Who Benefits from State Corporate Tax Cuts? A Local Labor Market Approach with Heterogeneous Firms: Further Results*

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Abstract

This paper estimates the incidence of state corporate taxes using new data and methods for estimating the effects on profits. We extend Suárez Serrato and Zidar (2016) by developing two new identification approaches that use the effects of business taxes on the labor demand of incumbent firms and local productivity to identify profit effects. We estimate these reduced-form effects using data from Census, show how reduced-form moments identify incidence and parameters, and provide incidence estimates using a variety of reduced-form approaches as well as a structural model. Across these approaches, we find that owners bear a substantial portion of incidence. Our central estimate is that firm owners bear half of the incidence, while workers and landowners bear 35-40 percent and 10-15 percent, respectively.

Who benefits from local business tax cuts? To answer this question, Suárez Serrato and Zidar (2016) (SZ hereafter), used a model to estimate how much firm owners benefitted relative to workers and landowners. SZ inferred the profit effects on firm owners from mechanical changes in the cost of capital and estimated changes in wages. This paper develops and implements two novel approaches for inferring profit effects from other sources of variation: changes in the labor demand of incumbent firms and changes in local productivity.

To do so, we extend our framework in SZ in three ways. First, we show how to identify profit effects using these new reduced-form effects. Second, we update the structural model

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to incorporate these additional approaches to estimate profit effects. The updated model also correctly accounts for the effects of taxes on the composition of firms and the cost of capital, and allows for more flexible responses of the local cost of capital to changes in business taxes.[1] Third, we show how to derive income shares for each of the agents of the model. We use these income shares to compute income-share-weighted incidence estimates.

We extend the empirical analysis in SZ with new data from the U.S. Census Bureau's Longitudinal Business Database (LBD) and Annual Survey of Manufacturers (ASM). We first provide new evidence on the effect of business taxes on the labor demand of incumbent firms and on local productivity (TFP). Then we use these reduced-form estimates to estimate the effects on profits.

Our first main finding is that these reduced-form results lead to somewhat larger estimated effects on firm owners. The strategy that identifies firm owner's incidence using the reduced-form effect on labor demand of incumbent firms delivers an estimate of 61.9% ($SE = 11\%$). The second strategy that uses the effects of business taxes on local productivity (TFP) yields an estimate of the firm owner share of 52.3% ($SE = 34\%$).

Our second main finding is that our extended structural model that incorporates these new moments delivers an estimate for firm owners of 53.3% ($SE = 12\%$). In the main text, we discuss how these results vary using different parameterizations, weighting approaches, and specifications. Overall, our central estimate is that firm owners bear roughly half of the incidence, while workers and landowners bear 35-40 percent and 10-15 percent, respectively.

I Extending the Framework

This section develops two new approaches for inferring profit effects of local business tax cuts. As in SZ, we continue to infer the incidence on workers and landowners using the estimated effects of local business tax cuts on wages and housing costs. Table 1 recalls these incidence expressions.

A Identifying Incidence on Profits using Reduced-Form Effects

A key goal of SZ was to interpret reduced-form effects of state-corporate-tax cuts through the lens of a model to infer effects on profits, π. While profits are not directly observable,

[1] Malgouyres, Mayer and Mazet-Sonilhac (2022) correctly observe that SZ do not account for the compositional margin, which is the effect of tax changes on average idiosyncratic firm productivity. MMM-S also highlight that SZ were inconsistent in terms of whether or not the cost of capital ρ varied across locations. In Suárez Serrato and Zidar (2023), we show that accounting for the composition margin and cost of capital in the baseline SZ structural model has very modest effects on incidence estimates.

the model in SZ makes it possible to express the percentage change in profits with respect to a percentage change in the net-of-business-tax rate $(1-\tau^b)$ as follows:

$$\dot{\pi} = 1 + (1+\varepsilon^{PD})(\gamma\dot{w} - \delta\phi), \tag{1}$$

where γ and δ are the output elasticities of labor and capital, respectively, ε^{PD} is the product demand elasticity, and $\dot{w}$ is the elasticity of local wages with respect to net-of-tax rates. The parameter ϕ is the elasticity of the local cost of capital with respect to the net-of-business-tax rate, i.e., $\rho_c = \frac{\rho}{(1-\tau_c^b)^\phi}$. In the original paper, we set $\phi = 1$, which assumed that when the net-of-tax rate increased by one percent, the local cost of capital decreased by one percent. This expression generalizes and makes more explicit the relationship between the local cost of capital and business taxes.

