LOCAL SALES TAX, CROSS-BORDER SHOPPING, and TRAVEL COST

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Disclaimers

The views and opinions expressed herein are those of the author and do not necessarily represent the views of the Nebraska Department of Revenue. All errors and omissions are my own.

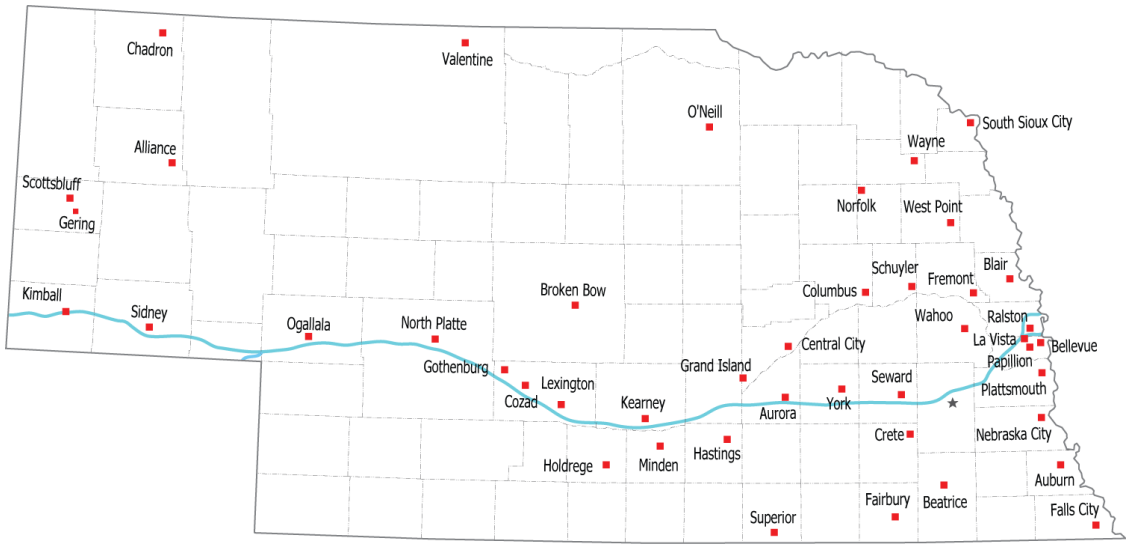
Back ground

- Cross-border shopping (CBS) is a well known phenomenon
- Previous studies found significant effects of CBS on demand, but focused on specific areas

However,

- It can occur everywhere
- Travel cost (i.e. driving time) is a crucial factor in deciding to engage in cross-border shopping

Nebraska : Land of Opportunity



- Cities levy local sales taxes,
- Counties **do not** exercise local sales tax options

- **Point To point Travel cost** between cities

Goal and Strategy

- Estimating the magnitude of CBS effect in response to a travel cost

1. Finding evidences of CBS
   - Constructing a demand function, in which separating impacts of state and local sales taxes
2. Evaluating the impact of CBS in terms of a travel cost
   - Explicitly incorporating traveling cost into the demand function

