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This paper estimates the effect of sales taxes on employment at state borders using county-level quarterly data and a newly developed data set of local tax rates. Sales tax increases, relative to cross-border neighbors, lead to losses of employment, as well as payroll and hiring, but these effects are only found in counties with large shares of residents working in another state. The effects also represent an upper-bound, largely driven by employment shifting across the state border. We also find that employment in food and beverage stores is negatively affected when cross-border neighbors adopt low sales tax rates on food.

Keywords: sales tax, local taxes, border models, cross-border shopping

JEL Codes: H2, H7, R5

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** The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors.

I. Introduction

State and local policy makers are interested in raising revenue in ways that will minimize disruption to economic activity. The more responsive households and firms are to the tax, the greater the disruption, in terms of deadweight loss and potentially jobs. For this reason, state border regions represent a potential concern for policy makers. In areas that border neighboring states it may be relatively easy for residents or firms to take action to avoid paying certain taxes. In the case of sales taxes, large rate differentials might motivate residents to simply cross the state line to shop, depriving a state of tax revenues, retail sales, and potentially jobs. Sales taxes are the single largest revenue source for state governments (accounting for 48 percent of state tax revenue in 2009), and the second largest for local governments (accounting for 16 percent of local taxes). The rate differentials between neighboring states are large in many cases, with state general sales tax rates range from zero (in four states) to 8.25 percent. Each of the continental states without a sales tax borders at least one other state with a rate of 6 percent or higher (Figure 1). Local sales taxes are also ubiquitous and exhibit considerable range. Two thirds of border counties in states with state-level sales taxes have a local tax, with rates ranging from 0.5 to 5.0 percent.

Compared to other taxes, it is relatively easy to avoid sales taxes. Cross-border shopping entails considerably less disruption than moving to another state, as would be required to avoid a state's personal income tax, or to another town to avoid a local property tax, for example. Tax differences between regions and the possibility of cross-border shopping have inspired a relatively large empirical literature, recently surveyed by Leal, Lopez-Laborda, and Rodrigo (2010). Most of these studies, however, focus on taxable sales, tax revenues, and the implied deadweight loss of taxes.

Only a handful of papers consider how cross-border shopping influences employment (Fox, 1986, Hoyt and Harden, 2005, and Thompson and Rohlin, 2012). As shopping shifts across borders, employment is expected to follow suit. Employment will respond as firms adjust the labor needed to service a given level of business, and also as firms start up or fail in response to geographic shifts in the demand. Findings from some of the studies considering the impact of sales taxes on employment, though, are inconclusive (Fox, 1986 and Hoyt and Harden, 2005). Thompson and Rohlin (2012) find a strong negative effect of states sales taxes on employment, but do not control for local rates, which could bias the results.[1]

In this study, we explore the effect of cross-border sales tax differences on employment using improved data and methods to obtain precise estimates that are fairly robust to alternative specifications. We use quarterly data, the Quarterly Workforce Indicators (QWI) from the Longitudinal Employer-Household Dynamics program at the U.S. Census Bureau, for all counties in forty-seven states (excluding Alaska, Hawaii, and Massachusetts) and the District of Columbia between 2004 and 2009, and estimate the employment response in border counties to changes in state and local sales taxes. We use fixed effects estimators on a panel of cross-border county pairs to identify the effect of changes in the general sales tax rate on employment, hiring and payroll, while also controlling for changes in the sales tax treatment of food. We further explore the impacts of food sales tax rates on employment in food and beverage stores, and also estimate the impacts by gender and age group. Additionally, we add to the discussion of state and border-area local government competition recently explored by Agrawal (2011).

[1] This paper differs from Thompson and Rohlin (2012) in several ways, most importantly by including county-level local sales tax rates, while the previous paper only used state-level taxes. Also, this paper uses only border counties, while Thompson and Rohlin (2012) also explored some regressions using interior counties as well. In addition, this paper excludes all Louisiana counties. Additionally, this paper explores the effect of sales taxes on employment in food and beverage stores

This study also extends the previous literature by explicitly incorporating variation in an alternative "distance" measures into our estimates. Proximity to a state border is an imperfect measure of the cost of cross-state shopping. Some state borders are separated by lakes and rivers, making travel difficult. In other cases, traffic and congestion may raise the time and gas cost of travel considerably. When residents work and live in different states, though, cross-border travel costs and time for shopping are minimized. Our specifications explore differential responses among border counties by the share of residents working in another state.

Our results show that sales tax changes have a detrimental effect on employment, payroll, and hiring in border areas, but that these effects are only present in counties with substantial levels of cross-border commuting. Specifically, among cross-border pairs of counties with the highest levels of inter-state commuting (above 22 percent of employed residents), we find that a 1 percentage point increase in the combined state and local sales tax rate results in a 0.2 to 0.3 percentage point decline in the share of total employment in the county pair. For those high-commuting areas we also find that the share of hiring and the share of payroll decline in counties raising sales taxes relative to their cross-border neighbor. Effects for all counties combined or for counties with lower levels of cross-border commuting are smaller and not statistically different from zero, although the coefficients are usually negative. Variables reflecting the sales tax treatment of food have no apparent impact on total employment, but do decrease employment (and payroll and hiring) in food and beverage stores. In counties where the cross-border neighbor adopts preferential sales tax treatment of food, the county share of food and beverage store employment in the county pair declines 0.24 percent in high commuting counties and between one-half and three-quarters as much in low and moderate commuting counties.

The next section briefly reviews previous literature and describes our empirical approach to estimating the employment effect from sales tax changes, including a description of the data used and the sales tax policy changes under study. The following section includes the results from our different specifications. The final section discusses these findings and concludes.

II. Identifying the Employment Impacts of Cross-Border Shopping Caused by Sales Taxes

Previous studies of sales taxes and cross-border shopping have typically estimated basic local demand functions, where shopping is a function of income and prices in a county and in neighboring counties, as well as the cost of transportation.

$$(1) \qquad S_{it} = F(\alpha_0 Y_{it} P_{ijt}^{\ T} P_{ijt}^{\ U} C_{ij})$$

Where $P_{ijt}^{\ T}$ is the ratio of after-tax prices between county "*i*" and neighboring county "*j*" in the taxed sector, $P_{ijt}^{\ U}$ is the ratio of prices in the non-taxed sector, and C_{ij} is the cost of travelling between the two counties.

$$(2) \qquad P_{ijt}^{\ T} = (\tau_{it} + (p_{it} - \theta\tau_{it})) / (\tau_{jt} + (p_{jt} - \theta\tau_{jt}))$$

In (2), p_{it} is the pre-tax price and θ is a scalar representing the portion of the sales tax incidence on the seller.[2] If the consumer faces the full incidence of the tax, then θ is equal to zero and the after tax price in county "*i*" is simply [$\tau_{it} + p_{it}$].

The anticipated relationship between relative prices and shopping is negative. As own-prices rise relative to neighboring counties, local shopping declines.

[2] This expression simplifies to ratios of [(1-θ)T + p] in the two areas, but the depiction in (2) makes the separation between the tax and the pre-tax price clear.

(3) $$\frac{\partial S_i}{\partial P_{ij}} < 0$$

General demand equations include prices of taxable and non-taxable goods, as in (1), but empirical work on cross-border shopping typically assumes that the ratio of prices of non-taxed items between adjacent cross-border counties is equal to one, and can be excluded from the estimation. Studies differ in how they treat pre-tax prices for taxable items. In the conceptual model used by Fox (1986), the ratio of pre-tax prices for taxable goods is not assumed to be one or to be constant. Lacking data for actual pre-tax prices, though, Fox uses factors influencing pre-tax prices (including automobile travel costs and tax rates) in his empirical model. In his estimates using quarterly data, though, automobile costs are highly collinear and drop out.

Research examining the impact of sales taxes on pre-tax prices has generally concluded that the tax is primarily incident on the consumer, not the producer. A number of studies find that the tax is sometimes "over-shifted," causing pre-tax prices to rise by amount greater than the tax increase itself. Using city-level price data for specific commodities over many years, Besley and Rosen (1999) find evidence of over-shifting, while Poterba (1996) shows full, but not over, shifting. Ring (1999) uses state-level data and finds that sales taxes are only partially shifted to consumers, with the share borne by consumers averaging 59 percent across states. Ring (1999) also found that the consumers' share was rising over time. Cole (2009) studied prices of computers during sales tax holidays between 1997 and 2007, and found evidence that the sales tax is "fully or slightly over-shifted" to consumers.

In their study of cross-border shopping, Walsh and Jones (1988) treat the ratio of pre-tax prices as equal to one, assuming that input costs are equal on both sides of the cross-state

border.[3] This is consistent with the finding that taxes are fully shifted onto consumers, and is a standard assumption in incidence analysis. In this paper we follow Walsh and Jones (1988) and effectively assume input costs are equal on both sides of the cross-state border. To the extent, however, that pre-tax prices are not equal, our estimates will be biased. If some portion of the sales tax is borne by producers, then our findings will understate the employment response to the tax change. If sales tax changes are "over-shifted" onto consumers, our findings will overstate the employment response.