In equation 1, the first term in the sum is the number 1, which captures the mechanical effect of keeping more profits. The remaining terms in this expression capture the scale effect of a tax cut, which multiplies the percentage change in unit costs of production, $\gamma\dot{w} - \delta\phi$, by one plus the elasticity of product demand, which governs how firm production responds to output price changes and thus, how it responds to cost changes given fixed markups in the model.

We now provide two novel approaches to identify scale and profit effects. The first uses the micro labor demand elasticity, which we refer to as the intensive margin of labor demand to distinguish it from labor demand due to extensive margin location decisions of firms and compositional changes in firm productivity. The second uses the change in productivity at the local level. Both approaches allow us to identify $\dot{\pi}$ without making assumptions on the product demand elasticity ε^{PD}; these approaches also inform the model parameters.

A.1 Setting up the identification argument

Establishing these new ways to identify profit effects requires three inputs.

The first input is the micro labor demand elasticity. Equation 8 in SZ characterizes local labor demand for location c. It is the product of three terms: an extensive margin term that accounts for firm location (E_c), the average idiosyncratic productivity of firms in the location (z_c), and the intensive margin (l_c), which relates costs and average labor demand of firms in the area:

$$L_c^D = E_c \times \underbrace{\left[w_c^{\gamma(\varepsilon^{PD}+1)-1} \rho_c^{\delta(\varepsilon^{PD}+1)} \kappa_0 \left(\exp^{B_c(-\varepsilon^{PD}-1)} \right) \right]}_{\equiv l_c} z_c, \tag{2}$$

where B_c is the common component of firm productivity in location c.[2] E_c is determined by Equation 7 in SZ, which relates the fraction of firms to local costs and taxes.

$$E_c = \frac{\exp\left\{\frac{v_c}{\sigma^F}\right\}}{\sum_{c'} \exp\left\{\frac{v_{c'}}{\sigma^F}\right\}}, \tag{3}$$

where $v_c = \frac{\ln(1-\tau_c^b)}{-(\varepsilon^{PD}+1)} + B_c - \gamma \ln w_c - \delta \ln \rho_c + \frac{\ln \kappa_1}{-(\varepsilon^{PD}+1)}$ is the mean value of locating in c and where κ_1 is a constant.

Taking logs of the intensive margin of local labor demand and derivating gives:

$$\dot{l} = (1+\varepsilon^{PD})(\gamma \dot{w} - \delta \phi) - \dot{w}, \tag{4}$$

where $\dot{l}$ is the micro labor demand elasticity with respect to net-of-business-tax rates. The average percentage change in labor demand for incumbent firms in a given area depends on the scale effect of the tax cut and a substitution effect given by $-\dot{w}$.

The second input relates average idiosyncratic productivity for firms in the local area, z_c, to the share of firms in the local area, E_c. Recall that each firm chooses its location by maximizing its total value $v_c + \zeta_{jc}$, where ζ_{jc} is firm j's idiosyncratic, location-specific productivity in location c. The assumption that the ζ_{jc}'s are i.i.d. with a Type 1 Extreme Value distribution implies that:

$$z_c = \mathbb{E}\left[\exp\left\{-(1+\varepsilon^{PD})\zeta_{jc}\right\} \middle| c\right] = \Gamma\left(1 + (1+\varepsilon^{PD})\sigma^F\right) \times E_c^{(1+\varepsilon^{PD})\sigma^F}, \tag{5}$$

where Γ is the gamma function and σ^F is the dispersion in firm productivity. This setup delivers the result from Hanemann (1984) that MMM-S highlight, which relates z_c and E_c. In particular, taking logs and derivatives shows that the elasticity of local firm productivity with respect to the net-of-business-tax rate is

$$\dot{z} = (\sigma^F)(1+\varepsilon^{PD})\dot{E}. \tag{6}$$

Since $\varepsilon^{PD} < -1$, average local productivity declines as tax cuts attract a larger number of firms with lower levels of productivity.

