax revenue. As shown in Figure 8, the overall effect of the sales tax rate indicates that a one percentage point increase in the sales tax rate would be, ceteris paribus, associated with an increase ranging from 90.59 dollars to 1,358.76 dollars in per capita state sales tax revenue and with an increase ranging from 84.97 dollars to 1,055.77 dollars in per capita state and local sales tax revenue, depending on the percentage of the population that makes online purchases. Contrary to expectations, an increase in the sales tax rate is associated with a larger increase in sales tax revenue for states with a higher percentage of the population making online purchases than for states with fewer residents purchasing online.[72]

[70] The government financial data used to develop the per capita figures are stated in thousands of dollars.
[71] As noted in the additional analyses, when including only a more recent timeframe when Internet purchasing is more widespread, the influence of online shopping on per capita sales tax revenue appears insignificant rather than negative. Models using only the years 2001 to 2004, in which the percentage of the population making online purchases exceeds 20 percent, also indicate that online purchasing exerts no significant influence on sales tax revenue per capita.
[72] The finding that sales tax revenue increases more with an increase in the sales tax rate for states with a higher proportion of online purchasers appears to be driven by the unexpected positive sign on the interaction term.

The traditional measures of cross-border shopping do not appear to have a large influence on the per capita sales tax revenue for the state. As expected, I find a marginally significantly negative association between outbound cross-border shopping and per capita state and local sales tax revenue. I find no significant relation between inbound cross-border shopping and per capita sales tax revenue. Previous studies (Walsh and Jones 1988, Fox 1986, Mikesell 1970) find that tax rate differentials influence retail sales in areas in which consumers can easily take advantage of such differences. However, the small percentage of the population that can realistically take advantage of such cross-border shopping opportunities and the sometimes small tax differentials between jurisdictions make it difficult to find significant changes in per capita sales tax revenue in this model.

Results for the control variables appear as expected. As expected, I find a significantly negative relation between the presence of a food tax exemption and the per capita state sales tax revenue, suggesting that having a food tax exemption results in lower per capita state sales tax revenue collections. I find a significantly negative association between per capita outstanding debt and per capita sales tax revenues and between the previous year's per capita lottery revenues and per capita sales tax revenues. These findings support the idea that high debt levels may be associated with low revenues (Fink et al. 2004) and that lottery revenues are associated with a decrease in revenues from general sales taxes (Fink et al. 2004, Borg et al. 1993). As expected, I find a significantly negative relation between the unemployment rate and per capita sales tax revenues and a significantly positive relation between per capita income and per capita sales tax revenues, consistent with Fink et al. (2004). I also find a negative association

between the percentage of the population between the ages of 5 and 17 and per capita sales tax revenues, implying that states with a higher proportion of school aged children collect less sales tax revenue per capita than states with fewer school aged children, all else equal.

The rho statistic denotes the portion of the variation in the model that is explained by the state fixed effects. These state characteristics explain almost 97 percent of the variation in the model. This finding seems reasonable because, in addition to the factors controlled for specifically in the model, many unobservable factors unique to each state would be expected to influence the state's per capita sales tax revenue.

5. Additional Analyses

In additional analyses, I examine the influence of Internet access and Internet purchasing on a state's response to its neighbor's sales tax rate using only data from 1999 through 2004, when Internet access and purchasing are much more common, and using only the years 2003 and 2004, when data for the states in which vendors collect the sales tax are available.[73,74] I also examine the tax competition models by separating the "effective Internet tax rate" into its components, the previous year's tax rate and the nexus percentage, to determine whether both components influence a state's current year sales tax rate. In addition, I look at the impact of Internet access on tax competition using access data from the Pew Internet & American Life Project, in which Internet access is measured during each year beginning in 2001. I analyze the influence of Internet purchasing and traditional cross-border shopping on per capita sales tax revenues using only data from 1999 through 2004, when Internet purchasing is more common, and using a natural log transformation for all monetary variables included in the sales tax revenue model to be consistent with prior literature that measures tax revenues. Finally, I examine the sales tax revenue model using a definition for Internet cross-border shopping that incorporates the "effective Internet tax rate" to examine the influence of Internet

[73] The limited time dimension in the dataset precludes me from performing common tests for a structural break in the data. Thus, I choose to partition the data at 1999 based on an examination of the trend in the data as it relates to Internet access and Internet purchases. I also examine results using 1998 to 2004 and using 2000 to 2004. The primary results using 1998 to 2004 data appear qualitatively similar to the results presented for 1999 to 2004. Using 2000 to 2004 data, results for the geographic neighbors appear largely insignificant, and results for the "effective Internet tax rate" appear similar to the results presented for 1999 to 2004.

[74] I examine models using only the years 2003 and 2004 to test the models using only years for which the nexus variable is not estimated using separate time series regressions for each state. Nexus for the years in these models is based on the top Internet vendors collected for the respective years.

purchasing, including those Internet purchases on which the sales tax is collected, on sales tax revenues.

Tax Competition Model - Internet Access

Most Recent Six Years

Table 10 presents results for the tax competition model including a measure for Internet access and using data only from 1999 through 2004, when Internet access was more common.[75] I examine models using only the more recent data to determine the influence of Internet access on sales tax competition during years in which a relatively large percentage of the population accesses the Internet. Internet access likely influences sales tax policy in a more meaningful way during years in which a larger portion of the population maintains Internet access and a larger number of Internet vendors conduct operations online. The primary results appear largely consistent with the findings using data from all available years. I find a significantly positive coefficient on the interaction between the neighbor's tax rate and the percentage of the population with Internet access for both the contiguity and Internet neighbor definitions. These results provide additional support for the idea that Internet access influences the response of a state to its neighbors' tax rates.

The overall effect of Internet access on the sales tax rate, too, is significant when defining neighbors using either contiguity weights or the "effective Internet tax rate," consistent with previous findings. The overall effect of the neighbor's sales tax rate on

[75] As can be seen in Table 3, the mean percentage of a state's population having Internet access equaled 46.27 percent in 1999 and rose to 71.41 percent in 2004. These percentages represent a substantial increase in Internet access when compared to early years in the dataset.

the weighted average state and local sales tax rate is significant when using any of the three definitions for neighbors, while the effect of the neighbor's sales tax rate on the state sales tax rate is significant only when using the "effective Internet tax rate" as the definition of a state's neighbors. Again, this finding is relatively similar to the findings when using data from all available years. The control variables appear largely insignificant when examining only these more recent data.[76] The lack of significance in the control variables likely relates to the decrease in statistical power associated with using fewer years in this model. The insignificant control variables exhibit much less variation during the recent time period than does the Internet access variable, and the reduced power of the model makes it difficult to find significance among these variables.[77]

2003 and 2004 Only

Table 11 shows the results of the tax competition model including a measure for Internet access using data only from 2003 and 2004, when the nexus variable is available. I examine these years separately to help determine whether the estimation of data on the states in which Internet vendors collect the sales tax (nexus) alters my conclusions related to the influence of Internet access on sales tax competition.[78] The results indicate that the model is not significant. Although the overall effect of the neighbor appears significant

[76] I examine the data for correlations between Internet access and other control variables and find that the only control variable with which Internet access appears to be highly correlated is per capita income.
[77] The models using only the most recent six years contain a maximum of 300 observations. The standard deviation of the Internet access variable during this time period equals 13.34, while the standard deviation of insignificant control variables during this same period ranges from 0.11 to 1.85.
[78] As an additional check on the influence of estimated nexus data, I examine the tax competition model for all years, including a dummy variable for years in which nexus data is available and interacting this dummy variable with the "effective Internet tax rate." I find that the interaction is not significant, which indicates that the influence of the "effective Internet tax rate" does not differ between the two years in which I have nexus data and the other years in the model.

in one case, in each case, the F test that all coefficients are equal to zero cannot be rejected. Thus, the model does not appear significant when examining only 2003 and 2004. The lack of significance in the model likely relates to the use of only two years of data and the small number of tax rate changes (three) that occur during this time period. Thus, the model has very low statistical power.

Pew Internet Data

Table 12 shows the results of the tax competition model including the measure of Internet access obtained from surveys conducted by the Pew Internet & American Life Project.[79] I examine models using the Pew survey data to determine whether results related to Internet access using this data source are consistent with results using the Internet access data from the CPS Computer Ownership Supplement. In addition, the Pew survey was conducted in each year beginning in 2001, eliminating the need to estimate Internet access for years in which the survey was not conducted. The primary results indicate that the interaction between the neighbor's tax rate and the percentage of the population having Internet access is not significant. In addition, the overall effect of Internet access on the sales tax rate does not appear significant. The total effect of the neighbor's sales tax rate on the weighted average state and local sales tax rate is highly significant only when using the Internet definition of a state's neighbors. Among control variables, I find a significantly positive association between selective sales tax revenue

[79] The Pew survey data is included to determine whether results related to Internet access in this survey are consistent with the results using data from the CPS Computer Ownership Supplement. The Pew survey is conducted every year. However, the Pew survey data is available only for years beginning in 2001, and the data exhibit high variability in responses related to Internet access from one year to the next. In addition, the Pew survey data includes questions relating to Internet access but does not include any questions related to Internet purchases, making it impossible to test Internet purchases with the Pew survey data.

and the sales tax rate, and I find a significantly positive relation between the percentage of the population that is 65 years of age or older and the state sales tax rate. The general lack of significance in the model using data from the Pew Internet & American Life Project may relate to the substantially smaller number of years available using this data and the related loss of statistical power.[80]

Separate Nexus and Lagged Tax Rate

Table 13 presents results for the tax competition model using the Internet neighbor when the "effective Internet tax rate" is separated into the two variables that comprise it, the previous year's home tax rate and the previous year's nexus percentage. I examine this model to determine whether the influence of the "effective Internet tax rate" found in the primary analyses is driven by both the tax rate and the percentage of Internet sales on which sales taxes would be collected in a given state. The primary results indicate that, as expected, the previous year's tax rate is significantly positive. Because states change their sales tax rates relatively infrequently and the majority of these changes are increases, I would expect a strong positive relationship between the state's sales tax rate in the previous year and the state's current sales tax rate. The nexus percentage appears to have a significantly positive relationship with the state sales tax rate, but it does not appear to significantly influence the weighted average state and local sales tax rate. Further, the influence of the nexus percentage on the state's tax rate becomes more positive as the percentage of the population accessing the Internet

[80] Due to lagging the explanatory variables and the small number of years during which the Pew survey data are available, these regressions could be run using Internet access data from only three years (2001 – 2003).

increases. Thus, as a higher percentage of Internet vendors collect the sales tax in a given state, consumers in that state are likely less able to avoid paying the sales tax by making online purchases, allowing the state to increase its sales tax rate with less concern about losing its sales tax base to online shopping. The overall effect of Internet access on the sales tax rate is significant and negative in this model, consistent with findings from the primary analysis. In addition, control variables appear very similar to the primary analysis.

Tax Competition Model - Internet Purchases

Most Recent Six Years

Table 14 describes the results for the tax competition model including a measure for Internet purchasing and using data only from 1999 through 2004, when Internet purchasing became more widespread.[81] Similar to the analysis of Internet access data using only more recent years, I examine these models to determine the effect of online shopping on sales tax competition for years in which a larger portion of the population makes purchases on the Internet. I would expect online purchasing to have a greater influence on sales tax competition during recent years because a larger percentage of the population shops online during these years. The main results look primarily consistent with the findings using data from all available years. I find a significantly positive interaction between the neighbor's tax rate and the percentage of the population making Internet purchases for five out of six models. Thus, these results present further support

[81] As can be seen in Table 3, the mean percentage of a state's population making Internet purchases equaled 8.29 percent in 1999 and grew to 31.691 percent in 2004. These percentages demonstrate the growth in the popularity of online purchasing when comparing them to the percentage of the population making Internet purchases during early years in the sample.

for the notion that Internet purchasing influences the response of a state to its neighbors' tax rates. The overall effect of Internet purchases on the weighted average state and local sales tax rate is significant when using the contiguity definition for neighbors or when using the "effective Internet tax rate," while the effect of Internet purchases on the state sales tax rate is significant only when using the "effective Internet tax rate" as the definition of a state's neighbors. This finding differs somewhat from results using all years in the dataset, likely due to the much smaller sample size in the model using only more recent data. The overall effect of the neighbor's sales tax rate on the state's own sales tax rate is significant only when defining a state's neighbors using the "effective Internet tax rate," which indicates that the state has no significant response to the sales tax rate changes of its geographic neighbors in this time period. However, the neighbor's sales tax rate significantly influences the weighted average state and local sales tax rate when using any of the three definitions for neighbors. These results appear relatively similar to the findings when using data from all available years. As in the Internet access model using only the most recent years, the control variables appear largely insignificant in this model. Again, the shorter time period reduces the sample size considerably and results in a decrease in statistical power that makes it more difficult to find significance in the control variables, which tend to exhibit much less variation than does the Internet purchasing variable.[82]

[82] The standard deviation of the Internet purchasing variable during this time period equals 8.61.

