Graduate Public Finance
Business Taxation Part II: Corporate Tax Incidence

Owen Zidar
Princeton
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Lecture 9
1 Motivation

2 Local Labor Market Approach of Suárez Serrato and Zidar (AER, 2016)
   - Model overview
     - Worker Location, Housing, and Local Labor Supply
     - Firm Location and Local Labor Demand
   - Incidence
   - Empirical Implementation and Identification
     - Structural and Reduced-Form of the Model
   - Estimation: Incidence and Parameter Estimates
     - Reduced-Form Estimation
     - Structural Estimation and Minimum Distance
   - Brief discussion of Local vs National/Global Effects

3 Fuest, Peichl, Siegloch (AER, 2018)
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3 Fuest, Peichl, Siegloch (AER, 2018)
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
Who will benefit from corporate tax cuts?

Corporate Tax Reform and Wages: Theory and Evidence
Who will benefit from corporate tax cuts?

Figure 2. Estimated Increases in Average Household Income under the Corporate Tax Proposal of the Unified Framework ($2016)

Source: Census Current Population Survey; CEA calculations

Who will benefit from corporate tax cuts?

POLITICS

Who Ultimately Pays for Corporate Taxes? The Answer May Color the Republican Overhaul

Investors and workers bear tax burdens, but the politics of tax-code changes hinge on which group carries the heavier load.
“This is about creating jobs” Treasury Secretary Steven Mnuchin said on CBS in April, because many surveys show that 70% or more of the tax burden is borne by the American worker. This is about putting money back in the American worker’s pocket” Last month, Mr. Mnuchin offered an increased estimate, saying 80% of business taxes are paid by workers.

“There’s a pretty wide band of possible outcomes that are plausible,” said Alan Auerbach

1. Local Labor Market Approach
   - Framework from Suárez Serrato and Zidar (AER, 2016)

2. Brief discussion of Local vs National Effects
   - State vs federal impacts
   - Harberger-type general equilibrium models

3. Recent Estimates
   - Fuest, Peichl, Siegloch (AER, 2018)
   - Other considerations when measuring labor market impacts of corporate tax cuts (e.g., Auerbach, 2005 & forthcoming JEP paper)
Outline

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3 Fuest, Peichl, Siegloch (AER, 2018)
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
2. New framework for evaluating welfare effects
3. New assessment of corporate taxation in an open economy

Source: Suárez Serrato and Zidar (AER, 2016)
Relax two crucial assumptions

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

2. Firms are **perfectly mobile**
   - Every firm is marginal in their location decisions
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
Who Benefits from State Corporate Tax Cuts?

Our Estimate

- Workers
- Firm Owners
- Landowners
Who Benefits from State Corporate Tax Cuts?

Our Estimate

- Landowners
- Firm Owners
- Workers

Standard Model

- Workers
Context and Challenges

- **Empirical:** Desai et al. 2007, 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)
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** (skip for time)
   - 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
Local Labor Markets Approach
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)
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 $\hat{w}(\theta), \hat{\pi}(\theta), \hat{r}(\theta)$
   - $\varepsilon^{LS}(\theta)$ and $\varepsilon^{LD}(\theta)$,
Equilibrium in the Local Labor Market

The diagram illustrates the supply and demand for labor in a local market. The supply curve, $S_0(w)$, and the demand curve, $D_0(w)$, intersect at the equilibrium wage $w_0$ and employment $L_0$. This equilibrium represents a balance where the quantity of labor supplied equals the quantity demanded at the current wage level.
Equilibrium in the Local Labor Market

\[ w \]

\[ w^* \]

\[ w_0 \]

\[ L_0 \]

\[ L^* \]

\[ L_1 \]

\[ L \]

\[ S_0(w) \]

\[ D_0(w) \]

\[ D_1(w) \]

1. \( \tau \) cut

2. Point 2

3. Point 3
Equilibrium in the Local Labor Market

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

Diagram with axes labeled as follows:
- \( w \) (wage) on the vertical axis
- \( L \) (labor) on the horizontal axis

Points:
1. \( \tau \) cut
2. \( w_0 \)
3. \( w^* \)

Lines:
- \( S_0(w) \)
- \( D_0(w) \)
- \( D_1(w) \)
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
\[
\max_{h,X} \left\{ \ln A \text{ amenitites} + \alpha \ln h + (1 - \alpha) \ln X \text{ housing} \right\} \text{ composite good} \\
\text{s.t. } rh + \int_{j \in J} p_j x_j dj = w
\]

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

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

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

Indirect Utility of a Worker:

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

\( \equiv A_c + \xi_{nc} \)
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 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:**

\[
N_c = P \left( \max_{c'} \{ V^{W}_{nc'} \} = V^{W}_{nc} \right) = \frac{\exp \frac{u_c}{\sigma_W}}{\sum_{c'} \exp \frac{u_{c'}}{\sigma_W}}
\]
Location choice: Workers choose location with max utility:

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

Local Population:

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

(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:

\[ H_c^S = (B_c^H r_c)^{\eta_c} \]

- \( B_c^H \) is housing productivity
- \( r_c \) is price of housing

With Cobb-Douglas \( H_c^D \), 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
Local Labor Demand

Aggregate labor demand for firms in location $c$:

$$L^D_c = E_c \times \mathbb{E}_c[I^*(\zeta|c)]$$

- Extensive margin
- Intensive margin

Elasticity of labor demand:

$$\frac{\partial \ln L^D_c}{\partial \ln w_c} = \gamma - 1 + \gamma \varepsilon^{PD} - \frac{\gamma}{\sigma^F} \equiv \varepsilon^{LD}$$

- Substitution
- Scale
- Firm–Location

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

- Higher output elasticity of labor $\gamma$
- Higher product demand elasticity $\varepsilon^{PD}$
- 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:

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

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:

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

- Reducing Capital Wedge
- Higher Labor Costs

- Mechanical effects vs. higher production costs
### Welfare Effects of Corporate Tax Cut

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Benefit</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
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<td>Disposable Income</td>
<td>( \dot{w}_c - \alpha \dot{r}_c )</td>
</tr>
<tr>
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<td>Housing Costs</td>
<td>( \dot{r}_c )</td>
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## Welfare Effects of Corporate Tax Cut

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<td></td>
<td></td>
<td>= ( 1 + \frac{\gamma (\varepsilon^{PD} + 1)}{\text{Net Markup}} \times \left( \dot{w}_c - \frac{\delta}{\gamma} \right) )</td>
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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

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

- \( \mathbf{Y}_{c,t} = \begin{bmatrix} \Delta \ln w_{c,t} \\ \Delta \ln N_{c,t} \\ \Delta \ln r_{c,t} \\ \Delta \ln E_{c,t} \end{bmatrix} \)
- \( \mathbf{Z}_{c,t} = \begin{bmatrix} \Delta \ln (1 - \tau_{c,t}^b) \end{bmatrix} \)
- \( \mathbf{e}_{c,t} \) is a structural error term
Exact Reduced Form of the Model

\[ Y_{c,t} = A^{-1}B \overbrace{Z_{c,t} + A^{-1}e_{c,t}}^{\equiv \beta \text{Business Tax}} \]

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

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

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

\[
\Delta \ln w_{c,t} = (\hat{\omega}(\theta)) \Delta \ln (1 - \tau_{c,t}^b) + \phi^1_t + u^1_{c,t} \\
\Delta \ln N_{c,t} = \left(\varepsilon^{LS} \hat{\omega}(\theta)\right) \Delta \ln (1 - \tau_{c,t}^b) + \phi^2_t + u^2_{c,t} \\
\Delta \ln r_{c,t} = \left(\frac{1 + \varepsilon^{LS}}{1 + \eta_c} \hat{\omega}(\theta)\right) \Delta \ln (1 - \tau_{c,t}^b) + \phi^3_t + u^3_{c,t} \\
\Delta \ln E_{c,t} = \left(\frac{1}{-\sigma_F(\varepsilon^{PD} + 1)} - \frac{\gamma}{\sigma_F} \hat{\omega}(\theta)\right) \Delta \ln (1 - \tau_{c,t}^b) + \phi^4_t + u^4_{c,t}
\]
Identification of Local Welfare Effects

Reduced forms:

\[ \dot{w} = \beta W, \dot{N} = \beta N \Rightarrow \varepsilon_{LS} = \beta N \beta W \]

Labor Demand

\[ \varepsilon_{LD} = \gamma (\varepsilon_{PD} + 1) - \gamma \sigma F - 1 \]

Establishment Location

\[ \frac{\partial \ln D}{\partial \ln (1 - \tau)} = \beta E + \gamma \sigma F \beta W \]

\[ \varepsilon_{LS} - \varepsilon_{LD} = \beta N - \beta E \beta W + 1 \]

\[ \gamma (\varepsilon_{PD} + 1) = \frac{\partial \ln D}{\varepsilon_{LS} - \varepsilon_{LD}} \]
Identification of Local Welfare Effects