A. Previous Empirical Findings

Decades ago Mikesell (1970, 1971) and Fischer (1980) examined the influence of sales taxes on cross-border shopping at the county and city level. Like most of the more general cross-border shopping literature, surveyed in Leal, Lopez-Borda, and Rodrigo (2010), however, these early studies focused on sales, not employment. More recent analysis by Fox (1986) and by Hoyt and Harden (2005) has explored the employment effects. The findings from these studies are suggestive, but remain inconclusive. Both Fox (1986) and Hoyt and Harden (2005) find that sales tax increases reduce employment, relative to cross-border counties, but in both cases the findings are statistically insignificant at standard levels, and are sensitive to the particular specifications. Fox (1986) uses quarterly county-level panel data, and compares border counties in several Tennessee MSAs to their cross-border counterparts in Kentucky, Georgia, and Virginia.[4] Most of the sales tax coefficients from the various specifications explored by Fox (1986) were statistically insignificant. Fox does report findings from regressions using total employment as the dependent variable which indicate a one percentage point increase in the sales

[3] Walsh and Jones also assume that firm cost structures are constant on both sides of the border.

[4] Fox (1986) transforms level variables to "relative" variables by, in the case of employment, for example, dividing the employment of $County_i$ by the total employment in $County_i$ plus that in its cross-border pair, $County_j$.

tax rate in Tennessee results in a 4.7 percent reduction in relative employment in the Tennessee portion of the Clarksville/Hopkinsville MSA relative to the non-Tennessee portion, but only a 0.32 percent reduction in the Tri-Cities MSA relative employment from the same size of sales tax change.

Hoyt and Harden (2005) use county-level panel data with annual observations for MSAs in all 50 states. They use county-level fixed effects, and explore the differential response among border and "interior" MSAs by estimating separate equations for the two groups. The results for border MSAs also include variables reflecting the sales tax rate of neighboring counties (weighted by the county share of total MSA population). Coefficients from the main specification are negative, but insignificant, for own-county sales taxes and positive and insignificant for neighboring county sales taxes.

Thompson and Rohlin (2012) uses quarterly county-level data from the US Census Bureau's Quarterly Workforce Indicators (QWI) and an "augmented border approach" to study the effects of state sales tax changes on employment, payroll and hiring. That earlier paper finds evidence of negative effects on employment, as well as payroll and hiring, particularly in border counties, relative to counties on the interior of a state, and in cross-border county pairs with high levels of interstate commuting. But, those estimates are potentially biased because the analysis does not include local sales tax rates. Also, the employment effects reported in that earlier paper likely overstate the employment effects from sales tax changes due the construction of the dependent variable. To the extent that sales taxes reallocate shopping across borders, the estimates in Thompson and Rohlin (2012) are as much as twice as large as the actual effect on employment in counties raising rates. The findings in this paper are not entirely free of that concern, but some alternative specifications are used to explore the extent of cross-border

reallocation and discussion of the findings makes clear that the measured effects represent an upper-bound to the employment effects.

III. Our Approach and the Data

This paper uses the same county-level employment data as Thompson and Rohlin (2012) as well as newly collected data on local sales tax rates – quarterly rates for all counties between 2004 and 2009 – to study the employment effects of sales taxes at state borders. We explore the differential effect of sales tax increases by the extent of economic contact between county pairs, proxied by the share of county residents who work in another state.

A. Changes in state and local sales tax rates

Between 2004 and 2009 there were 20 general sales tax changes in 16 states (see Table 1). The average cumulative point change in these states was 1.0 percent, with the largest increase in California (2.5 percentage points) and the smallest in Washington DC, which raised its rate 0.25 percentage points in the fourth quarter of 2009. Seven states also modified their sales tax treatment of food purchased for home consumption over this period, with all states lowering their rates. Three of those states fully exempted food from the general sales tax.

State sales tax rate changes between 2004 and 2009 were implemented during each of the calendar quarters. Four of the twenty changes were implemented in the first and second calendar quarters, while six changes were implemented in the third and fourth. Using annual average data like Hoyt and Harden (2005) makes it harder to identify the impact of sales tax changes due to aggregation bias. Sales tax changes can occur in any calendar quarter, and the annual average employment level combines pre- and post-tax change quarters. Because the particular quarter

when the policy change is implemented varies over states and over time, using quarterly data provides additional variation for identification.

Unlike most previous analysis, this study considers combined state and local rates for all states. The previous studies that have included local rates have either been cross-sectional (Agrawal, 2011), or focused on single states or regions (Fox, 1986, Luna, Bruce, and Hawkins, 2007, Walsh and Jones, 1988). We have data for 3,003 counties, although we focus on the 1,092 counties on a state border. Nearly all of the border counties are in states with sales taxes (1,046) and sixty percent (634) of those counties also have local sales taxes. [5] The local taxes we collect are at the county-level for the whole county, and do not include city-specific taxes, although this distinction is not always clear in the statistical reports made available by state tax and revenue offices. These local rates are also intended to reflect taxes collected at the local level, whether or not the local jurisdiction determines those rates.

Local sales taxes are very common in states with sales taxes, but the rates are typically quite low. In the 1,790 counties with local taxes (2009 Q2) the rate ranged from 0.5 to 5.0 percent, averaging just 1.18 percent (**Table 2**). Between 2003 (Q2) and 2009 (Q2), more than one fourth of the counties with a local tax changed their local rate. Changes in local rates ranged from -1 to +2 percent, averaging .09.

The sales tax rate we use in this paper is the combined state and local general sales tax rate. This is the same as in most other studies (Fox, 1986; Walsh and Jones, 1988). The sales tax rate used in Hoyt and Harden (2005), though, is the effective sales tax rate which divides sales

[5] These data were gathered by the authors and research assistant Thomas Krumel over the internet from state tax and revenue office statistical reports. The data for Tennessee were provided by Don Bruce.

tax revenue by personal income.[6] This choice of tax rate introduces the possibility that changes in the denominator (a county's personal income) are influencing the effective tax rate in ways unrelated to the costs of shopping in another county. Also, because they smooth the local component of the sales tax over five years, Hoyt and Harden's (2005) tax rate measure dampens the actual variation in statutory sales tax rates, and arbitrarily assigns equal changes over the five years spanned by the Census of Governments, regardless of the year in which an actual law change may have occurred. We use the actual sales tax rate in order to avoid some of these concerns.

B. Quarterly UI-based data (Quarterly Workforce Indicators)

The primary data used in this paper are the Quarterly Workforce Indicators (QWI) from the Longitudinal Employer-Household Dynamics (LEHD) program at the US Census Bureau. These data are based on Unemployment Insurance (UI) wage records made available through a data sharing arrangement between the Census Bureau and 49 states; Massachusetts is the only state not included in the most recent data. Over the 2004 to 2009 period, we have quarterly data for forty-seven continental states and the District of Columbia.[7] We exclude Lousiana, and all of the cross-border county pairs that include Lousiana counties, from the analysis due to the timing of Hurricane Katrina, which hit in August 2005, in the middle of the period we are analyzing. The 46 continental states that are included in the QWI over the full range of years that we study contain 3,003 counties. The regressions include as many as 1,233 pairs of cross-border neighbor

[6] Annual State-level sales tax revenue is from the Census Bureau's Survey of State Government Finances, while the county level sales tax figures are produced every five years in the Census of Governments. The county level annual collections are estimated by Hoyt and Harden (2005) by smoothing the data over the intervening years.

[7] Data for the District of Columbia were first brought into the QWI system in early 2012, with data reaching back to the second quarter of 2005.

counties. For the food and beverage industry and for younger age groups there are fewer cross-border pairs with usable data.[8]

The QWI data include counts and means of quarterly employment and earnings information by county, ownership status, and broad-industry group for all workers in all establishments covered by UI in those states.[9] Because the data are based on Unemployment Insurance wage records, results even for most individual small counties are available and reliable, whereas they would not be in a standard survey.[10] Additionally, because the data are quarterly, empirical tests can be closely tailored to the timing of the policy, instead of relying on annual averages which might dampen the impacts. Also, there are several variables in the QWI that are not present in other data sets that can be explored as possible responses to the sales tax: hiring decisions and payroll, which reflect joint changes in employment as well as hours.

The data can also be further broken down by some limited demographic variables. Additional tabulations by age group and gender is the option available over the longest period, but more recently the QWI can alternatively be tabulated by age and education groups or by race and ethnicity groups. Previous studies in this literature have not typically controlled for demographics, but in this paper we do explore some of the tabulations of the QWI data by gender and age group. Some of the regressions also include county-level income data from the Bureau

[8] None of the counties bordering Massachusetts can be used, and all of the county-pairs including Louisiana are also dropped. In some smaller counties the QWI does not provide employment data for smaller industries or age groups, resulting in county pairs with missing data.

[9] The QWI data are described in detail in working papers by principal investigators and staff at the LEHD, including Abowd, et al. (2006). Access to the underlying LEHD "infrastructure" files is limited. Two public-use versions of the data, referred to as the Quarterly Workforce Indicators, are available. Eight QWI variables, including employment, earnings, turnover, separations, and hires can be accessed at a web-site targeted to "workforce development" practitioners. For this study, the full QWI data were accessed through the Cornell Institute for Social and Economic Research using the Cornell VirtualRDC. Only data for private sector employment are used.