2003 and 2004 Only

Table 15 shows the results of the tax competition model including a measure for Internet purchasing using data only from 2003 and 2004, when the nexus variable is available. As with the Internet access model, I examine these two years separately in the Internet purchases model to help determine whether the estimation of the nexus variable changes my conclusions related to the influence of online shopping on sales tax competition.[83] Consistent with the results of the Internet access model for 2003 and 2004, the model is not significant. Again, in each case, the F test that all coefficients are equal to zero cannot be rejected. As in the Internet access model, the lack of significance in this model likely relates to the small number of years used in the model and the small number of tax rate changes in the short time period.

Separate Nexus and Lagged Tax Rate

Table 16 shows results for the tax competition model using the Internet neighbor as the measure of a state's competitors and separating the "effective Internet tax rate" into the previous year's home tax rate and the previous year's nexus percentage. As with the Internet access model, I examine this model to determine whether both the tax rate and the percentage of Internet sales on which sales taxes would be collected in a state influence the state's sales tax rate. Consistent with the Internet access model and with expectations, the previous year's sales tax rate is significantly positive. As in the Internet

[83] Again, I examine the tax competition model for all years using a dummy variables for years in which nexus data is available as another check on the influence of the estimated nexus data. I find that the interaction of the dummy variable with the "effective Internet tax rate" is not significant, indicating that the influence of the "effective Internet tax rate" does not differ between the two years for which I have nexus data and the other years included in the model.

access model, an increase in the nexus percentage is associated with an increase in the state's sales tax rate but not the weighted average state and local sales tax rate. The influence of the nexus percentage on the state's tax rate also becomes more positive as a larger portion of the population makes online purchases. Again, this indicates that as more Internet vendors collect the sales tax in a state, that state can increase its sales tax rate without losing as much of its tax base to online shopping. The overall effect of Internet purchasing on the sales tax rate is significant only when looking at the state sales tax rate. The control variables appear quite consistent with the primary analysis.

Sales Tax Revenue Model

Most Recent Six Years

Table 17 presents the results for the sales tax revenue model using data only from 1999 through 2004.[84] I examine models using only the more recent data to determine the effect of online shopping on a state's per capita sales tax revenues for years in which online shopping is more common. I would expect that if online shopping negatively impacts sales tax revenues, as policymakers are concerned it does, the influence of these Internet purchases would likely be most pronounced during years in which a larger portion of the population makes Internet purchases. The primary results vary slightly from the findings using data from all available years. Both the main effect and the overall effect of Internet purchasing on the sales tax revenue per capita are insignificant

[84] The limited time dimension in the dataset precludes me from performing common tests for a structural break in the data. Thus, as mentioned, I choose to partition the data at the in 1999 based on an examination of the trend in the data as it relates to Internet access and Internet purchases. I also examine results using 1998 to 2004 and using 2000 to 2004. The primary results using either of these alternatives appear qualitatively very similar to the results presented for 1999 to 2004.

when considering only data from more recent years.[85] This finding indicates that in more recent years, Internet purchasing has little impact on sales tax revenues. Thus, consumers may have altered the types of items purchased on the Internet somewhat in more recent years. Rather than Internet purchases representing an increase in consumption, these purchases may represent a combination of both items that would otherwise not be purchased and items that would otherwise be purchased locally. Thus, the impact of Internet purchases on sales tax revenues could be somewhat muted by the mix of items purchased. However, consistent with previous findings, I find a significantly negative association between outbound cross-border shopping and per capita state and local sales tax revenue. In addition, I find a significantly positive relation between the sales tax rate and per capita sales tax revenue. The control variables differ somewhat from previous findings when examining only data from 1999 until 2004.

Natural Log Transformation

Table 18 describes the results for the sales tax revenue model when using natural logs of all monetary values.[86] I test the sales tax revenue model using a natural log transformation to be consistent with prior literature (e.g., Fink et al. 2004, Borg et al. 1993), which typically uses natural logs for monetary values when modeling tax

[85] The finding that no significant association exists between Internet purchasing and per capita sales tax revenue for recent years could be due to a smaller sample size. In contrast, these findings could differ from results using all years in the dataset because the full dataset may be capturing some effects of rapid technology growth on sales taxable B2B transactions.

[86] Some states may have zero values for some monetary amounts included in the model (e.g., lottery revenues). Therefore, I add 0.1 to all dollar figures before taking the natural log of those amounts.

revenues.[87] The main results look quite consistent with the findings using the original monetary values. The overall effect of Internet purchasing on per capita sales tax revenue is highly significant and, contrary to my hypothesis, implies that increasing cross-border shopping through Internet commerce would result in higher sales tax revenue per capita. Traditional measures of cross-border shopping do not appear to significantly influence the state's per capita sales tax revenue. Consistent with previous findings, the sales tax rate exerts a positive and significant influence on per capita sales tax revenue. The control variables are largely consistent with earlier findings.

Internet Cross-Border Shopping Including "Effective Internet Tax Rate"

Table 19 presents the results for the sales tax revenue model using the "effective Internet tax rate" weighted by the percentage of the population making online purchases as the definition of the Internet cross-border shopping effect. I examine models using this alternate definition for Internet cross-border shopping to incorporate the influence of online shopping in which the sales tax is collected on sales tax revenue per capita. The sales tax is collected on many purchases made on the Internet, and including the "effective Internet tax rate" in the sales tax revenue model helps allow for these purchases. The primary results are quite similar to the primary analysis. The measure of Internet-based cross-border shopping indicates that Internet purchasing has a statistically significant but economically very small positive influence on the sales tax revenue per

[87] I examine scatterplots of my data to determine whether natural log transformations appear appropriate and find no patterns that indicate that transformation is necessary. Tests reveal that these monetary values are not normally distributed, and that using the natural logs of these variables helps minimally. Thus, I present my primary results without using the transformations for ease of interpretation and also present the results using natural logs for all monetary values.

capita when using the "effective Internet tax rate" in the Internet cross-border shopping measure. The measures of traditional cross-border shopping are again largely insignificant, except for a significantly negative association between outbound cross-border shopping and per capita state and local sales tax revenue. In addition, I find a significantly positive relation between the sales tax rate and per capita sales tax revenue. The control variables are very similar to previous findings when using this alternate definition for Internet cross-border shopping.

6. Contributions, Limitations, and Extensions

Previous research in the area of tax competition indicates that governments consider the taxes of their neighbors in setting their own tax rates (Conway and Rork 2004, Luna 2004, Rork 2003, Brueckner and Saavedra 2001, Buettner 2001, Hayashi and Boadway 2001, Heyndels and Vuchelen 1998). Rork (2003) finds a negative relationship between the neighbor's general sales tax rate and a state's own sales tax rate and interprets this as an indication that the general sales tax base is relatively immobile. The current study contributes to this literature by examining horizontal sales tax competition among states using data from a time period that includes increasing levels of Internet commerce. Thus, this study investigates the changes in a state's response to its geographic neighbors in the context of an increasingly mobile tax base (proxied by increasing Internet usage). In addition, this study develops a definition of a state's neighbors that includes the impact of online purchasing as a method of cross-border shopping. This study also contributes to the literature that examines the influence of online purchasing on a state's sales tax revenues by separately measuring traditional methods of cross-border shopping and a measure of Internet purchasing to determine the impact of both forms of cross-border shopping on the resulting sales tax revenue for the state.

One limitation of this study is the comprehensive nature of the general sales tax rate. Because the general sales tax includes a wide range of products in its tax base, measuring changes in tax base mobility using the Internet access rate or online purchasing rate may not capture the true tax base mobility for some products included in the tax base. While the Internet represents a legitimate medium through which to

purchase many products included in a state's sales tax base, it may be impractical or illegal to purchase some items online. These items may render the tax base less mobile, biasing against finding changes in the nature of state sales tax competition resulting from the increase in Internet use by consumers. In addition, the study does not capture the variation in the number and types of sales tax exemptions states incorporate into their sales tax policies. I include the presence of an exemption on food items to help mitigate this issue. The overall breadth of the base should also be captured by the tax base measure included in the models. Another limitation relates to online purchases for which consumers do pay the sales or use tax. For purchases from Internet vendors who maintain nexus in the state of a consumer or who voluntarily collect the tax, a consumer does not avoid the sales tax by purchasing online. These types of online purchases would bias against finding that the increase in Internet use by consumers would alter the nature of state sales tax competition. Additionally, this study cannot adequately capture the influence of B2B e-commerce on sales tax competition and sales tax revenues. Studies estimate that B2B e-commerce transactions make up the major portion of e-commerce activity (Bruce and Fox 2000, Bruce and Fox 2004).[88] This study also cannot capture changes over time in the states in which individual companies collect the sales tax and must estimate the nexus percentage for many years in the dataset. Thus, although the t-statistics and related conclusions regarding the statistical significance of my results should not be biased, the magnitude of the coefficient on the "effective Internet tax rate" is likely biased upward. Finally, this study would capture only the influence of online

[88] Data necessary to include B2B e-commerce in the current study are not available. Data related to the percentage of the population having Internet access and making Internet purchases are inherently related to B2C e-commerce. Further, Internet vendor information used to calculate the "effective Internet tax rate" focuses on vendors making B2C transactions.

purchasing on state sales tax *rate* competition. It cannot capture other responses policymakers may have to the growth in Internet commerce, including changes in state sales tax bases and participation in the Streamlined Sales Tax Project (SSTP).

Subject to the limitations above, the results of this study help to shed light on the impact on horizontal sales tax competition of the increasing mobility and decreasing opportunity cost for consumers related to rising use of the Internet as a retail medium. Results indicate that increases in both the percentage of the population having Internet access and the percentage of the population making online purchases influence the response of a state to its neighbors' tax rates. Specifically, results indicate that states respond to an increase in the "effective Internet tax rate" by increasing their own sales tax rate, and states with higher percentages of Internet users increase their sales tax rate by more than those states with fewer Internet users. Thus, policymakers may opt to attain more revenue from local purchases by increasing the sales tax rate instead of lowering the sales tax rate to try to limit online purchasing. In contrast, states respond to changes in the tax rates of their geographic neighbors with only small increases in their own sales tax rate. Thus, as Internet usage increases and physical location matters less for commerce, policymakers seem to focus little on the sales tax rate changes of their geographic neighbors.

The study also provides evidence on the influence of both traditional and Internet-based methods of cross-border shopping on a state's sales tax revenues. Specifically, the results indicate that traditional methods of cross-border shopping generally do not significantly influence a state's per capita sales tax revenue. Thus, the influence of traditional methods of cross-border shopping appears to be limited, likely due to the small

percentage of consumers who participate in these methods of cross-border shopping. Further, results indicate that, contrary to expectations, sales tax revenue per capita appears to increase with an increase in my measure of Internet-based cross-border shopping. Thus, online shopping may not function exclusively as a substitute for local forms of shopping but rather may represent an increase in consumption. These findings indicate that electronic commerce may not, at least to this point, represent the loss of revenue that policymakers have worried that it would. Overall, these findings may be relevant to state policymakers concerned about the erosion of the sales tax base and who may be interested in the influence of increasing Internet commerce on state sales tax policy decisions.

Future research can examine the change over time in the relationship between sales taxes and a consumer's decision to purchase online. As online purchases become increasingly popular and consumers gain experience with online purchasing, their sensitivity to tax rates may change. The Goolsbee (2000a) and Alm and Melnik (2005) studies examine the influence of sales taxes on the decision to purchase online. However, both studies examine a cross-section of data in one time period. The results of a study that examines the change in the influence of sales taxes on online purchasing over time would be relevant to policymakers interested in the future implications of the current sales tax treatment of remote purchases and the related erosion of the sales tax base. Future research can investigate the importance of sales taxes relative to other factors in a consumer's decision to purchase online. Such a study could help shed light on which factors are most important in determining whether or not a consumer purchases online and the influence of requiring Internet vendors to collect the sales or use tax on the level

of online purchases. Additional research could investigate factors that determine which types of businesses may choose to voluntarily collect the sales tax under the simplified sales tax system proposed in the Streamlined Sales Tax Project (SSTP). These findings would be of interest to policymakers involved in developing the SSTP and those who would be involved in discussions of whether to alter the current nexus standard to make it mandatory for remote vendors to collect the tax.

References

References

Alm, James, and Mikhail I. Melnik. 2005. Sales Taxes and the Decision to Purchase Online. *Public Finance Review* 33 (2): 184 – 212.

Alm, James, Michael McKee, and Mark Skidmore. 1993. Fiscal Pressure, Tax Competition, and the Introduction of State Lotteries. *National Tax Journal* 46 (4): 463 – 476.

Baicker, Katherine. 2005. The Spillover Effects of State Spending. *Journal of Public Economics* 89 (2-3): 529 – 544.

Borg, Mary O., Paul M. Mason, and Stephen L. Shapiro. 1993. The Cross Effects of Lottery Taxes on Alternative State Tax Revenue. *Public Finance Quarterly* 21 (2): 123 – 140.

Bruce, Donald, John Deskins, and William F. Fox. 2004. Has Internet Access Taxation Affected Internet Use? *Public Finance Review* 32 (2): 131 – 147.

Bruce, Donald, and William F. Fox. 2000. E-Commerce in the Context of Declining State Sales Tax Bases. *National Tax Journal* 53 (4): 1373 – 1388.

