,

Zoning: Externalities or Misallocation?

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Measure quantitative effect of zoning

- Model of Location Choice
  - Neighborhoods differ by productivity and residential amenities

    $\Rightarrow$ Comparative advantage for workers vs. residents
  - Also by residential vs. commercial zoning

    $\Rightarrow$ Observed allocation $\neq$ comparative advantage
- Parcel Level Data on American Cities and Taipei
  - Production and Utility Cobb-Douglas in Land
  - Infer gap in MP Land between workers and residents
  - Use Taipei as a benchmark for land allocation without zoning

Quantitative Effect of Zoning

- Large dispersion in MPL (Workers vs. Residents)
  - 90-10 Gap 1.5 log points higher than Taipei
  - Average TFP loss of 13% (not taking externalities into account)
- Zoning results in more segregation (workers vs. employees)

Model

- Production: $Y = AL_E^{\alpha} H_C^{1-\alpha}$
- Income (live in i and work in j): $w_{ij} t_{ij} \mu + r$
  - μ iid Frechet; $t_{ij} \leq 1$
  - Expected Income: $x_i = \left[\sum_j \left(w_j t_{ij} \right)^{\epsilon} \right]^{\frac{1}{\epsilon}} + r$
- Utility: $U = BC^{1-\gamma} H_R^{\gamma}$
  - Expected (indirect) Utility: $V_i = \frac{B_i x_i}{q_{Ri}^{\gamma}}$
  - Utility equalized across neighborhoods
- Zoning: $\frac{q_C}{q_R} = \tau$

Imputing Zoning from Land/Labor Ratios

- Production FOC: $\frac{H_C}{L_E} = \frac{1-\alpha}{\alpha}\frac{w}{q_C}$
- Consumption FOC: $\frac{H_R}{L_R} = \gamma\frac{x}{q_R}$

$$\Rightarrow \underbrace{\frac{H_{Ri}/L_{Ri}}{H_{Ci}/L_{Ei}}}_{\text{data}} = \frac{\gamma\,\alpha}{1-\alpha}\,\tau_i\,\underbrace{\frac{x_i}{w_i}}_{\text{“data”}}$$

- Dispersion in τ_i could also reflect
  - Dispersion in relative shares $\frac{\gamma\,\alpha}{1-\alpha}$
  - Measurement error

Equilibrium with no commuting cost ($t = 1$)

- Utility equalization: $q_{Ri} \propto B_i^{1/\gamma}$
- Zero profits: $w_i^{\alpha} = \frac{A}{q_{Ci}^{1-\alpha}} \propto \frac{A_i}{(B_i^{1/\gamma}\,\tau_i)^{1-\alpha}}$
- Local Employment: $L_{E_i} \propto w_i^{\epsilon-1}$
  - "Comparative advantage in production"
  - Pro-commercial zoning ($\tau < 1$)
- Local Residents: $L_{Ri}^{\gamma} \propto \frac{B_i}{\left(1+\frac{H_{Ci}}{H_{R_i}}\right)}$
  - H_{Ci}/H_{Ri} increasing in A_i, decreasing in B_i and τ_i
  - "Comparative advantage in residential amenities"
  - Pro-residential zoning ($\tau > 1$)

US Data

- Census block group in 36 MSAs $>$ 1 million
  - 0.76 km^2 ($\approx$ 6 square blocks)
  - 1600 block groups in average city
  - Only "dense" block groups
- Floor space aggregated from parcel level data
  - Corelogic: local tax records + appraisals (insurance, banks)
  - Remove public admin, education, recreation, transportation, warehouse, industrial
  - Residential vs. Commercial
- Residential population from ACS
- Employment from public tabulations of LEHD

