Who Benefits from State Corporate Tax Cuts?  
A Local Labor Markets Approach  
with Heterogeneous Firms

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Harvard

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I, like many economists, suspect that our corporate income tax is economically self-defeating – hurting workers, not capitalists.

What can workers do to mitigate their plight? One useful step would be to lobby to eliminate the corporate income tax. That might sound like a giveaway to the rich. It’s not. The rich, including Boeing’s stockholders, can take their companies & run
We relax two crucial assumptions

1. Firms are **perfectly competitive**
   - If firm owners earn zero profits, they cannot bear incidence

2. Firms are **perfectly mobile**
   - Every firm is marginal in their location decisions

Allow for **monopolistically competitive & heterogeneously productive firms**
Question: What are the welfare effects of cutting corporate taxes in an open economy on workers, firm owners, and landowners?

Contributions

1. New evidence on business location and local economic activity
2. New framework for evaluating welfare effects
3. New assessment of corporate taxation in an open economy
Who Benefits from State Corporate Tax Cuts?

**Our Estimate**
- Firm Owners
- Workers
- Landowners

**Standard Model**
- Workers
Context and Challenges

- **Empirical:** Gravelle 2011, Clausing 2013
  - Insufficient time series variation in US corporate rates
  - Cross-country variation compares countries with dissimilar institutions

- **Theoretical:**
  - Harberger-type general equilibrium with focus on open economy (Gravelle 2010)
  - Computable General Equilibrium Models (Kotlikoff & Summers 1987, Kotlikoff et al. 2013)
Outline: 3 Steps

1. **Develop spatial equilibrium model with firms**
   - Allow workers, firm owners, landowners to bear incidence
   - Map reduced-form effects to parameters governing welfare

2. **Reduced-form effects of corporate tax cuts**
   - Implement state apportionment system using establishment data
   - Number of establishments increases by roughly 3.5% following a 1% corporate tax cut

3. **Estimate incidence and structural elasticities**
   - Implement reduced-form incidence expressions
   - Minimize distance between reduced-form expressions and estimates to estimate structural elasticities
   - Evaluate consequences for equity & efficiency of corporate tax policy
Broader Contribution: Local Labor Markets with Firms

- Last few years - important **link between workers and location**
  

- This literature and benchmark models have representative/identical, perfectly competitive firms & **no link between firms and location**
  
  - Incidence: Kotlikoff & Summers 1987, Gordon & Hines 2002
  - Locational: Rosen 1979, Roback 1982

- **Monopolistically competitive and heterogeneously productive firms**
Roadmap

1. Model

2. Incidence Expressions, Identification

3. Data and Reduced-Form Analysis of Business Location

4. Incidence and Parameter Estimates

5. Policy Implications
You have to start this conversation with the philosophy that businesses have more choices than they ever have before. And if you don’t believe that, you say taxes don’t matter. But if you do believe that, which I do, it’s one of those things, along with quality of life, quality of education, quality of infrastructure, cost of labor, it’s one of those things that matter.

—Delaware Governor Jack Markell (11/3/2013) ¹

A Spatial Equilibrium Model with Firms: Outline

1. **Setup**

2. **Worker Location, Labor Supply**

3. **Housing Market**
   Kline (2010), Notowidigdo (2012)

4. **Firm Location and Labor Demand**

5. **Results**: Incidence $\dot{w}(\theta), \dot{\pi}(\theta), \dot{r}(\theta)$
   - $\varepsilon^{LS}(\theta)$ and $\varepsilon^{LD}(\theta)$, and $b(\theta)$
Equilibrium in the Local Labor Market
Equilibrium in the Local Labor Market

Diagram:
- $w$ axis
- $L$ axis
- $D_0(w)$ and $D_1(w)$ demand curves
- $S_0(w)$ supply curve
- $L_0$, $L^*$, $L_1$ points
- $w_0$, $w^*$ points
- Markers 1, 2, 3

Legend:
- $\tau$ cut
Equilibrium in the Local Labor Market

\[ \dot{w} = \frac{\frac{\partial \ln D}{\partial \ln(1 - \tau)}}{\varepsilon^{LS} - \varepsilon^{LD}} \]

Diagram with axes labeled as follows:
- \( w \) on the vertical axis
- \( L \) on the horizontal axis
- Points labeled:
  1. \( \tau \) cut
  2. \( w_0 \)
  3. \( w^* \)

Lines labeled:
- \( S_0(w) \)
- \( D_0(w) \)
- \( D_1(w) \)
**Model Setup**

1. **Geography:** Small open economy $c \in C$

2. **Agents:** $N_c$ households, $E_c$ establishments, representative landowner in each location $c$

3. **Market Structure:**
   - Monopolistically competitive traded goods market for each variety $j$
   - Global capital market
   - Local labor market
   - Local housing market

4. **Timing:** Steady state, exogenous tax shock, new steady state
Household Problem

\[
\max_{h, X} \ln A \text{ amenitites} + \alpha \ln h + (1 - \alpha) \ln X \quad \text{s.t.} \quad rh + \int_{j \in J} p_j x_j \, dj = w
\]