[10] The QWI data are subject to a distortion procedure designed to protect confidentiality of the underlying data, but also retain "analytic validity" for researchers. As Abowd, et al. (2006) explain, "the statistical properties of [the primary means of] distortion are such that when the estimates are aggregated, the effects of the distortion cancel out for the vast majority of the estimates, preserving both cross-sectional and time-series analytic validity." Estimates based on three or fewer persons or firms are suppressed entirely in the QWI.

of Economic Analysis (BEA). Since these income data are only available annually, these specifications include only one calendar quarter from each year.[11]

C. Distance Measures – Geography and Economy

Similar to Fox (1986) and Hoyt and Harden (2005), this study employs a border approach. Cross-border shopping is more prevalent when transportation costs are low. It is typically easier for residents of border counties to travel across the state line to take advantage of lower after-tax prices than it is for residents of the interior of the state. The impact of the sales tax differences on shopping and employment is expected to dissipate as you go from the border to the interior of the state. For the purposes of identification, the border method, as emphasized in the analysis by Holmes (1998), allows comparisons between neighboring areas that are part of the same labor market and presumably differ only as a result of the time-varying cross-state tax differential we are studying. "Spillovers" caused by policy changes on one side of a border, causing employment to rise on the other side of the border, are a complication for identification, but do so in a way that systematically overstates the magnitude of the effects. We discuss spillover in the case of sales taxes at state borders, and how it influences the interpretation of our results, later in the results section.

Figure 2 is a county map of the United States that highlights counties on the state border (shaded in dark gray), and interior counties that are not on the border (shaded in white).[12]

Using only the border counties, we calculate the difference in employment and sales tax rates for each cross-border county pair, the employment share for each county in the pair, and include county pair fixed effects in the regressions. The identifying assumption in all of these

[11] In regressions reported below we use the second quarter, but the results do not depend on the choice of quarter.
[12] Border counties with more than one cross-border neighbor will appear in multiple cross-border pairs.

fixed effects specifications is that it is the sales tax variation that is driving the observed employment differences, not other factors the vary across counties and over time, and are hence not absorbed by the county fixed effect. This assumption is more likely to hold when we include only counties adjacent to the state border, and directly compare cross-border pairs of counties. Cross-border pairs are assumed to be part of the same labor market and influenced by the same economic factors, save for policy differences between the states. Similar to Rohlin, Rosenthal, and Ross (2012), we initially use these cross-border differences as the dependent variable and the independent variables of interest and estimate:

$$(4) \qquad EMP_{ijt} = \alpha + \beta_1 DiFF\_SalesTax_{ijt-1} + \beta_2 DIFF\_X_{ijt} + \gamma_{ij} + \delta_{t1} + \delta_{t2} + \varepsilon_{ijt} .$$

The "sales tax" is the statutory general sales tax rate, and X_{it} is a vector including the tax treatment of food, and, in some cases, a measure of personal income. These differenced specifications include year and quarter fixed effects ($\delta_{t1,2}$) as well as county-pair-level fixed effects (γ_i).[13] Other differenced covariates (DIFF_X_{ijt}) include the food sales tax rate, and in some specifications personal income. Effectively, the key coefficient (β_1) reflects differences from the over-time average for the county-pair. In all specifications we use robust standard errors to allow for unknown forms of heteroskedasticity. We also cluster standard errors at the state-level to allow for an arbitrary variance-covariance structure within each state. The regressions are also weighted by the square root of the combined total population of the county pair.[14]

[13] Regressions are estimated in STATA, using xtreg, fe.

[14] Results from unweighted regressions are not shown in this paper, but the coefficient magnitudes and the statistical significance for most regressions, as well as the overall pattern of results, are not dependent on the use of weights. Results from the unweighted regressions are available on request from the authors.

The dependent variable, similar to the other differenced variables in the specification, is calculated as the difference in employment between the two counties in each cross-border county-pair:

$$(5) \qquad EMP_{ijt} = \ln(EMPLOYMENT_{it}) - \ln(EMPLOYMENT_{jt})$$

In most specifications, however, we use the county share of employment in the cross-border pair as the dependent variable:

$$(6) \qquad EMP_{ijt} = \frac{EMPLOYMENT_{it}}{EMPLOYMENT_{it} + EMPLOYMENT_{jt}}$$

To the extent that some of the jobs lost to one county are gained by other counties – as shopping relocates across the state border – using either the differenced version of the dependent variable or the share version will overstate the employment effect of sales tax changes, giving us an upper bound of those effects. Regressions using either dependent variable produce equivalent results, but the share version makes clear, for exposition purposes, that we are measuring changes in the share of employment, not necessarily lost employment for the county or, for that matter, the cross-border pair. For this reason, most of the regressions use the employment (or payroll or hiring) share dependent variable.

This paper uses a border method that is similar to some previous research, but cross-border county pairs may be imperfect measures of the feasible alternative shopping locations. In some cases, cross-border counties are separated by rivers or lakes with no available bridge or commercial ferry service. These cases can be excluded, at the cost of losing most observations in the data, by focusing exclusively on MSAs (as in Hoyt and Harden (2005)). In some cases, though, travelling between counties within an MSA is time consuming (congestion, limited

public transportation) and costly (tolls, gas, and parking). The potential after-tax cost savings is the factor motivating cross-border shopping, and geographic proximity to the border is simply a proxy for cost. We explore an alternative proxy based on the share of county residents working outside of the state. More cross-state employment among cross-border pairs is a further sign of the relative ease of transportation between the states. The share of employed residents working in another state ranges from 0 to 66 percent, with a mean of 4.2 percent. Among the border counties in our data, the share working in another state also ranges from 0 to 66, with an average of 9.2 percent. Limiting the data to only the 286 border counties in MSAs, the share working in another state ranges from 0.6 percent to 56 percent, with a mean of 12 percent.[15]

Residents crossing the border to work have already taken on the cost of getting to the other state, so additional costs associated with taking advantage of sales tax rate differentials should be low. Cross-border county pairs with greater concentrations of out-of-state employment are expected to exhibit larger reactions to cross-state tax differentials. We explore the influence of cross-state commuting first by including interactions between the sales tax variable and the share of cross-state commuters, and then by separately estimating (4) for high and low cross-state employment groups. Breaking the number of cross-border pairs roughly into thirds, we estimate (4) for pairs with less than 11 percent (combined) working in another state, from 11 percent up to 22 percent, and 22 percent or higher.

If employers reduce employment in response to tax-induced reductions in sales, then payroll should also be expected to decline. Firms reducing their overall employment will also reduce their hiring. We use the additional variables in the QWI to explore each of these

[15] The share of county residents working in another state is calculated using the 2000 Census, and is calculated separately for both counties in each pair, so the combined out-of-state work share could be as high as 200 percent if all residents in both counties worked in a state other than the state of residence.

additional outcomes. And we also explore the impacts on employment among food and beverage stores, and among female employees and different age groups.

IV. Results

We begin by presenting results using the differenced employment dependent variable, highlighting the differential impact by the extent of cross-state commuting in the county pair and the impact of adding local sales taxes to the state-level rate. Next we show how the employment impacts are influenced by the inclusion of an additional variable reflecting county-level personal income, and compare the results from several different approaches to parameterizing the employment dependent variable before settling on the employment share. We then consider the impacts on payroll and hiring. The section concludes by presenting results showing employment (and payroll and hiring) effects for food and beverage stores, and employment effects by gender and for different age groups (shown separately for food and beverage stores and for non-food industries).

A. Baseline Results by Extent of Working Out of State

The preliminary results in Table 3 – using differenced employment levels as the dependent variable – indicate that counties in states that raise the sales tax rate by one percentage point see employment fall by 1.4 percent relative to their cross-border neighbors (Panel A, Column 1). The remaining results in Panel A suggest, however, that the employment effects from a state sales tax increase are isolated to those county pairs with relatively high levels of cross-border commuting. When we include an interaction between a continuous measure of the commuting share (the percent of employed county residents who work in another state) and the sales tax difference measure, we see that the interaction term is negative and significant, while the main effect is small and not statistically significant (Column 2). The implication that the

employment effects are larger for, and only statistically significant in, counties with higher levels of cross-border is supported in specifications that use a discrete interaction term for "low" (less than 11 percent), "medium" (from 11 up to 22 percent) or "high" (22 percent and higher) level of cross-state commuting (Column 3) as well as specifications which estimate (4) separately on those groups.[16] The results on the separately estimated specifications indicate that a one percent increase in a state sales tax rate reduces border county employment by 1.5 percent relative to cross-border neighbors in mid-level commuting counties and 2.1 percent in high-level commuting counties, but has no effect in county pairs with lower levels of cross-border commuting.[17]

B. Local Sales Taxes and Employment Shares

If local governments enact sales tax rate changes that exacerbate or offset the differences created by state-level policy changes, then our results in Panel A will be biased. To test whether omitting local sales taxes are biasing the results we estimate the effect of sales taxes on employment by incorporating local sales tax changes. After we include the local sales tax rate, creating a combined state and local rate, we find that employment effects are slightly smaller. Each of the specifications using the combined state and local sales tax rate produces a smaller coefficient than the identical regressions using only the state-level rate, while the signs and significance levels of the coefficients are unchanged. Once the local rate is included, however, the coefficients for mid-level commuting counties are no longer statistically different from zero.