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

\[
\dot{w} = \frac{\partial \ln D}{\partial \ln (1 - \tau)} \frac{\beta^W}{\epsilon^{LS} - \epsilon^{LD}}
\]
Identification of Local Welfare Effects

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

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Identification of Local Welfare Effects

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

Labor Demand
\[ \varepsilon_{LD} = \gamma(\varepsilon^{PD} + 1) - \frac{\gamma}{\sigma_F} - 1 \]
Identification of Local Welfare Effects

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

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

- Establishment Location
  \[
  \frac{\partial \ln D}{\partial \ln(1-t)} = \beta^E + \frac{\gamma}{\sigma^F} \beta^W
  \]
Identification of Local Welfare Effects

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

\[ \implies \varepsilon^{LS} = \frac{\beta^N}{\beta^W} \]

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

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

\[ \beta^W = \frac{\beta^E + \frac{\gamma}{\sigma^F} \beta^W}{\frac{\beta^N}{\beta^W} - \gamma(\varepsilon^{PD} + 1) + \frac{\gamma}{\sigma^F} + 1} \]
Identification of Local Welfare Effects

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

- Labor Demand
  \[ \varepsilon^{LD} = \gamma(\varepsilon^{PD} + 1) - \frac{\gamma}{\sigma'^{F}} - 1 \]

- Establishment Location
  \[ \frac{\partial \ln D}{\partial \ln (1-t)} = \beta^E + \frac{\gamma}{\sigma'^{F}} \beta^W \]

\[
\beta^W = \frac{\beta^E + \frac{\gamma}{\sigma'^{F}} \beta^W}{\frac{\beta^N}{\beta^W} - \gamma(\varepsilon^{PD} + 1) + \frac{\gamma}{\sigma'^{F}} + 1} \implies \gamma(\varepsilon^{PD} + 1) = \left( \frac{\beta^N - \beta^E}{\beta^W} + 1 \right)
\]
### Identification of Local Welfare Effects

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<td>$1 + \left( \frac{\hat{\beta}^N - \hat{\beta}^E}{\hat{\beta}^W} + 1 \right) (\hat{\beta}^W - \frac{\delta}{\gamma})$</td>
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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
Incidence and Parameter Estimates
Effects on establishments, pop., wages, & rental cost growth over 10 years

\[ \Delta \ln E_{c,t} = \left( \frac{1}{-\sigma^E (\varepsilon^{PD} + 1)} - \frac{\gamma}{\sigma^E} \dot{w}(\theta) \right) \Delta \ln(1 - \tau^b_{c,t}) + \phi^1_t + u^1_{c,t} \]

\[ \Delta \ln N_{c,t} = \left( \varepsilon^{LS} \dot{w}(\theta) \right) \Delta \ln(1 - \tau^b_{c,t}) + \phi^2_t + u^2_{c,t} \]

\[ \Delta \ln w_{c,t} = \left( \dot{w}(\theta) \right) \Delta \ln(1 - \tau^b_{c,t}) + \phi^3_t + u^3_{c,t} \]

\[ \Delta \ln r_{c,t} = \left( \frac{1 + \varepsilon^{LS}}{1 + \eta_c} \dot{w}(\theta) \right) \Delta \ln(1 - \tau^b_{c,t}) + \phi^4_t + u^4_{c,t} \]
### Identification of Local Incidence on Welfare

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

### A. Incidence

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<th>(4)</th>
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<tbody>
<tr>
<td><strong>Landowners</strong></td>
<td>1.17</td>
<td>1.17</td>
<td>1.17</td>
<td>0.32</td>
<td>1.86</td>
<td>0.62</td>
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<tr>
<td></td>
<td>(1.43)</td>
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<td>(1.43)</td>
<td>(1.36)</td>
<td>(1.56)</td>
<td>(0.60)</td>
</tr>
<tr>
<td><strong>Workers</strong></td>
<td>1.1*</td>
<td>0.69</td>
<td>1.1*</td>
<td>0.68</td>
<td>0.98</td>
<td>0.58*</td>
</tr>
<tr>
<td></td>
<td>(0.59)</td>
<td>(0.44)</td>
<td>(0.59)</td>
<td>(0.52)</td>
<td>(0.84)</td>
<td>(0.33)</td>
</tr>
<tr>
<td><strong>Firmowners</strong></td>
<td>1.63*</td>
<td>1.63*</td>
<td>2.08**</td>
<td>0.81</td>
<td>1.54*</td>
<td>0.9***</td>
</tr>
<tr>
<td></td>
<td>(0.90)</td>
<td>(0.90)</td>
<td>(0.95)</td>
<td>(1.4)</td>
<td>(0.92)</td>
<td>(0.34)</td>
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### Specification

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<td><strong>Net-of-Business Tax</strong></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Net-of-Corporate Tax</strong></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Housing share $\alpha$</strong></td>
<td>0.3</td>
<td>0.65</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Output elasticity ratio $\delta/\gamma$</strong></td>
<td>0.9</td>
<td>0.9</td>
<td>0.5</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
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<tr>
<td><strong>Bartik</strong></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td><strong>Net-of-Personal Tax</strong></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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### Economic Incidence Estimates Using RF Effects (cont.)