Bruce, Donald, and William F. Fox. 2001. E-Commerce and Local Finance: Estimates of Direct and Indirect Sales Tax Losses. *Municipal Finance Journal* 22 (3): 24 – 47.

Bruce, Donald, and William F. Fox. 2004 State and Local Sales Tax Revenue Losses from E-Commerce: Estimates as of July 2004. Prepared for the Institute for State Studies (ISS), Salt Lake City, Utah.

Bruce, Donald, William F. Fox, and Matthew Murray. 2003. To Tax or Not to Tax? The Case of Electronic Commerce. *Contemporary Economic Policy* 21 (1): 25 – 40.

Brueckner, Jan K. 2003. Strategic Interaction Among Governments: An Overview of Empirical Studies. *International Regional Science Review* 26 (2): 175 – 188.

Brueckner, Jan K., and Luz A. Saavedra. 2001. Do Local Governments Engage in Strategic Property-Tax Competition? *National Tax Journal* 54 (2): 203 – 229.

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.

Case, Anne C., Harvey S. Rosen, and James R. Hines, Jr. 1993. Budget Spillovers and Fiscal Policy Interdependence. *Journal of Public Economics* 52 (3): 285 – 307.

Conway, Karen Smith, and Jonathan C. Rork. 2004. Diagnosis Murder: The Death of State Death Taxes. *Economic Inquiry* 42 (4): 537 – 559.

Cooper, Adrienne. 2004. Electronic Commerce: The Taxing Effect of Not Assessing Internet Sales. *Journal of State Taxation* 22 (4): 84 – 92.

Craig, Steven G., and Robert P. Inman. 1986. Education, Welfare, and the "New" Federalism: State Budgeting in a Federalist Public Economy. NBER Working Paper 1562.

Due, John F. 1967. Liability of Out of State Mail Order Vendors for Collection of Use Tax. *National Tax Journal* 20 (4): 463 – 466.

Ellison, Glenn, and Sara F. Ellison. 2006. Internet Retail Demand: Taxes, Geography, and Online-Offline Competition. NBER Working Paper 12242.

Federation of Tax Administrators. *2005 State Tax Collection by Source*. [cited 20 July 2006]. Available from http://www.taxadmin.org/fta/rate/05taxdis.html.

Ferris, J. Stephen. 2000. The Determinants of Cross Border Shopping: Implications for Tax Revenues and Institutional Change. *National Tax Journal* 53 (4): 801 – 824.

Fink, Stephen C., Alan C. Marco, and Jonathan C. Rork. 2004. Lotto Nothing? The Budgetary Impact of State Lotteries. *Applied Economics* 36 (21): 2357 – 2367.

Fletcher, Jason M., and Matthew N. Murray. 2006. Competition over the Tax Base in the State Sales Tax. *Public Finance Review* 34 (3): 258 – 281.

Fox, William F. 1986. Tax Structure and the Location of Economic Activity Along State Borders. *National Tax Journal* 39 (4): 387 – 401.

Fox, William F., and LeAnn Luna. 2000. Taxing E-Commerce: Neutral Taxation is Best for the Industry and the Economy. *Quarterly Journal of Electronic Commerce* 1 (2): 139 – 150.

Fox, William F., and Matthew N. Murray. 1997. The Sales Tax and Electronic Commerce: So What's New? *National Tax Journal* 50 (3): 573 – 592.

Friedlaender, Ann F., Gerald J. Swanson, and John F. Due. 1973. Estimating Sales Tax Revenue Changes in Response to Changes in Personal Income and Sales Tax Rates. *National Tax Journal* 26 (1): 103 – 110.

Goolsbee, Austan. 2000a. In a World Without Borders: The Impact of Taxes on Internet Commerce. *The Quarterly Journal of Economics* 115 (2): 561 – 576.

Goolsbee, Austan. 2000b. Internet Commerce, Tax Sensitivity, and The Generation Gap. *NBER/Tax Policy & the Economy* 14 (1): 45 – 65.

Goolsbee, Austan. 2001. The Implications of Electronic Commerce for Fiscal Policy (and Vice Versa). *Journal of Economic Perspectives* 15 (1): 13 – 23.

Goolsbee, Austan, and Jonathan Zittrain. 1999. Evaluating the Costs and Benefits of Taxing Internet Commerce. *National Tax Journal* 52 (3): 413 – 428.

General Accounting Office. 2000. Sales Taxes: Electronic Commerce Growth Presents Challenges; Revenue Losses Are Uncertain. GAO Report B-284955.

Gujarati, Damodar N. 2004. *Basic Econometrics (Fourth Edition)*. New York: McGraw-Hill/Irwin.

Hausman, Jerry A. 1978. Specification Tests in Econometrics. *Econometrica* 46 (6): 1251 – 1271.

Hayashi, Masayoshi, and Robin Boadway. 2001. An Empirical Analysis of Intergovernmental Tax Interaction: The Case of Business Income Taxes in Canada. *Canadian Journal of Economics* 34 (2): 481 – 503.

Hettich, Walter, and Stanley L. Winer. 1988. Economic and Political Foundations of Tax Structure. *The American Economic Review* 78 (4): 701 – 712.

Hewett, Roger S., and Susan C. Stephenson. 1983. State Tax Revenues Under Competition. *National Tax Journal* 36 (1): 95 – 101.

Heyndels, Bruno and Jef Vuchelen. 1998. Tax Mimicking among Belgian Municipalities. *National Tax Journal* 51 (1): 89 – 101.

Hill, Brian C. 2006. Essays on Tax Competition. Dissertation.

Kanbur, Ravi, and Michael Keen. 1993. Jeux Sans Frontières: Tax Competition and Tax Coordination When Countries Differ in Size. *The American Economic Review* 83 (4): 877 – 892.

Legler, John B., and Perry Shapiro. 1968. The Responsiveness of State Tax Revenue to Economic Growth. *National Tax Journal* 21 (1): 46 – 56.

Luna, LeAnn. 2004. Local Sales Tax Competition and the Effect on County Governments' Tax Rates and Tax Bases. *Journal of the American Taxation Association* 26 (1): 43 – 61.

McLure, Charles E., Jr. 1999. Electronic Commerce and the State Retail Sales Tax: A Challenge to American Federalism. *International Tax and Public Finance* 6 (2): 193 - 224.

McLure, Charles E., Jr. 2000. Sales Taxation of Electronic Commerce: What John Due Knew All Along. Proceedings of the National Tax Association 93rd Annual Conference on Taxation: 216 – 222.

Merrifield, John. 2000. State Government Expenditure Determinants and Tax Revenue Determinants Revisited. *Public Choice* 102 (1-2): 25 – 50.

Mikesell, John L. 2001. The Threat to State Sales Taxes from E-Commerce: A Review of the Principal Issues. *Municipal Finance Journal* 22 (3): 48 – 60.

Mikesell, John L. 1970. Central Cities and Sales Tax Rate Differentials: The Border City Problem. *National Tax Journal* 23 (2): 206 – 214.

Mintz, Jack, and Henry Tulkens. 1986. Commodity Tax Competition Between Member States of a Federation: Equilibrium and Efficiency. *Journal of Public Economics* 29 (2): 133 – 172.

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

Pedwell, Kathryn. 2002. Taxation of Electronic Commerce: An Assessment of the Opportunities and Challenges Facing Taxpayers and Tax Authorities. *Journal of E-Business* 1 (2): 1 – 9.

Rork, Jonathan C. 2003. Coveting Thy Neighbors' Taxation. *National Tax Journal* 56 (4): 775 – 787.

Stehr, Mark. 2007. The Effect of Sunday Sales Bans and Excise Taxes on Drinking and Cross-Border Shopping for Alcoholic Beverages. *National Tax Journal* 60 (1): 85 – 105.

U.S. Census Bureau. *Quarterly Retail E-Commerce Sales 4th Quarter 2005*. [updated 17 February 2006; cited 25 July 2006]. Available from http://www.census.gov/mrts/www/data/html/05Q4.html.

Walsh, Michael J., and Jonathan D. Jones. 1988 More Evidence on the 'Border Tax' Effect: The Case of West Virginia, 1979 – 84. *National Tax Journal* 41 (2): 261 – 265.

Wilson, John D. 1999. Theories of Tax Competition. *National Tax Journal* 52 (2): 269 – 304.

Zodrow, George R. 2006. Optimal Commodity Taxation of Traditional and Electronic Commerce. *National Tax Journal* 59 (1): 7 – 31.

Appendix

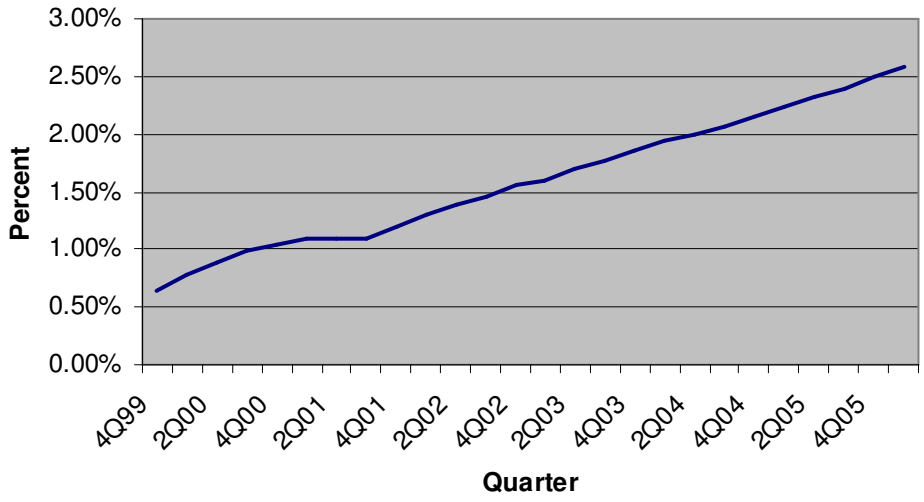


Figure 1: E-Commerce as a Percent of Total Retail (Seasonally Adjusted)

Source: U.S. Census Bureau, available at:
http://www.census.gov/mrts/www/data/html/06Q1.html

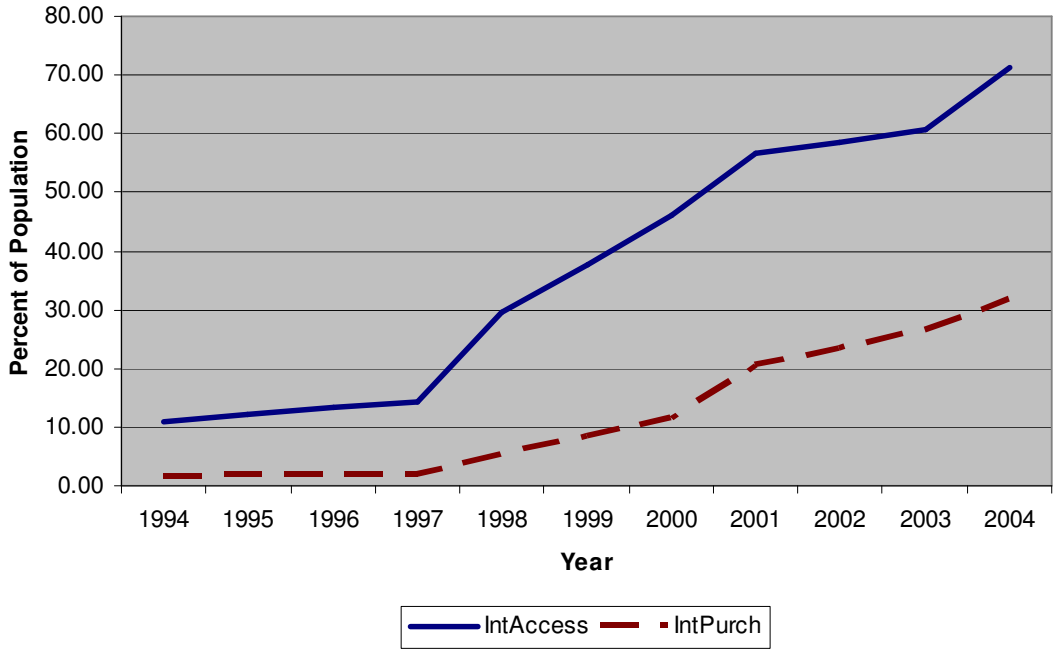


Figure 2: Percentage of the Population Having Internet Access and Making Internet Purchases

