# Appendix

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# A. Model

## A.1. Open-Economy Ramsey Taxation Rule

This appendix derives the open-economy Ramsey rule (23). The objective function of county $i$ can be written as:

$$W_i = \frac{E_i \mathbb{G}_i^{\nu}}{P_i}. \tag{A.1}$$

Under Assumption 1, differentiation of (A.1) entails the first-order condition:[15]

$$\frac{\partial W_i}{\partial E_i}\frac{\partial E_i}{\partial p_i}\frac{\partial p_i}{\partial t_i} + \frac{\partial W_i}{\partial P_i}\left(\frac{\partial P_i}{\partial t_i} + \frac{\mathrm{d}P_i}{\mathrm{d}p_i}\frac{\partial p_i}{\partial t_i}\right) + \frac{\partial W_i}{\partial \mathbb{G}_i}\left(\frac{\partial \mathbb{G}_i}{\partial t_i} + \frac{\partial \mathbb{G}_i}{\partial p_i}\frac{\partial p_i}{\partial t_i} + \frac{\partial \mathbb{G}_i}{\partial X_i}\frac{\partial X_i}{\partial t_i} + \frac{\partial \mathbb{G}_i}{\partial G_i}\frac{\partial G_i}{\partial t_i}\right) = 0,$$

where:

$$\frac{\partial W_i}{\partial P_i} = -\frac{E_i \mathbb{G}_i^{\nu}}{P_i^2}, \qquad \frac{\partial W_i}{\partial E_i} = \frac{\mathbb{G}_i^{\nu}}{P_i}, \qquad \frac{\partial W_i}{\partial \mathbb{G}_i} = \nu\frac{E_i \mathbb{G}_i^{\nu-1}}{P_i}, \qquad \frac{\mathrm{d}P_i}{\mathrm{d}p_i} = \frac{\partial P_i}{\partial p_i} + \frac{\partial P_i}{\partial m_i}\frac{\partial m_i}{\partial p_i}.$$

Inserting these expressions into the first-order condition and collecting terms, we obtain:

$$-\frac{E_i}{P_i}\frac{\partial P_i}{\partial t_i} + \frac{\nu E_i}{n_i p_i \mathbb{G}_i}\left(n_i p_i \frac{\partial \mathbb{G}_i}{\partial t_i} + n_i p_i \frac{\partial \mathbb{G}_i}{\partial X_i}\frac{\partial X_i}{\partial t_i}\right) + \left(\frac{\partial E_i}{\partial p_i} - \frac{E_i}{P_i}\frac{\mathrm{d}P_i}{\mathrm{d}p_i} + \frac{\nu E_i}{\mathbb{G}_i}\frac{\partial \mathbb{G}_i}{\partial p_i}\right)\frac{\partial p_i}{\partial t_i} + \frac{\nu E_i}{\mathbb{G}_i}\frac{\partial \mathbb{G}_i}{\partial G_i}\frac{\partial G_i}{\partial t_i} = 0. \tag{A.2}$$

Differentiating the expression of the price index (5), we obtain:

$$\frac{\partial P_i}{\partial t_i} = \frac{P_i X_{ii}}{E_i}, \qquad \frac{\partial P_i}{\partial p_i} = \frac{(1+t_i+T_i)P_i X_{ii}}{E_i p_i}, \qquad \frac{\partial P_i}{\partial m_i} = -\frac{(1+t_i+T_i)P_i X_{ii}}{(\sigma-1)E_i m_i}. \tag{A.3}$$

Differentiating the expressions of the number of firms (8) and that of income (3) entails:

$$\frac{\partial m_i}{\partial p_i} = \frac{1-\alpha}{\alpha}\frac{m_i}{p_i}, \qquad \frac{\partial E_i}{\partial p_i} = \frac{E_i - n_i(1-\tau_i)r\kappa_i}{\alpha p_i}. \tag{A.4}$$

The government's budget constraint (9) allows us to write the public service index as:

$$\mathbb{G}_i = \varphi g_i + (1-\varphi)G_i = \varphi\left(\frac{t_i X_i}{n_i p_i} + \mathit{\Delta}_i\right) + (1-\varphi)G_i, \tag{A.5}$$

whose differentiation gives:

$$\frac{\partial \mathbb{G}_i}{\partial t_i} = \varphi\frac{X_i}{n_i p_i}, \qquad \frac{\partial \mathbb{G}_i}{\partial p_i} = -\varphi\frac{t_i X_i}{n_i p_i^2}, \qquad \frac{\partial \mathbb{G}_i}{\partial X_i} = \varphi\frac{t_i}{n_i p_i}, \qquad \frac{\partial \mathbb{G}_i}{\partial G_i} = 1-\varphi. \tag{A.6}$$

[15] For simplicity, derivatives are written without side bars, even though they should include them, as they represent government $i$'s perceived responses.

Inserting (A.3), (A.6) and (A.4) into (A.2), and collecting terms, we obtain:

$$-X_{ii} + \frac{\varphi \nu E_i}{n_i p_i \mathbb{G}_i}\left(X_i + t_i \frac{\partial X_i}{\partial t_i}\right) - \phi_i E_i = 0, \tag{A.7}$$

where $\phi_i$ is the equilibrium effect defined as:

$$\phi_i = -\left(\frac{p_i}{E_i}\frac{\partial E_i}{\partial p_i} - \frac{p_i}{P_i}\frac{\mathrm{d}P_i}{\mathrm{d}p_i} + \frac{\nu p_i}{\mathbb{G}_i}\frac{\partial \mathbb{G}_i}{\partial p_i}\right)\frac{1}{p_i}\frac{\partial p_i}{\partial t_i} - \frac{\nu G_i}{\mathbb{G}_i}\frac{\partial \mathbb{G}_i}{\partial G_i}\frac{1}{G_i}\frac{\partial G_i}{\partial t_i},$$

or equivalently:

$$\phi_i = -\left(\varepsilon^i_{E,p} - \varepsilon^i_{P,p} + \nu \varepsilon^i_{G,p}\right)\epsilon^i_{p,t} - \nu \varepsilon^i_{\mathbb{G},G}\,\epsilon^i_{G,t}.$$

Inserting (A.5) and collecting terms, the first-order condition (A.7) is equivalent to:

$$-\left(t_i X_i + R_i + \frac{1-\varphi}{\varphi} n_i p_i G_i\right) X_{ii} + \nu E_i \left(1 + \frac{t_i}{X_i}\frac{\partial X_i}{\partial t_i}\right) X_i - \frac{n_i p_i \mathbb{G}_i}{\varphi}\phi_i E_i = 0.$$

Finally, after a few trivial algebraic manipulations, we obtain:

$$\frac{t_i}{1+t_i+T_i} = \frac{1 - \dfrac{R_i + \frac{1-\varphi}{\varphi} n_i p_i G_i}{\nu E_i} \times \dfrac{X_{ii}}{X_i} - \dfrac{n_i p_i \mathbb{G}_i/\varphi}{X_i} \times \dfrac{\phi_i}{\nu}}{-\dfrac{1+t_i+T_i}{X_i}\dfrac{\partial X_i}{\partial t_i} + \dfrac{(1+t_i+T_i)X_{ii}}{\nu E_i}}.$$

This can be more compactly written as:

$$\frac{t_i}{1+t_i+T_i} = \frac{1 - \dfrac{\lambda_i \chi_i}{\nu} - \dfrac{\eta_i \phi_i}{\nu}}{\varepsilon_i + \dfrac{\theta_i}{\nu}},$$

by introducing the following notation:

$$\varepsilon_i \equiv -\frac{1+t_i+T_i}{X_i}\frac{\partial X_i}{\partial t_i}, \quad \theta_i \equiv \frac{(1+t_i+T_i)X_{ii}}{E_i}, \quad \chi_i \equiv \frac{X_{ii}}{X_i}, \quad \lambda_i \equiv \frac{R_i + \frac{1-\varphi}{\varphi} n_i p_i G_i}{E_i}, \quad \eta_i \equiv \frac{n_i p_i \mathbb{G}_i/\varphi}{X_i}.$$

This proves (23).

### *A.2. From Theory to Data*

**Table A.1.** Characteristics of the main model variables and parameters.

| Variable | Value | Description | Type | Observed | Match | Role |
|---|---|---|---|---|---|---|
| A. Endogenous variables | | | | | | |
| $t_i$ | | Effective county tax rate | Endogenous | Yes | Exact | |
| $m_i$ | | Number of firms | Endogenous | Yes | Exact | |
| $y_i$ | | Individual income | Endogenous | Yes | Exact | |
| $w_i$ | | Individual earnings | Endogenous | Yes | Variance | |
| $t_i X_i/(n_i g_i)$ | | Sales tax revenue to expenditure ratio | Endogenous | Yes | MM | |
| B. Exogenous variables | | | | | | |
| $n_i$ | | Number of households | Exogenous | Yes | Exact | |
| $T_i$ | | State sales tax rate | Exogenous | Yes | Exact | |
| $\tau_i$ | | State income tax rate | Exogenous | Yes | Exact | |
| C. Local fundamentals (residuals) | | | | | | |
| $\kappa_i$ | | Capital endowment | Exogenous | No | | Match $y_i$ |
| $f_i$ | | Firm fixed entry cost | Exogenous | No | | Match $m_i$ |
| $\Delta_i$ | | County public service endowment | Exogenous | No | | Match $t_i X_i/(n_i g_i)$ |
| D. Exogenous parameters | | | | | | |
| $\sigma$ | 5 | Elasticity of substitution among varieties | Exogenous | | | Match $w_i$ |
| $\alpha$ | 2/3 | Labor share in firm cost | Exogenous | | | Calibration |
| $\nu$ | 0.5 | Parameter of marginal willingness to pay for public services | Exogenous | | | Match $t_i X_i/(n_i g_i)$ |
| $\varphi$ | 0.27 | Relative preference for local versus state public services | Exogenous | | | Match $t_i X_i/(n_i g_i)$ |
| $\mu_{ij}$ | | Iceberg cost | Exogenous | | | Gravity regression |

NOTE— MM: method of moment; "Variance": minimize difference of variance between observed and model variable.