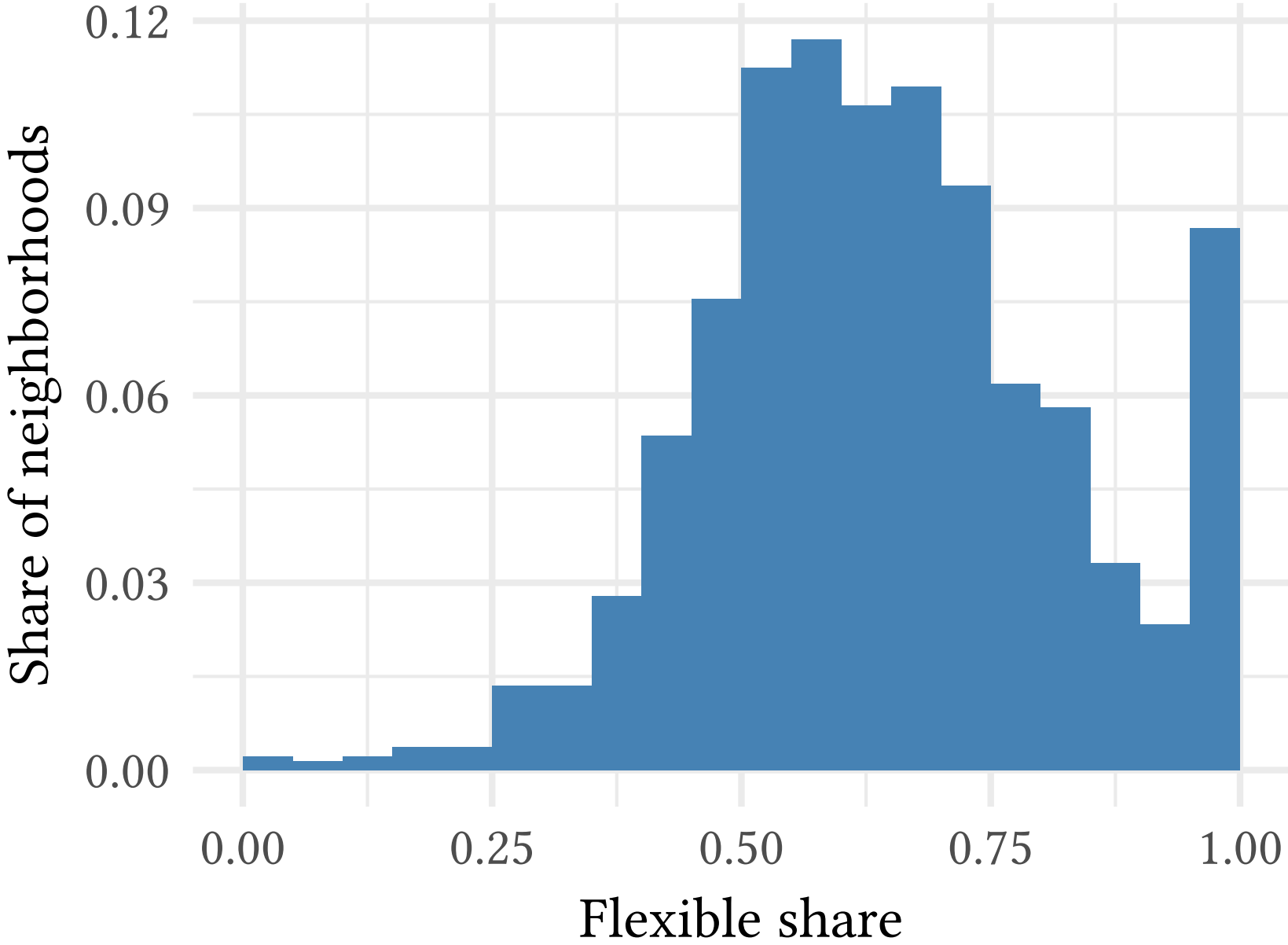
Data from Taipei

- 1500 Urban "neighborhoods" in Taipei
  - Roughly same size as US census block groups
- Residential population from household registration
- Employment from 2016 Economic Census
- Floor space aggregated from property tax records

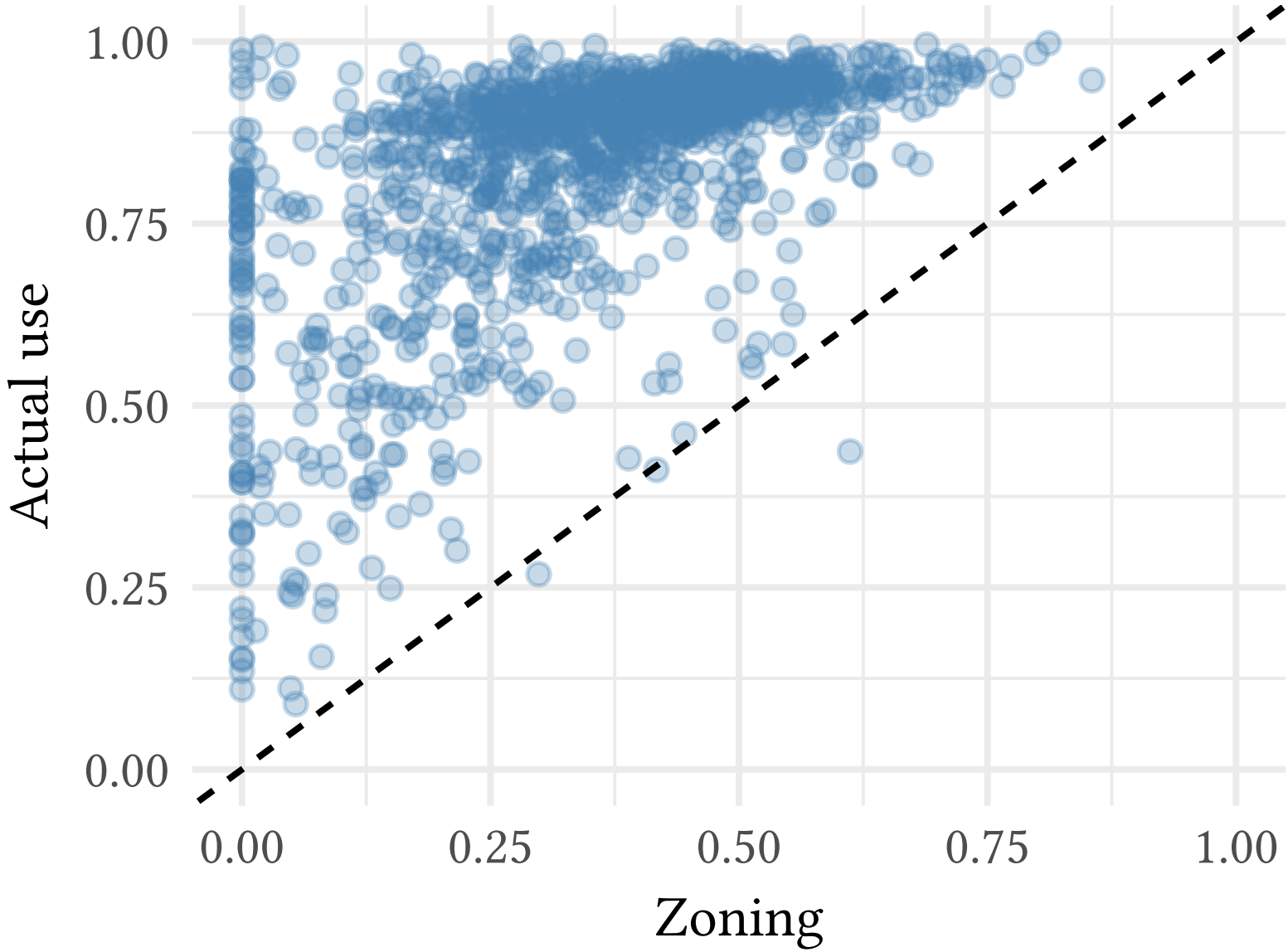
"Flexible Zoning" in Taipei

- Zoning in Taipei
  - No commercial zoning
  - 30% of floor space zoned residential; 70% zoned "flexible use"
- Effectively no-zoning in Taipei
  - Observed share of residential space (almost) always exceeds zoning
  - Land use changes frequently