#### B. Share of Incidence

<table>
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<tr>
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<tr>
<td>Landowners</td>
<td>0.30</td>
<td>0.34</td>
<td>0.27</td>
<td>0.18</td>
<td>0.42**</td>
<td>0.29*</td>
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<tr>
<td></td>
<td>(0.19)</td>
<td>(0.24)</td>
<td>(0.2)</td>
<td>(0.48)</td>
<td>(0.17)</td>
<td>(0.16)</td>
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<tr>
<td>Workers</td>
<td>0.28***</td>
<td>0.20</td>
<td>0.25***</td>
<td>0.37</td>
<td>0.22*</td>
<td>0.28***</td>
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<tr>
<td></td>
<td>(0.09)</td>
<td>(0.16)</td>
<td>(0.07)</td>
<td>(0.43)</td>
<td>(0.12)</td>
<td>(0.08)</td>
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<tr>
<td>Firmowners</td>
<td>0.42***</td>
<td>0.47***</td>
<td>0.48***</td>
<td>0.45***</td>
<td>0.35***</td>
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<tr>
<td></td>
<td>(0.12)</td>
<td>(0.10)</td>
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<td>(0.13)</td>
<td>(0.09)</td>
<td>(0.10)</td>
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<td>Conventional View Test</td>
<td>(\chi^2) of (S^W = 1, S^F = 0)</td>
<td>132.67</td>
<td>108.14</td>
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<td>76.27</td>
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<td>0.00</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td></td>
<td>Net-of-Corporate Tax</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Housing share (\alpha)</td>
<td>0.3</td>
<td>0.65</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Output elasticity ratio (\delta/\gamma)</td>
<td>0.9</td>
<td>0.9</td>
<td>0.5</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Bartik</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Net-of-Personal Tax</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
Structural Estimation

- 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 $\Rightarrow \sigma^F$, $\sigma^W$, $\eta$, $\varepsilon^{PD}$
Parameters $\theta$

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

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

\[
\beta^E
\]

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

\[
\beta^N
\]

\[
\Delta \ln w_{c,t} = \left( \dot{w}(\theta) \right) \Delta \ln(1 - \tau_{c,t}^b) + \phi^3_t + u^3_{c,t}
\]

\[
\beta^W
\]

\[
\Delta \ln r_{c,t} = \left( \frac{1 + \varepsilon^{LS}}{1 + \eta_{c}} \dot{w}(\theta) \right) \Delta \ln(1 - \tau_{c,t}^b) + \phi^4_t + u^4_{c,t}
\]

\[
\beta^R
\]
1. **Reduced Form:** Estimate reduced form $\hat{b}$ and covariance $\hat{V}$
Estimating Structural Parameters

1. **Reduced Form:** Estimate reduced form $\hat{b}$ and covariance $\hat{V}$

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

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

Panel (a) Business Tax Shock

<table>
<thead>
<tr>
<th></th>
<th>Population</th>
<th>Wage</th>
<th>Rent</th>
<th>Establishments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empirical Moments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Tax</td>
<td>4.275***</td>
<td>1.451</td>
<td>1.172</td>
<td>4.074**</td>
</tr>
<tr>
<td></td>
<td>(1.642)</td>
<td>(0.938)</td>
<td>(1.428)</td>
<td>(1.815)</td>
</tr>
<tr>
<td><strong>Predicted Moments ($\gamma = .15, \varepsilon^{PD} = -2.5$)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Tax</td>
<td>3.514</td>
<td>0.839</td>
<td>0.591</td>
<td>4.542</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Over-id Test</th>
<th>Test: $\beta^E = \beta^N - (\gamma(\varepsilon^{PD} + 1) - 1)\beta^W$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$-Stat</td>
<td>2.453</td>
</tr>
<tr>
<td>$\chi^2$-P-Value</td>
<td>0.117</td>
</tr>
<tr>
<td>T-stat</td>
<td>-1.566</td>
</tr>
<tr>
<td>P-value</td>
<td>0.117</td>
</tr>
</tbody>
</table>
Enhancing precision with supplemental LD shocks