Data

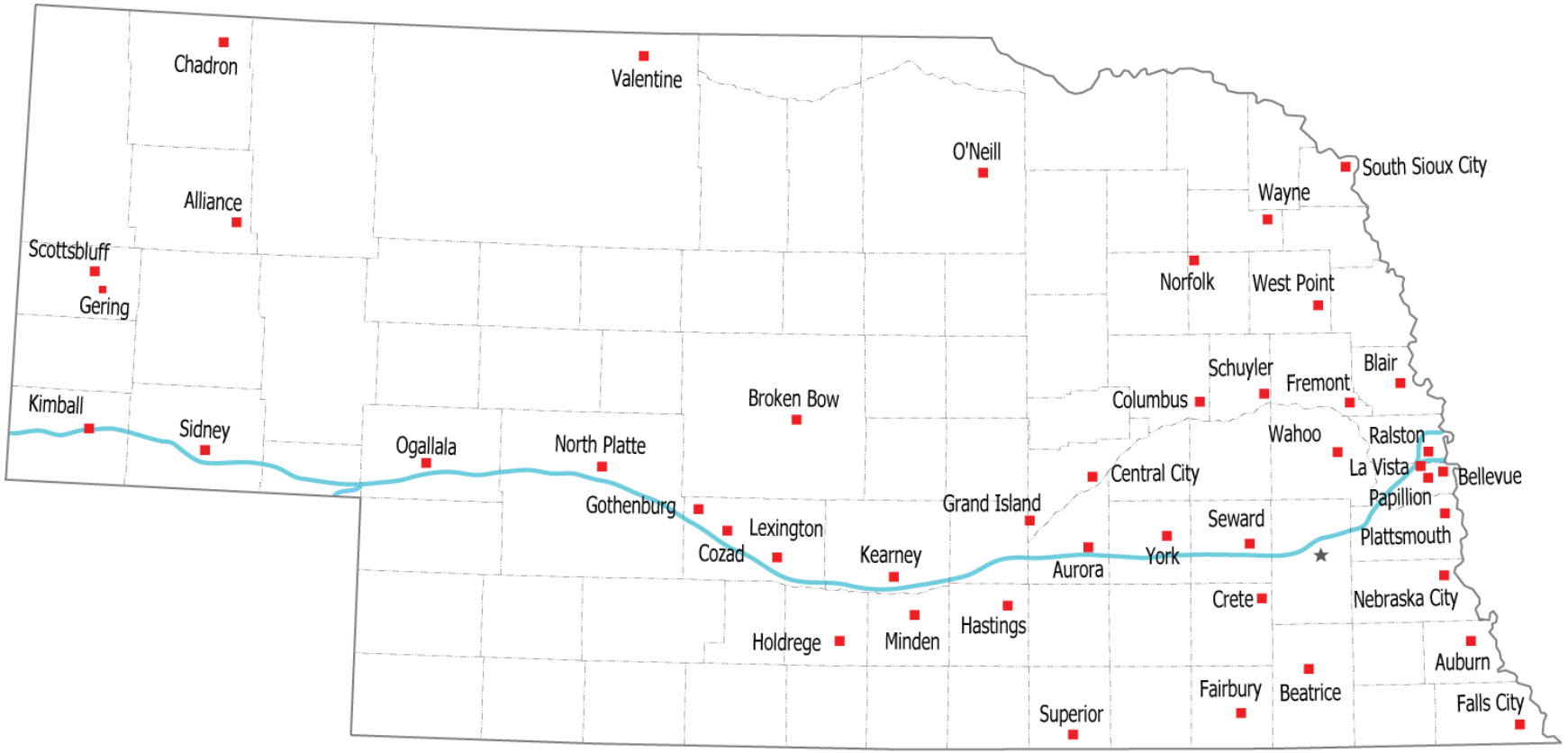
- 44 mid-sized cities in Nebraska except Omaha and Lincoln
- Quarterly Data over 1994:1 to 2014:4

- Dependent Variables
  - Net taxable sales by city as demand

- Independent Variables
  - Changes in state sales tax rates: 3 times
  - Changes in local sales tax rates: 66 times
  - Price Index from CPI
  - Driving time between a home city and a neighboring city

- Control variables
  - Per capita Income
  - Unemployment rate
  - Population
  - The number of filing

Nebraska Again



Simple Demand Function

- Demand Function $x(p,\tau\uparrow s,\tau\uparrow l)$
  - $\ln x\downarrow jt = \alpha\downarrow j + \beta ln(1+\tau\downarrow t\uparrow s) + \theta\downarrow c\ \beta ln(1+\tau\downarrow jt\uparrow l) + \gamma \ln p\downarrow t + \delta\chi\downarrow jt + \varepsilon\downarrow jt$

- The null Hypothesis
  - Consumers do not have an incentives to cross a city border to shop when a local sales tax changes
  - $\theta\downarrow c = \partial \ln x / \partial ln(1+\tau\uparrow l) / \partial \ln x / \partial \ln(1+\tau\uparrow s) = \varepsilon\downarrow x,\ 1+\tau\uparrow l\ / \varepsilon\downarrow x,\ 1+\tau\uparrow s = 1$