The third input relates firm location to cost changes. Taking logs of Equation 3 and

[2] The local labor demand elasticity is $\varepsilon^{LD} = -\frac{\gamma}{\sigma^F} - 1$. SZ did not account for the composition margin, which resulted in an elasticity of $\gamma\left(1 + \varepsilon^{PD} - \frac{1}{\sigma^F}\right) - 1$.

derivating gives the following expression for the firm location elasticity:

$$\dot{E} = \frac{1}{-(1+\varepsilon^{PD})}\frac{1}{\sigma^F} - \frac{\gamma}{\sigma^F}\dot{w} + \frac{\delta\phi}{\sigma^F}, \tag{7}$$

which shows how firm location responds to tax changes through mechanical effects and effects on costs. For the results below, it is useful to multiply both sides of this equation by $(\sigma^F)(1+\varepsilon^{PD})$:

$$(\sigma^F)(1+\varepsilon^{PD})\dot{E} = -1 - (1+\varepsilon^{PD})(\gamma\dot{w} - \delta\phi). \tag{8}$$

A.2 Direct approaches for quantifying profit impacts and incidence

We now combine these three ingredients to obtain two new expressions for profit effects in terms of observables.

The first, which we refer to as the "labor approach," uses the fact that the scale effect can be identified by adding the wage effect, $\dot{w}$, to the micro elasticity of labor demand, $\dot{l}$. Equation 4 implies that $\dot{w} + \dot{l} = (1+\varepsilon^{PD})(\gamma\dot{w} - \delta\phi)$. Combined with equation 1, we can express the effect on profits as the sum of one, the intensive margin labor elasticity, and the wage elasticity:

$$\dot{\pi} = 1 + \dot{l} + \dot{w}. \tag{9}$$

Intuitively, because the scale effect is identified by wage and employment changes along the intensive margin, we can use intensive margin labor and wage changes to determine the impact on profits.[3] Empirically, we use this expression to estimate the impact on profits as one plus the sum of the effects on wages and on the intensive margin of labor demand. Notably, this expression does not depend on firm location decisions, $\dot{E}$, the composition margin, $\dot{z}$, the effect of taxes on the local cost of capital, ϕ, or the product demand elasticity ε^{PD}.

The second approach for identifying profit effects uses changes in local productivity, $\dot{z}$. We refer to this approach as the productivity approach. Combining Hanemann's result (equation 6) and the expression for firm location (equation 8) yields:

$$\dot{z} = -1 - (1+\varepsilon^{PD})(\gamma\dot{w} - \delta\phi) = -\dot{\pi}. \tag{10}$$

[3]The result in Equation 9 relies on the assumption of Cobb-Doulgas production. Curtis, Garrett, Ohrn, Roberts and Surez Serrato (2021) show how to isolate scale and substitution effects using reduced-form effects of taxes and general production functions.

Intuitively, firms trade off idiosyncratic location-specific differences in productivity with tax and cost considerations. In equilibrium, the tax and cost changes embedded in $\dot{\pi}$ equal the change in the average productivity of firms in a given area. We can therefore use changes in productivity to infer how profit changes as a second empirical approach.

In section III, we conduct a reduced-form estimation of incidence on profits by plugging in the empirical counterparts in equations 9 and 10, which are summarized in Table 1.

B Extending the Structural Model

This section extends the structural model to include these new ways to identify profit effects and to incorporate the composition margin and consistent cost of capital characterization. We then derive new reduced-form expressions, and describe how these reduced-form effects of business taxes identify parameters and incidence.

B.1 Simultaneous equation model

There are six key equations in the updated model that characterize changes in economic activity in location c and year t:

$$(11) \qquad \Delta \ln N_{c,t} = \frac{1}{\sigma^W}(\Delta \ln w_{c,t} - \alpha \Delta \ln r_{c,t}) + \frac{\Delta \ln(1-\tau^i_{c,t})}{\sigma^W} + \frac{\Delta A_{c,t}}{\sigma^W}$$

$$(12) \qquad \Delta \ln N_{c,t} = \Delta \ln E_{c,t} + \Delta \ln l_{c,t} + \Delta \ln z_{c,t}$$

$$(13) \qquad \Delta \ln r_{c,t} = \frac{\Delta \ln N_c + \Delta \ln w_c + \Delta \ln(1-\tau^i_{c,t})}{1+\eta_c} - \frac{\eta_c \Delta B^h_{c,t}}{1+\eta_c} - \frac{\kappa \Delta \ln(1-\tau^i_{c,t})}{(1+\eta_c)}$$

$$(14) \qquad \Delta \ln E_{c,t} = -\frac{\gamma}{\sigma^F}\Delta \ln w_{c,t} + \left(\frac{\delta\phi}{\sigma^F} - \frac{1}{\sigma^F(\varepsilon^{PD}+1)}\right)\Delta \ln(1-\tau^b_{c,t}) + \frac{1}{\sigma^F}\Delta B_{c,t}$$