Source: U.S. Census Bureau, CPS Computer Ownership Supplement, various years

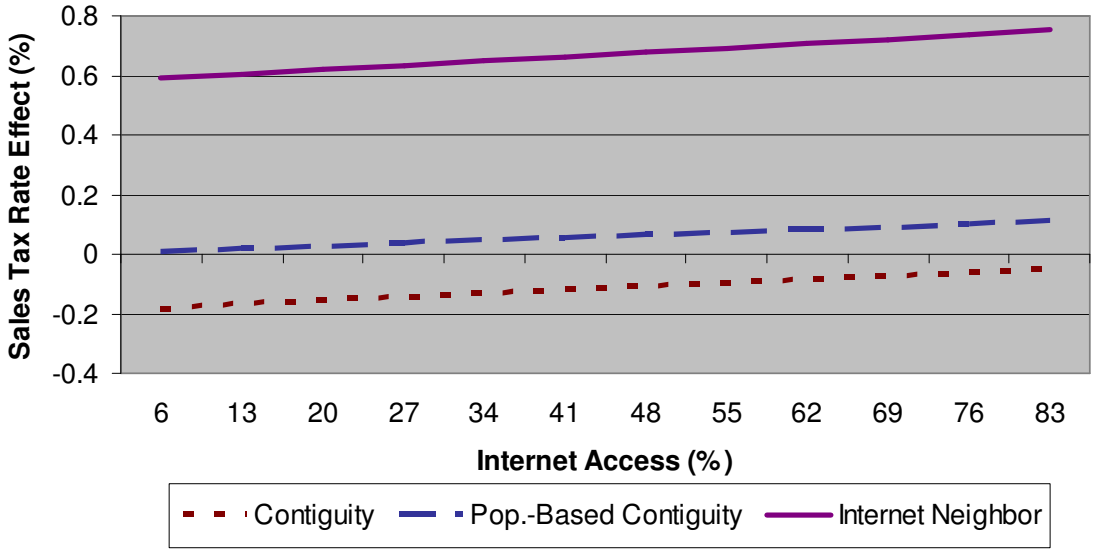


Figure 3: Effect of the "Neighbor's" Tax Rate on the Sales Tax Rate at Different Levels of Internet Access

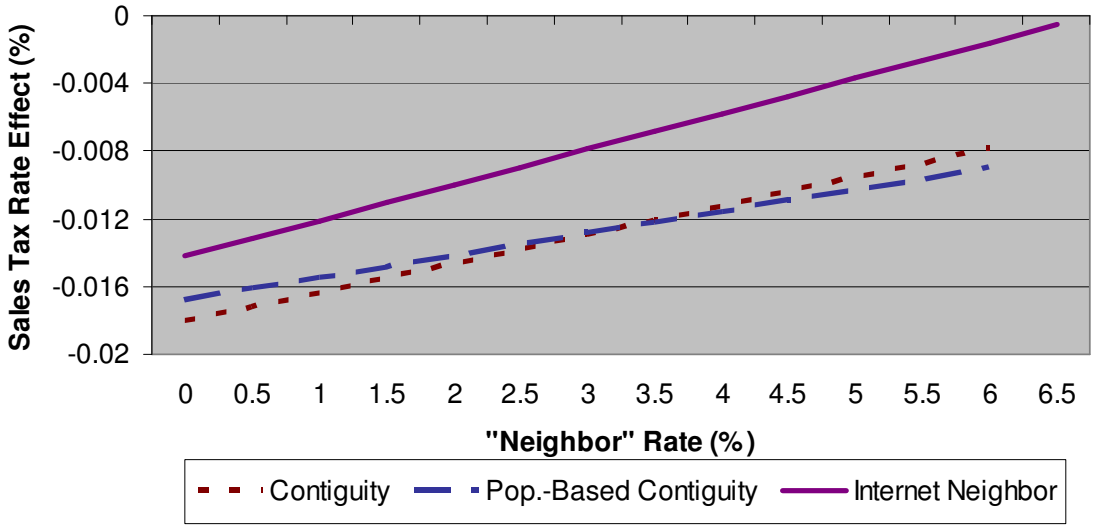


Figure 4: Effect of Internet Access on the Sales Tax Rate at Different "Neighbor" Tax Rates

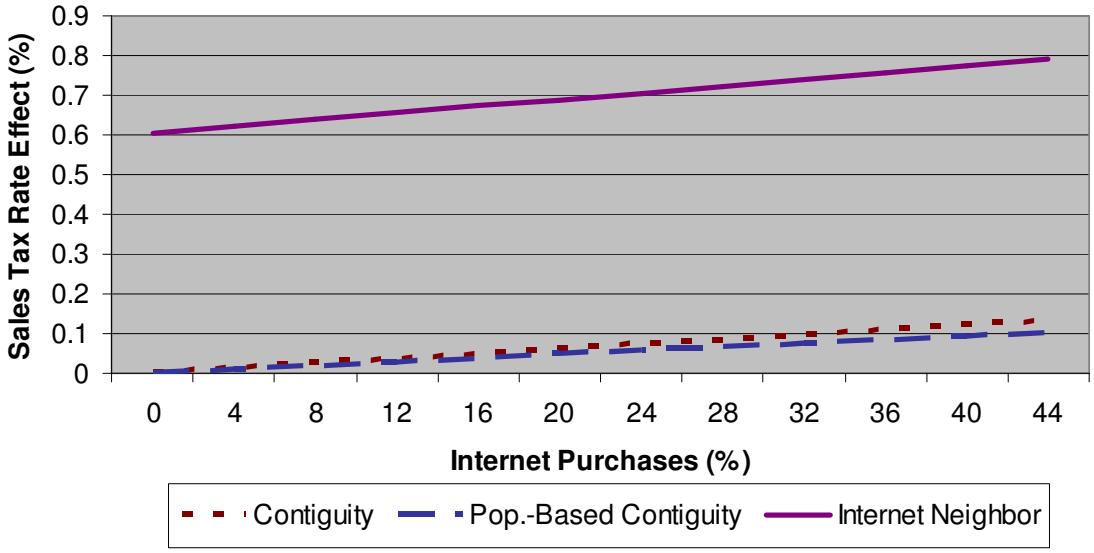


Figure 5: Effect of the "Neighbor's" Tax Rate on the Sales Tax Rate at Different Levels of Internet Purchasing

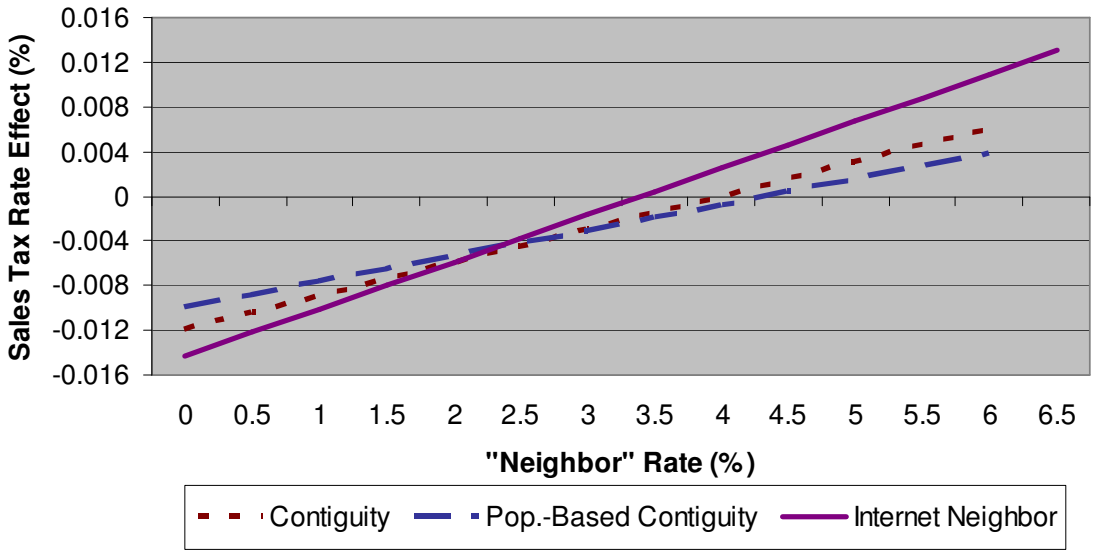


Figure 6: Effect of Internet Purchases on the Sales Tax Rate at Different "Neighbor" Tax Rates

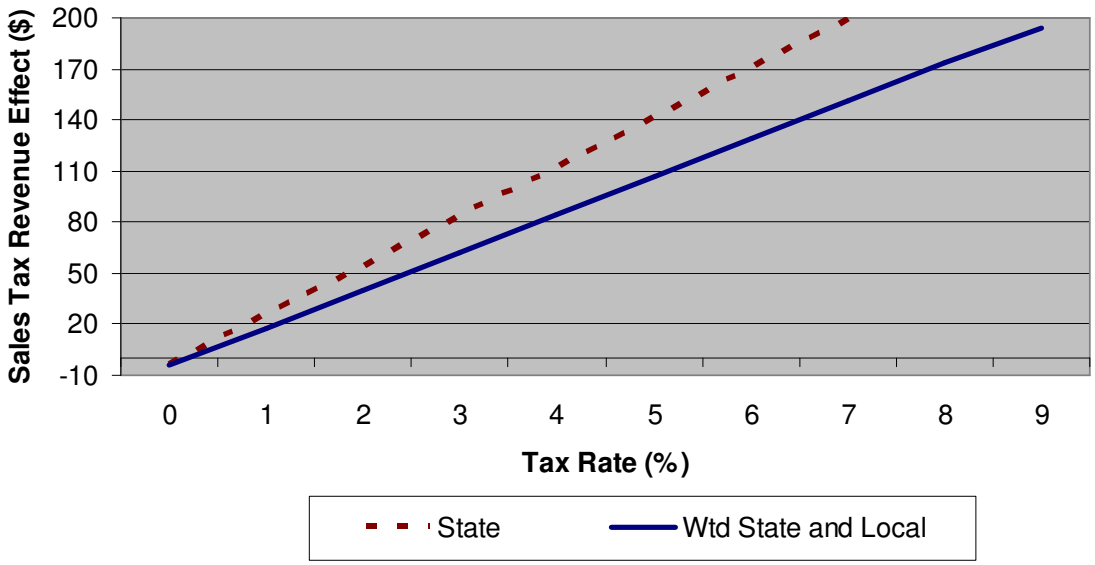


Figure 7: Effect of Internet Purchases on Per Capita Sales Tax Revenue at Different Tax Rates

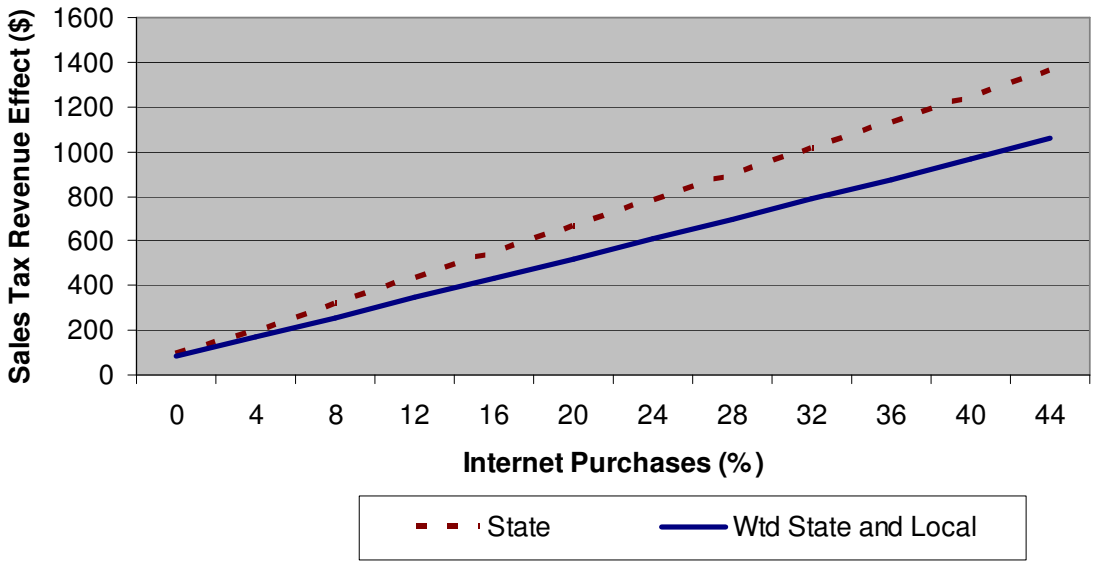


Figure 8: Effect of the Tax Rate on Per Capita Sales Tax Revenue at Different Levels of Internet Purchasing