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

\[
\Delta \ln E_{c,t} = b_1 \Delta \ln (1 - \tau_{b,c,t}) + b_5 \text{Bartik}_{c,t} + \tilde{\phi}_1 + \tilde{u}_1^{c,t}
\]

\[
\Delta \ln N_{c,t} = b_2 \Delta \ln (1 - \tau_{b,c,t}) + b_6 \text{Bartik}_{c,t} + \tilde{\phi}_2 + \tilde{u}_2^{c,t}
\]

\[
\Delta \ln w_{c,t} = b_3 \Delta \ln (1 - \tau_{b,c,t}) + b_7 \text{Bartik}_{c,t} + \tilde{\phi}_3 + \tilde{u}_3^{c,t}
\]

\[
\Delta \ln r_{c,t} = b_4 \Delta \ln (1 - \tau_{b,c,t}) + b_8 \text{Bartik}_{c,t} + \tilde{\phi}_4 + \tilde{u}_4^{c,t}
\]
### 8 Moments from Tax and Bartik Shocks

#### Panel (b) All Shocks

<table>
<thead>
<tr>
<th>Empirical Moments</th>
<th>Population</th>
<th>Wage</th>
<th>Rent</th>
<th>Establishments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Tax</strong></td>
<td>1.516</td>
<td>1.534</td>
<td>1.857</td>
<td>1.749</td>
</tr>
<tr>
<td></td>
<td>(1.915) (1.117)</td>
<td>(1.562) (1.540)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bartik</strong></td>
<td>0.446**</td>
<td>0.554***</td>
<td>0.697***</td>
<td>0.600***</td>
</tr>
<tr>
<td></td>
<td>(0.183)</td>
<td>(0.079)</td>
<td>(0.257)</td>
<td>(0.189)</td>
</tr>
<tr>
<td><strong>Personal Tax</strong></td>
<td>1.731</td>
<td>-0.588</td>
<td>-1.192</td>
<td>1.247</td>
</tr>
<tr>
<td></td>
<td>(1.247)</td>
<td>(0.728)</td>
<td>(1.173)</td>
<td>(1.420)</td>
</tr>
</tbody>
</table>

#### B. Predicted Moments ($\gamma = .15, \varepsilon_{PD} = -2.5$)

<table>
<thead>
<tr>
<th>Over-id Test</th>
<th>Test: $\beta^E = \beta^N - (\gamma(\varepsilon^{PD} + 1) - 1)\beta^W$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$-Stat</td>
<td>4.665</td>
</tr>
<tr>
<td>$\chi^2$-P-Value</td>
<td>0.458</td>
</tr>
<tr>
<td>T-stat</td>
<td>-1.217</td>
</tr>
<tr>
<td>P-value</td>
<td>0.224</td>
</tr>
</tbody>
</table>
## Structural Elasticities Using Estimated Parameters

### A. All Shocks

<table>
<thead>
<tr>
<th>Calibrated Parameters</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Elasticity $\gamma$</td>
<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
<td>0.200</td>
<td>0.250</td>
<td>0.150</td>
<td>0.250</td>
</tr>
<tr>
<td>Housing Share $\alpha$</td>
<td>0.300</td>
<td>0.500</td>
<td>0.650</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.500</td>
</tr>
<tr>
<td>Elasticity of Product Demand $\varepsilon^{PD}$</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-4.000</td>
<td>-4.000</td>
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### Estimated Parameters

<table>
<thead>
<tr>
<th>Idiosyncratic Location</th>
<th>0.277**</th>
<th>0.271**</th>
<th>0.233**</th>
<th>0.321*</th>
<th>0.304</th>
<th>0.149</th>
<th>0.136</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prod. Disp. $\sigma^F$</td>
<td>(0.138)</td>
<td>(0.120)</td>
<td>(0.092)</td>
<td>(0.186)</td>
<td>(0.186)</td>
<td>(0.096)</td>
<td>(0.093)</td>
</tr>
<tr>
<td>Idiosyncratic Location</td>
<td>0.829***</td>
<td>0.686***</td>
<td>0.621***</td>
<td>0.845***</td>
<td>0.843***</td>
<td>0.839***</td>
<td>0.649***</td>
</tr>
<tr>
<td>Pref. Disp. $\sigma^W$</td>
<td>(0.282)</td>
<td>(0.260)</td>
<td>(0.230)</td>
<td>(0.294)</td>
<td>(0.295)</td>
<td>(0.294)</td>
<td>(0.253)</td>
</tr>
<tr>
<td>Elasticity of Housing Supply $\eta$</td>
<td>0.513</td>
<td>2.185</td>
<td>1.157</td>
<td>1.600</td>
<td>0.707</td>
<td>1.995</td>
<td>2.812</td>
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<td>Overid Test (p-value)</td>
<td>0.458</td>
<td>0.390</td>
<td>0.393</td>
<td>0.385</td>
<td>0.444</td>
<td>0.390</td>
<td>0.507</td>
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### Calibrated Parameters