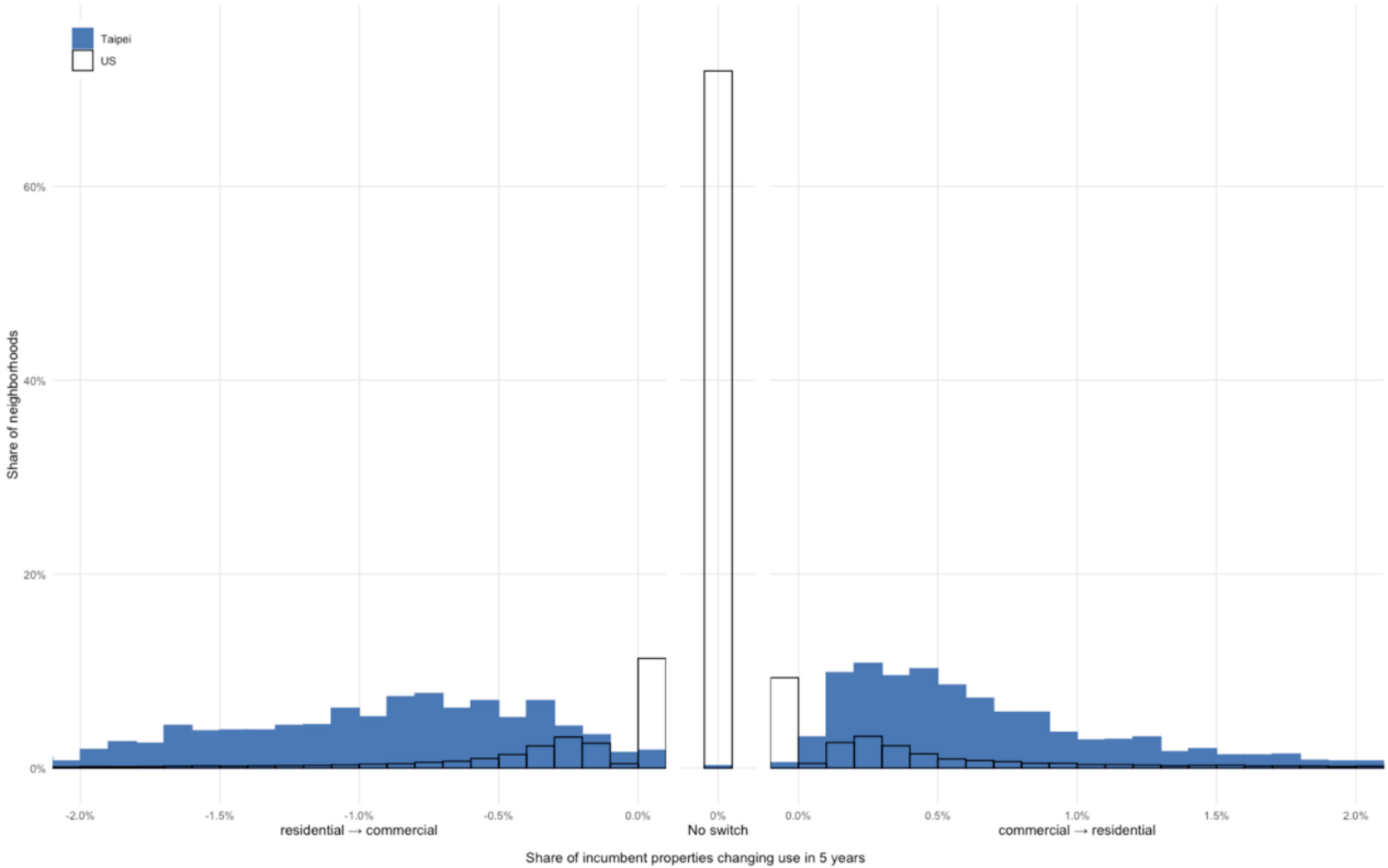
Share of Flexible Zoned Space in Taipei



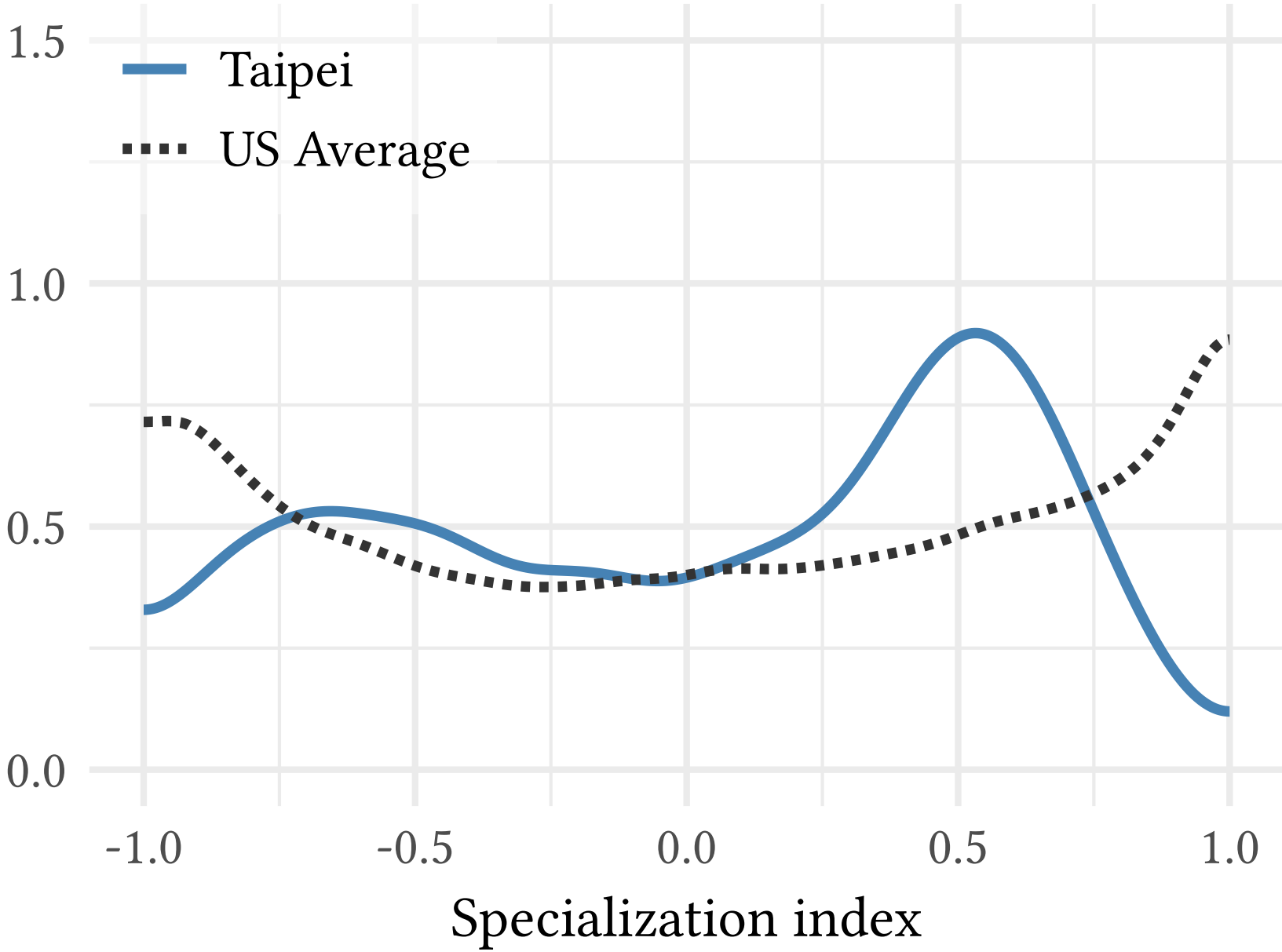