$$(15) \qquad \Delta \ln l_{c,t} = \big(\gamma(\varepsilon^{PD}+1) - 1\big)\Delta \ln w_{c,t} - (\varepsilon^{PD}+1)\delta\phi \Delta \ln(1-\tau^b_{c,t}) - (\varepsilon^{PD}+1)\Delta B_{c,t}$$

$$(16) \qquad \Delta \ln z_{c,t} = (\sigma^F)(1+\varepsilon^{PD})\Delta \ln E_{c,t}$$

Recall from SZ that equation 11 describes labor supply, which increases with the net-of-personal-tax rate $(1-\tau^i_c)$, real wages, and amenities (A_c). The responsiveness to these labor supply shifters depends on the dispersion of idiosyncratic-location preferences σ^W. Real wages depend on the housing expenditure share α and the cost of housing $r_{c,t}$. Equation 12 is the total derivative of local labor demand in equation 2.[4] Equation 13 describes equilibrium rental prices in the local housing market, which depend on the elasticity of housing supply (η_c)

[4]This expression includes the composition margin and is equivalent to the wage incidence expression in SZ equation 16 when equated to the labor supply expression in equation 11.

and productivity in the housing sector (B^h).[5] Equation 14 is the firm location equation as in equation 7, and also includes the productivity shifter B_c. The sensitivity of firm location to profit shifters depends on the dispersion of idiosyncratic-location productivity σ^F. Equation 15 is the intensive margin labor demand expression as in equation 2. Finally, equation 16 accounts for the composition margin through Hanemann's equation as in equation 6.

For empirical implementation, we project productivity terms $\Delta B_{c,t}$ and $\Delta B^h_{c,t}$ on Bartik shocks.

$$\begin{aligned}
\Delta B_{c,t} &= \varphi \Delta \ln BARTIK_{c,t} + v_{c,t} \\
\Delta B^h_{c,t} &= \varphi^h \Delta \ln BARTIK_{c,t} + v^h_{c,t}
\end{aligned}$$

Concisely, the updated structural form is as follows: $\mathbf{A}\mathbf{Y}_{c,t} = \mathbf{B}\mathbf{Z}_{c,t} + \epsilon_{c,t}$, where

$$\begin{aligned}
\mathbf{Y}_{c,t} &= [\Delta \ln N_{c,t}, \Delta \ln w_{c,t}, \Delta \ln r_{c,t}, \Delta \ln E_{c,t}, \Delta \ln l_{c,t}, \Delta \ln z_{c,t}]' \\
\mathbf{Z}_{c,t} &= [\Delta \ln(1-\tau^b_{c,t}), \Delta \ln BARTIK_{c,t}, \Delta \ln(1-\tau^i_{c,t})]',
\end{aligned}$$

and where $\mathbf{A}$ and $\mathbf{B}$ take the following form:

$$\mathbf{A} = \begin{bmatrix}
1 & -\frac{1}{\sigma^W} & +\frac{\alpha}{\sigma^W} & 0 & 0 & 0 \\
1 & 0 & 0 & -1 & -1 & -1 \\
-\frac{1}{1+\eta_c} & -\frac{1}{1+\eta_c} & 1 & 0 & 0 & 0 \\
0 & \frac{\gamma}{\sigma^F} & 0 & 1 & 0 & 0 \\
0 & -\big(\gamma(\varepsilon^{PD}+1)-1\big) & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & -\sigma^F(\varepsilon^{PD}+1) & 0 & 1
\end{bmatrix},$$

$$\mathbf{B} = \begin{bmatrix}
0 & 0 & \frac{1}{\sigma^w} \\
0 & 0 & 0 \\
0 & \frac{-\eta_c}{1+\eta_c}\varphi^h & \frac{1-\kappa}{1+\eta_c} \\
\frac{\delta\phi}{\sigma^F} - \frac{1}{\sigma^F(\varepsilon^{PD}+1)} & \frac{\varphi}{\sigma^F} & 0 \\
-(\varepsilon^{PD}+1)\delta\phi & -(\varepsilon^{PD}+1)\varphi & 0 \\
0 & 0 & 0
\end{bmatrix}.$$

Pre-multiplying by the inverse of the matrix of structural coefficients gives the reduced form:

$$\mathbf{Y}_{c,t} = \underbrace{\mathbf{A}^{-1}\mathbf{B}}_{\equiv \mathbf{C}} \mathbf{Z}_{c,t} + \underbrace{\mathbf{A}^{-1}\epsilon_{c,t}}_{\equiv \mathbf{u}_{c,t}}. \tag{17}$$

[5] As in SZ, κ governs the impact of personal taxes on housing supply.