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<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Elasticity $\gamma$</td>
<td>0.150</td>
<td>0.150</td>
<td>0.250</td>
<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
<td>0.250</td>
</tr>
<tr>
<td>Housing Share $\alpha$</td>
<td>0.300</td>
<td>0.650</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.650</td>
<td>0.300</td>
</tr>
<tr>
<td>Elasticity of Product Demand $\varepsilon^{PD}$</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-4.000</td>
<td>Estimated Below</td>
<td></td>
<td></td>
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### Estimated Parameters

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<tr>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
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<tbody>
<tr>
<td>Idiosyncratic Location $\sigma^F$</td>
<td>0.119*</td>
<td>0.117*</td>
<td>0.106</td>
<td>0.048</td>
<td>0.109</td>
<td>0.105</td>
<td>0.138</td>
</tr>
<tr>
<td>Prod. Disp. $\sigma^W$</td>
<td>(0.065)</td>
<td>(0.064)</td>
<td>(0.075)</td>
<td>(0.039)</td>
<td>(0.392)</td>
<td>(0.194)</td>
<td>(0.411)</td>
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<tr>
<td>Idiosyncratic Location $\sigma^F$</td>
<td>0.188</td>
<td>0.128</td>
<td>0.171</td>
<td>0.170</td>
<td>0.892***</td>
<td>0.571**</td>
<td>0.753***</td>
</tr>
<tr>
<td>Pref. Disp. $\sigma^W$</td>
<td>(0.184)</td>
<td>(0.147)</td>
<td>(0.176)</td>
<td>(0.175)</td>
<td>(0.337)</td>
<td>(0.234)</td>
<td>(0.245)</td>
</tr>
<tr>
<td>Elasticity of Housing Supply $\eta$</td>
<td>6.367</td>
<td>5.724</td>
<td>7.328</td>
<td>6.424</td>
<td>1.925</td>
<td>1.783</td>
<td>3.056</td>
</tr>
<tr>
<td>Elasticity of Product Demand $\varepsilon^{PD}$</td>
<td>-4.704</td>
<td>-4.439</td>
<td>-4.986</td>
<td>(11.945)</td>
<td>(6.471)</td>
<td>(12.190)</td>
<td></td>
</tr>
<tr>
<td>Overid Test (p-value)</td>
<td>0.117</td>
<td>0.117</td>
<td>0.098</td>
<td>0.088</td>
<td>0.251</td>
<td>0.334</td>
<td>0.290</td>
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</table>
## Economic Incidence Using Estimated Parameters

### A. Incidence

<table>
<thead>
<tr>
<th>Calibrated Parameters</th>
<th>All Shocks</th>
<th>Business Tax</th>
<th>Est. $\varepsilon^{PD}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Elasticity $\gamma$</td>
<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
</tr>
<tr>
<td>Housing Share $\alpha$</td>
<td>0.300</td>
<td>0.650</td>
<td>0.300</td>
</tr>
<tr>
<td>Elasticity of Product Demand $\varepsilon^{PD}$</td>
<td>-2.500</td>
<td>-4.000</td>
<td>-2.500</td>
</tr>
<tr>
<td>Demand $\varepsilon^{PD}$</td>
<td></td>
<td></td>
<td>(11.945)</td>
</tr>
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### Estimated Incidence