Zoning vs Actual Use in Taipei



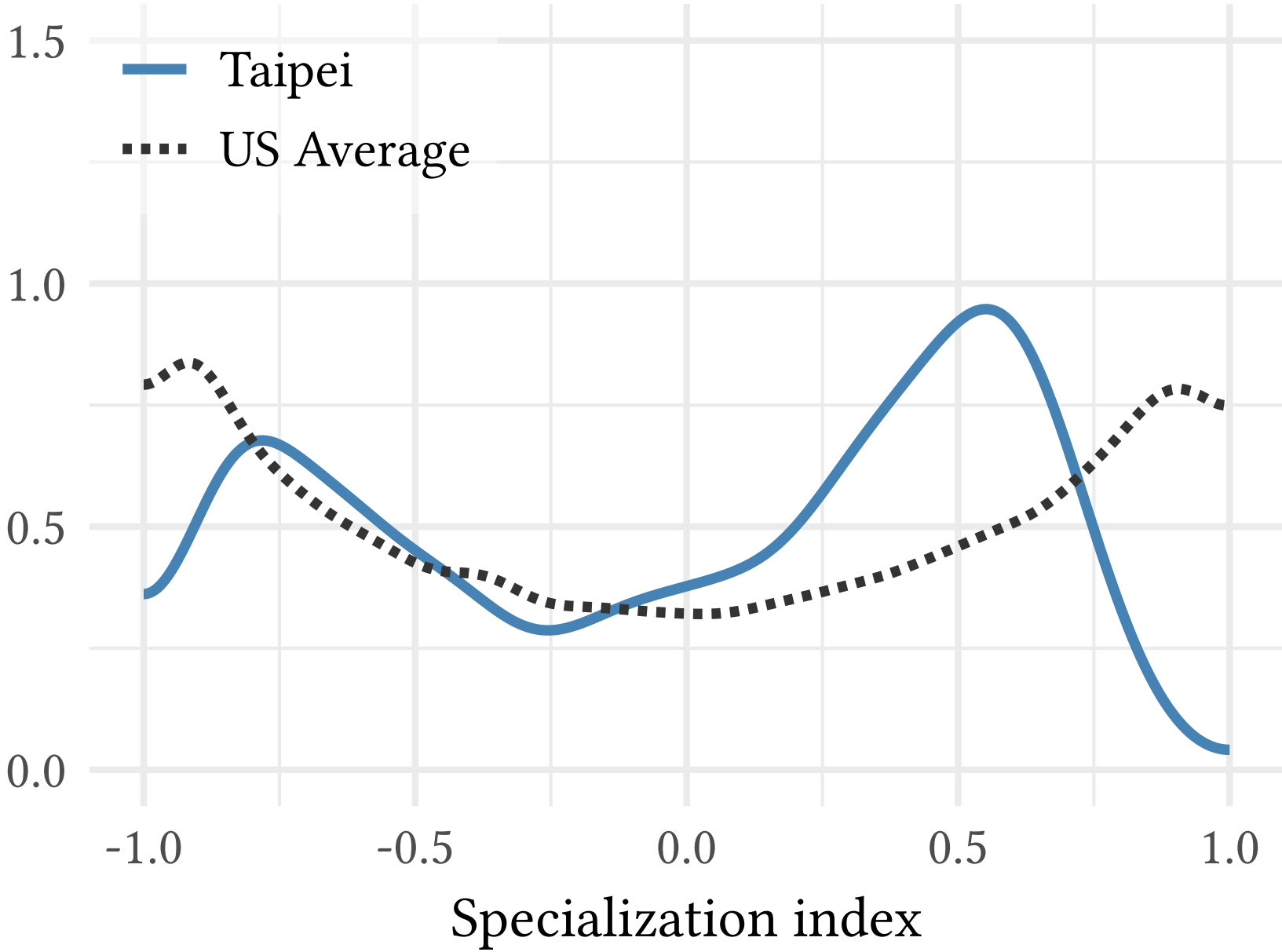
Share of Parcels that Switch Use



Distribution of $\frac{H_{Ri}}{H_R} - \frac{H_{Ci}}{H_C}$: Taipei vs. US



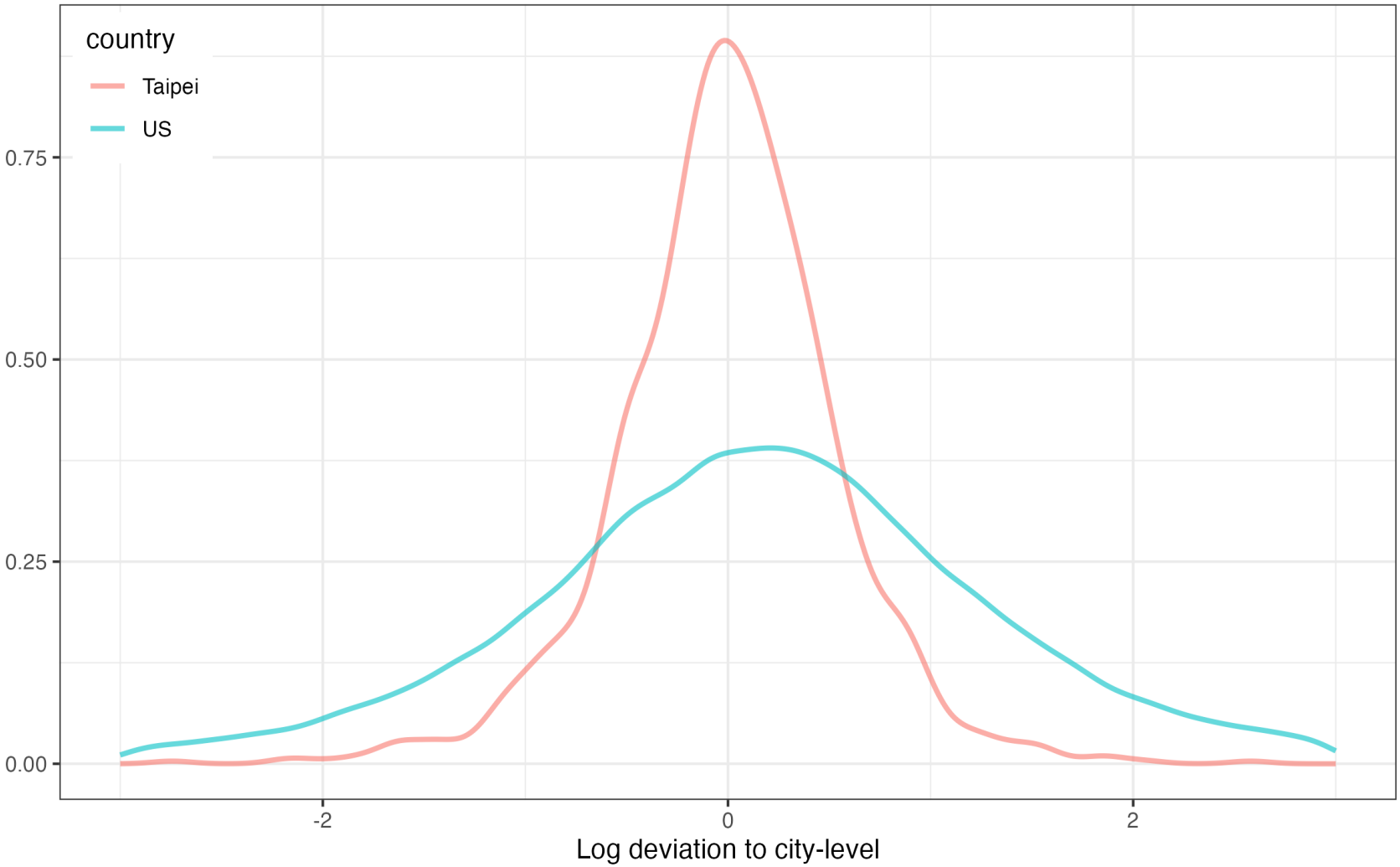
Distribution of $\frac{L_{Ri}}{L} - \frac{L_{Ei}}{L}$: Taipei vs. US