[16] These categories split the sample of county pairs into three roughly equal sized groups.

[17] These results for employment effects from state sales taxes are considerably lower than what was previously reported in Thompson and Rohlin (2012). The differences are due to a number of factors. Counties from Louisiana, not included here due to concerns over the impact of Hurricane Katrina, were previously included in Thompson and Rohlin (2012). Data for Washington DC are include here, but were not included in Thompson and Rohlin (2012) since they were not available at the time the files were constructed for analysis. Also a coding error in the program merging the personal income covariate into the QWI data produced an error which inadvertently resulted in larger coefficients in Thompson and Rohlin (2012).

The sales tax coefficient in Column 6 (separate specification for high commuting pairs) is 16 percent smaller when we include local sales taxes for a combined sales tax rate. These results indicate that employment declines 1.8 percent in high-commuting counties relative to cross-border neighbors following a one point increase in the combined sales tax rate. Overall, these findings suggest that excluding local sales taxes, which much of the literature does due to difficulty obtaining local sales taxes, overestimates the true effect of state sales tax changes.

Inclusion of a covariate for the cross-border difference in the sales tax rate on food does not affect the main sales tax coefficient on any of the specifications in Panels A or B. The coefficients on the food tax variable are small and none are statistically different from zero.

C. Including Personal Income

Personal income is part of the local demand function (1), but is not available quarterly at the county (or state) level, so has not been included in the specifications presented in Tables 3. We can include county-level personal income as a covariate if we include only one quarter from each year. Panel A in Table 4 contains results from specifications using the employment difference dependent variable using all quarters without the income covariate (columns 1 through 4) alongside the results from specifications using only the second quarter and including personal income (columns 5 through 8). In all of these specifications the coefficient on income is positive and highly significant. The sales tax coefficients in those specifications are quite similar to what we see in columns 1 through 4. The signs on the sales tax coefficients are negative, and the magnitude is somewhat larger for counties with more cross-state commuting. After including the personal income covariate, the combined sales tax coefficient for high-level commuting areas rises from -1.8 percent to -2.2 percent (Panel A, Columns 4 and 8).

D. Interpreting the Employment Impacts in the Presence of Spillover Effects

If employment shifts across state borders in response to sales tax increases – following the flow of shopping dollars as they shift from the high-tax side to the low-tax side – then calculating the employment effects using cross-border differences will overstate the employment effects. Without knowing the extent of the spillover, we do not know much our specifications overstate the employment impacts.

With no cross-border employment spillover in response to a sales tax change on one side of the border we would expect specifications using the employment difference dependent variable to produce the same results as specifications using only the county-level employment ($\ln(EMPLOYMENT_{it})$) as the dependent variable in (4). If all of the measured employment difference is due to cross-state spillovers, we would expect the specifications using the county employment level dependent variable to result in coefficients as little as one half the magnitudes of coefficients using the differenced dependent variable. Panel B includes the sales tax coefficients from specifications similar those from in Panel A, but instead using county employment level as the dependent variable. The coefficients from employment regressions for high-level commuting area – the only specifications that are consistently different from zero statistically – are two thirds the size of those using the differenced dependent variable, consistent with a substantial amount of spillover. If measured employment losses are due solely due to spillover, we would also expect specifications using the combined employment of the cross-border pair ($\ln(EMPLOYMENT_{it} + EMPLOYMENT_{jt})$) as the dependent variable in (4) to find zero employment effect. The coefficients from specifications using combined employment level as the dependent variable (Panel C) are very small and not significantly different from zero.

Given that the results from these regressions using different ways of characterizing the employment variable are consistent with very high levels of cross-border employment spillovers, the employment effects we measure are best viewed as indicating changes in the employment share within the cross-border pair of counties. For the remainder of the paper, we use the employment share dependent variable for purposes of exposition. As expected, specifications using the employment share dependent variable yield similar results. Each of the sales tax coefficients is negative (Panel D), but they are larger and only statistically different from zero in county pairs with higher levels of cross-state commuting. In the highest commuting areas, the employment share declines between 0.25 and .34 percent, when the personal income covariate is included (Column 8).

E. Considering the Impacts on Payroll and Hiring

In addition to employment, both payroll and hiring are important to local policymakers, making them potentially important outcomes in their own right. Payroll and hiring also represent other means of detecting the impact of general of sales tax changes on economic activity. Panels B and C in Table 5 show results from specifications using share of payroll and share of hiring, respectively, as the dependent variable. In both cases, the coefficients tend to be negative, with larger magnitudes in counties with more cross-border commuting. Results from the specifications including personal income (Columns 6 through 10) indicate that a one point increase in the combined state and local sales tax rate lowers the county share of payroll by 0.3 percent and the share of hiring by 0.6 percent (Column 10 in Panels B and C).

For each potential outcome (employment, payroll, and hiring) the coefficient for higher commuting areas is larger in the specifications including personal income. In the specifications without personal income the employment effects for mid-level commuting areas statistically

significant and as large, or larger, than those from the highest commuting areas. Sales tax coefficients from the lowest commuting areas (Columns 3 and 8), however, are always the lowest and never statistically different from zero. The coefficients for the food sales tax rate are small, not statistically significant, and lacking a consistent sign for each outcome variable.

F. Alternative Food Tax Variables and Effects for Food and Beverage Stores

If the sales tax treatment on food has any effect on employment (or hiring or payroll) that is independent of the effect of the general sales tax rate we would expect it to be present in stores that sell groceries. Estimates of the direct effect also might be sensitive to how the food tax covariate is parameterized. Results from specifications exploring the influence of industry type and food tax parameterization are included in Table 6.

When the same regressions shown above in Table 5 are estimated using food and beverage stores (3-digit NAICS code 445), there are no consistent results suggesting any particular relationship between state and local sales taxes, or the tax treatment of food, and employment, payroll or hiring (not shown). The results are entirely different, however, if instead of using the cross-border difference in the sales tax rate on food, we use indicators identifying whether a county is in a state that has adopted preferential sales tax treatment of food ("low food tax") and another for whether the cross-border neighbor is in a state that has adopted preferential treatment of food ("neighbor low food tax").[18]

Employment in food and beverage stores is not influenced by the general sales tax rate, but does seem to be negatively affected when cross-border neighbors adopt special tax treatment on food sales. In high-commuting counties, the employment share declines .24 percent; the effect

[18] Using this alternative food tax variable is never significant in, and makes no difference on, regressions for all industries combined or on non-food industries.

in other counties is small, but still statistically significant (Panel A, Columns 3 through 5). The sign on the own-state tax treatment of food is usually positive, but the magnitudes are small and the estimates (for employment and payroll at least) are not statistically different from zero. The share of hiring for food and beverage stores in high commuting areas falls 0.5 percent when neighboring states adopt low food taxes, but the own-state effect is positive and significant, rising 0.2 percent (Panel C Column 10). The own-state food tax indicator in the hiring regressions, however, is highly sensitive to the inclusion of the personal income covariates. Without personal income the magnitudes are small, signs are inconsistent, and not of the coefficients are significantly different from zero (Panel C columns 1 through 5). Including personal income, all of the coefficients are positive and most are statistically different from zero, but the effect is present in low and high-level commuting areas.

G. Effects by Age Group and Gender

In the final portion of the results section we use the limited demographic variables in the QWI to explore whether the sales tax-related employment effects vary by group. For both non-food industries (all industries excluding NAICS 445) and food and beverage store employment, we re-estimate (4) for teenage (14-18), other young (19-21), and adult (22-99) workers and for males and females separately.

In non-food industries the employment effects are somewhat larger for male than females (-0.45 percent versus -0.22 percent in in high commuting areas using regressions with personal income included; Table 7, Column 10, Panels A and B). For males, the employment effects in non-food industries are also significant in mid-level commuting areas. For teens (14-18) and other young workers (19-21), however, the employment effect are not statistically significant and often have the "wrong" sign, but with very small coefficient (Panels C and D). When we exclude

teen and other young works, and focus explicitly on adults (22-99), the employment effects are the same as what we reported earlier in Table 4 and 5.

Employment effects appear to differ by demographic groups in food and beverage stores as well, but in different ways than they do for non-food industries (Table 8). In food stores the employment effects are greater among females. Neighboring states adopting preferential sales tax treatment of food is related to 0.21 percent declines in a county's share of male employment in the cross-border county pair, but a 0.26 percent decline in female employment (Column 10 Panels A and B). Also, unlike non-food industries, the employment effects for younger workers are negative and mostly statistically significant. Effect on the county share of teen employment are negative when neighboring states lower taxes on food, but these effects appear to be concentrated among low commuting counties, a pattern which contrasts sharply with what we observe for every other groups, industries, and outcome. Young workers (19-22) and adult workers (22-99) follow a similar pattern, with the effects for each being larger and statistically significant in high-commuting areas. But the effects appear to be larger among young worker. In food stores the county share of young worker employment falls 0.36 percent when neighbors lower food taxes, compared to a 0.26 decline for the adult share (Column 10 Panels D and E).

V. Discussion and Conclusion

This paper examines the effects of increases in state and local sales taxes on employment (and payroll and hiring) in state border areas. Combined sales tax rates appear to influence employment, payroll, and hiring, but those effects are concentrated in counties with relatively high levels of cross-state commuting. Neighboring states' sales tax treatment of food impacts employment, payroll, and hiring in food and beverage stores, and those effects are somewhat larger for females and younger workers.