Table 1: Variable Definitions

Variable		Definition
Base	=	per capita sales tax base for state *i* in year *t-1*, adjusted for inflation
CIncTax	=	per capita corporate income tax revenue for state *i* in year *t-1*, adjusted for inflation
College	=	percent of the population with a bachelor's degree or higher for state *i* in year *t*
ContNeigh	=	weighted average sales tax rate for state *i*'s neighbors in year *t-1* as defined by the contiguity definition
ContNeighWtd	=	contiguity definition, including both the state and local sales tax rates
Debt	=	per capita outstanding debt for state *i* in year *t-1*, adjusted for inflation
Dem	=	indicator set to 1 if a Democratic governor and majority in state *i*'s legislature in year *t-1*, zero otherwise
Elect	=	indicator set to 1 if an election year for state *i* in year *t-1*, zero otherwise
Expend	=	per capita expenditures for state *i* in year *t-1*, adjusted for inflation
Food	=	indicator set to 1 if state *i* exempts food from the sales tax in year *t-1*, zero otherwise
InRate	=	the traditional cross-border shopping effect representing additional sales tax revenues for state *i* in year *t*
IntAccess	=	percent of the population with Internet access for state *i* in year *t-1*
InterRate	=	the Internet cross-border shopping effect for state *i* in year *t*
IntNeigh	=	Internet neighbor definition
IntNeighWtd	=	Internet neighbor definition, including both the state and local sales tax rates
IntPurch	=	percent of the population that used the Internet to purchase products or services for state *i* in year *t-1*
Lottery	=	per capita lottery revenue for state *i* in year *t-1*, adjusted for inflation
Nexus	=	percent of Internet sales by top 100 Internet retailers with nexus in state *i* in year *t*
OutRate	=	the traditional cross-border shopping effect representing lost sales tax revenues for state *i* in year *t*
Over65	=	percent of the population over age 65 for state *i* in year *t-1*
PCIncome	=	per capita income for state *i* in year *t-1*, adjusted for inflation
PIncTax	=	per capita personal income tax revenue for state *i* in year *t-1*, adjusted for inflation
PopNeigh	=	population-based contiguity definition
PopNeighWtd	=	population-based contiguity definition, including both the state and local sales tax rates
PropTax	=	per capita property tax revenue for state *i* in year *t-1*, adjusted for inflation
Rep	=	indicator set to 1 if a Republican governor and majority in state *i*'s legislature in year *t-1*, zero otherwise
SalesRev	=	per capita sales tax revenue for state *i* in year *t*, adjusted for inflation
SchoolAge	=	percent of the population between the ages of 5 and 17 for state *i* in year *t*
SelTax	=	per capita selective sales tax revenue for state *i* in year *t-1*, adjusted for inflation
Tax	=	sales tax rate for state *i* in year *t*
Trans	=	per capita federal transfers to state *i* in year *t-1*, adjusted for inflation
Unemploy	=	unemployment rate for state *i* in year *t-1*
WtdInRate	=	state *i* in year *t*, including both the state and local sales tax rates
WtdInterRate	=	and local sales tax rates
WtdOutRate	=	*i* in year *t*, including both the state and local sales tax rates
WtdTax	=	sales tax rate for state *i* in year *t*, including both the state and local sales tax rates

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Minimum	Maximum
Base	10.649	5.231	0.000	34.775
CIncTax	0.108	0.140	0.000	2.327
College	24.108	4.739	11.400	38.700
ContNeigh	4.114	1.780	0.000	6.250
ContNeighWtd	4.971	2.152	0.000	7.695
Debt	2.241	1.552	0.417	8.519
Dem	0.182	0.386	0.000	1.000
Elect	0.245	0.430	0.000	1.000
Expend	3.943	1.248	2.354	11.868
Food	0.543	0.495	0.000	1.000
InRate	0.801	2.397	0.000	14.587
IntAccess	37.499	22.364	5.684	83.391
InterRate	0.473	0.585	0.000	2.605
IntNeigh	3.616	1.513	0.000	6.500
IntNeighWtd	4.325	1.726	0.000	7.583
IntPurch	12.154	11.147	0.327	44.057
Lottery	0.040	0.052	0.000	0.396
Nexus	69.526	25.011	0.000	100.000
OutRate	0.484	0.678	0.000	2.984
Over65	12.527	1.892	4.506	18.199
PCIncome	26620.650	4354.945	17413.790	42049.480
PIncTax	0.565	0.579	0.000	12.228
PopNeigh	4.448	1.656	0.000	6.217
PopNeighWtd	5.546	2.070	0.000	8.568
PropTax	0.044	0.096	0.000	0.667
Rep	0.243	0.429	0.000	1.000
SalesRev	0.544	0.265	0.000	1.391
SchoolAge	18.534	1.396	15.442	25.358
SelTax	0.300	0.169	0.130	3.669
Tax	4.667	1.810	0.000	7.000
Trans	0.977	0.325	0.465	3.491
Unemploy	4.943	1.245	2.300	10.400
WtdInRate	0.925	2.430	0.000	14.587
WtdInterRate	0.562	0.685	0.000	3.027
WtdOutRate	0.418	0.601	0.000	2.381
WtdTax	5.522	2.074	0.000	8.917

Table 3: Correlation Matrix of Primary Variables

Variable	Cont Neigh	Cont Neigh Wtd	InRate	Int Access	Inter Rate	Int Neigh	Int Neigh Wtd	Int Purch	Out Rate	Pop Neigh	Pop Neigh Wtd	Sales Rev	Tax	Wtd In Rate	Wtd Inter Rate	Wtd Out Rate	Wtd Tax
ContNeigh	1.000																
ContNeighWtd	0.908	1.000															
InRate	0.210	0.062	1.000														
IntAccess	-0.052	-0.053	0.063	1.000													
InterRate	-0.018	0.027	-0.210	0.518	1.000												
IntNeigh	0.034	0.117	-0.573	-0.220	0.214	1.000											
IntNeighWtd	0.166	0.257	-0.579	-0.229	0.177	0.880	1.000										
IntPurch	-0.042	-0.033	0.048	0.955	0.464	-0.203	-0.205	1.000									
OutRate	-0.182	-0.179	-0.195	0.019	0.180	0.386	0.167	0.025	1.000								
PopNeigh	0.883	0.750	0.182	-0.022	-0.120	-0.281	-0.153	-0.020	-0.300	1.000							
PopNeighWtd	0.686	0.870	-0.036	0.016	-0.016	-0.146	-0.045	0.029	-0.126	0.778	1.000						
SalesRev	-0.249	-0.123	-0.485	0.048	0.370	0.680	0.589	0.038	0.255	-0.367	-0.159	1.000					
Tax	0.023	0.133	-0.611	-0.046	0.327	0.947	0.825	-0.029	0.442	-0.250	-0.061	0.734	1.000				
WtdInRate	0.184	0.054	0.983	0.070	-0.190	-0.548	-0.604	0.057	-0.111	0.159	-0.013	-0.458	-0.575	1.000			
WtdInterRate	0.031	0.083	-0.206	0.519	0.971	0.166	0.210	0.466	0.095	-0.074	0.024	0.333	0.278	-0.205	1.000		
WtdOutRate	-0.130	-0.214	-0.180	0.016	0.153	0.325	0.237	0.026	0.869	-0.303	-0.259	0.169	0.365	-0.147	0.108	1.000	
WtdTax	0.169	0.288	-0.609	-0.065	0.317	0.811	0.949	-0.037	0.199	-0.104	0.053	0.629	0.856	-0.627	0.360	0.264	1.000

Table 4: Average Tax Rates and Internet Access by Year

Variable	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Tax Rates											
Tax	4.609	4.640	4.650	4.650	4.640	4.640	4.633	4.633	4.698	4.718	4.763
WtdTax	5.399	5.450	5.480	5.488	5.478	5.482	5.517	5.539	5.642	5.716	5.715
Internet Variables											
IntAccess	10.967	12.103	13.239	14.376	29.564	37.917	46.270	56.878	58.880	60.883	71.408
IntPurch	1.620	1.754	1.888	2.022	5.146	8.290	11.434	20.390	23.281	26.172	31.691

Values shown are the mean values of the respective variables for each year.

Table 5: Percentage of Internet Vendors with Nexus by State

State	Mean Nexus	Min. Nexus	Max. Nexus
Alabama	77.601	64.407	91.187
Alaska	NA	NA	NA
Arizona	77.078	66.088	88.368
Arkansas	74.051	62.703	85.632
California	80.322	71.925	89.047
Colorado	78.824	66.238	91.774
Connecticut	79.602	65.658	93.974
Delaware	NA	NA	NA
Florida	82.811	68.518	97.814
Georgia	79.867	66.189	94.204
Hawaii	60.912	54.419	67.678
Idaho	75.237	63.891	87.124
Illinois	80.774	68.403	93.563
Indiana	76.455	67.825	85.456
Iowa	77.217	64.423	90.392
Kansas	89.797	79.429	100.000
Kentucky	90.310	80.105	100.000
Louisiana	67.727	56.966	78.834
Maine	75.544	64.886	86.786
Maryland	80.783	68.129	94.063
Massachusetts	72.044	61.198	82.523
Michigan	78.472	66.143	91.289
Minnesota	80.257	66.743	94.306
Mississippi	75.260	62.823	87.876
Missouri	80.001	66.246	94.312
Montana	NA	NA	NA
Nebraska	69.301	60.718	78.222
Nevada	79.745	66.960	92.829
New Hampshire	NA	NA	NA
New Jersey	76.515	70.246	82.601
New Mexico	66.541	57.114	76.292
New York	79.860	69.332	90.890
North Carolina	80.969	68.197	94.229
North Dakota	86.493	75.425	97.337
Ohio	80.132	67.254	93.588

Table 5: Continued

State	Mean Nexus	Min. Nexus	Max. Nexus
Oklahoma	77.066	64.674	89.732
Oregon	NA	NA	NA
Pennsylvania	81.904	68.133	96.291
Rhode Island	77.584	65.298	90.440
South Carolina	76.754	64.936	88.972
South Dakota	73.234	61.469	85.321
Tennessee	76.036	67.962	84.403
Texas	78.236	69.231	87.716
Utah	77.366	66.542	88.460
Vermont	60.785	54.525	67.161
Virginia	83.198	69.579	97.299
Washington	92.591	81.945	100.000
West Virginia	67.919	58.781	77.362
Wisconsin	78.753	65.983	92.075
Wyoming	64.352	56.845	72.200

Table 6: Percentage of Internet Vendors with Nexus and Effective Tax Rate by State, 2003

State	Tax	WtdTax	Nexus	IntNeigh	IntNeighWtd
Alabama	4.000	7.010	69.529	2.781	4.874
Alaska	0.000	0.000	NA	0.000	0.000
Arizona	5.600	7.868	70.398	3.942	5.539
Arkansas	5.125	6.708	67.230	3.446	4.510
California	6.000	8.917	74.833	4.490	6.673
Colorado	2.900	6.358	71.065	2.061	4.518
Connecticut	6.000	6.000	71.095	4.266	4.266
Delaware	0.000	0.000	NA	0.000	0.000
Florida	6.000	6.302	73.965	4.438	4.661
Georgia	4.000	6.992	71.350	2.854	4.989
Hawaii	4.000	4.000	57.086	2.283	2.283
Idaho	5.000	5.000	68.310	3.415	3.415
Illinois	6.250	6.959	73.224	4.577	5.096
Indiana	6.000	6.000	71.082	4.265	4.265
Iowa	5.000	5.957	69.297	3.465	4.128
Kansas	5.300	6.972	83.756	4.439	5.839
Kentucky	6.000	6.006	84.401	5.064	5.069
Louisiana	4.000	8.145	60.828	2.433	4.955
Maine	5.000	5.000	68.859	3.443	3.443
Maryland	5.000	5.000	72.946	3.647	3.647
Massachusetts	5.000	5.000	65.465	3.273	3.273
Michigan	6.000	6.000	70.831	4.250	4.250
Minnesota	6.500	6.576	71.945	4.676	4.731
Mississippi	7.000	7.000	67.819	4.747	4.747
Missouri	4.225	6.502	71.566	3.024	4.653
Montana	0.000	0.000	NA	0.000	0.000
Nebraska	5.500	6.308	63.959	3.518	4.034
Nevada	6.500	7.000	72.082	4.685	5.046
New Hampshire	0.000	0.000	NA	0.000	0.000
New Jersey	6.000	6.000	72.681	4.361	4.361
New Mexico	5.000	6.574	60.510	3.026	3.978
New York	4.000	8.017	73.449	2.938	5.889
North Carolina	4.500	5.903	73.118	3.290	4.316
North Dakota	5.000	5.910	80.134	4.007	4.736
Ohio	5.000	6.028	72.208	3.610	4.353

Table 6: Continued

State	Tax	WtdTax	Nexus	IntNeigh	IntNeighWtd
Oklahoma	4.500	7.853	69.466	3.126	5.456
Oregon	0.000	0.000	NA	0.000	0.000
Pennsylvania	6.000	6.165	73.309	4.399	4.519
Rhode Island	7.000	7.000	69.993	4.900	4.900
South Carolina	5.000	5.230	69.471	3.474	3.634
South Dakota	4.000	5.083	66.017	2.641	3.356
Tennessee	7.000	8.532	70.900	4.963	6.049
Texas	6.250	8.135	72.440	4.527	5.893
Utah	4.750	6.430	70.828	3.364	4.554
Vermont	5.000	5.000	56.668	2.833	2.833
Virginia	3.500	4.582	74.914	2.622	3.433
Washington	6.500	7.527	86.711	5.636	6.527
West Virginia	6.000	6.002	62.343	3.741	3.742
Wisconsin	5.000	5.283	70.893	3.545	3.746
Wyoming	4.000	4.983	59.670	2.387	2.974