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages $\dot{w}$</td>
<td>0.944**</td>
<td>1.088**</td>
<td>0.655*</td>
<td>0.839</td>
<td>0.646</td>
</tr>
<tr>
<td></td>
<td>(0.408)</td>
<td>(0.457)</td>
<td>(0.348)</td>
<td>(0.847)</td>
<td>(1.028)</td>
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<tr>
<td>Landowners $\dot{r}$</td>
<td>1.111</td>
<td>0.886</td>
<td>0.428</td>
<td>0.591</td>
<td>0.420</td>
</tr>
<tr>
<td></td>
<td>(1.119)</td>
<td>(1.052)</td>
<td>(1.079)</td>
<td>(1.373)</td>
<td>(1.517)</td>
</tr>
<tr>
<td>Workers $\dot{w} - \alpha\dot{r}$</td>
<td>0.611**</td>
<td>0.512</td>
<td>0.527*</td>
<td>0.662</td>
<td>0.520</td>
</tr>
<tr>
<td></td>
<td>(0.293)</td>
<td>(0.355)</td>
<td>(0.269)</td>
<td>(0.517)</td>
<td>(0.703)</td>
</tr>
<tr>
<td>Firm Owners $\dot{\pi}$</td>
<td>0.990***</td>
<td>0.958***</td>
<td>1.110***</td>
<td>1.014***</td>
<td>1.141</td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td>(0.103)</td>
<td>(0.157)</td>
<td>(0.191)</td>
<td>(1.012)</td>
</tr>
</tbody>
</table>

| Elasticity of Labor Supply $\varepsilon^{LS}$ | 0.780**    | 0.757      | 0.958      | 4.188      | 0.902      |
|                                                  | (0.386)    | (0.729)    | (0.588)    | (4.795)    | (0.645)    |
| Elasticity of Labor Demand $\varepsilon^{PD}$   | -1.766***  | -1.867***  | -2.457***  | -2.485***  | -2.933     |
### B. Shares of Incidence

<table>
<thead>
<tr>
<th>Calibrated Parameters</th>
<th>(1) All Shocks</th>
<th>(2) Business Tax</th>
<th>(3) All Shocks</th>
<th>(4) Business Tax</th>
<th>(5) Estimated (\epsilon^{PD})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Elasticity (\gamma)</td>
<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
<td>0.150</td>
</tr>
<tr>
<td>Housing Share (\alpha)</td>
<td>0.300</td>
<td>0.650</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
</tr>
<tr>
<td>Elasticity of Product Demand (\epsilon^{PD})</td>
<td>-2.500</td>
<td>-2.500</td>
<td>-4.000</td>
<td>-2.500</td>
<td>-4.704</td>
</tr>
</tbody>
</table>

### Estimated Incidence

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowners (\hat{\tau})</td>
<td>0.410</td>
<td>0.376</td>
<td>0.207</td>
<td>0.261</td>
<td>0.202</td>
</tr>
<tr>
<td></td>
<td>(0.263)</td>
<td>(0.339)</td>
<td>(0.434)</td>
<td>(0.430)</td>
<td>(0.621)</td>
</tr>
<tr>
<td>Workers (\hat{w} - \alpha\hat{\tau})</td>
<td>0.225*</td>
<td>0.217</td>
<td>0.255</td>
<td>0.292**</td>
<td>0.250</td>
</tr>
<tr>
<td></td>
<td>(0.134)</td>
<td>(0.197)</td>
<td>(0.185)</td>
<td>(0.142)</td>
<td>(0.290)</td>
</tr>
<tr>
<td>Firm Owners (\hat{\pi})</td>
<td>0.365**</td>
<td>0.407**</td>
<td>0.537*</td>
<td>0.447</td>
<td>0.548</td>
</tr>
<tr>
<td></td>
<td>(0.168)</td>
<td>(0.164)</td>
<td>(0.297)</td>
<td>(0.392)</td>
<td>(0.734)</td>
</tr>
<tr>
<td>Test of Standard View (p-value)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.026</td>
</tr>
</tbody>
</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 $\eta_c$) ⇒ 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 ⇒ lower wages)
   - This reinforces conclusion that firm owners enjoy substantial portion of benefit
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
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
Brief discussion of Local vs National/Global Effects
A few considerations:

1. Local versus national labor supply and demand are different.
2. Key question is how elastic supply of capital is, and how that impacts labor market (both in short and long run).
3. At national level, other issues, like deficit financing’s impact on interest rates, and the effects of those higher interest rates on growth, capital accumulation, and labor demand matter more.
4. We have more variation and empirical evidence from changes at state and local level. National effects more uncertain.
Outline

1 Motivation

2 Local Labor Market Approach of Suárez Serrato and Zidar (AER, 2016)
   - Model overview
     - Worker Location, Housing, and Local Labor Supply
     - Firm Location and Local Labor Demand
   - Incidence
   - Empirical Implementation and Identification
     - Structural and Reduced-Form of the Model
   - Estimation: Incidence and Parameter Estimates
     - Reduced-Form Estimation
     - Structural Estimation and Minimum Distance
   - Brief discussion of Local vs National/Global Effects