One key result highlighted in the analysis is that for county pairs with the highest levels of cross-state commuting among the workforce – with 22 percent or more of employed residents traveling to another state for work – the county share of employment declines 0.34 percentage points following a one point increase in the combined state and local sales tax rate. The construction of the employment share dependent variable in the presence of employment spillovers following shifts in cross-border shopping suggests that these effects represent an upper bound on the actual employment decline an individual county will face. Regressions exploring the effects using several alternative dependent variables indicate that spillovers are likely, and that the effects on county employment will be between two thirds and one half as large as our results suggest.

Despite the concern implicitly raised by Agrawal's (2011) research on the strategic response by border-area local governments to state-level sales taxes – where local policy changes work to diminish cross-state differences – our results suggest that using only state-level rates does not impart a downward bias to our estimates. When we include local rates, the employment effects actually rise modestly. Our state and county sales tax rate data do confirm the presence of the relationship described in Agrawal (2011). In the cross-section we observe a negative correlation between local rates and the own-state rate, and a positive correlation between the local rate and the combined rate in the cross-border neighbor (Appendix Table 1, Panel A). The correlation coefficients in our rates for 2009 Q2, for example, are -0.2 and +0.1, respectively.

When we look to changes over time, however, these correlations are absent across the spans of time we explore in this paper. The correlation coefficient between 2006 Q2 to 2009 Q2 rate changes in rates is just -.024 between the local rate (of border counties) and the own-sate rate, and only 0.003 between the local rate and the combined rate of the cross-border neighbor

(Panel B). Since the regressions in this paper analyze over time changes using county pair fixed effects, we are differencing from any given quarter and the over-time average within that county pair. Correlation coefficients between rate changes constructed to be equivalent to that over-time differencing are nearly as small as those looking at the 2006 to 2009 change.

The only case where we find correlations between rate changes that are consistent with the mechanism described by Agrawal (2011) is when we measure correlations between changes over the longest period available in our rate data (2003 to 2009). Measured over six years we do observe coefficients indicating that changes in local rates are negatively correlated with changes in the own-state rate (-0.12) and are positively correlated with changes in the combined rate of the cross-border neighbor (.04), with magnitudes roughly half as large as what we observe in the cross-section. The employment effects we measure in this paper apparently occur over the relatively short-term, shifting across the state border along with shopping, before local governments respond. Because they ultimately do respond, however, it is likely that the effects we measure are not permanent features, but will instead be at least partially counteracted by offsetting policy changes on the other side of the border.

In the near term, though, the primary objective for state and local governments in raising sales tax rates – to generate additional revenue to finance basic public services – will be achieved, though with some leakages due to increased cross-border shopping. The ability of state and local governments to raise tax revenues in the near term is particularly important during periods of economic distress. Those public services, including public safety and education services, are generally valued by residents, but the employment effects we identify in this paper make clear that those revenue increases come at an economic cost for a state's border region. These costs, however, are quite possibly primarily limited to geographic shifts in employment,

hiring and payroll within the broader region with little net reduction for the combined region. The extent to which residents and policy makers value own-state (or county) economic opportunities relative to those in the broader region will influence perceptions of the tradeoff between revenue and services on the one hand and taxes and economic costs on the other.

This paper extends the literature by gathering and incorporating county-level sales tax rates into the analysis. Counties are the predominant source of local sales taxes, but many cities also have rates, and that variation could have still further implications for the measured employment effects of sales taxes at state borders. Future work in this area will be directed toward collecting over-time changes in those city-level taxes.

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Figure 1. State Sales Tax Rates in 2009