# B. Data and Descriptive Statistics

## *B.1. Descriptive Statistics*

**Table A.2.** Descriptive statistics for sociodemongraphic variables in taxing counties.

| | Mean | SD | Min | Max | Obs |
|---|---|---|---|---|---|
| Area | 970 | 1386 | 1.999 | 20057 | 2146 |
| % Male | 50.008 | 2.395 | 40.85 | 67.69 | 2146 |
| Median age | 40.271 | 5.182 | 21.6 | 63.8 | 2146 |
| % White | 82.801 | 15.797 | 16.38 | 100 | 2146 |
| % Agriculture | 6.789 | 7.053 | 0 | 48.69 | 2146 |
| % Households with public assistance | 2.372 | 1.43 | 0 | 11.84 | 2146 |
| % Foreign born | 3.19 | 3.862 | 0 | 36.52 | 2146 |
| % Workers working in state of residence | 96.041 | 7.061 | 30.15 | 100 | 2146 |
| Housing unit: median number of rooms | 5.591 | 0.443 | 3.3 | 7.5 | 2146 |
| % Senior | 16.337 | 4.42 | 3.29 | 46.72 | 2146 |
| % High school education | 80.397 | 8.807 | 25.61 | 96.77 | 2146 |
| Private/public school attendance | 0.109 | 0.074 | 0 | 0.62 | 2146 |
| Housing unit: age | 36.874 | 11.575 | 9 | 72 | 2146 |
| % Vote Democratic candidate in 2000 or 2008 | 40.464 | 14.018 | 7.816 | 88.716 | 2146 |
| % Vote Democratic candidate in 2004 or 2012 | 37.687 | 14.868 | 6.275 | 90.214 | 2146 |
| Border crossing with Mexico | 0.008 | 0.091 | 0 | 1 | 2146 |
| Border crossing with Canada | 0.009 | 0.096 | 0 | 1 | 2146 |
| Coastline | 0.069 | 0.254 | 0 | 1 | 2146 |

### *B.2. Geography of Taxation*

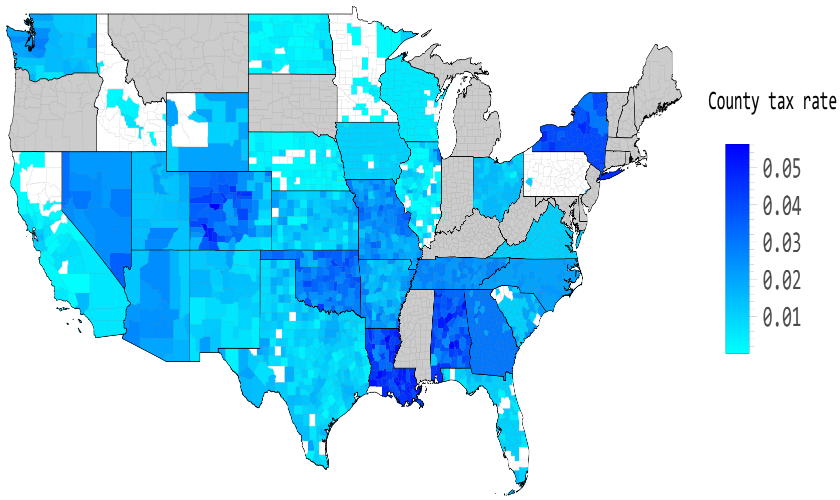



**Figure A.1.** County tax rates. In white are the 257 nontaxing counties with tax authority. In gray are the 706 nontaxing counties without tax authority. The intensity of blue denotes the level of tax rates of the 2,146 taxing counties.

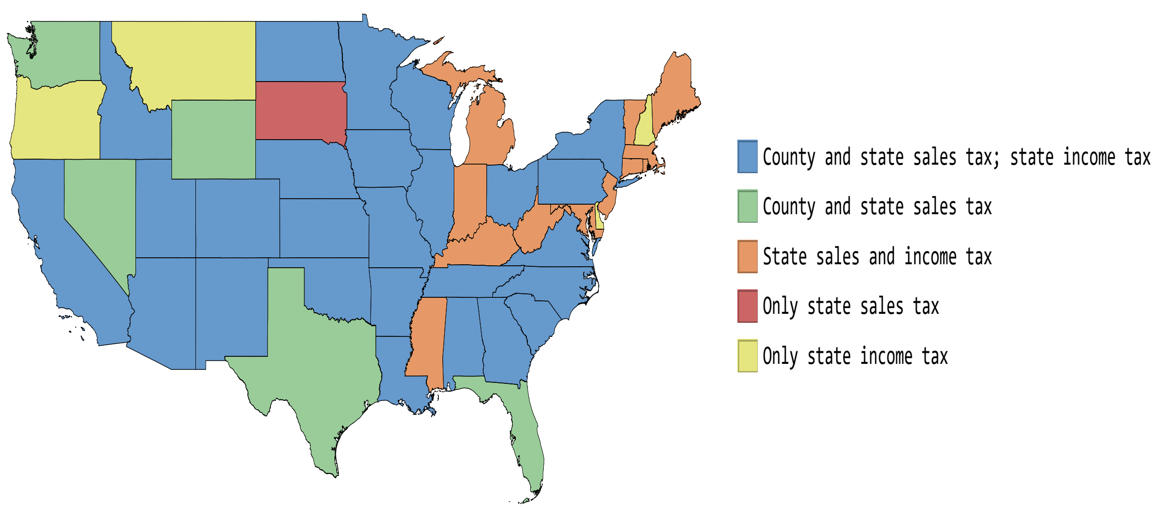
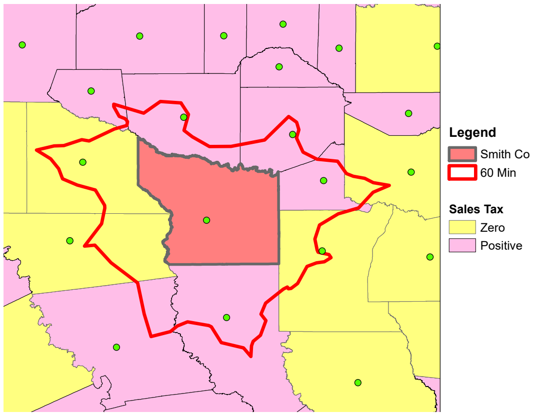



**Figure A.2.** Types of taxation per states.

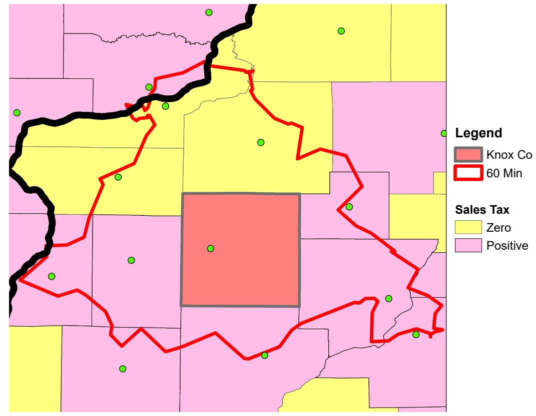
### *B.3. Neighbors*

Our analysis requires identifying the "competitors" of a given county, which for cross-border shopping, can be thought of as neighboring counties that are sufficiently close. Theoretically, a competitor county is a county that a consumer would reasonably elect to purchase goods from as a result of cross-border shopping. Depending on county sizes and the underlying road infrastructure, this may be more than simply using contiguous counties. For example, if a county is on a major interstate and is sufficiently small, consumers may want to buy goods two or three counties away. At the same time, if two counties are separated by a large river with no bridges, then a contiguous county may not be a reasonable competitor.

We compute a measure of market access for each county. A naive approach may calculate an area around the county that is a given number of miles, but such an approach would ignore the road network. Instead, we construct "service areas", which are all points that can be reached in a given number of minutes using the road network. Such an approach requires calculation multi-dimensional travel times around a point, and cannot be implemented around a polygon. To operationalize this, we calculate the population-weighted centroid of each county. We then use a network dataset containing the complete U.S. road network (both major and minor roads), along with driving speeds, to calculate driving costs. When optimizing driving, we follow a hierarchical system — we prioritize highways and major roads over back roads. We then calculate "travel areas" for each county. A travel area is a region that encompasses all accessible streets within a given number of driving minutes from the population centroid. We calculate 60 minute, 90 minute, and 120 minute service areas. Agrawal (2015) shows that 60 minutes is the extent of cross-border shopping, but given we use the centroids rather than the boundary of the polygons, longer distances may be relevant because individuals near the border do not need to incur the time driving within the county. For example, a 60-minute service area for a county centroid includes all the streets that can be reached within 60 minutes of driving from that point. Counties are considered as neighbors if they have a common border or if the driving time from one to the other does not exceed one hour.




**(a)** Smith County, Texas: service area, neighbors and streams. Service area and selection of the 10 neighbors for a 60 minute drive.




**(b)** Knox County, Illinois and its 13 neighbors.

**Figure A.3**

Figure A.3a depicts the case of Smith County in Texas. The solid red line shows the 60 minute service area around the centroid. As can be seen, the county has 10 neighbors within a 60 minute drive: eight contiguous counties plus two counties that can be reached beyond those. Of these counties, four out of the ten are zero-tax counties. One can observe that our definition of market access and who the neighbors are depends on several idiosyncratic features: the location of the population centroid within the county, the extent of the road infrastructure in the area, and topographical features that define the areas of neighboring county sizes.

The case of Smith County is rather simple because all its competitors are located in the state of Texas which allows for local taxation. More generally, some counties may also border states that ban local sales taxes or do not have a state sales tax.[16] For each county, we therefore calculate the population-weighted average state tax rate of the county itself and its neighbors. Counties with neighboring counties located outside the US represent another specific case. Indeed, several states contiguous to Canada (e.g. Washington, North Dakota and Minnesota) and to Mexico (California, Arizona, New Mexico and Texas) allow for local taxation. We ignore the potential international cross-border neighbors of these boundary US counties. This

[16] Figure A.3b depicts the case of Knox County in Illinois whose 13 neighbors spreads over two states. In particular, although the Mississippi River has few road crossings, some crossings allow shoppers to reach the Iowa border in less than an hour.

assumes that the costs of crossing the international border are sufficiently high.[17]

## C. Model Inversion

### *C.1. Equilibrium prices $p_i$*

This section describes the algorithm that allows to compute the equilibrium prices $p_i$. To this aim, we use data on endogenous variables: income $E_i$, number of firms $m_i$ and tax rates $t_i$. We also use data on exogenous variables: population $n_i$, state tax rates $T_i$ and $\tau_i$. And, we use the parameter values of $\alpha$ and $\sigma$. Computation of the equilibrium prices $p_i$ uses the following six-step algorithm.

First, initialize $p_i$.

Then, we compute the wages from (11):

$$w_i = \left(\frac{\sigma - 1}{\sigma}\right)^{\frac{1}{\alpha}} p_i^{\frac{1}{\alpha}}. \tag{C.1}$$

Then, we compute the price indices (5):

$$P_j = \left(\sum_i m_i[(1 + t_i + T_i)p_i\mu_{ij}]^{1-\sigma}\right)^{\frac{1}{1-\sigma}}. \tag{C.2}$$

Then, we compute the value of the demand $X_i$ from (4):

$$X_i = \sum_j m_i(1 + t_i + T_i)^{-\sigma}(p_i\mu_{ij})^{1-\sigma} P_j^{\sigma-1} E_j. \tag{C.3}$$

Then, we compute the state public services as defined in (10):

$$G_i = \frac{T_i \sum_{k\in\mathcal{S}_i} X_k + \sum_{k\in\mathcal{S}_i} \frac{\tau_k}{1-\tau_k} E_k}{\sum_{k\in\mathcal{S}_i} n_k p_k}.$$

Inserting the expression of $Y_i$ (12) and $w_i$ (11) into the commodity market clearing (15) allows to update the market price:

$$p_i = \frac{\sigma}{\sigma - 1}\left(\frac{\sigma - 1}{\sigma}\frac{\alpha}{n_i}[(1 + t_i)X_i + n_i p_i G_i]\right)^{\alpha}.$$

Then, we repeat this loop from (C.1) until convergence.