- where \( X = \left( \int_{j \in J} x_j^{\varepsilon_{PD} + 1} \right)^{\frac{\varepsilon_{PD}}{\varepsilon_{PD} + 1}} \)
- \( rh \) is housing expenditures
- \( p_j x_j \) is expenditure on variety \( j \)

**Indirect Utility of a Worker:**

\[
V_{nc}^W = a_0 + \ln w_c - \alpha \ln r_c + \ln A_{nc} \]

Disposable income \( \equiv \tilde{A}_c + \xi_{nc} \)
Local Labor Supply

Location choice: Workers choose location with max utility:

$$\max_c \left( a_0 + \ln w_c - \alpha \ln r_c + \bar{A}_c + \xi_{nc} \right) \equiv u_c$$

Local Population:

$$N_c = P \left( V_{nc}^W = \max_{c'} \left\{ V_{nc'}^W \right\} \right) = \frac{\exp \frac{u_c}{\sigma_W}}{\sum_{c'} \exp \frac{u_{c'}}{\sigma_W}}$$

(Log) Local Labor Supply:

$$\ln N_c(w_c, r_c; \bar{A}_c) = \frac{1}{\sigma_W} \left( \ln w_c - \alpha \ln r_c + \bar{A}_c \right) + C_0$$

Key Parameter: $\sigma_W$, dispersion of idiosyncratic preferences $\xi_{nc}$
Housing Market: Upward-sloping supply of housing:

\[ H_S^c = (B_H^c r_c)^{\eta_c} \]

- \( B_H^c \) is housing productivity
- \( r_c \) is price of housing

With Cobb-Douglas \( H^D_c \), HM equilibrium given by:

\[ \ln r_c = \frac{1}{1 + \eta_c} \left( \ln N_c + \ln w_c \right) + C_1 \]

Key Parameter: \( \eta_c \) elasticity of housing supply
Local Labor Supply: Key points

- People move into a local area when wages increase
- How many people move in depends on:
  1. **Dispersion of Idiosyncratic Preferences** $\sigma^W$
     Higher $\sigma^W$ means smaller inflows of people following wage increases
  2. **Housing Supply Elasticity** $\eta_c$
     Lower $\eta_c$ means rents get bid up more when people move in

Higher $\sigma^W$ and lower $\eta_c$ make $\varepsilon^{LS}$ smaller, so LS is more vertical
Establishment Production
Local Labor Demand: Establishment Production

- Demand for variety $j$ is $y_{jc} = l \left( \frac{p_{jc}}{P} \right)^{\varepsilon_{PD}}$

- Establishment $j$ produces its variety with the following technology

$$y_{jc} = B_{jc} l_{jc}^{\gamma} k_{jc}^{\delta} M_{jc}^{1-\gamma-\delta} \equiv \bar{B}_c + \zeta_{jc}$$

- Firm Value Function

$$V_{jc}^F = \frac{\ln(1 - \tau_s^b)}{-(\varepsilon_{PD} + 1)} - \gamma \ln w_c - \delta \ln \rho + \bar{B}_c + \zeta_{jc}.$$

$$\equiv v_c$$
Fraction of Establishments:

\[ E_c = P \left( V_{jc}^F = \max_{c'} \{ V_{jc'}^F \} \right) = \frac{\exp \frac{v_c}{\sigma^F}}{\sum_{c'} \exp \frac{v_{c'}}{\sigma^F}} \]

Establishment Growth:

\[ \Delta \ln E_{c,t} = \frac{\Delta \ln (1 - \tau_{c,t}^b)}{-\sigma^F (\varepsilon^{PD} + 1)} - \frac{\gamma}{\sigma^F} \Delta \ln w_{c,t} + \phi_t + \frac{1}{\sigma^F} \Delta \bar{B}_{c,t} \]

Key Parameter:

- Dispersion of idiosyncratic productivity \( \sigma^F \)
- Larger \( \sigma^F \) means lower responsiveness to tax changes
Local Labor Demand

Aggregate labor demand for firms in location $c$:

$$L_c^D = \underbrace{E_c}_{\text{Extensive margin}} \times \underbrace{E_\zeta[l^*(\zeta_{jc})|c]}_{\text{Intensive margin}}$$

Elasticity of labor demand:

$$\frac{\partial \ln L_c^D}{\partial \ln w_c} = \gamma - 1 + \gamma \epsilon^{PD} - \frac{\gamma}{\sigma^F} \equiv \epsilon^{LD}$$

More elastic $\epsilon^{LD}$ when:

- Higher output elasticity of labor $\gamma$
- Higher product demand elasticity $\epsilon^{PD}$
- Lower productivity dispersion $\sigma^F$ (i.e. firms more mobile)
Let $\dot{w}_c(\theta) \equiv \frac{\partial \ln w_c}{\partial \ln(1-\tau^b)}$. Incidence on wages is:

$$
\dot{w}_c(\theta) = \frac{1}{(\epsilon^{PD}+1)\sigma^F} \left( \frac{1 + \eta_c - \alpha}{\sigma^W (1 + \eta_c) + \alpha} \right)_{\epsilon^{LS}} - \gamma \left( \epsilon^{PD} + 1 - \frac{1}{\sigma^F} \right)_{\epsilon^{LD}} + 1
$$