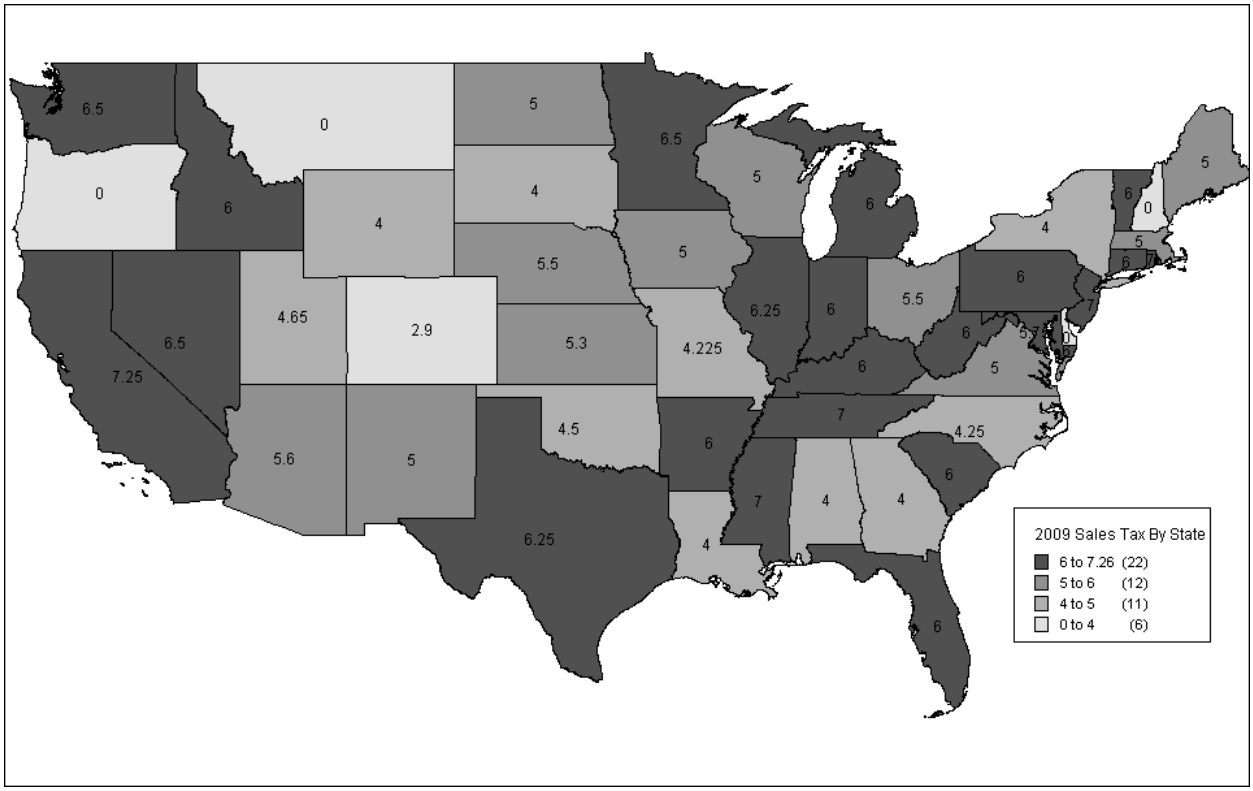

Figure 2. U.S. County Map showing border counties

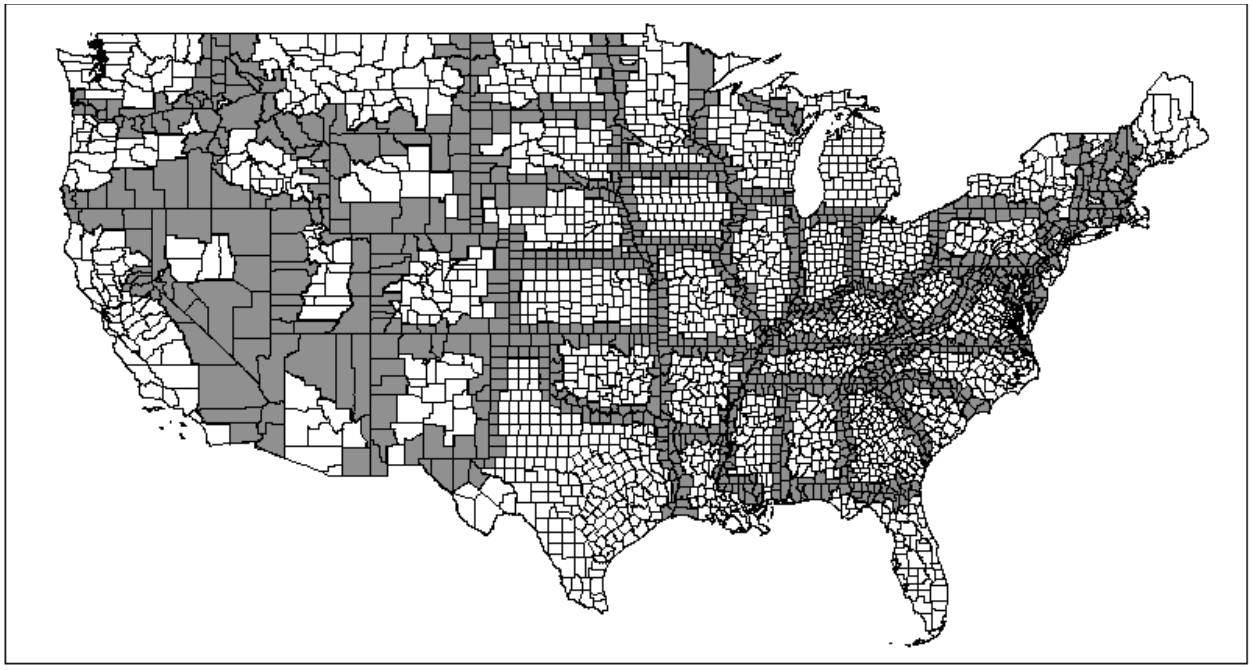

Table 1. States changing general sales tax rates in 2004 to 2009

	2003	2004	2005	2006	2007	2008	2009	2010
Arkansas	5.13	5.13	6	6	6	6	6	6
California	6	6	6.25	6.25	7.25	7.25	7.25	8.25
District of Columbia	5.75	5.75	5.75	5.75	5.75	5.75	5.75	6.0
Idaho	5	6	6	6	6	6	6	6
Indiana	6	6	6	6	6	6	6	7
Iowa	5	5	5	5	5	5	5	6
Maryland	5	5	5	5	5	6	6	6
Massachusetts	5	5	5	5	5	5	6.25	6.25
Minnesota	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.875
Nevada	6.5	6.5	6.5	6.5	6.5	6.5	6.85	6.85
New Jersey	6	6	6	6	7	7	7	7
North Carolina	4.5	4.5	4.5	4.5	4.25	4.25	4.50	5.75
Ohio	5	6	6	5.5	5.5	5.5	5.5	5.5
South Carolina	5	5	5	5	5	6	6	6
Vermont	5	6	6	6	6	6	6	6
Virginia	3.5	3.5	4	4	5	5	5	5

Source: Tax Foundation

Table 2. Local Sales Tax Rates (in Q2)

	2003			2006			2009		
	mean	min	max	mean	min	max	mean	min	max
AL	1.89	0	4	1.93	0	5	2.03	0	5
AR	1.26	0	3	1.37	0	3.75	1.44	0	3
AZ	0.68	0	1.5	0.73	0.25	1.125	0.77	0.25	1.5
CA	1.45	1.25	2.5	1.25	1	2.5	1.30	1	2.5
CO	1.43	0	5	1.44	0	5	1.45	0	5
FL	0.78	0	1.5	0.81	0	1.5	0.85	0	1.5
GA	2.77	1	3	2.89	2	3	2.94	2	3
IA	0.78	0	1	0.90	0	1	0.99	0	1
IL	0.14	0	1.75	0.22	0	1.75	0.30	0	2.75
KS	0.74	0	2	0.84	0	2	0.89	0	2.25
MN	0.01	0	1	0.01	0	1	0.02	0	0.4
MO	1.23	0.5	2.5	1.38	0.5	2.5	1.51	0.5	3
NC	2.45	2	2.5	2.50	2.5	2.5	2.52	2.5	2.75
ND	0.00	0	0.25	0.02	0	1	0.03	0	1
NE	0.00	0	0	0.01	0	0.5	0.01	0	0.5
NM	0.71	0.125	1.4375	0.92	0.125	1.6875	1.05	0.375	2.0625
NV	0.26	0	0.75	0.36	0	1.25	0.38	0	1.25
NY	3.56	2.5	4.25	3.89	3	5.5	3.91	3	4.75
OH	1.12	0	1.5	1.20	0.25	1.5	1.25	0.5	1.5
OK	0.88	0	2	0.99	0	2	1.12	0	2
PA	0.03	0	1	0.03	0	1	0.03	0	1
SC	0.71	0	1	0.71	0	1	0.71	0	1
SD	1.60	0	2	1.60	0	2	1.60	0	2
TN	2.45	1.5	2.75	2.46	1.5	2.75	2.48	1.5	2.75
TX	0.24	0	1.5	0.24	0	1.5	0.24	0	1.5
UT	1.00	1	1	1.00	1	1	1.00	1	1
VA	1.00	1	1	1.00	1	1	1.00	1	1
WA	1.22	0.5	2	1.27	0.5	2.1	1.41	0.5	3
WI	0.40	0	0.5	0.40	0	0.5	0.42	0	0.5
WY	1.21	0	2	1.23	0	2	1.27	0	2
Total	1.09	0	5	1.14	0	5.5	1.18	0	5

Source: County-level sales taxes collected by Thompson and Rohlin (with research assistance from Thomas Krumel) from state-level revenue and tax agency documents and reports.

Table 3. County Pair Employment Difference Regressions, by Tax Measure and Extent of Cross-border Commuting

				Cross-State Work Share		
				<11%	11 to 22%	>=22%
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Employment Difference - State Rate						
Sales Tax Rate	-0.0137	0.000899	0.00682	0.00503	-0.0150	-0.0215
	(0.00523)	(0.00962)	(0.0119)	(0.0120)	(0.00632)	(0.00631)
	**				**	***
Sales Tax * Commute Share		-0.0594				
		(0.0323)				
		*				
Sale Tax * Mid-level Commute			-0.0217			
			(0.0120)			
			*			
Sales Tax * High level Commute			-0.0299			
			(0.0123)			
			**			
Food Tax Rate	-0.000446	-0.000296	-0.000364	-0.00296	-0.00124	0.00420
	(0.00255)	(0.00262)	(0.00265)	(0.00358)	(0.00463)	(0.00429)
Panel B. Employment Difference - Combined Rate						
Sales Tax Rate	-0.0116	0.000701	0.00363	0.00239	-0.0122	-0.0181
	(0.00507)	(0.00938)	(0.0102)	(0.0102)	(0.00720)	(0.00613)
	**					***
Sales Tax * Commute Share		-0.0514				
		(0.0310)				
Sale Tax * Mid-level Commute			-0.0156			
			(0.0109)			
Sales Tax * High level Commute			-0.0234			
			(0.0112)			
			**			
Food Tax Rate	-0.000423	-0.000290	-0.000365	-0.00304	-0.00123	0.00428
	(0.00259)	(0.00265)	(0.00266)	(0.00357)	(0.00463)	(0.00430)
Panel C. Employment Share - Combined Rate						
Sales Tax Rate	-0.00192	-0.000572	-0.000213	-0.000304	-0.00229	-0.00250
	(0.000672)	(0.00132)	(0.00138)	(0.00131)	(0.00135)	(0.000737)
	***				*	***
Sales Tax * Commute Share		-0.00566				
		(0.00398)				
Sale Tax * Mid-level Commute			-0.00206			
			(0.00179)			
Sales Tax * High level Commute			-0.00239			
			(0.00172)			
Food Tax Rate	.000008	.000023	.000013	0.000145	-0.000289	.000051
	(0.000309)	(0.000312)	(0.000317)	(0.000475)	(0.000551)	(0.000496)
# County Pairs	1,233	1,233	1,233	418	416	399

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4. Employment Regressions Including Personal Income Covariate and Assessing Cross-border Employment Spillover Using Different Employment Dependent Variables

	Full Quarterly Data				Single Quarter Data			
		Cross-State Work Share				Cross-State Work Share		
		<11%	11 to 22%	>=22%		<11%	11 to 22%	>=22%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Employment Difference								
Combined Sale Tax	-0.0116	0.00239	-0.0122	-0.0181	-0.0113	0.00329	-0.00768	-0.0215
	(0.00507)	(0.0102)	(0.00720)	(0.00613)	(0.00629)	(0.0118)	(0.00689)	(0.00762)
	**			***	*			***
Food Tax	-0.000423	-0.00304	-0.00123	0.00428	0.000582	-0.000534	-0.00387	0.00752
	(0.00259)	(0.00357)	(0.00463)	(0.00430)	(0.00318)	(0.00418)	(0.00400)	(0.00501)
Personal Income					0.487	0.413	0.492	0.590
					(0.0695)	(0.131)	(0.0773)	(0.0744)
					***	***	***	***
Panel B. County Employment								
Combined Sale Tax	-0.00767	-0.00395	-0.00564	-0.0114	-0.00879	-0.00373	-0.00564	-0.0139
	(0.00570)	(0.0102)	(0.00686)	(0.00643)	(0.00720)	(0.0122)	(0.00723)	(0.00753)
				*				*
Food Tax	-0.00378	-0.00622	-0.00677	0.00284	-0.00287	-0.00483	-0.00763	0.00556
	(0.00493)	(0.00583)	(0.00580)	(0.00367)	(0.00351)	(0.00339)	(0.00503)	(0.00402)
Personal Income					0.313	0.339	0.253	0.333
					(0.0475)	(0.0833)	(0.0753)	(0.0695)
					***	***	***	***
Panel C. County Pair Employment Total								
Combined Sale Tax	0.000844	-0.00214	0.00388	-0.000721	0.000517	-0.000706	0.00119	-0.000416
	(0.00404)	(0.00783)	(0.00472)	(0.00407)	(0.00533)	(0.00994)	(0.00596)	(0.00418)
Food Tax	-0.00255	-0.00243	-0.00654	0.000836	-0.00191	-0.000744	-0.00632	0.000754
	(0.00473)	(0.00690)	(0.00432)	(0.00212)	(0.00470)	(0.00638)	(0.00449)	(0.00249)
Personal Income					0.0618	0.146	-0.00357	0.00469
					(0.0435)	(0.0700)	(0.0676)	(0.0592)
						**		
Panel D. Employment Share								
Combined Sale Tax	-0.00192	-0.000304	-0.00229	-0.00250	-0.00217	-0.000909	-0.00134	-0.00336
	(0.000672)	(0.00131)	(0.00135)	(0.000737)	(0.000769)	(0.00133)	(0.00117)	(0.000933)
	***		*	***	***			***
Food Tax	.000008	0.000145	-0.000289	.000051	0.000339	0.000752	-0.000590	0.000511
	(0.000309)	(0.000475)	(0.000551)	(0.000496)	(0.000358)	(0.000337)	(0.000555)	(0.000606)
						**		
Personal Income					0.0769	0.0601	0.0888	0.0903
					(0.0119)	(0.0183)	(0.0136)	(0.0101)
					***	***	***	***
# County Pairs	1,233	418	416	399	1,233	418	416	399