[17] Nonetheless, we control for whether a county has an international border.

### *C.2. Capital Income $\kappa_i$ and Firm Entry Cost $f_i$*

The non-labor income $\kappa_i$ is computed so that the observed income match the theoretical income (3):

$$\kappa_j = \frac{1}{r}\left(\frac{E_j}{(1-\tau_j)n_j} - \frac{(\sigma-1)\alpha+1}{(\sigma-1)\alpha}w_j\right).$$

The entry cost is calibrated so that the observed number of firms matches the theoretical number of firms (8):

$$f_i = \frac{(1+t_i+s_i)X_i}{(\sigma-1)p_i m_i}.$$

### *C.3. Preference for Public services $\nu$, $\varphi$ and Non-Sales Tax Revenues $\Delta_i$*

Differentiating the aggregate utility (A.1), county $i$'s first-order condition can be written as:

$$\frac{1}{E_i}\left.\frac{\partial E_i}{\partial t_i}\right| - \frac{1}{P_i}\left.\frac{\partial P_i}{\partial t_i}\right| + \frac{\varphi\nu}{\mathbb{G}_i}\left(\left.\frac{\partial g_i}{\partial t_i}\right| + \frac{1-\varphi}{\varphi}\left.\frac{\partial G_i}{\partial t_i}\right|\right) = 0. \tag{C.4}$$

Besides, differentiating the government budget constraint (9), we get:

$$\left.\frac{\partial g_i}{\partial t_i}\right| = \frac{1}{n_i p_i}\left(X_i + t_i\left.\frac{\partial X_i}{\partial t_i}\right| + \frac{t_i X_i}{p_i}\left.\frac{\partial p_i}{\partial t_i}\right|\right). \tag{C.5}$$

Inserting this public good response (C.5) into the first-order condition (C.4), we get:

$$\frac{1}{E_i}\left.\frac{\partial E_i}{\partial t_i}\right| - \frac{1}{P_i}\left.\frac{\partial P_i}{\partial t_i}\right| + \frac{\varphi\nu}{\mathbb{G}_i}\left[\frac{1}{n_i p_i}\left(X_i + t_i\left.\frac{\partial X_i}{\partial t_i}\right| + \frac{t_i X_i}{p_i}\left.\frac{\partial p_i}{\partial t_i}\right|\right) + \frac{1-\varphi}{\varphi}\left.\frac{\partial G_i}{\partial t_i}\right|\right] = 0.$$

Then, a few algebraic manipulations entail:

$$t_i = \frac{\frac{\mathbb{G}_i n_i p_i}{\varphi\nu}\left(\frac{1}{E_i}\left.\frac{\partial E_i}{\partial t_i}\right| - \frac{1}{P_i}\left.\frac{\partial P_i}{\partial t_i}\right|\right) + X_i + \frac{1-\varphi}{\varphi}n_i p_i\left.\frac{\partial G_i}{\partial t_i}\right| - \frac{t_i X_i}{p_i}\left.\frac{\partial p_i}{\partial t_i}\right|}{-\left.\frac{\partial X_i}{\partial t_i}\right|}. \tag{C.6}$$

Inserting the definition of

$$\mathbb{G}_i = \varphi g_i + (1-\varphi)G_i, \tag{C.7}$$

and rearranging, we obtain an expression for the share of the county's sales taxes in its expenditure:

$$\frac{t_i X_i}{n_i p_i g_i} = t_i X_i\left(\nu\frac{-t_i\left.\frac{\partial X_i}{\partial t_i}\right| - X_i - \frac{1-\varphi}{\varphi}n_i p_i\left.\frac{\partial G_i}{\partial t_i}\right| + \frac{t_i X_i}{p_i}\left.\frac{\partial p_i}{\partial t_i}\right|}{\frac{1}{E_i}\left.\frac{\partial E_i}{\partial t_i}\right| - \frac{1}{P_i}\left.\frac{\partial P_i}{\partial t_i}\right|} - \frac{1-\varphi}{\varphi}n_i p_i G_i\right)^{-1},$$

which is the theoretical revenue share of sales taxes in total revenues of county $i$. We choose $\nu$ and $\varphi$ such that the first two stastictical moments of this theoretical revenue share match the observed moments in the data:

$$\mathbb{E}\left[\frac{t_i X_i}{n_i p_i g_i}\right] = \text{mean}(share_i), \qquad \mathbb{V}\left[\frac{t_i X_i}{n_i p_i g_i}\right] = \text{variance}(share_i),$$

where $share_i$ is the observed share of non-sales tax revenue in the total tax revenues of the county. Notice that we also tried versions in which the denominator of $share_i$ could alternatively be the total expenditure of the county. This does not change significantly the values of $\nu$ and $\varphi$.

We now turn to the computation of the non-sales tax revenues $\Delta_i$. The first-order condition (C.4) can be rearranged:

$$g_i + \frac{1-\varphi}{\varphi} G_i = \nu \left( \frac{1}{P_i} \left. \frac{\partial P_i}{\partial t_i} \right| - \frac{1}{E_i} \left. \frac{\partial E_i}{\partial t_i} \right| \right)^{-1} \left( \left. \frac{\partial g_i}{\partial t_i} \right| + \frac{1-\varphi}{\varphi} \left. \frac{\partial G_i}{\partial t_i} \right| \right),$$

in which the definiton of $\mathbb{G}_i$ (C.7) has been inserted. Then, using and the government budget constraint (9), we can compute the non-sales tax endowment $\Delta_i$:

$$\Delta_i = \nu \left( \frac{1}{P_i} \left. \frac{\partial P_i}{\partial t_i} \right| - \frac{1}{E_i} \left. \frac{\partial E_i}{\partial t_i} \right| \right)^{-1} \left( \left. \frac{\partial g_i}{\partial t_i} \right| + \frac{1-\varphi}{\varphi} \left. \frac{\partial G_i}{\partial t_i} \right| \right) - \frac{1-\varphi}{\varphi} G_i - \frac{t_i X_i}{n_i p_i}. \tag{C.8}$$

## D. Overidentification Checks

We now examine the model's predictions for variables not used in the calibration and for relations between variables not directly imposed by the model. We begin with assessing the ability of the model to predict observed local consumption shares (Appendix D.1). Then, we check the empirical relevance of the Ramsey rule in the setting of observed tax rates (Appendix D.2).

### *D.1. Local Expenditure Shares*

Inserting the predicted commuting frictions, $\widehat{\mu}_{ij}$, into the model, and solving for the equilibrium prices, we compute the local expenditure shares $X_{jj}/\sum_i X_{ij}$. Table A.3 indicates that the specification of the gravity regression does not alter significantly the local expenditure share.

**Table A.3.** Summary statistics local expenditure share.

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | Observed | Predictions | | | | | |
| | | A. All counties | | | | | |
| Mean | 0.671 | 0.737 | 0.736 | 0.736 | 0.737 | 0.736 | 0.736 |
| SD | 0.308 | 0.142 | 0.14 | 0.139 | 0.142 | 0.14 | 0.139 |
| Max | 1 | 0.993 | 0.993 | 0.992 | 0.993 | 0.993 | 0.992 |
| Min | 0 | 0.047 | 0.067 | 0.078 | 0.046 | 0.066 | 0.077 |
| Obs | 2051 | 3109 | 3109 | 3109 | 3109 | 3109 | 3109 |
| | | B. Restriction to the observed sample | | | | | |
| Mean | 0.671 | 0.75 | 0.749 | 0.748 | 0.75 | 0.748 | 0.748 |
| SD | 0.308 | 0.136 | 0.135 | 0.134 | 0.137 | 0.135 | 0.134 |
| Max | 1 | 0.993 | 0.993 | 0.992 | 0.993 | 0.993 | 0.992 |
| Min | 0 | 0.047 | 0.067 | 0.078 | 0.046 | 0.066 | 0.077 |
| Obs | 2051 | 2587 | 2587 | 2587 | 2587 | 2587 | 2587 |
| Neighborhood (miles) | | 60 | 90 | 120 | 60 | 90 | 120 |
| Neighborhood×log(dist) | | NO | NO | NO | YES | YES | YES |

Table A.4 suggest that the observed and the predicted local consumption shares are similar as the slope of the regression is close to one.

**Table A.4.** Summary statistics local expenditure share.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $\left(\frac{X_{jj}}{\sum_i X_{ij}}\right)^{\text{observed}}$ on $\left(\frac{X_{jj}}{\sum_i X_{ij}}\right)^{\text{predicted}}$ | $1.054^{***}$ | $1.077^{***}$ | $1.087^{***}$ | $1.053^{***}$ | $1.076^{***}$ | $1.087^{***}$ |
| | (0.049) | (0.049) | (0.05) | (0.049) | (0.049) | (0.05) |
| Neighborhood (miles) | 60 | 90 | 120 | 60 | 90 | 120 |
| Neighborhood×log(dist) | NO | NO | NO | YES | YES | YES |

## *D.2. Testing the Open-Economy Ramsey Rule*

This appendix examines correlations between observed tax rates and emprical measures of the components of the open-economy Ramsey rule (23) introduced in Subsection 2.4.

### *D.2.1. Local Expenditure Share $\theta_i$*

According to the open-economy Ramsey rule, the local expenditure share of a household puts a downward pressure on the sales tax rate it is willing to pay. Table A.5 examines this relationship.

**Table A.5.** Regression of local tax rates on local expenditure shares in the data.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $t_i$ on $\theta_i^{\text{observed}}$ | −35.29*** | −23.59* | −35.45*** | −21.69* |
| | (9.326) | (9.462) | (9.544) | (9.552) |
| Controls | NO | YES | NO | YES |
| Nontaxing counties | NO | NO | YES | YES |
| $N$ | 1404 | 1404 | 1555 | 1555 |

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

NOTE— The dependent variable is the county plus average municipal sales tax rate. The local expenditure $X_{ii}$ in $\theta_i = (1 - t_i - T_i)X_{ii}/E_i$ is computed using Nielsen shopping data. The control variables are thoses listed in Table A.2. The large scale point estimates are due to the fact that the scale of $t_i$ (mean: 1.2%) is much larger than that of $\theta_i$ (mean: 0.003%).

Table A.5 reports strongly negative and significant point estimates, which seem to confirm the expected negative effect of the local expenditure share on the sales tax rates.