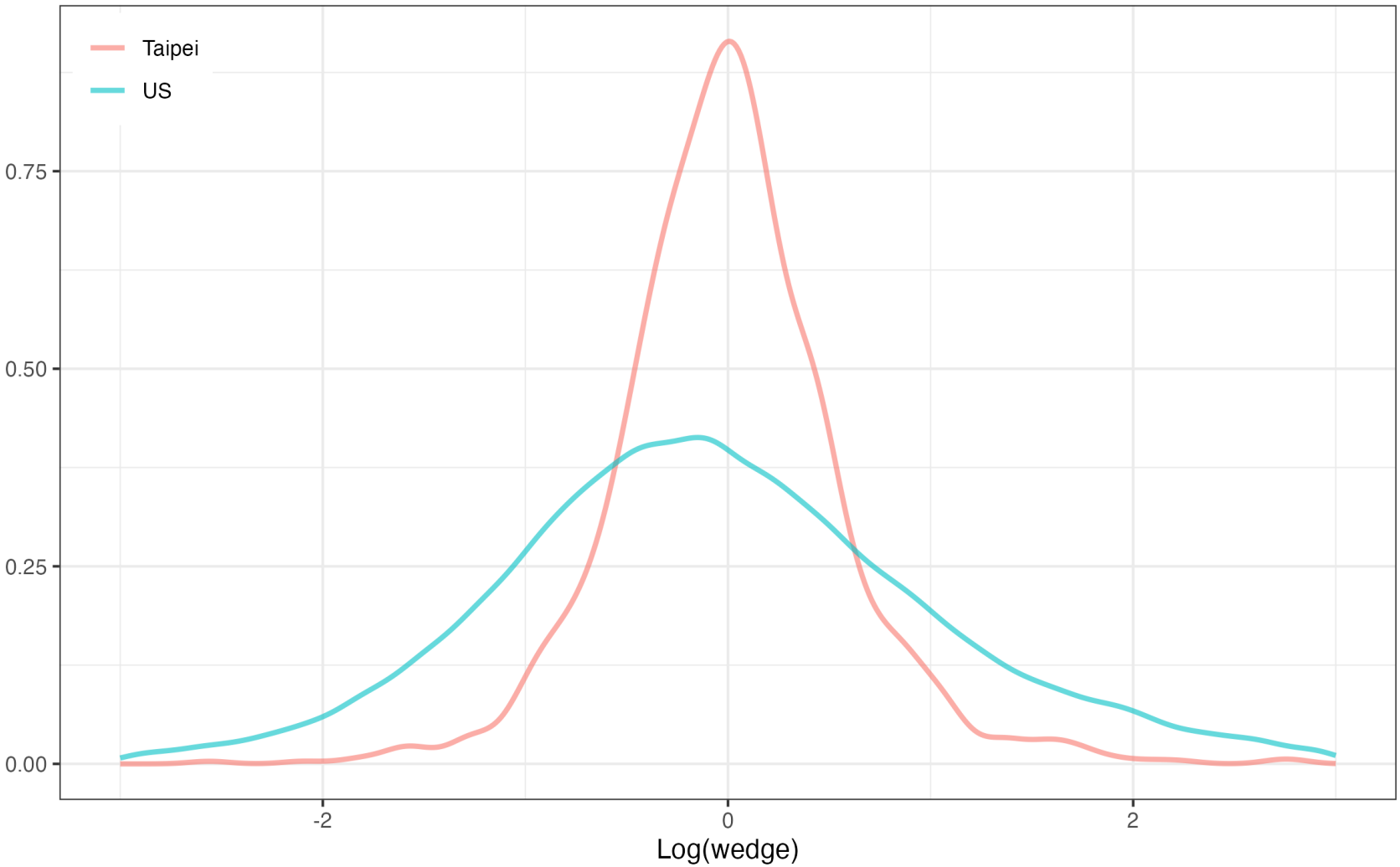
Specialization in Land and People

	Land: $\frac{1}{2}\sum_i \left\lvert \frac{H_{Ri}}{H_R} - \frac{H_{Ci}}{H_C} \right\rvert$	People: $\frac{1}{2}\sum_i \left\lvert \frac{L_{Ri}}{L} - \frac{L_{Ei}}{L} \right\rvert$
Average US City	0.65	0.62
Taipei	0.49	0.50
Lowest	0.56 (Austin)	0.56 (Portland)
Largest	0.79 (Chicago)	0.69 (Las Vegas)
Median	0.64 (Miami)	0.62 (San Antonio)