3 Fuest, Peichl, Siegloch (AER, 2018)
Overview of Fuest, Peichl, Siegloch (AER, 2018)

- Question: What is the effect of corporate taxes on wages?
- Data: 20-year panel of German municipalities. Administrative linked employer-employee data
- Findings:
  - Workers bear roughly half the burden of corporate taxes
  - Low-skilled, young and female employees bear a larger share of the tax burden
Event Study: Effects of corp tax change on log real wages

Source: Fuest, Peichl, Siegloch.
Distributed lag: Effects of corp tax change on log real wages

Source: Fuest, Peichl, Siegloch.
Event Study: Effects of corp tax change on log GDP

Source: Fuest, Peichl, Siegloch.
Estimating equation:

\[ \ln w_{f,t}^{p50} = \delta \ln(1 - \tau_{m,t}) + \mu_f + \mu_m + \psi_{s,t} + \varepsilon_{f,t} \]
Table 1: Differences-in-differences estimates: baseline wage effects

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log net-of-LBT rate</td>
<td>0.388</td>
<td>0.229</td>
<td>0.386</td>
<td>0.396</td>
<td>0.343</td>
<td>0.399</td>
</tr>
<tr>
<td></td>
<td>(0.127)</td>
<td>(0.110)</td>
<td>(0.127)</td>
<td>(0.128)</td>
<td>(0.164)</td>
<td>(0.118)</td>
</tr>
<tr>
<td>Incidence ($I^w$)</td>
<td>0.505</td>
<td>0.288</td>
<td>0.502</td>
<td>0.516</td>
<td>0.442</td>
<td>0.520</td>
</tr>
<tr>
<td></td>
<td>(0.170)</td>
<td>(0.140)</td>
<td>(0.170)</td>
<td>(0.172)</td>
<td>(0.217)</td>
<td>(0.159)</td>
</tr>
</tbody>
</table>

State × year FE      | ✓      |        |        | ✓      |        | ✓      |
Year FE              |        | ✓      |        |        |        |        |
CZ × year FE         |        |        | ✓      |        |        |        |
Municipal controls t – 2 | ✓      |        |        |        |        |        |
Firm controls t – 2  |        |        |        | ✓      |        |        |
Worker shares        |        |        |        |        | ✓      |        |

Source: LIAB and Statistical Offices of the Laender. Notes: This table presents the DiD estimates, $\hat{\delta}$, of regression model (3) at the firm level. Coefficients measure the wage elasticity with respect to the net-of-local-business-tax rate. The incidence effect $I^w$ is measured according to formula (4) as the share of the total tax burden borne by workers. All regression models include municipal and firm fixed effects. Additional control variables and fixed effects (year, “state × year” or “commuting zone (CZ) × year”) vary depending on the specification (as indicated at the bottom of the table). The estimation sample is restricted to all establishments liable to the LBT in non-merged municipalities. Standard errors are clustered at the municipal level. Corresponding standard errors for the incidence measure are obtained using the Delta method. Our preferred (baseline) specification is shown in column (1).
Table 4: Differences-in-differences estimates: wage effects by worker type

<table>
<thead>
<tr>
<th>Stratified by</th>
<th>Effect of log net-of-LBT rate by worker type</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill</td>
<td></td>
<td>9,295,488</td>
</tr>
<tr>
<td>High</td>
<td>0.013 (0.12)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>0.357 (0.115)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>0.377 (0.168)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>9,295,488</td>
</tr>
<tr>
<td>Female</td>
<td>0.530 (0.129)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.325 (0.119)</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td>9,295,442</td>
</tr>
<tr>
<td>Blue-collar</td>
<td>0.363 (0.132)</td>
<td></td>
</tr>
<tr>
<td>White-collar</td>
<td>0.250 (0.104)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>9,295,488</td>
</tr>
<tr>
<td>Young</td>
<td>0.507 (0.127)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>0.317 (0.111)</td>
<td></td>
</tr>
<tr>
<td>Old</td>
<td>0.329 (0.106)</td>
<td></td>
</tr>
</tbody>
</table>

Source: LIAB and Statistical Offices of the Laender. Notes: This table presents the DiD estimates \( \hat{\delta} \) of regression model (3) with the log individual wage as dependent variables for different worker types as indicated in the table. The heterogeneous effects are estimated by interacting the LBT rate with dummy variables for different firms types. Coefficients measure the wage elasticity with respect to the net-of-local-business-tax rate. All specifications include worker, firm and municipal fixed effects, as well as “state × year” and “worker type × year” fixed effects. The estimation sample comprises all establishments liable to the LBT in non-merged municipalities. Standard errors are clustered at the municipal level.

Source: Fuest, Peichl, Siegloch.