### *D.2.2. Tax Export Incentive $\chi_i$*

The discussion of the open-economy Ramsey rule suggests that a fundamental determinant of the level of a county's tax rate is the trade-off between local private consumption and public service provision, or equivalently, the tax export motive. According to this result, a county in which the residents' consumption of the local taxable variety represents a large share of the tax base would set a relatively lower tax rate. To investigate empirical evidence of this tax derminant, Table A.6 examines the relationship between taxes and a proxy for the share of total sales from own residents in the data.

**Table A.6.** Regression of local tax rates on the shares of total sales from own residents in the data.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $t_i^{county}$ on $\chi_i^{\text{observed}}$ | −0.00263 | −0.00347** | −0.00254 | −0.00327* | −0.00240 | −0.00302* |
| | (0.00136) | (0.00131) | (0.00134) | (0.00130) | (0.00134) | (0.00129) |
| Neighborhood (miles) | 60 | 60 | 90 | 90 | 120 | 120 |
| Nontaxing counties | NO | YES | NO | YES | NO | YES |
| $N$ | 1344 | 1487 | 1344 | 1487 | 1344 | 1487 |

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note— The dependent variable is the county tax rate. The share of total sales from own residents $\chi_i = X_{ii}/X_i$ is computed using Nielsen shopping data. All regressions include the control variables listed in Table A.2.

The negative coefficient with (pvalues<10%) suggests that, as predicted by our model, counties whose tax base is mostly composed of local consumption have relatively lower tax rates. This result becomes statistically significant as we also include nontaxing counties, This suggests that the decision to set a non-zero tax rate (extensive margin) is driven by the tax export motive. This effect is relatively small as it states that a county whose local contribution to its tax base increases by one percentage point (ppt) than another county has a 0.009 ppt lower tax rate than this other county. Given the sample averages of these variables reported in the table notes, this represents an elasticity of 0.06.

### *D.2.3. Non-sales tax revenue to income ratio $\lambda_i$*

The Ramsey rule suggests that a county would lower its sales tax rate if it benefits from more non-sales tax revenues. To examine this effect, we focus on the counties' own revenue sources and control for the state transfer using state fixed effects.

**Table A.7.** Regression of local tax rates on Non-sales tax revenues to income ratio in the data.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $t_i$ on $\left(\frac{R_i}{E_i}\right)^{\text{observed}}$ | −0.971 | −0.416 | −1.850** | −1.748*** |
| | (0.934) | (0.734) | (0.621) | (0.526) |
| Controls | NO | YES | NO | YES |
| Nontaxing counties | NO | NO | YES | YES |
| $N$ | 2141 | 2141 | 2398 | 2398 |

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note— The dependent variable is the county plus average municipal tax rate. All regressions include state fixed effects. The control variables are thoses listed in Table A.2.

Table A.7 suggests that the leverage effect played by other sources of revenue is mostly an extensive margin effect, as it becomes statistically significant only when including nontaxing counties.

## E. Tax Incidence and Tax Decision

Figure A.4 compares the partial and general equilibrium tax incidence on prices for the 2217 taxing counties. It first indicates that the standard negative tax incidence effect of tax on prices prevails systematically. This result is true both in partial and in general equilibrium.

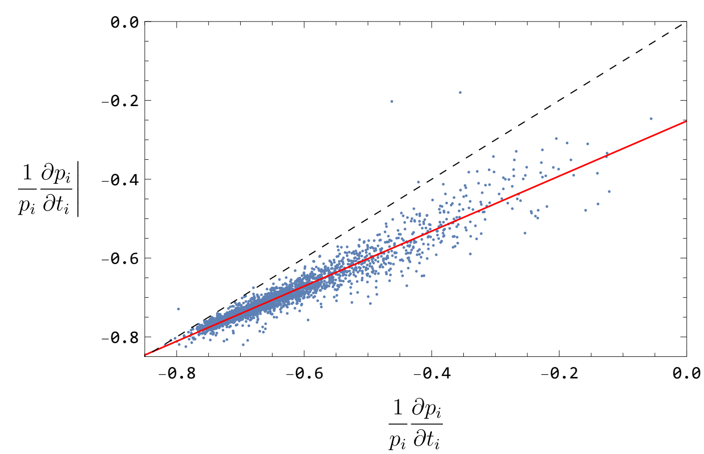



**Figure A.4.** Partial versus general equilibrium tax incidence. The dashed line represents the 45 degree line. The slope and intercept of the regression line (in red) are 0.69 and −0.25, respectively.

Another interesting insight is that, as expected, counties seem to overstate the negative impact of their tax rate on the price of their variety. This is intuitive because they do not account for the opposite positive price capitalization in other counties which will capture part of the effects of the policy. More importantly Figure A.4 reveals that both are strongly correlated and quite similar. This is reassuring and suggests that our tax setting rule is indeed reasonable. To our knowledge, this finding is one of the first evidence that counties are small enough to be considered as atomistic jurisdictions. Further evidence are provided in Table 4 which shows that interjurisdiction price effects are negligible compared to local price effects.

Table A.8 reports the partial and general equilibrium tax incidence on prices and on the other components of the governments first-order condition:

$$\frac{1}{E_i}\frac{\partial E_i}{\partial t_i}\bigg| - \frac{1}{P_i}\frac{\partial P_i}{\partial t_i}\bigg| + \frac{\nu}{\mathbb{G}_i}\frac{\partial \mathbb{G}_i}{\partial t_i}\bigg| = 0 \tag{E.1}$$

Panel A confirms that tax incidence on the price of the local variety is similar in partial and general equilibrium prices. Panel B indicates that at the equilibrium, as a county increases its tax, as expected, its public good provision increases. However, this welfare gain is partly compensated by a significant income reduction. And it is fully compensated once accounting for the increase in the cost of living represented by the increase in the price index resulting from the local tax increase.

**Table A.8.** Effects of taxation on the government's first-order conditions' variables.

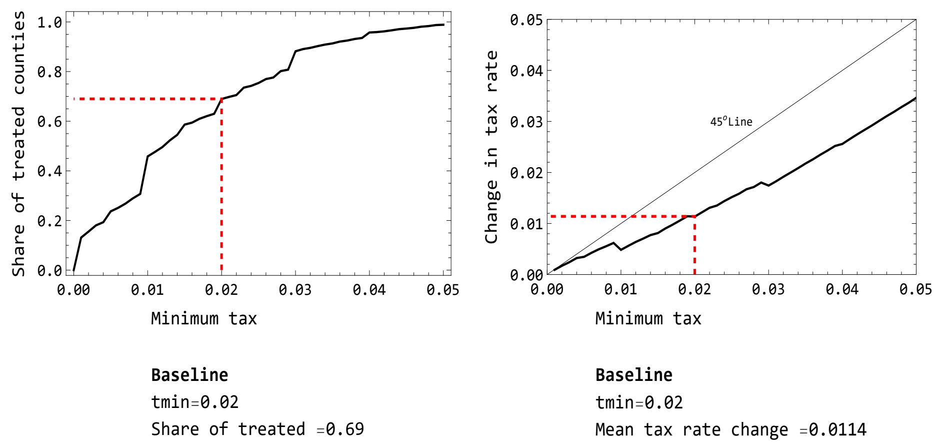
| Variable | Equilibrium | Mean | SD | Min | Max | Obs |
|---|---|---|---|---|---|---|
| *A. Tax incidence* | | | | | | |
| $\frac{1}{p_i}\frac{\partial p_i}{\partial t_i}$ | General | −0.636 | 0.109 | −0.786 | −0.056 | 2146 |
| $\frac{1}{p_i}\frac{\partial p_i}{\partial t_i}\Big\|$ | Partial | −0.696 | 0.078 | −0.825 | −0.18 | 2146 |
| *B. Component of the government's first-order condition* | | | | | | |
| $\frac{1}{E_i}\frac{\partial E_i}{\partial t_i}\Big\|$ | Partial | −0.732 | 0.115 | −1.397 | −0.199 | 2146 |
| $\frac{1}{P_i}\frac{\partial P_i}{\partial t_i}\Big\|$ | Partial | 0.247 | 0.095 | 0.021 | 0.76 | 2146 |
| $\frac{\nu}{\mathbb{G}_i}\frac{\partial \mathbb{G}_i}{\partial t_i}\Big\|$ | Partial | 0.98 | 0.116 | 0.478 | 1.544 | 2146 |
| *C. Local and state public services* | | | | | | |
| $\frac{\lambda}{1-\lambda}\frac{\nu}{g_i}\frac{\partial g_i}{\partial t_i}\Big\|$ | Partial | 1.327 | 1.046 | 0.303 | 24.999 | 2146 |
| $\frac{\nu}{G_i}\frac{\partial G_i}{\partial t_i}\Big\|$ | Partial | −0.355 | 0.12 | −0.71 | −0.07 | 2146 |

Panel C also indicates that local policy crowds out some of the state policy. The reason is that the reduction of the prices, reduces both the sales and income tax revenues collected by the state. Thus, Table A.8 offers novel insight into how local governments make their decisions by quantifying the aggregate components of the government's first-order condition (E.1).

## F. Supplementary Results on Minimum Taxation

This appendix supplements the results in Subsection 4.1 by providing more results on the welfare effects on minimum tax reforms.

Figure A.5 reports the share of counties constrained by the minimum tax and the resulting mechanical tax rate change with respect to different levels of minimum tax. As the average county-level tax rate is low (around 1.64%, see Table A.2), the share of treated counties increases rapidly.




**(a)** Share of treated counties. **(b)** Change in tax rate of treated counties.

**Figure A.5.** Share of treated counties and their average change in tax rate according to the level of the minimum tax. The red dashed line represents our baseline case of $t^{min} = 2\%$.