**Smaller wage increase if:**

1. Productivity Dispersion $\sigma^F$ is large (i.e. immobile firms)

2. Preferences Dispersion $\sigma^W$ is small (i.e. mobile people)

3. Any other reason why $\epsilon^{LS}$ and $|\epsilon^{LD}|$ are large
Rental Costs: $\dot{r}_c(\theta) = \left( \frac{1+\varepsilon^{LS}}{1+\eta_c} \right) \dot{w}_c$

- Smaller rent increases if housing supply is very elastic

Firm Profits:

$$\dot{\pi}_c(\theta) = 1 - \delta (\varepsilon^{PD} + 1) + \gamma (\varepsilon^{PD} + 1) \dot{w}_c$$

- Reducing Capital Wedge
- Higher Labor Costs

- Mechanical effects vs. higher production costs
<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Benefit</th>
<th>Statistic</th>
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</thead>
<tbody>
<tr>
<td>Workers</td>
<td>Disposable Income</td>
<td>( \dot{w}_c - \alpha \dot{r}_c )</td>
</tr>
<tr>
<td>Landowners</td>
<td>Housing Costs</td>
<td>( \dot{r}_c )</td>
</tr>
</tbody>
</table>
| Firm Owners         | After-tax Profit      | \[ 1 - \delta (\varepsilon^{PD} + 1) + \gamma (\varepsilon^{PD} + 1) \dot{w}_c \]
|                     |                       | \[ = 1 + \frac{\gamma (\varepsilon^{PD} + 1)}{\text{Labor cost factor}} \times \left( \dot{w}_c - \frac{\delta}{\gamma} \right) \]

Net Markup
Empirical Implementation and Identification
Structural Form of the Model

\[
\mathbf{A} \mathbf{Y}_{c,t} = \mathbf{B} \mathbf{Z}_{c,t} + \mathbf{e}_{c,t}
\]

where

\[
\mathbf{A} = \begin{bmatrix}
-\frac{1}{\sigma^W} & 1 & \frac{\alpha}{\sigma^W} & 0 \\
1 & -\frac{1}{\varepsilon^{LD}} & 0 & 0 \\
-\frac{1}{1+\eta} & -\frac{1}{1+\eta} & 1 & 0 \\
\frac{\gamma}{\sigma^F} & 0 & 0 & 1
\end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix}
0 \\
\frac{1}{\varepsilon^{LD} \sigma^F (\varepsilon^{PD} + 1)} \\
0 \\
\frac{1}{-\sigma^F (\varepsilon^{PD} + 1)}
\end{bmatrix}
\]

\[
\mathbf{Y}_{c,t} = \begin{bmatrix}
\Delta \ln w_{c,t} \\
\Delta \ln N_{c,t} \\
\Delta \ln r_{c,t} \\
\Delta \ln E_{c,t}
\end{bmatrix}
\]

\[
\mathbf{Z}_{c,t} = \begin{bmatrix}
\Delta \ln (1 - \tau_{c,t}^b)
\end{bmatrix}
\]

\[
\mathbf{e}_{c,t} \text{ is a structural error term}
\]
Exact Reduced Form of the Model

\[ Y_{c,t} = A^{-1}B Z_{c,t} + A^{-1}e_{c,t} \]

where \( \beta^{\text{Business Tax}} \) is a vector of reduced-form effects of business tax changes:

\[ \beta^{\text{Business Tax}} = \begin{bmatrix} \beta^W \\ \beta^N \\ \beta^R \\ \beta^E \end{bmatrix} = \begin{bmatrix} \dot{W} \\ \dot{W}_{\varepsilon LS} \\ \frac{1+\varepsilon_{LS}}{1+\eta} \dot{W} \\ \frac{\mu-1}{\sigma^F} - \frac{\gamma}{\sigma^F} \dot{W} \end{bmatrix} . \]
4 Reduced-Form Equations of the Model

Effects on establishments, pop., wages, & rental cost growth over 10 years

\[ \Delta \ln w_{c,t} = \left( \hat{\omega}(\theta) \right) \beta_W \Delta \ln(1 - \tau_{c,t}^b) + \phi_t^1 + u_{c,t}^1 \]

\[ \Delta \ln N_{c,t} = \left( \epsilon^{LS} \hat{\omega}(\theta) \right) \beta_N \Delta \ln(1 - \tau_{c,t}^b) + \phi_t^2 + u_{c,t}^2 \]

\[ \Delta \ln r_{c,t} = \left( \frac{1 + \epsilon^{LS}}{1 + \eta_c} \hat{\omega}(\theta) \right) \beta_R \Delta \ln(1 - \tau_{c,t}^b) + \phi_t^3 + u_{c,t}^3 \]

\[ \Delta \ln E_{c,t} = \left( \frac{1}{-\sigma^F(\epsilon^{PD} + 1)} - \frac{\gamma}{\sigma^F} \hat{\omega}(\theta) \right) \beta_E \Delta \ln(1 - \tau_{c,t}^b) + \phi_t^4 + u_{c,t}^4 \]
Identification of Local Incidence on Welfare