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses

Table 5. All Industry Regressions Using Alternative Dependent Variables, Combined Sales Tax Rates, by Frequency of Data and Extent of Cross-border Commuting

	Full Quarterly Data					Single Quarter Data				
			Cross-State Work Share					Cross-State Work Share		
			<11%	11 to 22%	>=22%			<11%	11 to 22%	>=22%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Employment Share										
Sales Tax Rate	-0.00192	-0.000572	-0.000304	-0.00229	-0.00250	-0.00217	-0.000538	-0.000909	-0.00134	-0.00336
	(0.000672)	(0.00132)	(0.00131)	(0.00135)	(0.000737)	(0.000769)	(0.00128)	(0.00133)	(0.00117)	(0.000933)
	***			*	***	***				***
Sales Tax * Commute Share		-0.00566					-0.00686			
		(0.00398)					(0.00399)			
							*			
Food Tax Rate	.000008	.000023	0.000145	-0.000289	.00005	0.000339	0.000365	0.000752	-0.000590	0.000511
	(0.000309)	(0.000312)	(0.000475)	(0.000551)	(0.000496)	(0.000358)	(0.000352)	(0.000337)	(0.000555)	(0.000606)
								**		
Personal Income						0.0769	0.0768	0.0601	0.0888	0.0903
						(0.0119)	(0.0119)	(0.0183)	(0.0136)	(0.0101)
						***	***	***	***	***
Panel B. Payroll Share										
Sales Tax Rate	-0.00185	-0.000429	0.000837	-0.00298	-0.00264	-0.00190	-0.000386	0.000203	-0.00176	-0.00323
	(0.000861)	(0.00144)	(0.00168)	(0.00161)	(0.000960)	(0.000924)	(0.00118)	(0.00123)	(0.00145)	(0.00122)
	**			*	***	**				**
Sales Tax * Commute Share		-0.00595					-0.00637			
		(0.00434)					(0.00402)			
Food Tax Rate	-0.000699	-0.000684	-0.000550	-0.00104	-0.000450	.0000055	2.99e-05	0.000699	-0.00130	0.000253
	(0.000471)	(0.000479)	(0.000931)	(0.000646)	(0.000590)	(0.000476)	(0.000477)	(0.000814)	(0.000778)	(0.000615)
Personal Income						0.0963	0.0961	0.0804	0.113	0.102
						(0.0149)	(0.0149)	(0.0220)	(0.0216)	(0.0171)
						***	***	***	***	***
Panel C. Hiring Share										
Sales Tax Rate	-0.00279	-0.00107	-0.000162	-0.00445	-0.00261	-0.00331	0.00136	-0.00104	-0.00117	-0.00620
	(0.00135)	(0.00222)	(0.00238)	(0.00217)	(0.00150)	(0.00191)	(0.00357)	(0.00426)	(0.00226)	(0.00176)
	**			**	*	*				***
Sales Tax * Commute Share		-0.00720					-0.0196			
		(0.00581)					(0.00940)			
							**			
Food Tax Rate	0.000368	0.000387	0.000312	.000039	0.000510	0.000253	0.000327	0.00133	-0.00180	0.000426
	(0.000782)	(0.000788)	(0.000783)	(0.00145)	(0.00100)	(0.000887)	(0.000906)	(0.00108)	(0.00154)	(0.00145)
Personal Income						0.0682	0.0681	0.0529	0.0700	0.0918
						(0.0165)	(0.0163)	(0.0263)	(0.0277)	(0.0160)
						***	***	*	**	***
# County Pairs	1,233	1,233	418	416	399	1,233	1,233	418	416	399

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses

Table 6. Food and Beverage Store Regressions Using Alternative Dependent Variables, Combined Sales Tax Rates, by Frequency of Data and Extent of Cross-border Commuting

	Full Quarterly Data					Single Quarter Data				
			Cross-State Work Share					Cross-State Work Share		
			<11%	11 to 22%	>=22%			<11%	11 to 22%	>=22%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Employment Share										
Sales Tax Rate	-0.00154	-0.00143	-0.000824	-0.00232	-0.00121	0.000238	0.000236	-0.00203	0.00118	-0.000635
	(0.00213)	(0.00269)	(0.00287)	(0.00289)	(0.00334)	(0.00365)	(0.00373)	(0.00499)	(0.00331)	(0.00505)
Sales Tax * Commute Share		-0.000440 (0.00749)					-.0000075 (0.0115)			
Low Food Tax	0.00194	0.00193	-0.00105	0.00265	0.00323	0.00236	0.00236	0.000137	-0.00331	0.00734
	(0.00563)	(0.00567)	(0.00437)	(0.00393)	(0.0145)	(0.00372)	(0.00375)	(0.00398)	(0.00584)	(0.00907)
Neighbor Low Food Tax	-0.0198	-0.0198	-0.0146	-0.0194	-0.0243	-0.0200	-0.0200	-0.0182	-0.0177	-0.0239
	(0.00638) ***	(0.00638) ***	(0.00443) ***	(0.00862) **	(0.0127) *	(0.00675) ***	(0.00676) ***	(0.00668) **	(0.0120)	(0.0117) **
Personal Income						0.110	0.110	0.128	0.0313	0.145
						(0.0277) ***	(0.0276) ***	(0.0360) ***	(0.0538)	(0.0360) ***
Panel B. Payroll Share										
Sales Tax Rate	-0.000410	-9.57e-05	0.000973	-0.000306	-0.000953	0.00116	0.00257	0.000603	0.00245	-0.000181
	(0.00240)	(0.00344)	(0.00385)	(0.00299)	(0.00363)	(0.00382)	(0.00428)	(0.00603)	(0.00270)	(0.00560)
Sales Tax * Commute Share		-0.00130 (0.00941)					-0.00590 (0.0137)			
Low Food Tax	0.00182	0.00180	0.00154	-0.000614	0.00210	0.00147	0.00137	0.00363	-0.00861	0.00478
	(0.00623)	(0.00629)	(0.00576)	(0.00407)	(0.0135)	(0.00520)	(0.00526)	(0.00595)	(0.00563)	(0.0111)
Neighbor Low Food Tax	-0.0102	-0.0102	-0.00446	-0.00733	-0.0169	-0.00796	-0.00792	-0.00934	-0.00358	-0.00972
	(0.00547) *	(0.00548) *	(0.00659)	(0.00578)	(0.00846) *	(0.00476)	(0.00478)	(0.00657)	(0.00807)	(0.00799)
Personal Income						0.0685	0.0684	0.0643	0.0256	0.105
						(0.0245) ***	(0.0245) ***	(0.0345) *	(0.0431)	(0.0403) **
Panel C. Hiring Share										
Sales Tax Rate	-0.00132	0.00496	-0.000907	0.000297	-0.00274	-0.00650	-0.00438	-0.0115	-0.00236	-0.00877
	(0.00323)	(0.00477)	(0.00419)	(0.00418)	(0.00572)	(0.00697)	(0.00909)	(0.00702)	(0.00746)	(0.00940)
Sales Tax * Commute Share		-0.0260 (0.0167)					-0.00890 (0.0298)			
Low Food Tax	-0.000619	-0.00105	-0.00225	0.000408	.000081	0.0186	0.0184	0.0286	0.00397	0.0218
	(0.00500)	(0.00507)	(0.00561)	(0.00949)	(0.0121)	(0.00879) **	(0.00884) **	(0.0143) *	(0.0144)	(0.00819) **
Neighbor Low Food Tax	-0.0333	-0.0332	-0.0241	-0.0373	-0.0382	-0.0412	-0.0411	-0.0165	-0.0534	-0.0511
	(0.0103) ***	(0.0103) ***	(0.0127) *	(0.0120) ***	(0.0117) ***	(0.0185) **	(0.0185) **	(0.0226)	(0.0254) **	(0.0135) ***
Personal Income						0.172	0.172	0.217	0.0946	0.181
						(0.0390) ***	(0.0390) ***	(0.0529) ***	(0.0686)	(0.0718) **
# County Pairs										
Employment	1,020	1,020	316	357	347	1,020	1,020	316	357	347
Payroll	1,217	1,217	409	413	395	1,217	1,217	409	413	395
Hiring	993	993	310	345	338	993	993	310	345	338

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses

Table 7. Employment Share Regressions in Non-Food Industries by Gender and Age Group