## F.1. *Overall Welfare Effects*

**Table A.9.** Effect of a minimum tax of 2% on the social welfare of an average individual, equal social weights.

| | Winner share (%) | Welfare change ($) | | | | Population (millions) | Nb counties |
|---|---|---|---|---|---|---|---|
| | | Mean | Median | Decile 10 | Decile 90 | | |
| *A. Endogenous taxation* | | | | | | | |
| All counties | 80.0 | 37.1 | 16.0 | −16.3 | 111 | 90.9 | 2402 |
| Non-treated counties | 75.9 | 3.4 | 4.5 | −6.8 | 16.0 | 31.3 | 746 |
| Treated counties | 82.2 | 54.8 | 41.0 | −16.3 | 130 | 59.6 | 1656 |
| *B. Exogenous taxation* | | | | | | | |
| All counties | 80.1 | 36.5 | 15.7 | −16.3 | 112 | 90.9 | 2402 |
| Non-treated counties | 75.9 | 2.5 | 4.5 | −12.4 | 15.7 | 31.3 | 746 |
| Treated counties | 82.2 | 54.3 | 41.6 | −16.3 | 130 | 59.6 | 1656 |

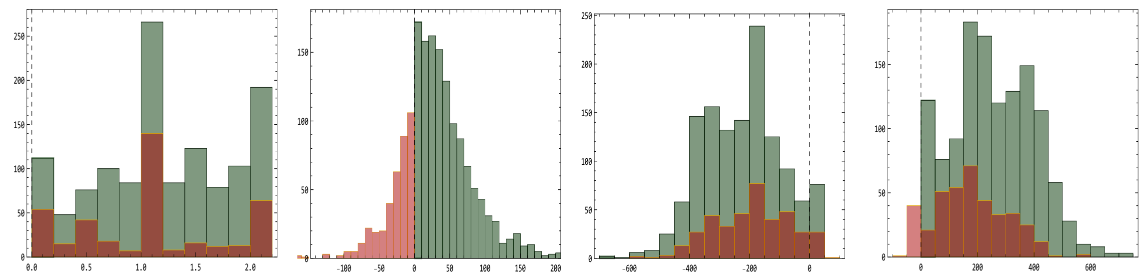
NOTE— Winner share: share of population with positive equivalent variation; Welfare chage: equivalent variation at the individual level.

## F.2. *Decomposition of the Effects of a Minimum Tax*

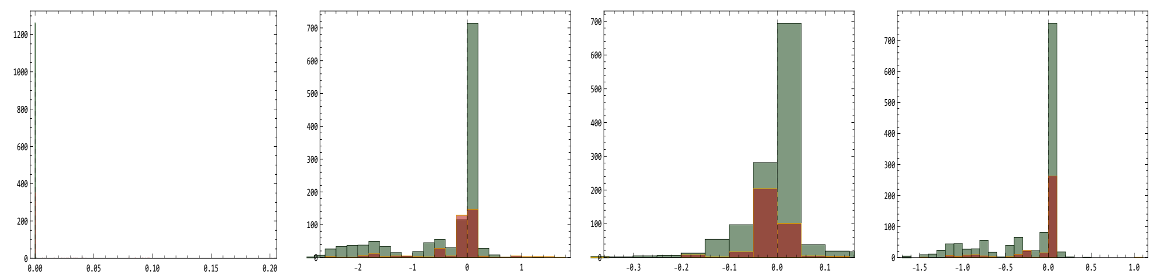
In this section, we decompose the effects of the minimum tax into public and private equivalent variations. In our model, the equivalent variation formula implies that the otal welfare effects for a resident of county $i$ is:

$$EV_i = \frac{\frac{E_i' \mathbb{G}_i'^{\nu}}{P_i'} - \frac{E_i \mathbb{G}_i^{\nu}}{P_i}}{\frac{E_i \mathbb{G}_i^{\nu}}{P_i}} E_i \qquad EV_i^{public} = \frac{\frac{E_i'}{P_i'} - \frac{E_i}{P_i}}{\frac{E_i}{P_i}} E_i \qquad EV_i^{private} = \frac{\mathbb{G}_i'^{\nu} - \mathbb{G}_i^{\nu}}{\mathbb{G}_i^{\nu}} E_i \tag{F.1}$$

in which the latter two terms are equivalent variations focusing on the disposable income effect or on the public service effects; the formulas are, respectively.



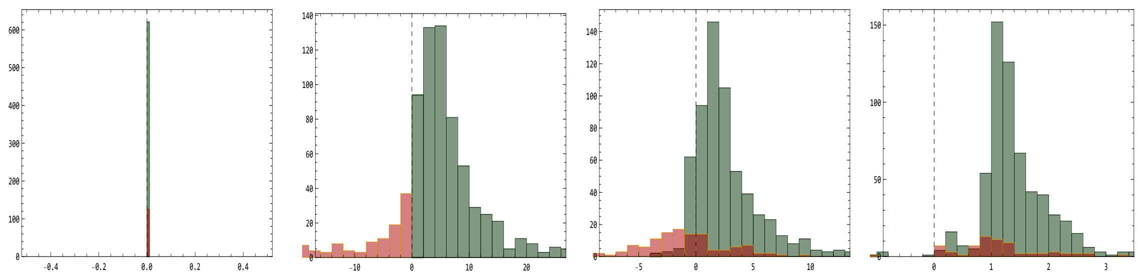
**(a)** Change in tax rates $t_i$ w.r.t. minimum tax. Exogenous tax rates.
**(b)** Total equivalent variation. Exogenous tax rates.
**(c)** Private equivalent variation. Exogenous tax rates.
**(d)** Public equivalent variation. Exogenous tax rates.



**(e)** Percentage change in tax rates $t_i$ w.r.t. minimum tax. Effect of policy competition.
**(f)** Change in total equivalent variation. Effect of policy competition.
**(g)** Change in private equivalent variation. Effect of policy competition.
**(h)** Change in public equivalent variation. Effect of policy competition.

Winning counties with increased total equivalent variation.
Losing counties with reduced total equivalent variation.

**Figure A.6.** Effect of a minimun tax of $t^{min} = 2\%$ on treated counties. Figure A.6a–Figure A.6d assume exogenous tax rates. Figure A.6e–Figure A.6h represent the level of the variable under endogenous taxation minus the level under exogenous tax rates. In Figure A.6a, the change in tax rate is: $100 \times (t^{after} - t^{before})$.

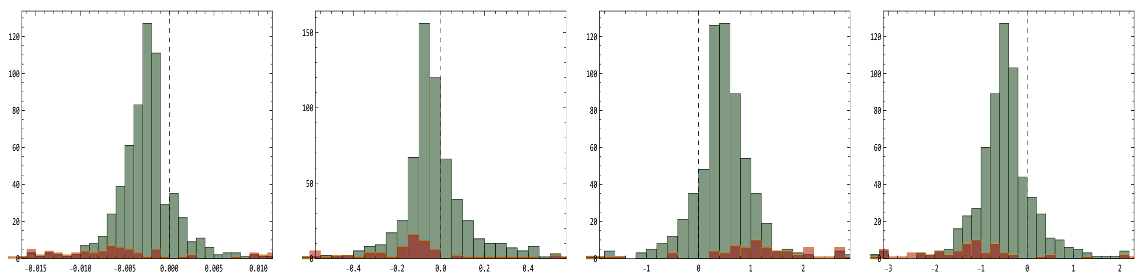


**(a)** Percentage change in tax rates $t_i$ w.r.t. minimum tax. Exogenous tax rates.

**(b)** Change in total equivalent variation. Exogenous tax rates.

**(c)** Change in private equivalent variation. Exogenous tax rates.

**(d)** Change in public equivalent variation. Exogenous tax rates.



**(e)** Change in tax rates $t_i$. Effect of policy competition.

**(f)** Change in total equivalent variation. Effect of policy competition.

**(g)** Change in private equivalent variation. Effect of policy competition.

**(h)** Change in public equivalent variation. Effect of policy competition.

Winning counties with increased total equivalent variation.
Losing counties with reduced total equivalent variation.

**Figure A.7.** Effect of a minimun tax of $t^{min} = 2\%$ on non-treated counties. Figure A.7a–Figure A.7d assume exogenous tax rates. Figure A.7e–Figure A.7h represent the level of the variable under endogenous taxation minus the level under exogenous tax rates. In Figure A.6a, the percentage change in tax rate is relative to the minimum tax: $100 \times (t^{after} - t^{before})$.

### *F.3. Other Figures*

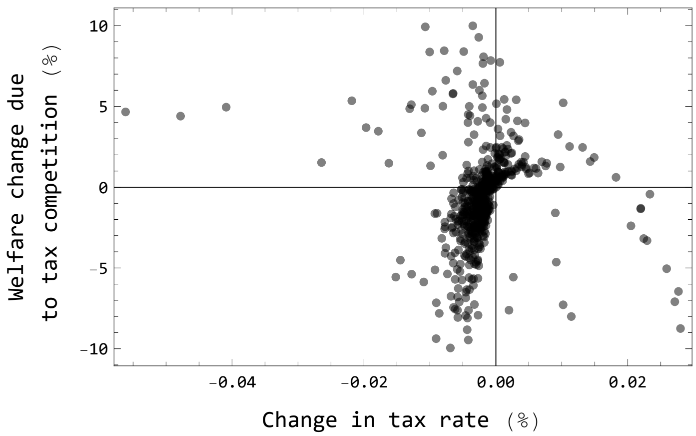
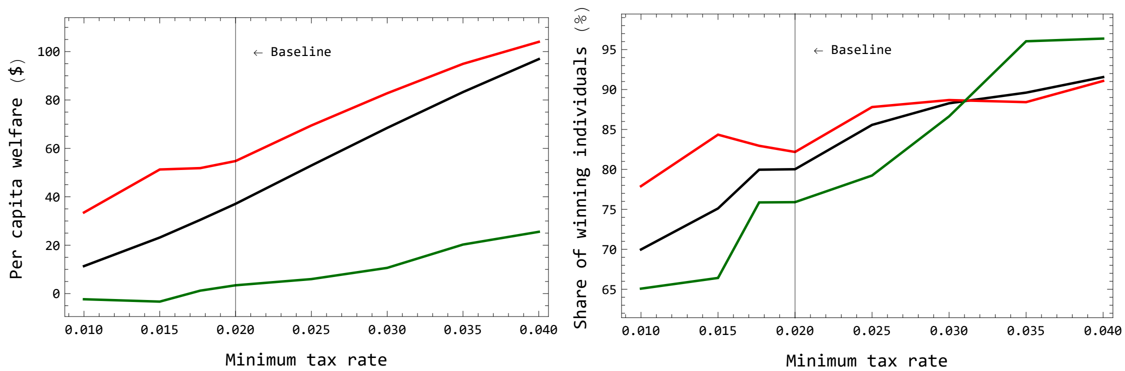



**Figure A.8.** Correlation between gain from tax competition and tax change, for non-treated counties.

Then, we vary the level of the minimum tax and investigate the aggregate welfare effect as well as the share of total population who would gain from the minimum tax (and who would plausibly support such initiative at the political level). Figure A.9a presents the overall change in welfare. Not surprisingly, it is positive and increasing for treated counties. There are different levels of welfare effects for treated and non-treated counties so they have different desired levels of minimum tax rates. Contrained who would rather the highest possible minimum tax rate, while conditional on a minmum tax being imposed, non-treated counties prefer a minimum tax of roughly 4%.




**(a)** Welfare per capita.

**(b)** Share of winning population.

All counties
Treated counties
Non-treated counties

**Figure A.9.** Welfare effects of a minimum tax on the average individual and share of winning individuals in the population. Only the inhabitants of the counties which are free to choose their tax rates of are included. The number of treated and non-treated counties changes with the level of the minimum tax.

Also interesting is the share of winning individuals reported in Figure A.9b. Treated counties may accept a tax a lower minium tax more easily, while non-treated counties could accept a higher minimum tax. Our results suggests that a minimum sales tax in the U.S. could convince at most 90% of the population if the tax rate is relatively high (around 3.5%).