Reduced forms:
\[ \dot{w} = \beta^W, \quad \dot{N} = \beta^N \]
\[ \implies \varepsilon^{LS} = \frac{\beta^N}{\beta^W} \]

Labor Demand
\[ \varepsilon^{LD} = \gamma(\epsilon^{PD} + 1) - \frac{\gamma}{\sigma_F} - 1 \]

Establishment Location
\[ \frac{\partial \ln D}{\partial \ln (1-t)} = \beta^E + \frac{\gamma}{\sigma_F} \beta^W \]

\[ \beta^W = \frac{\beta^E + \frac{\gamma}{\sigma_F} \beta^W}{\frac{\beta^N}{\beta^W} - \gamma(\epsilon^{PD} + 1) + \frac{\gamma}{\sigma_F} + 1} \implies \gamma(\epsilon^{PD} + 1) = \left( \frac{\beta^N - \beta^E}{\beta^W} + 1 \right) \]
### Identification of Local Incidence on Welfare

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<td>Housing Costs</td>
<td>$\hat{\beta}^R$</td>
</tr>
<tr>
<td>Firm Owners</td>
<td>After-tax Profit</td>
<td>$1 + \left(\frac{\hat{\beta}^N - \hat{\beta}^E}{\hat{\beta}^W} + 1\right) \left(\hat{\beta}^W - \frac{\delta}{\gamma}\right)$</td>
</tr>
</tbody>
</table>
Benefits of the incidence formulae

This framework enables us to:

1. Accommodate the conventional view
2. Transparently evaluate the sensitivity of our incidence estimates
3. Use data to govern relative factor mobility
4. Conduct inference and compare results to existing estimates
Data and Institutional Details of State Corporate Taxes
Non-Tax Data

1. **Annual Data**
   - Number of establishments from County Business Patterns
   - Population from BEA

2. **Decadal Data**
   - Wage and rental cost indexes from 1980-2000 Censuses and 2009 ACS
   - Adjust for changes in composition of observable characteristics

3. **Geographical Level**
   - Focus on county groups called consistent PUMAs [490 localities]

4. **Bartik**: Construct Bartik shock to predict labor demand:

   \[ Bartik_{c,t} = \sum_{Ind} \text{EmpShare}_{Ind,t-1,c} \times \Delta \text{Emp}_{Ind,t}^{\text{National}} \]
Three Types of Firm Taxes

1. Partnership and S-corps: $\tau^{\text{INC}}$ personal income tax rate
   - Synthetic changes as in Zidar (2013) using NBER’s TAXSIM

2. Single-state C-corps: $\tau^c$ corporate income tax rate
   - Digitized corporate tax rates from “Book of the States”

3. Multi-state C-corps: $\tau^A$ apportioned corporate income tax rate
   - Depends on corporate rate, apportionment, and activity weights

\[ \tau_i^A = \sum_s \tau_s^c \omega_{is} \]

where \( \omega_{is} = \left( \theta_s^w \frac{W_{is}}{W} \right) + \left( \theta_s^p \frac{R_{is}}{R} \right) + \left( \theta_s^x \frac{X_{is}}{X} \right) \)

- payroll
- property
- sales
Nike Apportionment Example
Nike Apportionment Example

\[ \tau_{OR}^c, \left( \theta_{OR}^W, \theta_{OR}^\rho, \theta_{OR}^X \right) \]

\[ \tau_{IL}^c, \left( \theta_{IL}^W, \theta_{IL}^\rho, \theta_{IL}^X \right) \]

\[ \tau_{AL}^c, \left( \theta_{AL}^W, \theta_{AL}^\rho, \theta_{AL}^X \right) \]
Nike Apportionment Example (2/2)

- Suppose Nike earns $2 M of profit in every state
- Their tax liability differs based on how profits are apportioned

<table>
<thead>
<tr>
<th>State</th>
<th>I. Using Payroll</th>
<th>II. Using Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apportioned Profit ($M)</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>80</td>
<td>2</td>
</tr>
<tr>
<td>IL</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>AL</td>
<td>10</td>
<td>2</td>
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</table>

<table>
<thead>
<tr>
<th>Corporate Tax Liability ($M)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OR with $\tau_{OR}^c = 50%$</td>
<td>40</td>
</tr>
<tr>
<td>IL with $\tau_{IL}^c = 10%$</td>
<td>1</td>
</tr>
<tr>
<td>AL with $\tau_{AL}^c = 0%$</td>
<td>0</td>
</tr>
</tbody>
</table>

Total Tax Liability ($M) | 41       | 3         |
Number of Corporate Tax Rate Changes by Region: ’77–’12