Table 7: Tax Competition Model (Internet Access)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	**-0.1928***	-0.1369	-0.0585	0.0266	**0.5767*****	**0.5114*****
	(0.1044)	(0.1068)	(0.0900)	(0.0781)	(0.0380)	(0.0481)
IntAccess	**-0.0181*****	**-0.0236*****	**-0.0168*****	**-0.0220*****	**-0.0142*****	**-0.0194*****
	(0.0033)	(0.0049)	(0.0033)	(0.0048)	(0.0025)	(0.0039)
Neigh*IntAcc	**0.0017*****	**0.0021*****	**0.0013*****	**0.0013*****	**0.0021*****	**0.0017*****
	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0002)	(0.0003)
Base	0.0154	-0.0217	0.0145	**-0.0252***	0.0113	0.0025
	(0.0096)	(0.0145)	(0.0097)	(0.0147)	(0.0076)	(0.0131)
Food	0.0487	**0.1825*****	0.0513	**0.1878*****	0.0482	**0.1334****
	(0.0448)	(0.0650)	(0.0454)	(0.0657)	(0.0369)	(0.0577)
Debt	-0.0069	0.0162	-0.0296	-0.0256	-0.0160	-0.0180
	(0.0292)	(0.0447)	(0.0290)	(0.0443)	(0.0218)	(0.0366)
Trans	**0.1449***	**0.2957****	0.1064	**0.2787***	0.0354	**0.2000***
	(0.0759)	(0.1452)	(0.0761)	(0.1462)	(0.0568)	(0.1209)
PIncTax	**0.1243****	0.2076	**0.1423****	0.1358	**0.1029*****	0.1622
	(0.0598)	(0.2183)	(0.0598)	(0.2208)	(0.0344)	(0.1897)
CIncTax	-0.2645	-0.4843	-0.3577	-0.5948	-0.1665	-0.3088
	(0.3046)	(0.4690)	(0.3049)	(0.4728)	(0.1705)	(0.2658)
PropTax	**0.4915*****	**0.3613***	**0.4466*****	0.2317	**0.2992****	0.2214
	(0.1473)	(0.2098)	(0.1481)	(0.2158)	(0.1177)	(0.1834)

Table 7: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	**0.2345*** **	**-0.8359***	**0.2328*** **	-0.6798	**0.1248*** **	-0.2419
	(0.0480)	(0.4383)	(0.0483)	(0.4455)	(0.0396)	(0.3787)
Expend	**-0.1246*** **	-0.0548	**-0.1052*** **	-0.0107	-0.0505	-0.0553
	(0.0474)	(0.0715)	(0.0480)	(0.0725)	(0.0362)	(0.0585)
Elect	0.0014	-0.0105	0.0001	-0.0095	-0.0094	-0.0119
	(0.0190)	(0.0277)	(0.0192)	(0.0279)	(0.0155)	(0.0244)
Rep	-0.0432	-0.0483	-0.0381	-0.0421	-0.0122	-0.0202
	(0.0266)	(0.0403)	(0.0269)	(0.0406)	(0.0212)	(0.0350)
Dem	-0.0363	0.0283	-0.0349	0.0199	-0.0236001	0.0340
	(0.0250)	(0.0384)	(0.0254)	(0.0393)	(0.0201)	(0.0333)
Unemploy	**0.0386*** **	0.0296	**0.0454*** **	0.0347	**0.0306*** **	**0.0391***
	(0.0156)	(0.0236)	(0.0155)	(0.0238)	(0.0122)	(0.0199)
PCIncome	0.0000	0.0000	0.0000	0.0000	**-0.0000*** **	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Over65	-0.0491	**-0.1488*** **	**-0.0710***	**-0.1833*** **	**-0.0829*** **	**-0.1463*** **
	(0.0393)	(0.0621)	(0.0392)	(0.0620)	(0.0314)	(0.0514)
Intercept	**7.5683*** **	**8.5792*** **	**7.1074*** **	**8.0556*** **	**5.0133*** **	**5.1286*** **
	(0.8587)	(1.1662)	(0.8274)	(1.0965)	(0.5854)	(0.9055)
Rho	0.9914	0.9888	0.9915	0.9884	0.9794	0.9733

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 8: Tax Competition Model (Internet Purchases)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	-0.0911	-0.0374	-0.0038	0.0463	**0.6047*** **	**0.5185*** **
	(0.1080)	(0.1057)	(0.0923)	(0.0788)	(0.0391)	(0.0490)
IntPurch	**-0.0120****	**-0.0147***	**-0.0100****	**-0.0136***	**-0.0143*** **	**-0.0184*** **
	(0.0048)	(0.0077)	(0.0047)	(0.0076)	(0.0034)	(0.0059)
Neigh*IntPur	**0.0030*** **	**0.0051*** **	**0.0023*** **	**0.0031*** **	**0.0042*** **	**0.0040*** **
	(0.0007)	(0.0009)	(0.0006)	(0.0008)	(0.0004)	(0.0006)
Base	0.0105	-0.0239	0.0098	**-0.0289***	0.0110	0.0001
	(0.0098)	(0.0147)	(0.0099)	(0.0149)	(0.0077)	(0.0132)
Food	**0.0765***	**0.2391*** **	**0.0775***	**0.2345*** **	**0.0712***	**0.1744*** **
	(0.0461)	(0.0665)	(0.0465)	(0.0675)	(0.0373)	(0.0589)
Debt	-0.0055	0.0326	-0.0223	-0.0097	0.0046	0.0039
	(0.0296)	(0.0449)	(0.0295)	(0.0451)	(0.0218)	(0.0367)
Trans	**0.1411***	**0.3083****	0.1063	**0.2731***	0.0527	0.2017
	(0.0785)	(0.1475)	(0.0782)	(0.1490)	(0.0572)	(0.1226)
PIncTax	**0.1059***	0.1252	**0.1194****	0.0799	**0.0782****	0.0788
	(0.0602)	(0.2199)	(0.0604)	(0.2235)	(0.0343)	(0.1921)
CIncTax	-0.1536	-0.3040	-0.2240	-0.4016	-0.0368	-0.1722
	(0.3066)	(0.4679)	(0.3070)	(0.4739)	(0.1695)	(0.2662)
PropTax	**0.4427*** **	0.2498	**0.3935****	0.1244	**0.3435*** **	0.2916
	(0.1524)	(0.2151)	(0.1542)	(0.2239)	(0.1201)	(0.1875)

Table 8: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	**0.2399*** **	-0.6901	**0.2337*** **	-0.6156	**0.1201*** **	-0.1901
	(0.0494)	(0.4434)	(0.0496)	(0.4521)	(0.0402)	(0.3833)
Expend	**-0.1072** **	-0.0223	**-0.0943** *	0.0102	-0.0450	-0.0369
	(0.0484)	(0.0720)	(0.0490)	(0.0735)	(0.0363)	(0.0587)
Elect	-0.0008	-0.0138	-0.0015	-0.0124	-0.0132	-0.0190
	(0.0194)	(0.0280)	(0.0196)	(0.0283)	(0.0156)	(0.0247)
Rep	-0.0385	-0.0459	-0.0336	-0.0331	0.0103	-0.0013
	(0.0273)	(0.0407)	(0.0276)	(0.0412)	(0.0215)	(0.0354)
Dem	-0.0368	0.0386	-0.0356	0.0298	-0.0252	0.0354
	(0.0257)	(0.0390)	(0.0260)	(0.0402)	(0.0203)	(0.0338)
Unemploy	**0.0324** **	0.0129	**0.0403** **	0.0243	0.0199	0.0275
	(0.0163)	(0.0243)	(0.0161)	(0.0245)	(0.0124)	(0.0204)
PCIncome	**-0.0000** **	**-0.0000** *	**-0.0000** **	0.0000	**-0.0000** **	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Over65	-0.0391	**-0.1389** **	-0.0562	**-0.1708*** **	**-0.0873*** **	**-0.1487*** **
	(0.0398)	(0.0618)	(0.0397)	(0.0622)	(0.0313)	(0.0511)
Intercept	**6.6927*** **	**8.4662*** **	**6.4105*** **	**8.2552*** **	**4.6242*** **	**5.1832*** **
	(0.8514)	(1.1761)	(0.8194)	(1.1381)	(0.5745)	(0.9351)
Rho	0.9914	0.9888	0.9914	0.9884	0.9802	0.9757

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 9: Sales Tax Revenue Model

Variable	State	Wtd. State and Local
Tax	**0.0811*** **	**0.0777*** **
	(0.0131)	(0.0107)
InRate	-0.0064	0.0144
	(0.0176)	(0.0114)
OutRate	0.0409	**-0.0489***
	(0.0273)	(0.0287)
InterRate	**0.0290*** **	**0.0222** **
	(0.0080)	(0.0094)
IntPurch	**-0.0038*** **	**-0.0044*** **
	(0.0009)	(0.0011)
Food	**-0.0331*** **	-0.0185
	(0.0100)	(0.0120)
Debt	**-0.0113** **	**-0.0173*** **
	(0.0057)	(0.0066)
Trans	-0.0086	-0.0089
	(0.0148)	(0.0175)
Lottery	**-0.1190***	**-0.1909** **
	(0.0658)	(0.0774)
Elect	-0.0020	-0.0015
	(0.0042)	(0.0050)
Rep	0.0028	0.0007
	(0.0057)	(0.0068)
Dem	0.0005	-0.0045
	(0.0055)	(0.0065)

Table 9: Continued

Variable	State	Wtd. State and Local
Unemploy	**-0.0103*** **	**-0.0098** **
	(0.0033)	(0.0039)
PCIncome	**0.0000*** **	**0.0000*** **
	(0.0000)	(0.0000)
Over65	-0.0076	-0.0114
	(0.0084)	(0.0099)
SchoolAge	**-0.0179*** **	**-0.0242*** **
	(0.0039)	(0.0044)
College	-0.0013	-0.0009
	(0.0011)	(0.0013)
Intercept	0.1841	0.3228
	(0.1929)	(0.2195)
Rho	0.9681	0.9683

All regressions contain state and year fixed effects.

***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

Standard errors are in parentheses.

Variables are not lagged for the sales tax revenue model.

Table 10: Tax Competition Model, 1999 – 2004 (Internet Access)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	-0.2011	-0.0366	-0.0874	0.0185	**0.6367*** **	**0.2399*** **
	(0.1920)	(0.1815)	(0.1696)	(0.1266)	(0.0770)	(0.0911)
IntAccess	**-0.0131** **	**-0.0182** *	-0.0111	**-0.0162** *	**-0.0120** **	**-0.0158** *
	(0.0066)	(0.0092)	(0.0069)	(0.0095)	(0.0052)	(0.0081)
Neigh*IntAcc	**0.0014** *	**0.0023** **	0.0007	0.0015	**0.0027*** **	**0.0022*** **
	(0.0008)	(0.0010)	(0.0007)	(0.0009)	(0.0006)	(0.0007)
Base	0.0257	0.0214	0.0266	0.0167	**0.0293** *	0.0336
	(0.0211)	(0.0291)	(0.0213)	(0.0294)	(0.0168)	(0.0267)
Food	0.0630	0.1317	0.0605	0.1314	0.0487	0.1248
	(0.0686)	(0.0949)	(0.0691)	(0.0955)	(0.0583)	(0.0907)
Debt	-0.0534	-0.0102	-0.0614	-0.0279	-0.0278	-0.0319
	(0.0595)	(0.0820)	(0.0598)	(0.0829)	(0.0452)	(0.0707)
Trans	0.0538	0.2645	0.0487	0.2930	0.0376	0.2495
	(0.1409)	(0.1961)	(0.1424)	(0.1966)	(0.1137)	(0.1778)
PIncTax	0.0181	0.2674	-0.0058	0.2505	-0.0127	0.0384
	(0.2461)	(0.3404)	(0.2462)	(0.3413)	(0.1991)	(0.3198)
CIncTax	-0.3721	-0.2788	-0.4229	-0.3043	-0.1739004	-0.1597
	(0.4460)	(0.6139)	(0.4479)	(0.6174)	(0.2766)	(0.4316)
PropTax	0.0978	0.0214	0.1165	-0.0374	0.1006	0.1340
	(0.2385)	(0.3281)	(0.2402)	(0.3337)	(0.1977)	(0.3097)

Table 10: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	0.3317	0.6546	0.3230	0.7021	0.1462	0.4415
	(0.5449)	(0.7600)	(0.5537)	(0.7710)	(0.4555)	(0.7100)
Expend	**-0.1201***	-0.0932	-0.1186	-0.0828	-0.0450	-0.1070
	(0.0718)	(0.0998)	(0.0730)	(0.1017)	(0.0567)	(0.0879)
Elect	-0.0121	0.0049	-0.0119	0.0049	-0.0182	0.0007
	(0.0270)	(0.0374)	(0.0272)	(0.0376)	(0.0228)	(0.0355)
Rep	-0.0415	-0.0797	-0.0363	-0.0644	-0.0189	-0.0512
	(0.0420)	(0.0580)	(0.0421)	(0.0585)	(0.0348)	(0.0543)
Dem	-0.0487	0.0412	-0.0469	0.0409	0.0076	0.0585
	(0.0410)	(0.0567)	(0.0411)	(0.0574)	(0.0339)	(0.0524)
Unemploy	0.0148	0.0468	0.0154	0.0473	0.0236	**0.0594***
	(0.0283)	(0.0390)	(0.0285)	(0.0392)	(0.0221)	(0.0347)
PCIncome	**-0.0001****	0.0000	**-0.0001****	0.0000	**-0.0000****	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Over65	0.0202	0.0433	-0.0089	0.0105	-0.0148	0.0473
	(0.0788)	(0.1098)	(0.0767)	(0.1078)	(0.0641)	(0.0989)
Intercept	**7.8335*****	**5.8536*****	**7.2602*****	**6.1865*****	**3.5909*****	**3.7987*****
	(1.6496)	(2.2350)	(1.5511)	(2.2002)	(1.1373)	(1.7879)
Rho	0.9910	0.9870	0.9911	0.9869	0.9652	0.9771