## G. The Welfare Effects of Tax Harmonization

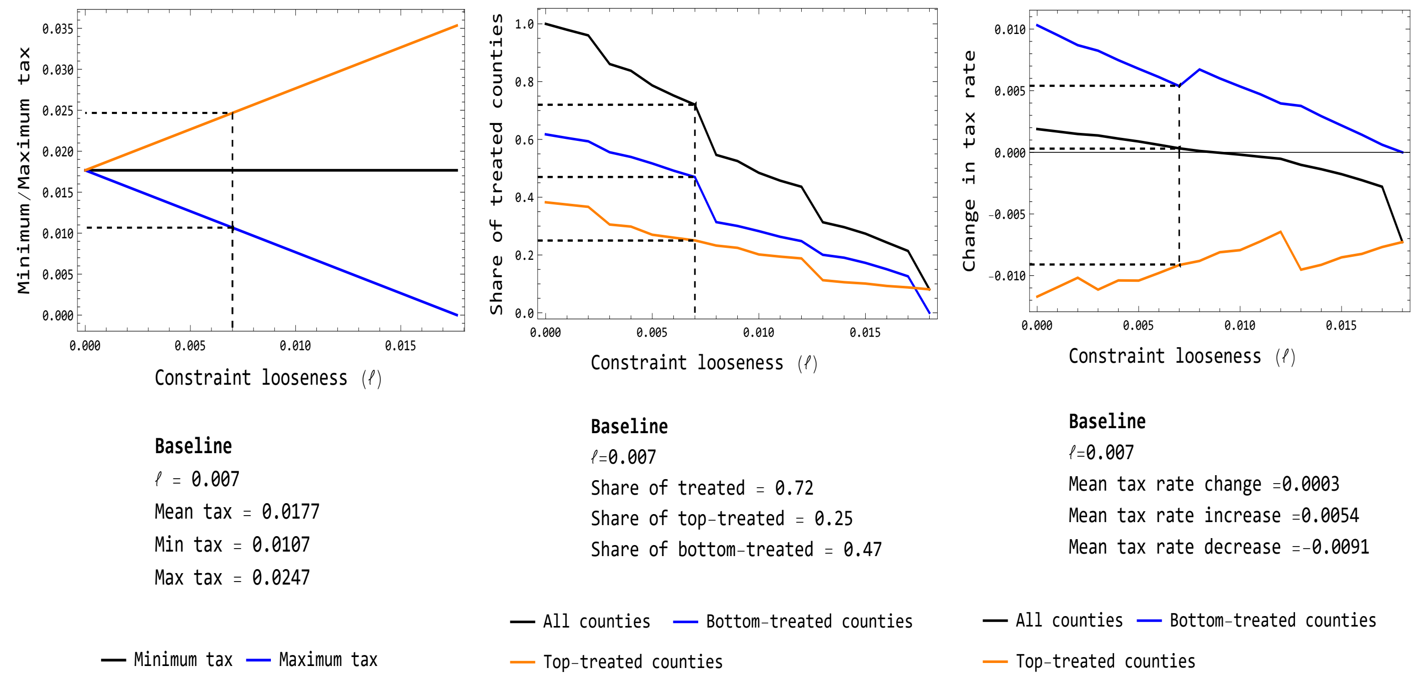
In this Appendix we study the welfare effects of (partial) tax harmonization (Fajgelbaum et al., 2019; Hines Jr, 2023). Formally, the constraint consists of imposing a bandwidth, $[t^{mean} - \ell, t^{mean} + \ell]$, around the mean tax rate of taxing counties, which is approximately, $t^{mean} \approx 1.77\%$.[18] The parameter, $\ell \in [0, t^{mean}]$, measures the degree of looseness of the tax harmonization constraint. Thus, unlike a minimum tax rate, counties can be treated from above ("top-treated", herafter) or from below ("bottom-treated" county, herafter).

### *G.1. Partial Tax Harmonization Reforms*

Figure A.10 reports its mechanical change in tax rates for different degrees of looseness. Figure A.10a shows how the degree of looseness translates in terms of minimum and maximum

[18] The harmonized tax is the county tax rate, $t_i$, and not the total sales tax rate incurred by the consumer, $t_i + T_i$, which includes the state tax rate.

tax rates. Figure A.10b shows that the bottom-treated counties represent the majority of the treated counties for any sufficiently low levels of $\ell$. In other words, counties that set relatively high tax rates are relatively few but they set particularly high tax rates. On the contrary, most treated counties set relatively low tax rates, but closer to the mean tax rate.




**(a)** Relation between looseness and tax constraint.

**(b)** Share of treated counties.

**(c)** Mechanical tax change of treated counties.

**Figure A.10.** Share of treated counties and their average change in tax rate according to the degree of looseness of the tax harmonization constraint. Figure A.10a represents the translation of the tax constraint looseness, $\ell$, into a minimum tax, $t^{min} = t^{mean} - \ell$, and a maximum tax, $t^{max} = t^{mean} + \ell$, where $t^{mean} = 1.77\%$ is the sample average tax rate of the taxing counties. The dashed line represents our baseline $\ell = 0.007$.

Figure A.10c shows that, indeed, the tax harmonization reform imposes larger tax increases than the tax cuts it involves. These considerations are important because we can expect the welfare effects in top-treated counties to go in the opposite direction of the welfare changes in the bottom-treated counties. This implies that the aggregate welfare effects is ambiguous and depends on whether the welfare effects of the relatively large tax cuts imposed on the less numerous top-treated counties will dominate the welfare effects of the relatively small tax increase of the many bottom-treated counties.

### G.2. *Welfare Effects*

Table A.10 summarizes the welfare effects of the policy for the baseline tax harmonization looseness of 0.7 percentage points. As expected, top-treated counties incur welfare losses ($105 per capita) and only 12% of their population benefits from the reform. On the opposite, bottom-treated counties benefit from welfare gains of $33 per individual and the vast majority (75%) of the population in these counties benefit from the reform. These results extend those observed for minimum tax reforms which indicated that forcing a county to raise its tax rate improved its' residents' welfare. As a tax harmonization reform is simply the joint imposition of both minimum and maximum taxes constraints, it is not surprising that a maximum tax reduces the welfare of the treated population.

**Table A.10.** Effect of a tax harmonization $[t^{mean} - \ell, t^{mean} + \ell]$ with looseness $\ell = 0.7\%$ on the social welfare of an average individual.

| | Winner share (%) | Welfare change ($) | | | | Population (millions) | Nb counties |
|---|---|---|---|---|---|---|---|
| | | Mean | Median | Decile 10 | Decile 90 | | |
| *A. Endogenous taxation* | | | | | | | |
| All counties | 45.8 | −17.4 | −1.6 | −108 | 60.9 | 90.9 | 2402 |
| Non-treated counties | 37.9 | −7.3 | −2.5 | −25.5 | 8.5 | 30.4 | 672 |
| Treated counties | 49.8 | −22.5 | −0.12 | −123 | 72.6 | 60.6 | 1730 |
| Top-treated counties | 12.2 | −105 | −62.5 | −235 | 4.6 | 24.3 | 602 |
| Bottom-treated counties | 74.9 | 33.0 | 27.0 | −19.4 | 93.9 | 36.3 | 1128 |
| *B. Exogenous taxation* | | | | | | | |
| All counties | 45.9 | −17.7 | −1.7 | −109 | 62.3 | 90.9 | 2402 |
| Non-treated counties | 37.7 | −8.8 | −2.6 | −30.2 | 9.5 | 30.4 | 672 |
| Treated counties | 50.0 | −22.2 | 0.029 | −124 | 72.7 | 60.6 | 1730 |
| Top-treated counties | 11.9 | −106 | −62.5 | −235 | 4.3 | 24.3 | 602 |
| Bottom-treated counties | 75.5 | 33.5 | 27.2 | −19.0 | 94.0 | 36.3 | 1128 |

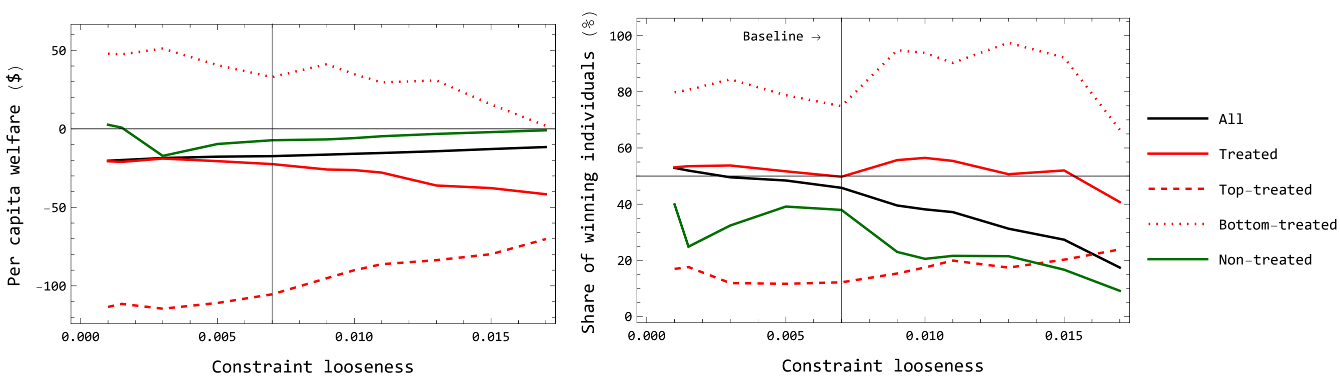
Note— Winner share: share of population with positive equivalent variation; Welfare change: equivalent variation at the individual level.

These ambiguous results in treated counties resulting from the two-fold nature of tax harmonization itself suggest that the overall effect on treated counties can be in any direction. Table A.10 confirms this ambiguity as, roughly 50%, of the population living in treated counties benefits from welfare gains. The average individual in treated counties incurs a small loss of $22 but the median individual is barely affected (loss of 12 cents).

These results extend those in Fajgelbaum et al. (2019) who also argue that in theory tax harmonization can generate ambiguous results. They however find that imposing a tax harmonization on U.S. states (with a degree of looseness of 0) generate welfare gains on average.

The contrast between our results is not surprising as the welfare effects of these types of reforms critically depend on the distribution of tax rates above and below the tax constraints.

A novel result of Table A.10 compared to prior literature which imposed full harmonization of tax rates (Fajgelbaum et al., 2019) is the effects on the non-treated. One can see that they incur welfare losses ($7 per capita) and would benefit only 38% of the population. This is intuitive as the main channel through which non-treated counties are affected by the policy is through the change is the net price of the goods their population consume in treated counties. As the vast majority of treated counties are bottom-treated counties (last column of Table A.10), it is not surprising that on average a resident of a non-treated county is worse-off.