Distribution of $\log\left(\frac{H_{Ci}}{L_{Ci}} / \frac{H_{Ri}}{L_{Ri}}\right)$



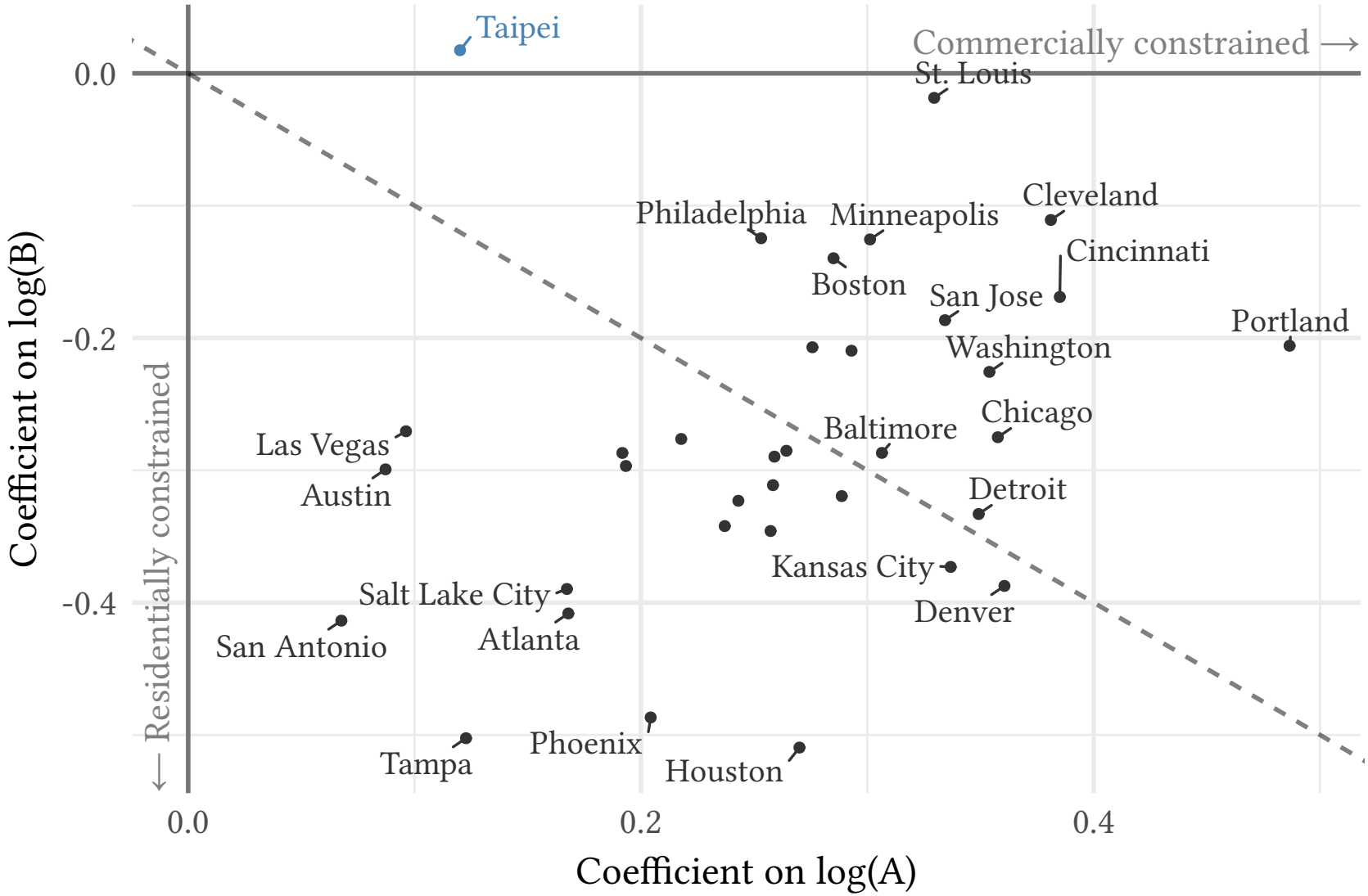
Distribution of $\log \tau$



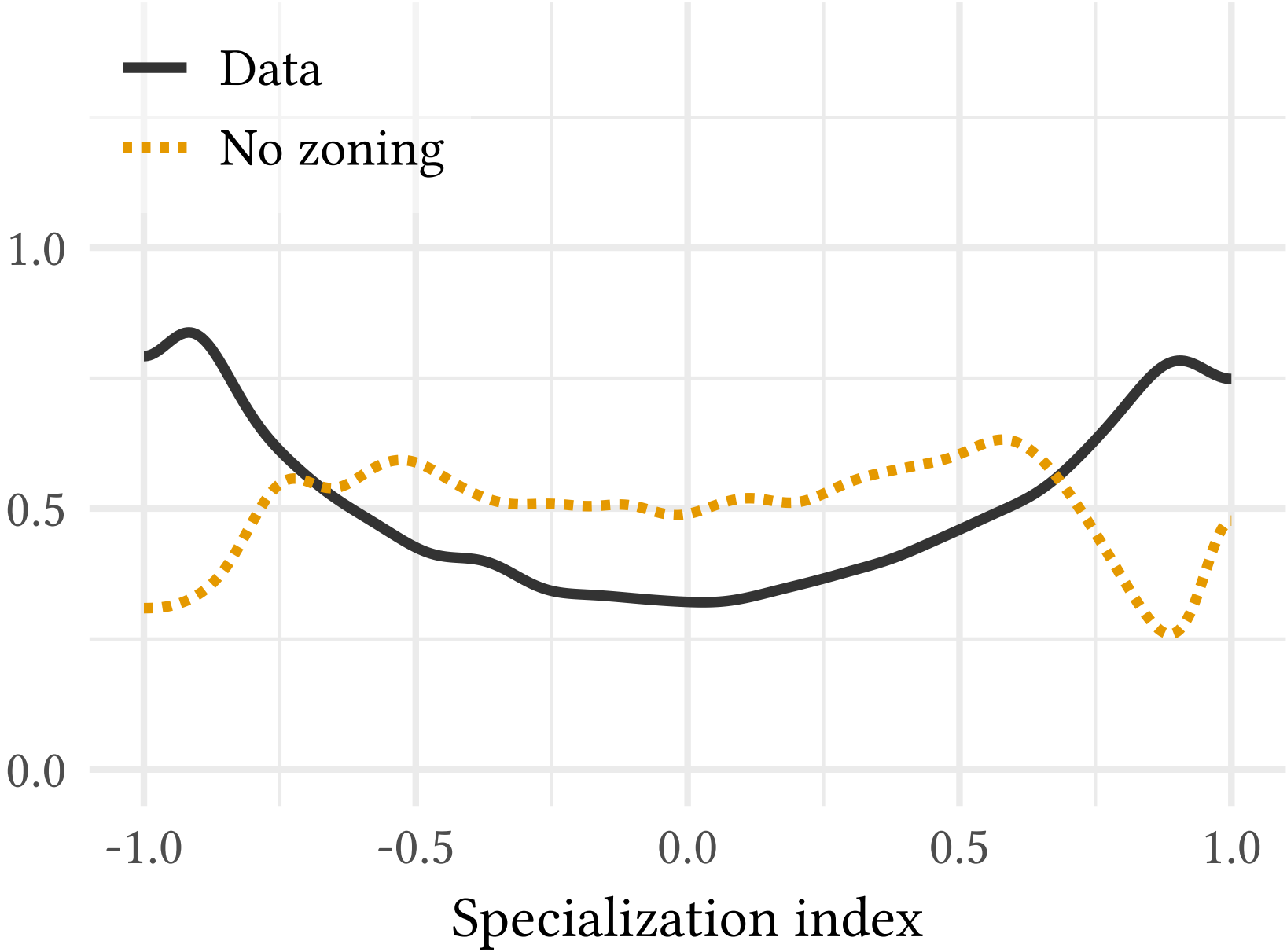
Dispersion (90-10 Gap) in τ

Average US City	2.74
Taipei	1.25
Lowest (Austin)	2.27
Largest (Detroit)	3.29
Median (LA)	2.72

Elasticity of τ wrt A and B



Effect of Zoning on Specialization of Land



Optimal Zoning with Negative Spillovers

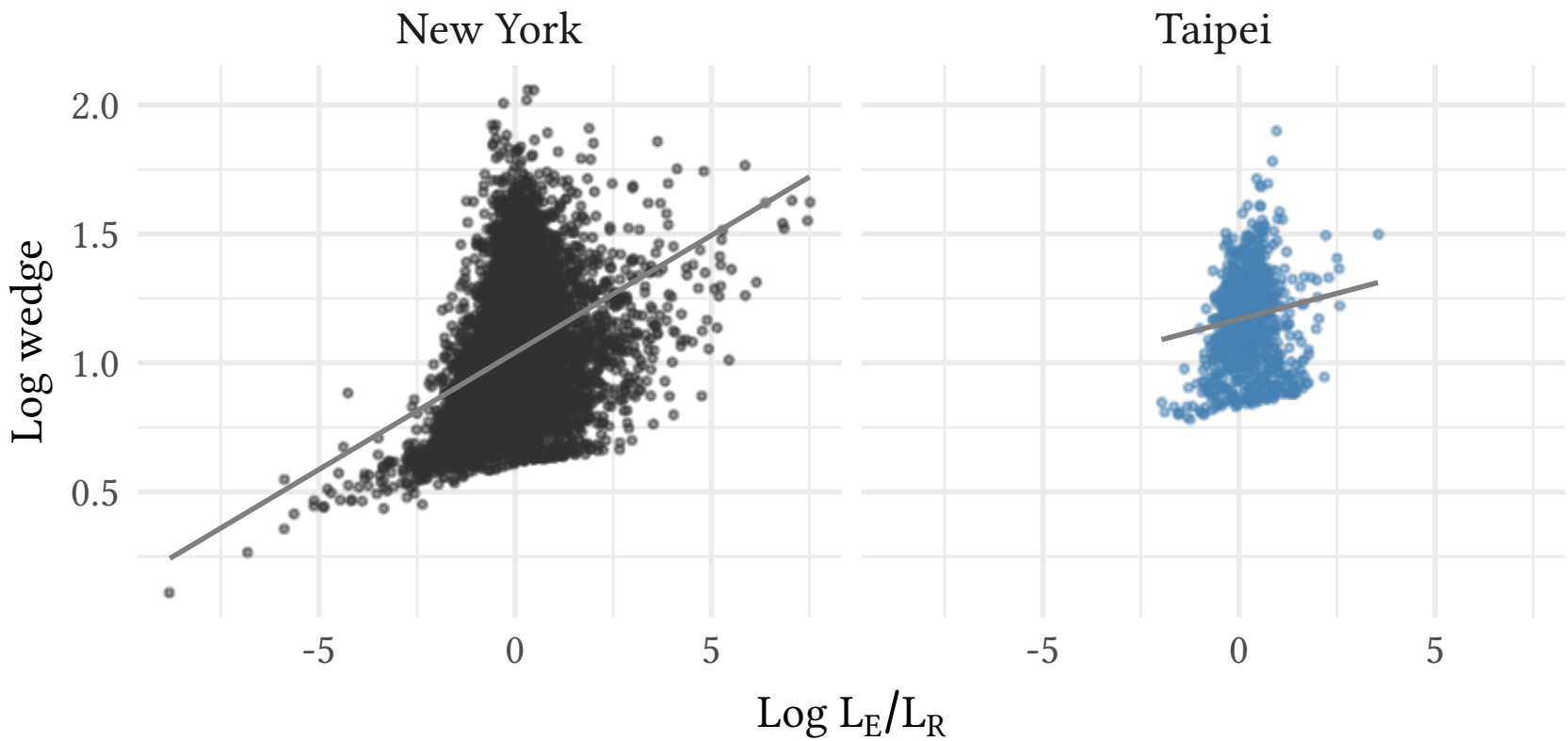
- Euclid vs. Amber Realty, 1926 ("Euclidian" zoning)
  - Separate workers from residents
- Optimal τ decreasing in A/B
  - Optimal zoning generates more specialization

Optimal Zoning with Positive Spillovers

- Jane Jacobs, "Life and Death of Great American Cities," 1961
  - Benefits of mixed neighborhoods

    $\Rightarrow$ Integrate workers with residents
- Optimal τ increasing in A/B
  - Optimal zoning generates less specialization

Scatterplot of $\log \tau$ on L_E^{free}/L_R^{free}



Regression of $\log \tau$ on L_E^{free}/L_R^{free}