	Full Quarterly Data				Single Quarter Data			
		Cross-State Work Share				Cross-State Work Share		
		<11%	11 to 22%	>=22%		<11%	11 to 22%	>=22%
Panel A. Male								
	(1)	(3)	(4)	(5)	(6)	(8)	(9)	(10)
Sales Tax Rate	-0.00256	-0.000148	-0.00320	-0.00349	-0.00292	-0.000800	-0.00233	-0.00452
	(0.000716)	(0.00145)	(0.00151)	(0.000880)	(0.000805)	(0.00135)	(0.00122)	(0.00122)
	***		**	***	***		*	***
Food Tax Rate	-0.000175	-9.84e-05	-0.000685	0.000202	0.000230	0.000735	-0.00104	0.000643
	(0.000417)	(0.000663)	(0.000734)	(0.000652)	(0.000377)	(0.000395)	(0.000566)	(0.000801)
						*	*	
Panel B. Female								
Sales Tax Rate	-0.00124	-0.000607	-0.00121	-0.00151	-0.00145	-0.00118	-0.000324	-0.00222
	(0.000687)	(0.00144)	(0.00122)	(0.000832)	(0.000818)	(0.00160)	(0.00126)	(0.000897)
	*			*	*			**
Food Tax Rate	0.000364	0.000535	0.000371	.000042	0.000616	0.000926	.000075	0.000575
	(0.000314)	(0.000335)	(0.000681)	(0.000336)	(0.000382)	(0.000340)	(0.000755)	(0.000478)
						**		
Panel C. Teens (14-18)								
Sales Tax Rate	-0.000646	0.00248	-.000074	-0.00282	0.000371	0.00383	0.00273	-0.00346
	(0.00174)	(0.00236)	(0.00224)	(0.00243)	(0.00179)	(0.00220)	(0.00209)	(0.00248)
						*		
Food Tax Rate	0.000521	0.000763	-0.000524	0.00109	0.00110	0.00158	-0.000677	0.00209
	(0.000946)	(0.000839)	(0.00143)	(0.00123)	(0.00101)	(0.000866)	(0.00168)	(0.00122)
						*		*
Panel D. Young (19-21)								
Sales Tax Rate	-0.00127	-0.00239	-0.000328	-0.00130	-0.00101	-0.00270	0.00207	-0.00213
	(0.00103)	(0.00163)	(0.00182)	(0.00163)	(0.00121)	(0.00209)	(0.00174)	(0.00237)
Food Tax Rate	0.000463	0.000845	-.000052	0.000259	0.000650	0.00159	-0.000909	0.000456
	(0.000578)	(0.000913)	(0.00121)	(0.000877)	(0.000564)	(0.000578)	(0.00123)	(0.00125)
						***		
Panel E. Adult (22-99)								
Sales Tax Rate	-0.00199	-0.000335	-0.00250	-0.00248	-0.00242	-0.00101	-0.00194	-0.00344
	(0.000714)	(0.00150)	(0.00140)	(0.000674)	(0.000864)	(0.00160)	(0.00133)	(0.000937)
	***		*	***	***			***
Food Tax Rate	-.000002	.000056	-0.000249	0.000124	0.000334	0.000680	-0.000583	0.000632
	(0.000307)	(0.000493)	(0.000530)	(0.000468)	(0.000335)	(0.000333)	(0.000521)	(0.000611)
						**		
# County Pairs								
Male	1,233	418	416	399	1,233	418	416	399
Female	1,231	416	416	399	1,231	416	416	399
Teen	1,228	414	415	399	1,228	414	415	399
Young	1,229	415	415	399	1,229	415	415	399
Adult	1,233	418	416	399	1,233	418	416	399

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses

Note: Coefficient for personal income not shown for space.

Table 8. Employment Share Regressions in Food and Beverage Stores by Gender and Age Group

	Full Quarterly Data				Single Quarter Data			
		Cross-State Work Share				Cross-State Work Share		
		<11%	11 to 22%	>=22%		<11%	11 to 22%	>=22%
Panel A. Male								
	(1)	(3)	(4)	(5)	(6)	(8)	(9)	(10)
Sales Tax Rate	-0.000484	0.000858	-0.00296	0.000790	0.00196	0.000225	0.00175	0.00171
	(0.00231)	(0.00391)	(0.00289)	(0.00335)	(0.00380)	(0.00609)	(0.00327)	(0.00489)
Low Food Tax	0.000987	-0.00424	0.00491	0.00216	0.00126	-0.00168	-0.00323	0.00613
	(0.00622)	(0.00472)	(0.00321)	(0.0153)	(0.00421)	(0.00430)	(0.00585)	(0.00899)
Neighbor Low Food Tax	-0.0174	-0.0116	-0.0197	-0.0203	-0.0182	-0.0160	-0.0173	-0.0212
	(0.00696)	(0.00327)	(0.00670)	(0.0147)	(0.00615)	(0.00752)	(0.0103)	(0.0121)
	**	***	***		***	**		*
Panel B. Female								
Sales Tax Rate	-0.00270	-0.00222	-0.00205	-0.00336	-0.00148	-0.00411	0.000626	-0.00299
	(0.00216)	(0.00238)	(0.00304)	(0.00363)	(0.00369)	(0.00447)	(0.00356)	(0.00550)
Low Food Tax	0.00257	0.000985	0.00129	0.00405	0.00323	0.00179	-0.00342	0.00834
	(0.00512)	(0.00421)	(0.00459)	(0.0139)	(0.00357)	(0.00486)	(0.00607)	(0.00917)
Neighbor Low Food Tax	-0.0218	-0.0157	-0.0203	-0.0277	-0.0210	-0.0187	-0.0178	-0.0258
	(0.00662)	(0.00726)	(0.00988)	(0.0110)	(0.00727)	(0.00799)	(0.0133)	(0.0112)
	***	**	**	**	***	**		**
Panel C. Teen (14-18)								
Sales Tax Rate	-0.00276	-0.00138	-0.00545	-0.00157	0.00210	0.00154	0.00107	0.00101
	(0.00408)	(0.00626)	(0.00553)	(0.00575)	(0.00580)	(0.00628)	(0.00659)	(0.00811)
Low Food Tax	0.00996	0.00654	0.0147	0.00777	0.0104	0.0102	0.00815	0.0105
	(0.00918)	(0.0101)	(0.00622)	(0.0210)	(0.00704)	(0.0110)	(0.00883)	(0.0110)
			**					
Neighbor Low Food Tax	-0.0334	-0.0484	-0.0489	-0.0102	-0.0338	-0.0557	-0.0514	-0.00304
	(0.0106)	(0.00900)	(0.0149)	(0.0169)	(0.0127)	(0.00703)	(0.0219)	(0.0135)
	***	***	***		**	***	**	
Panel D. Young (19-21)								
Sales Tax Rate	-0.00520	-0.00196	-0.00441	-0.00722	-0.00360	-0.00547	0.000596	-0.00645
	(0.00248)	(0.00416)	(0.00414)	(0.00369)	(0.00404)	(0.00618)	(0.00525)	(0.00513)
	**			*				
Low Food Tax	0.00259	0.000876	0.00409	0.00208	0.00362	0.00680	-0.00391	0.00567
	(0.00432)	(0.00662)	(0.00666)	(0.0109)	(0.00391)	(0.00746)	(0.00973)	(0.00599)
Neighbor Low Food Tax	-0.0318	-0.0213	-0.0418	-0.0322	-0.0317	-0.0194	-0.0382	-0.0362
	(0.0121)	(0.0129)	(0.0168)	(0.0171)	(0.0128)	(0.0144)	(0.0227)	(0.0170)
	**		**	*	**			**
Panel E. Adult (22-99)								
Sales Tax Rate	-0.000309	2.32e-05	-0.000589	-0.000173	0.00121	-0.00142	0.00254	0.000369
	(0.00218)	(0.00314)	(0.00271)	(0.00333)	(0.00358)	(0.00543)	(0.00300)	(0.00489)
Low Food Tax	0.000247	-0.00324	-0.000133	0.00299	0.000492	-0.00275	-0.00661	0.00754
	(0.00556)	(0.00404)	(0.00426)	(0.0142)	(0.00392)	(0.00421)	(0.00604)	(0.00960)
Neighbor Low Food Tax	-0.0151	-0.00744	-0.00899	-0.0259	-0.0151	-0.0113	-0.00586	-0.0260
	(0.00601)	(0.00445)	(0.00743)	(0.0109)	(0.00686)	(0.00795)	(0.00911)	(0.0106)
	**			**	**			**
# County Pairs								
Male	1,016	315	355	346	1,016	315	355	346
Female	1,020	316	357	347	1,020	316	357	347
Teen	1,000	309	352	339	1,000	309	352	339
Young	952	287	333	332	952	287	333	332
Adult	1,020	316	357	347	1,020	316	357	347

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses
Note: Coefficient for personal income not shown for space.

Appendix Table 1. Local Sales Tax Rate Correlation Coefficients - Cross Section and Panel for own state rate and opposite combined rate

	State Rate	Combined Opposite Rate
A. Cross-Section Correlation		
All Years Q2	-0.177	0.103
2009Q2	-0.200	0.100
2006Q2	-0.157	0.099
B. Panel Correlation		
All Years - Demeaned from Within-County, Over-Time Average	-0.001	0.027
2009 Q2 - 2006 Q2	-0.024	0.003
2009 Q2 - 2004 Q2	-0.120	0.040