- (34,41]
- (32,34]
- (30,32]
- [29,30]
- Never Tax
Gradual Shift Towards Sales Apportionment

The graph illustrates a gradual shift in the average sales weight over the years from 1980 to 2010. The average sales weight starts at a lower value in 1980 and shows a steady increase, particularly noticeable from 2000 onwards, reaching a peak by 2010.
Using Variation from Apportionment

Goolsbee and Maydew (Journal of Public Economics, 2000)

- Use variation in payroll burden $\tau_s^c \theta_s^w$

- Find that reducing payroll weight from 33% to 25% increases manufacturing employment by 1%

This paper

$$\tau_i^A = \sum_s \tau_s^c \omega_{is}$$

- where $\omega_{is} = \left( \theta_s^w \frac{W_{is}}{W} \right) + \left( \theta_s^\rho \frac{R_{is}}{R} \right) + \left( \theta_s^x \frac{X_{is}}{X} \right)$

- Use RefUSA data to construct $\omega_{is}$ for each firm $i$

- Take average of all local establishments to obtain $\bar{\tau}^A$
Average Business Tax Rate

- Use data on shares of establishments to calculate the average business tax in a conpsuma:

\[
\Delta \ln(1 - \tau^b)_{c,t} \equiv f_{c,t}^{SC} \Delta \ln(1 - \tau^c)_{c,t} + f_{c,t}^{MC} \Delta \ln(1 - \tau^A)_{c,t}
\]

\[
+ f_{c,t}^{P} \Delta \ln(1 - \tau^{INC})_{c,t}
\]

- Calculate shares \( f_{c,t}^{SC}, f_{c,t}^{MC}, f_{c,t}^{P} \) using County Business Patterns and RefUSA data
Reduced-form Effects on Business Location (and Local Economic Activity)
Specification

$$\ln E_{c,t} - \ln E_{c,t-10} = \beta [\ln(1 - \tau^b_{c,t}) - \ln(1 - \tau^b_{c,t-10})] + D'_{s,t} \Psi_{s,t} + u_{c,t}$$

- LHS: Growth in number of establishments
- RHS: Growth in net-of-business tax rate
- $D_{s,t}$ is a vector of year dummies and state dummies for industrial Midwest in the 1980s
Validity of Business Tax Variation

Potential for bias due to:

- Concomitant changes in corporate tax base, esp. tax credits
- Concomitant changes in spending
- Concurrent changes in productivity
- Prior economic conditions
## Business Taxes & Establishment Growth

<table>
<thead>
<tr>
<th>Establishment Growth</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
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<tbody>
<tr>
<td>Δ ln Net-of-Business-Tax Rate</td>
<td>4.07**</td>
<td>4.14**</td>
<td>4.06**</td>
<td>3.35**</td>
<td>3.91**</td>
<td>3.24**</td>
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<tr>
<td></td>
<td>(1.82)</td>
<td>(1.80)</td>
<td>(1.83)</td>
<td>(1.43)</td>
<td>(1.78)</td>
<td>(1.41)</td>
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<tr>
<td>Δ State ITC</td>
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<td></td>
<td>(0.32)</td>
<td>(0.30)</td>
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<td>Δ ln Gov. Expend./Capita</td>
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<td>(0.01)</td>
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<tr>
<td>Bartik</td>
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<td>0.59***</td>
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<td>0.57***</td>
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<td>(0.19)</td>
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<td>(0.18)</td>
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<tr>
<td>Change in Other States’ Taxes</td>
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<td>-4.66***</td>
<td>-4.18***</td>
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<td></td>
<td>(1.60)</td>
<td>(1.43)</td>
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<td>Fixed Effects</td>
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<td>Year</td>
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<tr>
<td>Observations</td>
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<td>1,470</td>
<td>1,470</td>
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<tr>
<td>R-squared</td>
<td>0.472</td>
<td>0.475</td>
<td>0.472</td>
<td>0.491</td>
<td>0.481</td>
<td>0.500</td>
</tr>
</tbody>
</table>

Tax changes & growth are over 10 years. *** p<0.01, ** p<0.05, * p<0.1
Robust standard errors clustered by state in parentheses
Cumulative Effects of Business Tax Cuts on Est. Growth

F-test all leads are 0 has p-value = 0.92
F-test all lags are 0 has p-value = 0.036

Cumulative Effect no leads
Cumulative Effect w/ leads
Long Difference Point Estimate
95 % Confidence Interval
Additional Validity Tests of Business Location Estimate

- Synthetic controls for states that change taxes
- Specifications over shorter durations that flexibly control for measures of prior economic conditions
- No detectable responsiveness of other state tax rates

**Bottom Line:** The approx. 3.5% effect on establishment growth over ten years is robust and economically sensible
Estimating Incidence Using Reduced-Form Estimates
## Identification of Local Incidence on Welfare

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<td>Firm Owners</td>
<td>After-tax Profit</td>
<td>$1 + \left( \frac{\hat{\beta}^N - \hat{\beta}^E}{\hat{\beta}^W} + 1 \right) \left( \hat{\beta}^W - \frac{\delta}{\gamma} \right)$</td>
</tr>
</tbody>
</table>