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 11: Tax Competition Model, 2003 – 2004 (Internet Access)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	**3.9381****	1.9924	2.2304	0.6613	-0.5144	0.7278
	(1.4482)	(1.8488)	(1.5303)	(1.7026)	(1.1730)	(1.2486)
IntAccess	**0.1619***	0.1237	0.0430	0.0241	-0.0299	0.0903
	(0.0903)	(0.1654)	(0.0980)	(0.1747)	(0.0762)	(0.0874)
Neigh*IntAcc	**-0.0318***	-0.0311	-0.0071	-0.0130	0.0102	-0.0315
	(0.0179)	(0.0261)	(0.0188)	(0.0254)	(0.0199)	(0.0197)
Base	0.0333	0.0583	0.0359	0.0697	0.0265	-0.0578
	(0.0473)	(0.0956)	(0.0512)	(0.0972)	(0.0508)	(0.0706)
Food	0.1870	0.2532	0.1036	0.2075	-0.0613	0.1788
	(0.1495)	(0.2581)	(0.1596)	(0.2584)	(0.1455)	(0.1884)
Debt	-0.1297	-0.3228	-0.2371	-0.3537	-0.0956	-0.1088
	(0.1811)	(0.3375)	(0.1956)	(0.3406)	(0.1894)	(0.2522)
Trans	-0.3177	-0.1678	-0.1622	0.0072	-0.1326	0.2357
	(0.2336)	(0.4503)	(0.2312)	(0.4221)	(0.2538)	(0.3140)
PIncTax	-1.4500	-0.4621	-1.1604	0.3703	-0.8042	-0.9697
	(1.0232)	(2.0089)	(1.0626)	(2.0090)	(1.1352)	(1.5004)
CIncTax	-0.9202	-0.3166	-0.2863	0.1357	0.0809	0.3447
	(1.0278)	(1.8819)	(1.0413)	(1.8824)	(1.0804)	(1.4107)
PropTax	-3.8012	-1.5427	-2.6914	-1.7678	1.0215	-3.0622
	(4.0252)	(7.1187)	(4.1664)	(7.1384)	(4.1771)	(5.4485)

Table 11: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	1.3481	2.6243	1.2469	3.2051	0.1674	4.4095
	(2.0335)	(3.8930)	(2.1466)	(3.9116)	(2.6151)	(3.0734)
Expend	-0.3520	-0.5829	-0.1300	-0.3964	-0.0777	-0.0780
	(0.3334)	(0.6130)	(0.3439)	(0.5911)	(0.2806)	(0.3639)
Elect	-0.0293	-0.0569	-0.0442	-0.0951	-0.0582	-0.0108
	(0.0565)	(0.1167)	(0.0592)	(0.1195)	(0.0646)	(0.0830)
Rep	0.0834	0.0177	0.0781	0.0145	0.0262	0.0279
	(0.0916)	(0.1727)	(0.0969)	(0.1757)	(0.1008)	(0.1328)
Dem	-0.1369	-0.0003	-0.0633	0.0789	0.0437	0.0802
	(0.1098)	(0.1962)	(0.1126)	(0.1944)	(0.0978)	(0.1276)
Unemploy	-0.0855	0.0585	-0.0784	0.0150	-0.0227	-0.0363
	(0.1062)	(0.2039)	(0.1122)	(0.2146)	(0.1185)	(0.1553)
PCIncome	-0.0001	0.0001	-0.0001	0.0001	-0.0001	0.0001
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Over65	0.3757	0.5104	0.3085	0.6971	0.4514	0.4735
	(0.7206)	(1.3637)	(0.7579)	(1.4013)	(0.8246)	(1.0279)
Intercept	-12.7191	-8.8663	-6.3305	-5.9395	3.9993	-4.4047
	(11.9836)	(21.8219)	(12.9376)	(21.9905)	(11.9878)	(15.2209)
Rho	0.9977	0.9783	0.9972	0.9808	0.9906	0.9974

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 12: Tax Competition Model, Pew Internet Access Data (Internet Access)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	-0.0372	0.1041	-0.1601	-0.0565	0.1479	**-0.5399*****
	(0.2743)	(0.2747)	(0.2600)	(0.2133)	(0.1624)	(0.1874)
IntAccess	-0.0020	0.0022	-0.0048	0.0027	0.0048	0.0056
	(0.0064)	(0.0092)	(0.0069)	(0.0102)	(0.0034)	(0.0049)
Neigh*IntAcc	0.0011	0.0001	0.0016	0.0000	-0.0007	-0.0010
	(0.0014)	(0.0016)	(0.0014)	(0.0017)	(0.0010)	(0.0013)
Base	0.0406	0.0346	0.0390	0.0351	0.0497	-0.0299
	(0.0330)	(0.0508)	(0.0327)	(0.0505)	(0.0335)	(0.0504)
Food	0.0102	0.2548	0.0035	0.2409	0.0252	0.2015
	(0.1010)	(0.1550)	(0.1009)	(0.1553)	(0.0998)	(0.1428)
Debt	-0.0312	-0.1823	-0.0299	-0.1715	-0.0111	-0.1599
	(0.1204)	(0.1814)	(0.1192)	(0.1824)	(0.1169)	(0.1662)
Trans	-0.1178	-0.0584	-0.1421	-0.0433	-0.1377	-0.0013
	(0.1783)	(0.2753)	(0.1775)	(0.2735)	(0.1780)	(0.2538)
PIncTax	-0.1093	-0.4731	-0.1132	-0.4175	-0.0629	-0.4713
	(0.3736)	(0.5762)	(0.3684)	(0.5686)	(0.3674)	(0.5245)
CIncTax	-0.3346	-0.2879	-0.2975	-0.2596	-0.3586	-0.4649
	(0.6921)	(1.0208)	(0.6739)	(1.0166)	(0.6647)	(0.9428)
PropTax	-0.2463	-3.0662	-0.2578	-3.0525	-0.1803	-2.8457
	(1.5265)	(2.3338)	(1.5195)	(2.3312)	(1.5277)	(2.1937)

Table 12: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	**2.7108****	**3.7088****	**2.6908****	**3.4670***	**2.9030****	**4.6567*****
	(1.1930)	(1.8144)	(1.1841)	(1.7833)	(1.1874)	(1.6850)
Expend	-0.1610	-0.1908	-0.1648	-0.2090	-0.1659	-0.2550
	(0.1499)	(0.2307)	(0.1487)	(0.2316)	(0.1497)	(0.2118)
Elect	-0.0543	-0.0377	-0.0574	-0.0440	-0.0529	-0.0427
	(0.0443)	(0.0681)	(0.0442)	(0.0689)	(0.0440)	(0.0627)
Rep	0.0341	0.0485	0.0291	0.0400	0.0354	0.0861
	(0.0620)	(0.0931)	(0.0612)	(0.0939)	(0.0620)	(0.0875)
Dem	0.0203	0.0471	0.0245	0.0511	0.0123	0.0185
	(0.0689)	(0.1035)	(0.0675)	(0.1035)	(0.0655)	(0.0922)
Unemploy	-0.0218	0.1027	-0.0185	0.1033	-0.0269	0.0775
	(0.0647)	(0.0987)	(0.0641)	(0.0985)	(0.0644)	(0.0920)
PCIncome	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Over65	**0.6533****	0.6663	**0.6806****	0.7087	**0.6775****	0.7084
	(0.3256)	(0.4844)	(0.3258)	(0.4882)	(0.3138)	(0.4465)
Intercept	-3.2524	-5.9407	-2.5303	-5.0971	-3.9848	-3.2593
	(4.5990)	(7.1426)	(4.6562)	(7.0770)	(4.5387)	(6.5451)
Rho	0.9941	0.9896	0.9943	0.9902	0.9935	0.9960

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 13: Tax Competition Model, Separate Nexus and Lagged Tax Rate (Internet Access)

	Internet	
Variable	State	Wtd. State and Local
Nexus	**0.0134*** **	0.0114
	(0.0043)	(0.0079)
Tax Rate Lagged	**0.6004*** **	**0.5134*** **
	(0.0390)	(0.0484)
IntAccess	**-0.0093*** **	**-0.0150*** **
	(0.0026)	(0.0045)
Nexus*IntAccess	**0.0001***	**0.0001***
	(0.0000)	(0.0001)
Rate Lagged*IntAccess	0.0000	-0.0006
	(0.0003)	(0.0005)
Base	0.0120	0.0067
	(0.0076)	(0.0134)
Food	0.0552	**0.1228** **
	(0.0365)	(0.0578)
Debt	-0.0159	-0.0326
	(0.0214)	(0.0372)
Trans	0.0387	**0.2117***
	(0.0553)	(0.1203)
PIncTax	**0.0818** **	0.1392
	(0.0337)	(0.1899)
CIncTax	-0.0661	-0.2489
	(0.1671)	(0.2661)
PropTax	**0.2500** **	0.1975
	(0.1154)	(0.1824)

Table 13: Continued

	Internet	
Variable	State	Wtd. State and Local
SelTax	**0.0815****	-0.1742
	(0.0394)	(0.3839)
Expend	-0.0469	-0.0561
	(0.0353)	(0.0584)
Elect	-0.0037	-0.0089
	(0.0151)	(0.0243)
Rep	-0.0113	-0.0238
	(0.0207)	(0.0349)
Dem	-0.0210	0.0487
	(0.0198)	(0.0336)
Unemploy	**0.0293****	**0.0393****
	(0.0122)	(0.0199)
PCIncome	0.0000	0.0000
	(0.0000)	(0.0000)
Over65	-0.0392	**-0.1051****
	(0.0311)	(0.0521)
Intercept	**2.3275*****	**3.1855*****
	(0.6234)	(1.0433)
Rho	0.9250	0.9327

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 14: Tax Competition Model, 1999 – 2004 (Internet Purchases)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	-0.1438	0.0050	-0.0575	0.0411	**0.7188*** **	**0.2943*** **
	(0.1951)	(0.1695)	(0.1712)	(0.1153)	(0.0786)	(0.0898)
IntPurch	-0.0065	-0.0081	-0.0036	-0.0073	**-0.0103***	-0.0103
	(0.0076)	(0.0102)	(0.0073)	(0.0102)	(0.0058)	(0.0089)
Neigh*IntPur	**0.0024****	**0.0044*** **	0.0013	**0.0025****	**0.0041*** **	**0.0033*** **
	(0.0011)	(0.0014)	(0.0011)	(0.0012)	(0.0008)	(0.0010)
Base	0.0202	0.0177	0.0204	0.0116	**0.0311***	0.0324
	(0.0208)	(0.0285)	(0.0210)	(0.0289)	(0.0165)	(0.0264)
Food	0.0791	**0.1609***	0.0784	0.1557	0.0633	0.1441
	(0.0688)	(0.0941)	(0.0695)	(0.0955)	(0.0576)	(0.0905)
Debt	-0.0512	0.0025	-0.0585	-0.0255	-0.0068	-0.0108
	(0.0602)	(0.0824)	(0.0606)	(0.0839)	(0.0450)	(0.0708)
Trans	0.0682	0.2913	0.0529	0.3032	0.0212	0.2353
	(0.1413)	(0.1945)	(0.1429)	(0.1966)	(0.1127)	(0.1779)
PIncTax	0.0452	0.3279	0.0137	0.2908	0.0006	0.0679
	(0.2477)	(0.3399)	(0.2487)	(0.3435)	(0.1973)	(0.3168)
CIncTax	-0.3293	-0.2017	-0.3671	-0.2313	-0.1443	-0.1120
	(0.4437)	(0.6072)	(0.4472)	(0.6149)	(0.2714)	(0.4277)
PropTax	0.0627	-0.0974	0.0905	-0.1014	0.1612	0.1988
	(0.2424)	(0.3324)	(0.2471)	(0.3416)	(0.1986)	(0.3143)