**(a)** Welfare per capita.

**(b)** Share of winning population.

**Figure A.11.** Welfare effects hare of winning individuals in the population as a function of the degree of tax harmonization looseness imposed. Only the inhabitants of the counties which are free to choose their tax rates are included. The number of treated and non-treated counties changes with the level of the minimum tax.

To enrich the picture of the effects of tax harmonization, Figure A.11 reports the welfare effects for different levels of constraint looseness. Figure A.11a extends the above findings by showing that for any level of tax harmonization, treated and non-treated counties balance each other in terms of welfare. Figure A.11b shows that in tax harmonization would never obtain a majority vote in the whole population because of the low support of top-treated counties and of non-treated ones.

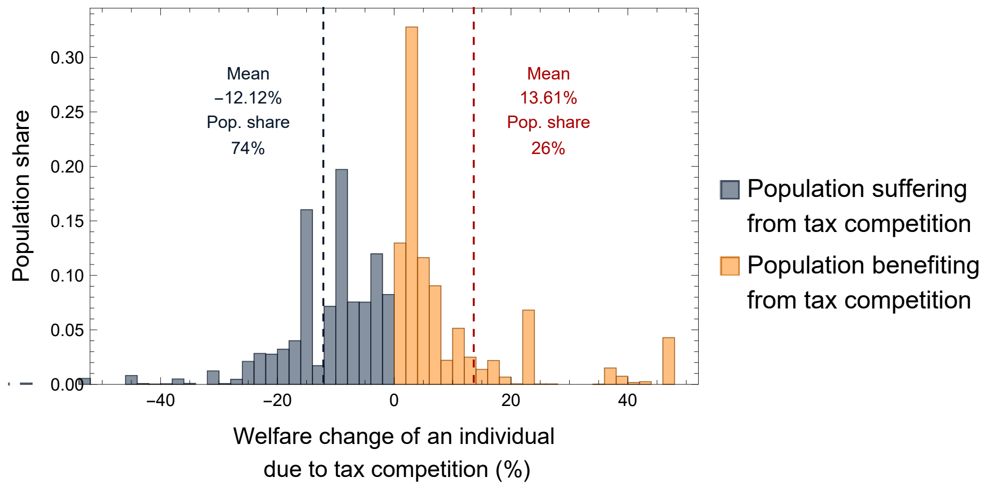
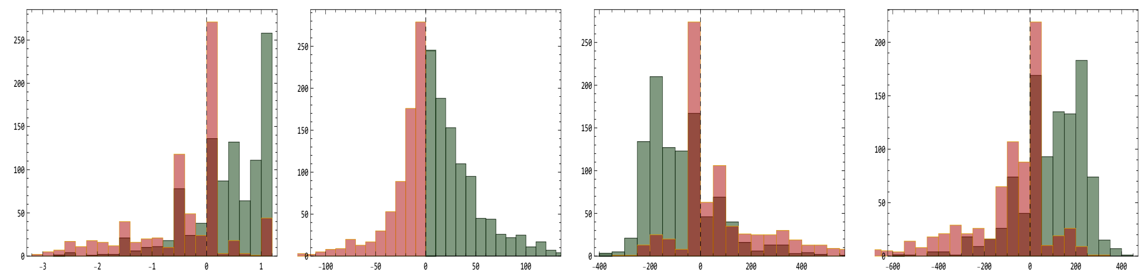



**Figure A.12.** Welfare effects due to tax competition as tax harmonization with looseness 0.7% is imposed. The graph represents the percentage change equivalent variations of the different shares of people leaving in the non-treated counties only. The population shares are computed within these two groups of counties. The mean welfare change due to tax competition in the entire population is −5.15%.

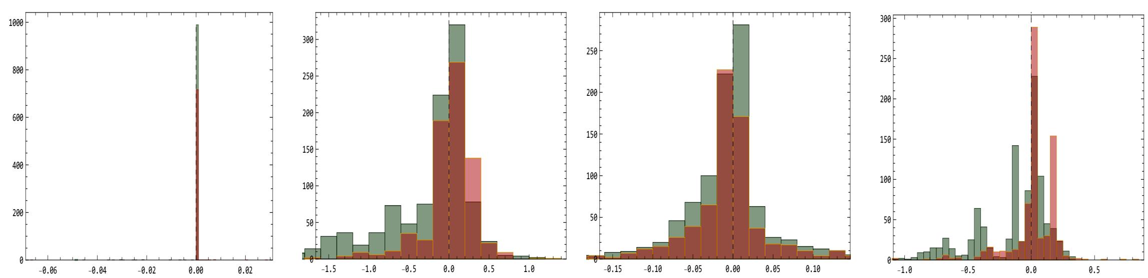
Figure A.12 shows that as our baseline tax harmonization reform is implemented, the presence of tax competition betters 26% of people in non-treated counties with a 15% welfare gain, on average. But a majority 74% of the population there incurs an average welfare loss of 12%. These numbers are comparable to those obtained in the minimum tax exercise, although of larger magnitude as the tax harmonization affects more people. Figures A.13 and A.14 in Appendix G.3 further decompose the welfare effects of the minimum tax into public and private gains.

### *G.3. Supplementary Results on Tax Harmonisation*

This appendix supplements the results in Subsection 4.2 by providing more results on the welfare effects on minimum tax reforms.



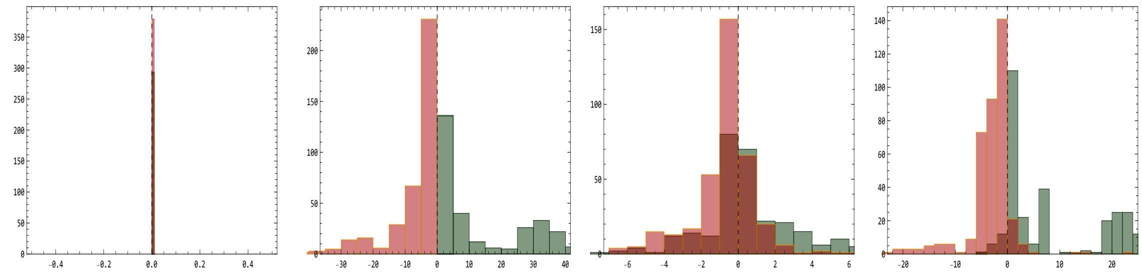
**(a)** Change in tax rates $t_i$ w.r.t. minimum tax. Exogenous tax rates.
**(b)** Total equivalent variation. Exogenous tax rates.
**(c)** Private equivalent variation. Exogenous tax rates.
**(d)** Public equivalent variation. Exogenous tax rates.



**(e)** Percentage change in tax rates $t_i$ w.r.t. minimum tax. Effect of policy competition.
**(f)** Change in total equivalent variation. Effect of policy competition.
**(g)** Change in private equivalent variation. Effect of policy competition.
**(h)** Change in public equivalent variation. Effect of policy competition.

Winning counties with increased total equivalent variation.
Losing counties with reduced total equivalent variation.

**Figure A.13.** Effect of a tax harmonization $[t^{mean} - \ell, t^{mean} + \ell]$ with looseness $\ell = 0.7\%$ on treated counties. Figure A.13a–Figure A.13d assume exogenous tax rates. Figure A.13e–Figure A.13h represent the level of the variable under endogenous taxation minus the level under exogenous tax rates. In Figure A.13a, the change in tax rate is relative to the minimum tax: $100 \times (t^{after} - t^{before})$.

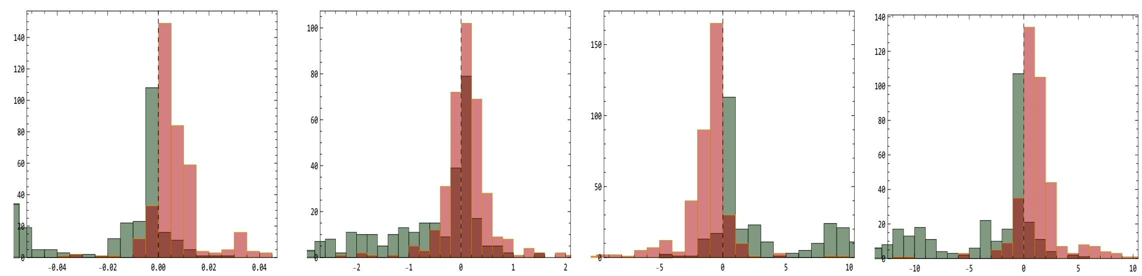


**(a)** Percentage change in tax rates $t_i$ w.r.t. minimum tax. Exogenous tax rates.

**(b)** Change in total equivalent variation. Exogenous tax rates.

**(c)** Change in private equivalent variation. Exogenous tax rates.

**(d)** Change in public equivalent variation. Exogenous tax rates.



**(e)** Change in tax rates $t_i$. Effect of policy competition.

**(f)** Change in total equivalent variation. Effect of policy competition.

**(g)** Change in private equivalent variation. Effect of policy competition.

**(h)** Change in public equivalent variation. Effect of policy competition.

Winning counties with increased total equivalent variation.
Losing counties with reduced total equivalent variation.

**Figure A.14.** Effect of a tax harmonization $[t^{mean} - \ell, t^{mean} + \ell]$ with looseness $\ell = 0.7\%$ on non-treated counties. Figure A.14a–Figure A.14d assume exogenous tax rates. Figure A.14e–Figure A.14h represent the level of the variable under endogenous taxation minus the level under exogenous tax rates. In Figure A.14a, the percentage change in tax rate is relative to the minimum tax: $100 \times (t^{after} - t^{before})$.

## H. Policy Network Matrix

### *H.1. Vocabulary and Notation*

**Table A.11.** Vocabulary and notation related to the Policy Network Matrix.

| Name | Abbreviation | Notation | Definition |
|---|---|---|---|
| Policy Network Matrix | PNM | $\boldsymbol{\Omega} \equiv (\omega_{ij})_{i,j\in[\![1,I]\!]^2}$ | $\omega_{ij} \equiv \partial t_i/\partial t_j$ |
| Tax competition effect or exposure | PR | $\boldsymbol{\beta} = (\beta_1, \ldots, \beta_I)'$ | $\beta_i \equiv \sum_j \omega_{ij}$ |
| policy impact | PI | $\boldsymbol{\gamma} = (\gamma_1, \ldots, \gamma_I)'$ | $\gamma_j \equiv \sum_i \omega_{ij}$ |
| Average tax competition effect | APR | $\overline{\beta}$ or $\overline{\gamma}$ | $\overline{\beta} \equiv \overline{\gamma} \equiv \frac{1}{I}\sum_i \sum_j \omega_{ij}$ |
| Row-standardized weight matrix | | $\mathbf{W} \equiv (\mathrm{w}_{ij})_{i,j\in[\![1,I]\!]^2}$ | $\mathrm{w}_{ij} \equiv \omega_{ij}/\sum_k \omega_{ik}$ |
| Column-standardized weight matrix | | $\mathbf{V} \equiv (\mathrm{v}_{ij})_{i,j\in[\![1,I]\!]^2}$ | $\mathrm{v}_{ij} \equiv \omega_{ij}/\sum_k \omega_{kj}$ |

### *H.2. PNM and Inverse Distance Weighting*

A longstanding question in the spatial econometrics is the appropriate specification of the spatial weight (LeSage and Pace, 2009). A common specification is inverse-distance weighting exponentiated to an arbitrary power. The structural weights of the PNM may offer a light on whether traditional inverse-distance weighting are good approximation and about the optimal exponent.