- Housing expenditure share $\alpha = .3$ from Consumer Expenditure Survey
- Output Elasticity of Capital $\delta = .9\gamma$ from BEA
## Economic Incidence Estimates Using RF Effects

<table>
<thead>
<tr>
<th></th>
<th>A. Incidence</th>
<th></th>
<th></th>
<th>B. Share of Incidence</th>
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<tr>
<td>Workers</td>
<td>1.10*</td>
<td>1.38**</td>
<td>1.10*</td>
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<td>0.28***</td>
<td>0.31***</td>
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<td>Bartik</td>
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<td>Y</td>
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# Robustness: Economic Incidence Estimates

## Panel (a) Incidence

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<td>Workers</td>
<td>1.26*</td>
<td>1.43**</td>
<td>1.39**</td>
<td>1.38**</td>
<td>1.54**</td>
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<td>(0.59 )</td>
<td>(0.60 )</td>
<td>(0.63 )</td>
<td>(0.69 )</td>
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<td>1.81**</td>
<td>2.17**</td>
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<td>1.79**</td>
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## Panel (b) Shares of Incidence

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<td>Landowner</td>
<td>0.38**</td>
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<td>0.30*</td>
<td>0.29*</td>
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<td>0.40***</td>
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## Controls

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<td>Y</td>
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Estimating Structural Parameters that Govern Incidence
4 Parameters of interest

4 Simultaneous equations with the following outcomes:

1. Establishment Growth
2. Population Growth
3. Wage Growth
4. Rental Cost Growth

RF effects of **Taxes** on **4 Outcomes** to estimate $\sigma^F, \sigma^W, \eta$

Enhance precision with supplement labor demand (Bartik) Shocks

1. RF effects of **Both Shocks** on **4 Outcomes** $\Rightarrow \sigma^F, \sigma^W, \eta$
2. RF effects of **Both Shocks** on **4 Outcomes** $\Rightarrow \sigma^F, \sigma^W, \eta, \varepsilon^{PD}$
1. Estimated Parameters
   1. Productivity Dispersion $\sigma^F$
   2. Preference Dispersion $\sigma^W$
   3. Housing Supply Elasticity $\eta$
   4. Product Demand Elasticity $\varepsilon^{PD}$

2. Calibrated Parameters
   - Housing expenditure share $\alpha = .3$ from Consumer Expenditure Survey
   - Output Elasticity of Labor $\gamma \in [.1, .3]$ from IRS, BEA
   - Output Elasticity of Capital $\delta = .9\gamma$ from BEA residual of L, M
4 Reduced-Form Equations of the Model

Effects on establishments, pop., wages, & rental cost growth over 10 years

\[ \Delta \ln E_{c,t} = \left( \frac{1}{-\sigma F(\varepsilon PD + 1)} - \frac{\gamma}{\sigma F} \dot{w}(\theta) \right) \Delta \ln(1 - \tau_{c,t}^b) + \phi_1^1 + u_1^1 \]

\[ \Delta \ln N_{c,t} = \left( \varepsilon^{LS} \dot{w}(\theta) \right) \Delta \ln(1 - \tau_{c,t}^b) + \phi_2^2 + u_2^2 \]

\[ \Delta \ln w_{c,t} = (\dot{w}(\theta)) \Delta \ln(1 - \tau_{c,t}^b) + \phi_3^3 + u_3^3 \]

\[ \Delta \ln r_{c,t} = \left( \frac{1 + \varepsilon^{LS}}{1 + \eta_c} \dot{w}(\theta) \right) \Delta \ln(1 - \tau_{c,t}^b) + \phi_4^4 + u_4^4 \]
1. **Reduced Form:** Estimate reduced form $\hat{b}$ and covariance $\hat{V}$

2. **Recover Structural Parameters via Classical Minimum Distance:**

$$\hat{\theta} = \arg \min_{\theta \in \Theta} [\hat{b} - m(\theta)]' \hat{V}^{-1} [\hat{b} - m(\theta)]$$

**Results:**

<table>
<thead>
<tr>
<th>Business Tax</th>
<th>Establishments</th>
<th>Population</th>
<th>Wage</th>
<th>Rent</th>
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</thead>
<tbody>
<tr>
<td>Predicted Moments</td>
<td>4.084</td>
<td>2.323</td>
<td>1.438</td>
<td>1.159</td>
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<tr>
<td>Empirical Moments</td>
<td>4.074**</td>
<td>2.331</td>
<td>1.451</td>
<td>1.172</td>
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<td></td>
<td>(1.80)</td>
<td>(1.46)</td>
<td>(0.94)</td>
<td>(1.42)</td>
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</table>

$\chi^2(1)$ Stat 0.001  $\chi^2$ P-Value 0.979
Enhancing precision with supplemental LD shocks