Table 14: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	0.5373	0.9570	0.5011	0.8670	0.2098	0.5999
	(0.5445)	(0.7492)	(0.5549)	(0.7602)	(0.4462)	(0.7035)
Expend	**-0.1217***	-0.0902	**-0.1222***	-0.0911	-0.0522	-0.1194
	(0.0719)	(0.0991)	(0.0730)	(0.1011)	(0.0564)	(0.0882)
Elect	-0.0168	-0.0026	-0.0170	-0.0016	-0.0297	-0.0126
	(0.0268)	(0.0368)	(0.0270)	(0.0373)	(0.0223)	(0.0352)
Rep	-0.0397	-0.0771	-0.0334	-0.0587	-0.0008	-0.0344
	(0.0421)	(0.0575)	(0.0422)	(0.0584)	(0.0347)	(0.0546)
Dem	-0.0399	0.0600	-0.0389	0.0561	0.0141	0.0633
	(0.0415)	(0.0566)	(0.0414)	(0.0579)	(0.0336)	(0.0524)
Unemploy	0.0172	0.0484	0.0200	0.0517	0.0203	0.0567
	(0.0283)	(0.0386)	(0.0285)	(0.0390)	(0.0220)	(0.0349)
PCIncome	**-0.0001****	0.0000	**-0.0001****	0.0000	**-0.0001****	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Over65	0.0403	0.0824	0.0085	0.0323	0.0020	0.0694
	(0.0785)	(0.1089)	(0.0767)	(0.1072)	(0.0629)	(0.0980)
Intercept	**6.7705*****	**4.5227*****	**6.8862*****	**5.2860****	**3.4249*****	**3.3818***
	(1.6281)	(2.1045)	(1.6273)	(2.0670)	(1.1455)	(1.8181)
Rho	0.9911	0.9878	0.9912	0.9874	0.96341	0.9784

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 15: Tax Competition Model, 2003 – 2004 (Internet Purchases)

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
Neighbor	**2.4112****	1.2487	**1.6097***	0.3447	0.0699	**-1.0422****
	(0.9387)	(0.9517)	(0.9455)	(0.6709)	(0.4347)	(0.4282)
IntPurch	0.1178	0.2286	0.0340	0.1352	0.0348	0.0671
	(0.0718)	(0.1363)	(0.0656)	(0.1308)	(0.0484)	(0.0677)
Neigh*IntPur	-0.0161	-0.0258	0.0031	-0.0116	0.0051	-0.0063
	(0.0145)	(0.0194)	(0.0134)	(0.0166)	(0.0100)	(0.0120)
Base	0.0215	0.0052	0.0254	0.0269	0.0197	-0.0843
	(0.0487)	(0.0992)	(0.0501)	(0.1018)	(0.0493)	(0.0723)
Food	0.1399	0.3363	0.0298	0.2508	-0.0809	0.1859
	(0.1585)	(0.2635)	(0.1674)	(0.2650)	(0.1398)	(0.1930)
Debt	-0.1707	-0.3303	-0.2496	-0.3225	-0.1058	-0.1381
	(0.1797)	(0.3303)	(0.1897)	(0.3380)	(0.1828)	(0.2576)
Trans	-0.3436	-0.4326	-0.2114	-0.1752	-0.2366	0.0605
	(0.2438)	(0.4756)	(0.2359)	(0.4454)	(0.2525)	(0.3403)
PIncTax	**-1.8509***	-0.9652	-1.5036	0.0126	-1.3263	-0.4750
	(1.0184)	(2.0795)	(1.0236)	(2.1142)	(1.0957)	(1.4965)
CIncTax	-0.8192	-0.5164	-0.3669	0.0910	-0.0515	0.0749
	(1.0129)	(1.8758)	(0.9995)	(1.8867)	(1.0367)	(1.4330)
PropTax	-3.7643	-3.2881	-2.1330	-2.3379	1.2270	-2.6917
	(4.0938)	(7.0563)	(4.1010)	(7.1583)	(4.0575)	(5.6039)

Table 15: Continued

	Contiguity		Population-Based Contiguity		Internet	
Variable	State	Wtd. State and Local	State	Wtd. State and Local	State	Wtd. State and Local
SelTax	0.8459	3.9550	0.5499	3.9128	-0.3855	**5.7174***
	(1.9285)	(3.5774)	(1.9607)	(3.6773)	(2.3361)	(2.8801)
Expend	-0.2666	-0.6533	-0.0522	-0.4153	-0.1030	-0.1177
	(0.3374)	(0.6038)	(0.3364)	(0.5843)	(0.2688)	(0.3720)
Elect	-0.0244	0.0213	-0.0428	-0.0460	-0.0531	-0.0190
	(0.0581)	(0.1228)	(0.0576)	(0.1238)	(0.0621)	(0.0858)
Rep	0.0741	0.0667	0.0619	0.0594	0.0232	0.0646
	(0.0888)	(0.1639)	(0.0917)	(0.1699)	(0.0988)	(0.1408)
Dem	-0.0948	0.0016	-0.0390	0.0769	0.0353	0.0685
	(0.1055)	(0.1868)	(0.1048)	(0.1865)	(0.0942)	(0.1313)
Unemploy	-0.0834	0.0988	-0.0633	0.0499	-0.0239	-0.0519
	(0.1062)	(0.2037)	(0.1096)	(0.2165)	(0.1140)	(0.1602)
PCIncome	-0.0001	0.0001	-0.0001	0.0001	-0.0001	0.0001
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Over65	0.0892	0.5593	0.0984	0.7414	0.2406	0.8218
	(0.7060)	(1.3227)	(0.7192)	(1.3851)	(0.7450)	(0.9969)
Intercept	-2.6321	-11.1487	-0.6374	-9.7052	4.6428	-4.1786
	(9.9282)	(18.3106)	(10.3303)	(18.7076)	(10.0856)	(13.7603)
Rho	0.9977	0.9846	0.9972	0.9854	0.9901	0.9975

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 16: Tax Competition Model, Separate Nexus and Lagged Tax Rate (Internet Purchases)

	Internet	
Variable	State	Wtd. State and Local
Nexus	**0.0138*** **	0.0096
	(0.0044)	(0.0080)
Tax Rate Lagged	**0.6169*** **	**0.5074*** **
	(0.0383)	(0.0480)
IntPurch	-0.0048	-0.0063
	(0.0039)	(0.0072)
Nexus*IntPurch	**0.0001***	0.0001
	(0.0001)	(0.0001)
Rate Lagged*IntPurch	0.0001	0.0000
	(0.0006)	(0.0011)
Base	0.0119	0.0059
	(0.0075)	(0.0134)
Food	**0.0825** **	**0.1650*** **
	(0.0363)	(0.0588)
Debt	-0.0047	-0.0146
	(0.0213)	(0.0371)
Trans	0.0433	**0.2154***
	(0.0554)	(0.1220)
PIncTax	**0.0639***	0.0656
	(0.0333)	(0.1909)
CIncTax	0.0359	-0.1023
	(0.1645)	(0.2648)
PropTax	**0.2452** **	0.1947
	(0.1182)	(0.1861)

Table 16: Continued

	Internet	
Variable	State	Wtd. State and Local
SelTax	**0.0722***	-0.2008
	(0.0399)	(0.3850)
Expend	-0.0353	-0.0322
	(0.0353)	(0.0583)
Elect	-0.0058	-0.0139
	(0.0152)	(0.0246)
Rep	0.0033	-0.0086
	(0.0209)	(0.0353)
Dem	-0.0198	0.0502
	(0.0199)	(0.0340)
Unemploy	**0.0217***	0.0333
	(0.0124)	(0.0203)
PCIncome	**-0.0000****	0.0000
	(0.0000)	(0.0000)
Over65	-0.0353	**-0.0937***
	(0.0310)	(0.0522)
Intercept	**1.9518*****	**3.3286*****
	(0.6035)	(1.0612)
Rho	0.9193	0.9453

All regressions contain state and year fixed effects.
***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.
Standard errors are in parentheses.

Table 17: Sales Tax Revenue Model, 1999 – 2004

Variable	State	Wtd. State and Local
Tax	**0.1044***** (0.0194)	**0.1075***** (0.0143)
InRate	-0.0003 (0.0214)	0.0029 (0.0135)
OutRate	0.0193 (0.0279)	**-0.0813**** (0.0347)
InterRate	-0.0104 (0.0125)	-0.0107 (0.0137)
IntPurch	0.0007 (0.0013)	0.0010 (0.0015)
Food	**-0.0314***** (0.0117)	**-0.0326**** (0.0135)
Debt	**-0.0177**** (0.0089)	**-0.0229**** (0.0104)
Trans	0.0156 (0.0151)	**0.0308*** (0.0175)
Lottery	-0.0364 (0.1289)	-0.0804 (0.1488)
Elect	-0.0044 (0.0051)	-0.0042 (0.0059)
Rep	0.0066 (0.0070)	0.0040 (0.0082)
Dem	-0.0052 (0.0067)	-0.0063 (0.0077)

Table 17: Continued

Variable	State	Wtd. State and Local
Unemploy	**-0.0149*** **	**-0.0158*** **
	(0.0048)	(0.0055)
PCIncome	**0.0000*** **	**0.0000*** **
	(0.0000)	(0.0000)
Over65	**-0.0420*** **	**-0.0457*** **
	(0.0152)	(0.0174)
SchoolAge	0.0022	0.0025
	(0.0075)	(0.0083)
College	-0.0017	-0.0025
	(0.0015)	(0.0017)
Intercept	0.1854	0.0938
	(0.3570)	(0.3939)
Rho	0.9799	0.9772

All regressions contain state and year fixed effects.

***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

Standard errors are in parentheses.

Variables are not lagged for the sales tax revenue model.

Table 18: Sales Tax Revenue Model, Natural Log Transformation

Variable	State	Wtd. State and Local
Tax	**0.1086*** **	**0.0767*** **
	(0.0174)	(0.0119)
InRate	-0.0023	0.0112
	(0.0228)	(0.0126)
OutRate	0.0397	-0.0226
	(0.0362)	(0.0319)
InterRate	**0.0413*** **	**0.0328*** **
	(0.0107)	(0.0105)
IntPurch	**-0.0043*** **	**-0.0035*** **
	(0.0011)	(0.0011)
Food	**-0.0369*** **	-0.0218
	(0.0133)	(0.0133)
Debt	**-0.0533*** **	-0.0288
	(0.0197)	(0.0198)
Trans	**-0.0863*** **	**-0.0658** **
	(0.0297)	(0.0296)
Lottery	**-0.0439** **	**-0.0433** **
	(0.0200)	(0.0198)
Elect	-0.0008	-0.0008
	(0.0056)	(0.0055)
Rep	0.0007	-0.0010
	(0.0075)	(0.0075)
Dem	0.0014	-0.0064
	(0.0073)	(0.0072)

Table 18: Continued

Variable	State	Wtd. State and Local
Unemploy	**-0.0092****	**-0.0097****
	(0.0046)	(0.0045)
PCIncome	**0.9527*****	**0.9075*****
	(0.1216)	(0.1209)
Over65	-0.0094	**-0.0195***
	(0.0109)	(0.0108)
SchoolAge	**-0.0144*****	**-0.0146*****
	(0.0054)	(0.0051)
College	-0.0008	-0.0010
	(0.0015)	(0.0015)
Intercept	**-10.3182*****	**-9.4965*****
	(1.3339)	(1.3235)
Rho	0.9902	0.9925

Note: All monetary values are naturally logged.

All regressions contain state and year fixed effects.

***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

Standard errors are in parentheses.

Variables are not lagged for the sales tax revenue model.

Table 19: Sales Tax Revenue Model, Effective Internet Tax Rate

Variable	State	Wtd. State and Local
Tax	**0.0948*** **	**0.0792*** **
	(0.0131)	(0.0110)
InRate	0.0083	0.0130
	(0.0177)	(0.0116)
OutRate	0.0261	**-0.0686** **
	(0.0277)	(0.0286)
InterRate[a]	**0.0000***	**0.0000** **
	(0.0000)	(0.0000)
Food	**-0.0273*** **	-0.0098
	(0.0100)	(0.0118)
Debt	**-0.0096***	**-0.0151** **
	(0.0058)	(0.0067)
Trans	-0.0081	-0.0064
	(0.0151)	(0.0178)
Lottery	-0.1074	**-0.1463***
	(0.0674)	(0.0793)
Elect	-0.0026	-0.0025
	(0.0043)	(0.0050)
Rep	0.0041	0.0027
	(0.0058)	(0.0068)
Dem	0.0018	-0.0044
	(0.0056)	(0.0065)

Table 19: Continued

Variable	State	Wtd. State and Local
Unemploy	**-0.0139*** **	**-0.0139*** **
	(0.0033)	(0.0038)
PCIncome	**0.0000*** **	**0.0000*** **
	(0.0000)	(0.0000)
Over65	**-0.0155***	**-0.0164***
	(0.0085)	(0.0098)
SchoolAge	**-0.0179*** **	**-0.0248*** **
	(0.0040)	(0.0045)
College	-0.0014	-0.0013
	(0.0011)	(0.0014)
Intercept	0.2846	**0.4780** **
	(0.1957)	(0.2182)
Rho	0.9665	0.9654

All regressions contain state and year fixed effects.

***, **, * represent significance at $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

Standard errors are in parentheses.

Variables are not lagged for the sales tax revenue model.

[a]InterRate is defined in this model as: (Tax Rate x IntPurch x Nexus).

Vita

Mary Elizabeth Howard was born in Cookeville, TN, on October 15, 1977. She attended elementary and high school in Baxter, TN. Beth received her Bachelor's of Science degree in Accounting from Tennessee Technological University in Cookeville, TN, in 1999. She worked with UBS Financial Services, Inc., until returning to Tennessee Technological University to complete her MBA degree in 2002. Beth then worked in the corporate accounting department of Fleetguard, Inc., before moving to Knoxville, TN, in 2003 to pursue her Ph.D. in Business Administration at the University of Tennessee.