- Estimation
  - $AR(4)\ with\ GLS: \varepsilon\downarrow jt = \rho\varepsilon\downarrow jt-4 + u\downarrow jt$

Effect of Sales Taxes on the Demand of Taxable Goods

	Baseline	Regional Trend	Demographic Changes	Business Cycle
Ln(1+State sales tax)	**-1.969****	**-1.688****	**-1.724****	**-1.689****
	(0.765)	(0.761)	(0.769)	(0.765)
Ln(1+Local sales taxes)	**-4.490*****	**-4.421*****	**-4.394*****	**-4.216*****
	(0.667)	(0.672)	(0.672)	(0.664)
The Effect of Cross-border Shopping	**-2.521**	**-2.733**	**-2.67**	**-2.527**
Ln(Price)	-0438***	-0.528***	-0.395**	-0.103
Ln(Population)	-	-	0.325***	0.528***
Ln(Filing)	-	-	0.203***	0.231***
Ln(Per Capita Income)			-	0.273***
Ln(Unemployment)			-	-0.051***
ρ (4)	1.002	0.931	0.896	0.828
Wald Test	0.007	0.007	0.01	0.014
Adjusted R^2	0.993	0.994	0.994	0.994
Observations	3,520	3,520	3,520	3,520

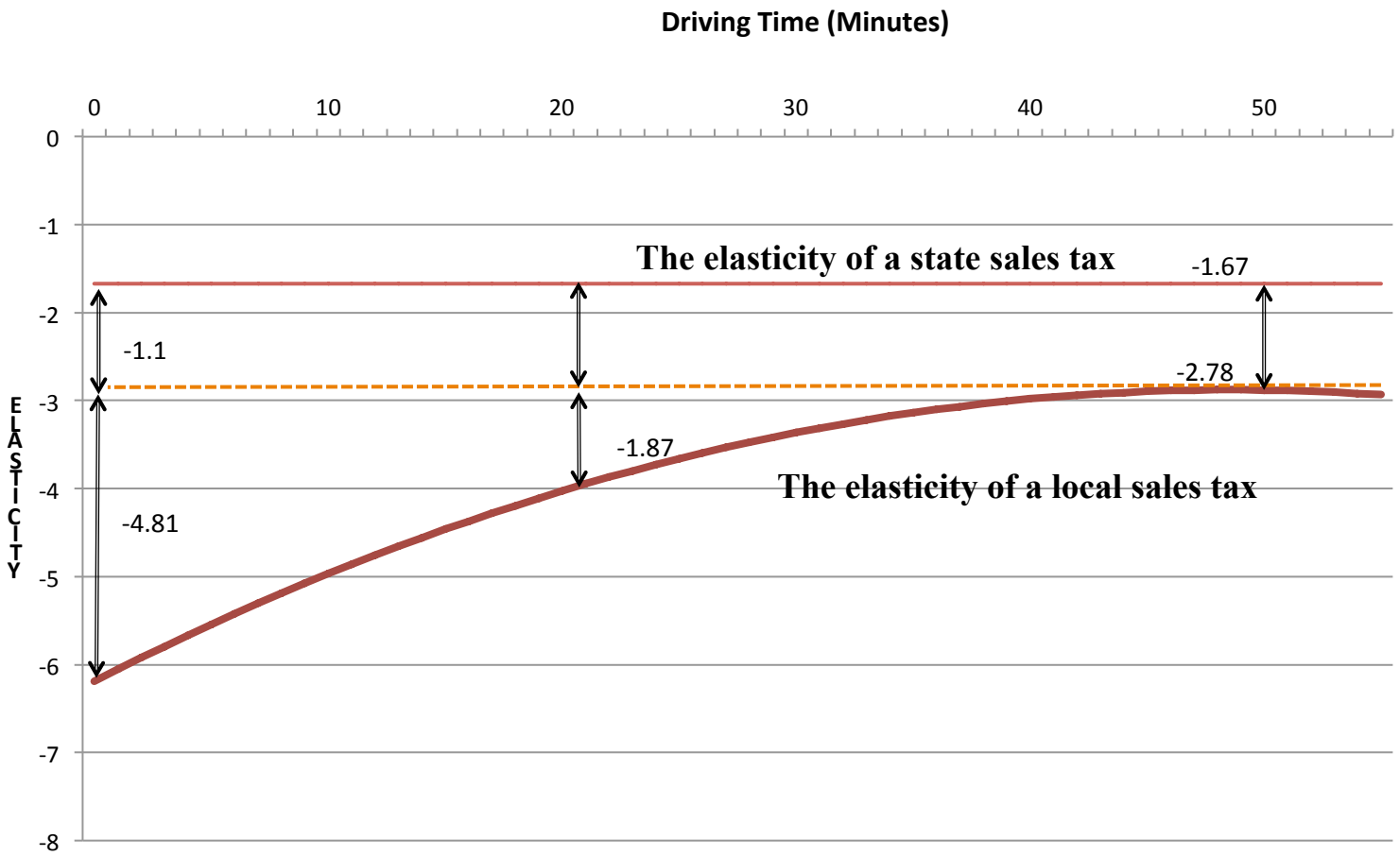
Travel Cost Function

- Demand function
  - $\ln x_{jt} = \alpha + \beta ln(1+\tau_{jt}^{s}) + \boldsymbol{g(d, D_j)} ln(1+\tau_{jt}^{l}) + \gamma \ln p_t + \delta X_{jt} + \epsilon_{jt}$
- Travel Distance Function
  - $g(d, D_j) = d_0 + d_1 * D_j + d_2 * D_j^2$
    - $g' = (d, D_j) > 0$ and $g'' = (d, D_j) < 0$;
- Estimating Equation : AR(4) with GLS
  - $\ln x_{jt} = \alpha + \beta ln(1+\tau_{jt}^{s}) + d_0 \ln(1+\tau_{jt}^{l}) + d_1 D_j * \ln(1+\tau_{jt}^{l}) + d_2 D_j^2 * ln(1+\tau_{jt}^{l}) + \gamma \ln p_t + \delta X_{jt} + \epsilon_{jt}$.