Effects on establishments, pop., wages, & rental cost growth over 10 years

\[ \Delta \ln E_{c,t} = b_1 \Delta \ln (1 - \tau_{c,t}^b) + b_5 \text{Bartik}_{c,t} + \tilde{\phi}_t^1 + \tilde{u}_c^1 \]
\[ \Delta \ln N_{c,t} = b_2 \Delta \ln (1 - \tau_{c,t}^b) + b_6 \text{Bartik}_{c,t} + \tilde{\phi}_t^2 + \tilde{u}_c^2 \]
\[ \Delta \ln w_{c,t} = b_3 \Delta \ln (1 - \tau_{c,t}^b) + b_7 \text{Bartik}_{c,t} + \tilde{\phi}_t^3 + \tilde{u}_c^3 \]
\[ \Delta \ln r_{c,t} = b_4 \Delta \ln (1 - \tau_{c,t}^b) + b_8 \text{Bartik}_{c,t} + \tilde{\phi}_t^4 + \tilde{u}_c^4 \]
## 8 Moments from Tax and Bartik Shocks

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<th></th>
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<th></th>
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<tbody>
<tr>
<td></td>
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<td>Population</td>
<td>Wage</td>
<td>Rent</td>
</tr>
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<td>1.300</td>
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<td>1.743</td>
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<td>(1.27)</td>
<td>(0.83)</td>
<td>(1.35)</td>
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<td>Bartik</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Establishments</td>
<td>Population</td>
<td>Wage</td>
<td>Rent</td>
</tr>
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<td>Predicted Moments</td>
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<td>0.453</td>
<td>0.568</td>
<td>0.740</td>
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<td>Empirical Moments</td>
<td><strong>0.595</strong>*</td>
<td><strong>0.445</strong></td>
<td><strong>0.557</strong>*</td>
<td><strong>0.702</strong>*</td>
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<td>(0.19)</td>
<td>(0.18)</td>
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<td>(0.27)</td>
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<td>$\chi^2(2)$ Stat</td>
<td>0.569</td>
<td>$\chi^2$ P-Value</td>
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Note: $\hat{\sigma}^F = 0.17^*(0.10)$, $\hat{\sigma}^W = 0.77^{**}(0.31)$, $\hat{\eta} = 2.47(5.10)$
### Panel (b) Demand and Supply Elasticities

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<th>(2) Tax &amp; Bartik</th>
<th>(3) Tax &amp; Bartik</th>
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<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
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<tr>
<td><strong>Elasticity of Product</strong></td>
<td>-2.500</td>
<td>-2.500</td>
<td>-6.852</td>
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<tr>
<td><strong>Demand</strong> ( \varepsilon^{PD} )</td>
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<td>(10.337)</td>
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<tr>
<td><strong>Labor Mobility</strong></td>
<td>2.130</td>
<td>1.308**</td>
<td>1.379**</td>
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<td>( \frac{1}{\sigma W} )</td>
<td>(1.636)</td>
<td>(0.535)</td>
<td>(0.578)</td>
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<td><strong>Elasticity of Labor Supply</strong></td>
<td>1.615</td>
<td>1.073**</td>
<td>1.163*</td>
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<td>(1.305)</td>
<td>(0.541)</td>
<td>(0.659)</td>
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<td><strong>Micro Elasticity of Labor Demand</strong></td>
<td>-1.225</td>
<td>-1.225</td>
<td>-1.878</td>
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<tr>
<td></td>
<td>(1.551)</td>
<td></td>
<td>(1.551)</td>
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<td><strong>Macro Elasticity of Labor Demand</strong></td>
<td>-2.584***</td>
<td>-2.086***</td>
<td>-24.509</td>
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<td>(0.850)</td>
<td>(0.510)</td>
<td>(26.914)</td>
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### Economic Incidence Using Estimated Parameters

#### Calibrated Parameters

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<th>Incidence</th>
<th>Shares of Incidence</th>
</tr>
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<td>(2) Tax &amp; Bartik</td>
</tr>
<tr>
<td>Output Elasticity $\gamma$</td>
<td>0.15</td>
<td>0.15</td>
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<tr>
<td>Elasticity of Product Demand $\varepsilon^{PD}$</td>
<td>-2.500</td>
<td>-2.500</td>
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<td>(10.337)</td>
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#### Estimated Parameters

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<th>Shares of Incidence</th>
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</thead>
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<td>(2) Tax &amp; Bartik</td>
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<td>Wages $\dot{w}$</td>
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<td>(0.798)</td>
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<td>(1.329)</td>
<td>(1.241)</td>
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<td>Workers $\dot{w} - \alpha \dot{r}$</td>
<td>1.090**</td>
<td>0.994***</td>
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<td>(0.476)</td>
<td>(0.316)</td>
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<td>Firm Owners $\dot{\pi}$</td>
<td>0.879***</td>
<td>0.930***</td>
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<td>(0.180)</td>
<td>(0.133)</td>
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</table>
Firm Owner’s Share of Incidence for Calibrated Values of $\gamma$ and $\varepsilon^{PD}$
Two Additional Considerations

1. **Regional Heterogeneity**
   - We document average effects, but regions can vary (e.g., housing market elasticities $\eta_c$) $\Rightarrow$ equity and efficiency impacts vary
   - Everything is bigger in Texas, including the efficiency costs of business location incentives

2. **Accounting for (small) Government Spending Changes**
   - Quantify 3 scenarios: cutting services, infrastructure, both
   - Expenditure shares on services exceed those on infrastructure, so worker amenities hit more
   - Shared impact even for infrastructure only case (lower productivity $\Rightarrow$ lower wages)
   - This reinforces conclusion that firm owners enjoy substantial portion of benefit

- Incidence accounting for government spending changes
Q: Given these behavioral responses, why do we observe low state corporate taxes?