**Table A.12.** Relation between structural weights and inverse-distance weighting, with origin and destination fixed effects.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| $1/d$ | 0.311*** | | | | | | | 1.556*** |
| | (0.0402) | | | | | | | (0.0690) |
| $1/d^2$ | | 0.103* | | | | | | -22.06*** |
| | | (0.0472) | | | | | | (2.054) |
| $1/d^3$ | | | 0.0312 | | | | | 153.3*** |
| | | | (0.0185) | | | | | (22.33) |
| $1/d^4$ | | | | 0.0142 | | | | -526.3*** |
| | | | | (0.00883) | | | | (100.3) |
| $1/d^5$ | | | | | 0.00752 | | | 917.7*** |
| | | | | | (0.00466) | | | (207.3) |
| $1/d^6$ | | | | | | 0.00444 | | -770.3*** |
| | | | | | | (0.00287) | | (194.4) |
| $1/d^7$ | | | | | | | 0.00290 | 243.5*** |
| | | | | | | | (0.00206) | (66.04) |
| Observations | 65464 | 65464 | 65464 | 65464 | 65464 | 654 64 | 65464 | 65464 |
| $R^2$ | 0.784 | 0.752 | 0.751 | 0.751 | 0.751 | 0.7 51 | 0.751 | 0.810 |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Standard errors are clustered at the origin level.

Table A.12 reports the results of the regression $w^+_{ij} = \gamma d^{-k}_{ij} + \lambda_i + \delta_j$, where $w^+_{ij}$ are structural weights of strategic subsitute neighbors, $d_{ij}$ is the crow-fly distance between them, $\lambda_i$ [$\delta_j$] are origin [destination] fixed effects.

Whatever the specification inverse-distance weighting in itself has a strong explanatory power as it explains more than 75% of the variance of structural weights after partialling out origin and destination fixed effects. Given the nonlinearity of the PNM (Subsection 5.2), it is not suprising that including as much flexibility as possible in the inverse-distance polynomial is better (column 8). Table A.12 also shows that if a monomial specification is used, simple inverse-distance weighting performs quite well as it has a significantly positive coefficient and the highest $R^2$ among all monomial specifications. Then, inverse-distance to the 2 is still significantly different from zero and higher order monomials are not statisticaly significant.

**Table A.13.** Relation between structural weights and inverse-distance weighting, without fixed effects.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| $1/d$ | 0.302*** | | | | | | | 0.456*** |
| | (0.0397) | | | | | | | (0.0980) |
| $1/d^2$ | | 0.109* | | | | | | 3.583 |
| | | (0.0527) | | | | | | (2.869) |
| $1/d^3$ | | | 0.0288 | | | | | -53.74 |
| | | | (0.0199) | | | | | (30.61) |
| $1/d^4$ | | | | 0.0108 | | | | 224.9 |
| | | | | (0.00930) | | | | (142.3) |
| $1/d^5$ | | | | | 0.00449 | | | -415.7 |
| | | | | | (0.00512) | | | (303.6) |
| $1/d^6$ | | | | | | 0.001 93 | | 350.8 |
| | | | | | | (0.0034 1) | | (290.2) |
| $1/d^7$ | | | | | | | 0.000845 | -109.4 |
| | | | | | | | (0.00259) | (99.66) |
| Observations | 65552 | 65552 | 65552 | 65552 | 65552 | 655 52 | 65552 | 65552 |
| $R^2$ | 0.033 | 0.002 | 0.000 | 0.000 | 0.000 | 0.0 00 | 0.000 | 0.051 |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

## *H.3. Policy Responsiveness and Policy Impact in Two States*

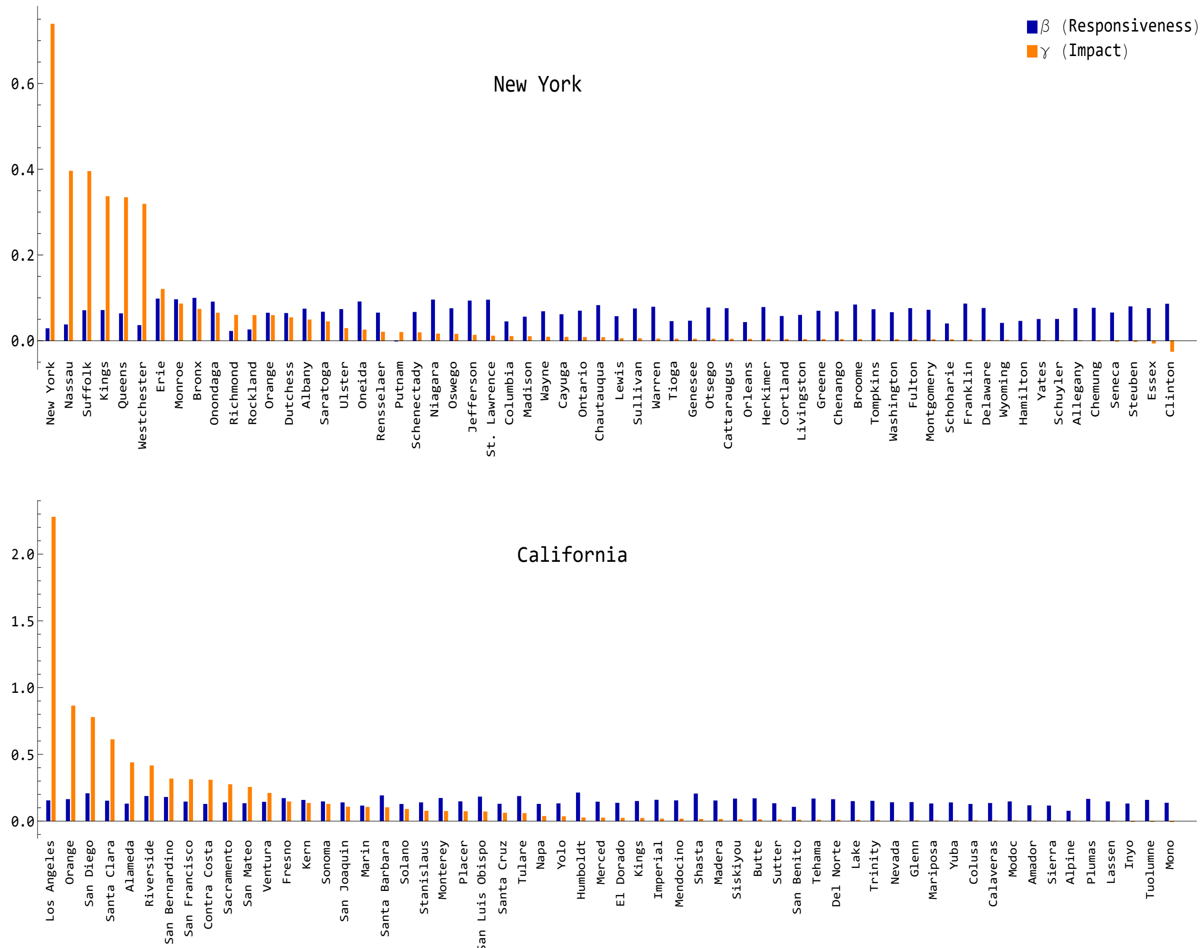



**Figure A.15.** Policy responsiveness and policy impact in New York State and in Calinoria.

## *H.4. Policy Impact and Welfare*

This appendix supplements the results on policy impact and welfare effects in Subsection 6.3.

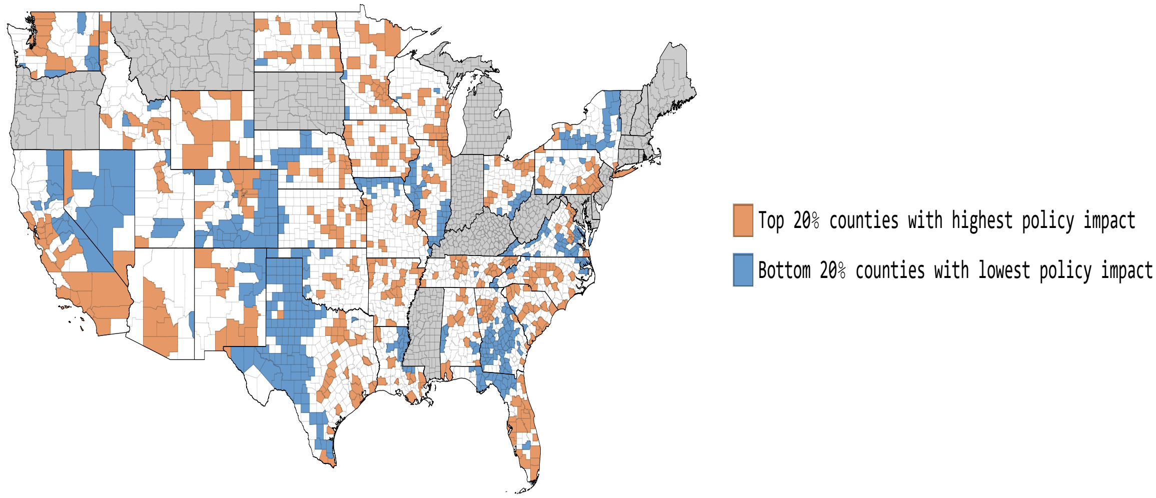



**Figure A.16.** Geographic distribution of counties with the highest and lowest policy impact. In gray are the 706 nontaxing counties without tax authority.

**Table A.14.** Descriptive statistics for the treated groups in the policy experiments.

| | Top 20% PI | | | Bottom 20% PI | | |
|---|---|---|---|---|---|---|
| | Mean | SD | Obs | Mean | SD | Obs |
| Policy impact ($\gamma$) | 0.352 | 0.556 | 480 | −0.002 | 0.013 | 481 |
| Tax rate ($t$) | 0.016 | 0.013 | 480 | 0.027 | 0.013 | 481 |
| Number of households ($n$) | 140,659 | 242,384 | 480 | 5,862 | 9,023 | 481 |
| Household income ($y$) | 70,116 | 16,015 | 480 | 52,935 | 9,866 | 481 |

NOTE— The left panel reports results for the top 20% counties with highest policy impact. The right panel reports results for the bottom 20% counties with lowest policy impact.