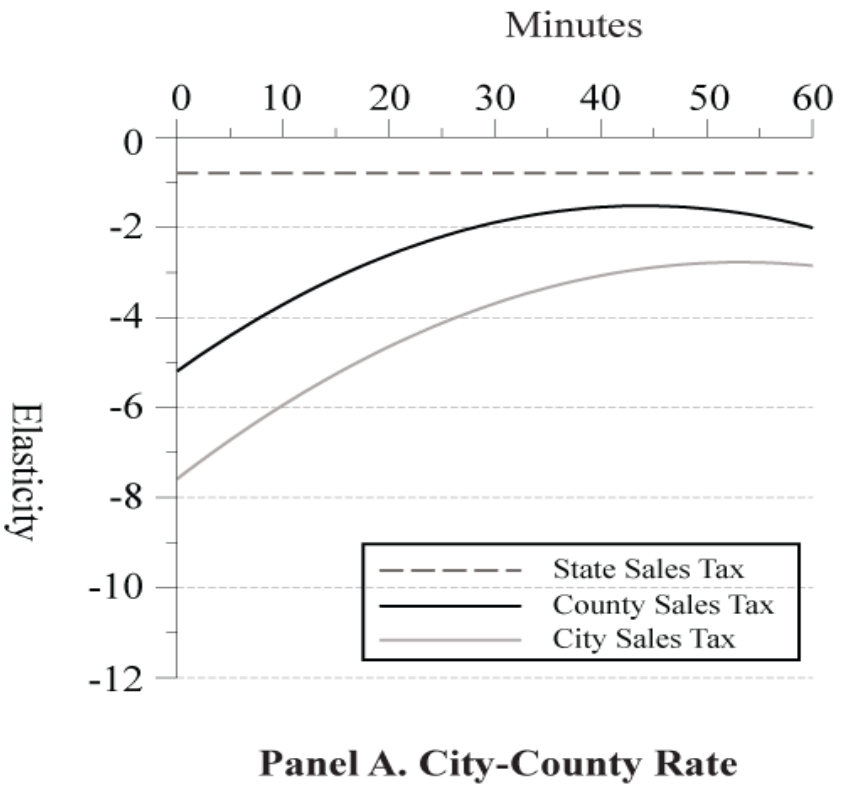
Effect of Sales Tax on the Demand

Ln(1+Local sales taxes)	**-7.588*** **
	(2.282)
Ln(1+Local sales taxes)*Travel cost	**0.181** **
	(0.076)
Ln(1+Local sales taxes)*travel cost^2	**-0.002*** **
	(0.000)
Ln(1+State sales tax)	**-1.672** **
	(0.946)
Ln(Price)	-0.102
Ln(Population)	0.524***
Ln(Filing)	0.235***
Ln(Per Capita Income)	0.275***
Ln(Unemployment)	-0.051***
ρ (4)	0.825
Wald Test	0.002
Adjusted R^2	0.994
Observations	3,520

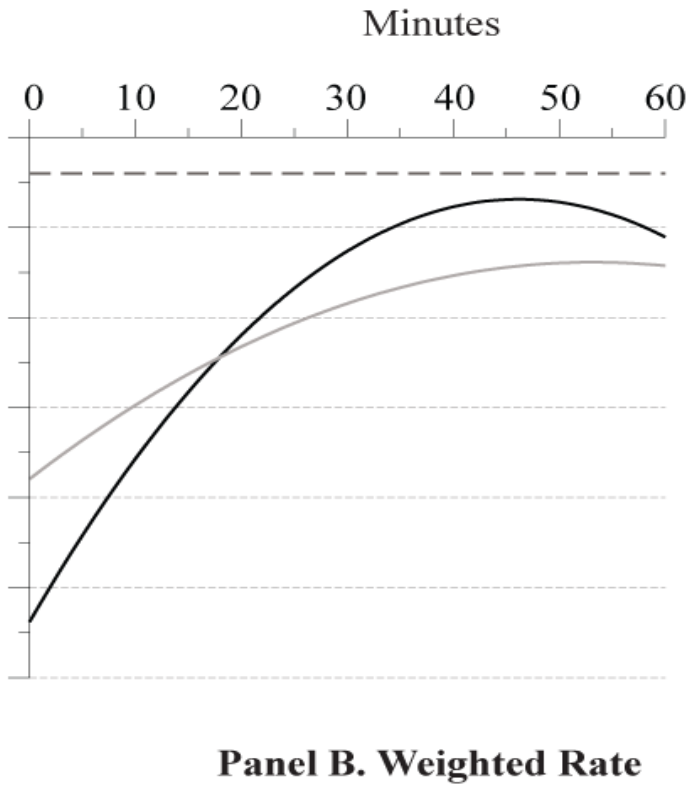
What Happen When Local Sales Tax Increase 1 %



The Case of County Sales Tax



Panel A. City-County Rate



Panel B. Weighted Rate

- Findings : ***The elasticity of cross-border shopping***
  - ***4.81 % at the border***
  - ***1.87% when a city is 20 minutes away***
  - ***No incentive when a city is 53 minutes away***

- Contributions
  - General understanding about Cross-border Shopping
  - A guideline for local policy makers

- Limitations and Future Study
  - The impact of Internet Sales
  - The impact of firm's behavior
  - The case of a large discrete change

Questions?

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Previous Work : Unaccomplished Mission

$$S_{it} = A_i Y_{it}^{a} P_{It}^{b} C_i^{c}$$

$$P_{It} = P_{it}(1+T_{it})/P_{at}(1+T_{at})$$
$$=(1+T_{it})/(1+T_{at})$$

$$\ln S_{it} = \ln A + a \ln Y_{it} + b \ln(\mathbf{1}+\boldsymbol{T_{it}})/$$
$$(\mathbf{1}+\boldsymbol{T_{at}}) + c\,\boldsymbol{\ln C_{it}} + u_{it}$$