- **Fiscal externalities, not mobility** may explain why states have low rates
- **Amenable feature of state corporate tax system**
If states wanted to maximize corporate tax revenues, the maximal tax rate would be:

$$\tau_c^* = \frac{1}{\hat{\pi}_c + \hat{E}_c}$$

However, this rate doesn’t account for fiscal externalities from other taxes (or from other spending)

$$\tau_c^{**} = \frac{1}{\hat{\pi}_c + \hat{E}_c + (\text{revshare}_{\text{pers}}^C / \text{revshare}_C^C)(\dot{w}_c + \dot{N}_c)}$$

Depends on size of location (e.g. states versus cities). It is likely that more local $\Rightarrow$ smaller $\sigma^F \Rightarrow$ smaller $t^*$

Depends on policy design: source based versus destination based
Corporate Rates vs Revmax Rate w/ Fiscal Externalities

- Corporate Tax Rate in 2010
- Revenue-Maximizing Rate with Fiscal Externalities

The graph shows a scatter plot with states represented by their initials. A line indicates the relationship between corporate tax rates and revenue-maximizing rates with fiscal externalities.
Rates, Fiscal Externalities, and Apportionment

Corporate Tax Rate in 2010

Revenue-Maximizing Rate with Fiscal Externalities and Sales Apportionment
## Revenue-Maximizing Corporate Tax Rates

<table>
<thead>
<tr>
<th>State</th>
<th>Sales Apport. Weight $\theta_s^x$</th>
<th>Corporate Tax Rate $\tau_s$</th>
<th>Revenue Max. Corp. Rate $\frac{\tau_s^<em>}{\tau_s^</em>/(1 - \theta_s^x)}$</th>
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<tbody>
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<td>Kansas</td>
<td>33</td>
<td>7.1</td>
<td>36.9</td>
</tr>
<tr>
<td>Indiana</td>
<td>90</td>
<td>8.5</td>
<td>40.3</td>
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<tr>
<td>U.S. Avg</td>
<td>66.1</td>
<td>6.7</td>
<td>38.8</td>
</tr>
<tr>
<td>U.S. Med</td>
<td>50.0</td>
<td>7.1</td>
<td>38.3</td>
</tr>
<tr>
<td>U.S. Min</td>
<td>33.3</td>
<td>0.0</td>
<td>33.8</td>
</tr>
<tr>
<td>U.S. Max</td>
<td>100.0</td>
<td>12.0</td>
<td>46.6</td>
</tr>
</tbody>
</table>
Conclusion

**Conventional view:** corporate taxation in an open economy hurts workers since “shareholders can take their companies and run”

1. New Measure of Local Business Taxes
2. New Reduced Form-Effects
3. New Tractable Spatial Equilibrium Framework with Firms

**New Assessment:** in terms of equity and efficiency, corporate taxation in an open economy may not be as bad as we thought
APPENDIX
### Incidence Estimates Accounting for Government Spending

<table>
<thead>
<tr>
<th>Assumptions for Analysis</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of Government Services</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Value for Infrastructure</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Change in Funds</td>
<td>None</td>
<td>Services</td>
<td>Infrastructure</td>
<td>Proportional</td>
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<table>
<thead>
<tr>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowners</td>
</tr>
<tr>
<td>Firm Owners</td>
</tr>
<tr>
<td>Workers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Share of Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowners</td>
</tr>
<tr>
<td>Firm Owners</td>
</tr>
<tr>
<td>Workers</td>
</tr>
</tbody>
</table>
Cumulative Effects of Business Tax Cuts on Pop. Growth

![Graph showing the cumulative effects of business tax cuts on population growth. The graph includes lines for cumulative effect with and without leads, and confidence intervals.](image)
10 Yr Effect of Business Tax Cut on Establishment Growth

10 Year Log Change in Establishments

10 Year Log Change in Net of Business Tax Rate

Slope = 3.94 (1.61)
10 Yr Effect of Business Tax Cut on Population Growth

Slope = 3.94 (1.57)
10 Yr Effect of Business Tax Cut on Wage Growth

10 Year Log Change in Composition Adj. Wages

10 Year Log Change in Net of Business Tax Rate Slope = 1.78 (.72)
10 Yr Effect of Business Tax Cut on Rental Cost Growth

Slope = 2.16 (1.4)