The matrix of reduced-form effects $\mathbf{C}$ can be expressed as follows:

$$
\begin{array}{cccc}
\text{Business Taxes} & \text{Bartik Shock} & \text{Personal Taxes} & \text{Outcomes} \\
\left[\begin{array}{c:cc}
\varepsilon^{LS}\beta_1^W & \varepsilon^{LS}\beta_2^W + \frac{\alpha\eta_c}{\sigma^W(1+\eta_c)+\alpha}\varphi^h & \varepsilon^{LD}\beta_3^W \\
\beta_1^W & \beta_2^W & \beta_3^W \\
\frac{1+\varepsilon^{LS}}{1+\eta}\beta_1^W & \frac{1+\varepsilon^{LS}}{1+\eta_c}\beta_2^W - \frac{\varphi^h\sigma^W\eta_c}{\sigma^W(1+\eta_c)+\alpha} & \frac{(1+\varepsilon^{LS})}{1+\eta_c}\beta_3^W + \frac{1+(1-\kappa)\sigma^W}{\sigma^W(1+\eta_c)+\alpha} \\
-\frac{1}{\sigma^F(\varepsilon^{PD}+1)} - \frac{\gamma\beta_1^W-\delta\phi}{\sigma^F} & -\frac{1}{\sigma^F}\left(\gamma\beta_2^W-\varphi\right) & -\frac{\gamma}{\sigma^F}\beta_3^W \\
\hdashline
(\gamma\beta_1^W-\delta\phi)(\varepsilon^{PD}+1)-\beta_1^W & (\gamma\beta_2^W-\varphi)(\varepsilon^{PD}+1)-\beta_2^W & \left(\gamma(\varepsilon^{PD}+1)-1\right)\beta_3^W \\
-1-(\varepsilon^{PD}+1)(\gamma\beta_1^W-\delta\phi) & -(\varepsilon^{PD}+1)(\gamma\beta_2^W-\varphi) & -\gamma(\varepsilon^{PD}+1)\beta_3^W
\end{array}\right]
& \begin{array}{c} \Delta\ln N \\ \Delta\ln w \\ \Delta\ln r \\ \Delta\ln E \\ \Delta\ln l \\ \Delta\ln z \end{array}
\end{array}
$$

where the labor demand elasticity $\varepsilon^{LD} = -\frac{\gamma}{\sigma^F} - 1$ and the labor supply elasticity $\varepsilon^{LS} = \frac{1+\eta-\alpha}{\sigma^W(1+\eta)+\alpha}$. Each element of this matrix represents the reduced form effects of changes in a given outcome to one of the three shocks. For example, the effect of net-of-business-tax rates on local population (β_1^N) equals the effective local labor supply ε^{LS} times the effect on local wages (β_1^W). The wage incidence of net-of-business-tax rates is given by:

$$\beta_1^W = \left(\frac{\delta\phi}{\sigma^F} - 1 - \frac{1}{\sigma^F(\varepsilon^{PD}+1)}\right)\frac{1}{\varepsilon^{LS}-\varepsilon^{LD}}. \tag{18}$$

Appendix A.1 provides the wage incidence expressions for Bartik, net-of-personal-tax rate, and amenity shocks. Relative to SZ, this system adds the two outcomes below the dashed line: $\Delta\ln l$ and $\Delta\ln z$. Importantly, equation 18 correctly accounts for the composition margin and for the impact of business taxes on the local cost of capital through the term $\frac{\delta\phi}{\sigma^F}$.

B.2 Identifying parameters

The reduced form effect matrix $\mathbf{C}$ yields several insights about identification of structural parameters and profit effects.

Remark 1: Identifying Labor Supply Parameters with Business Taxes. As in SZ, the labor supply parameters are identified by the effects of the business tax in the first column. Dividing β_1^N by β_1^W identifies ε^{LS}. Together with the effect on rents β_1^R, ε^{LS} and β_1^W

then pin down the housing supply elasticity η. We obtain the preference dispersion parameter σ^W by solving the equation for ε^{LS}. Intuitively, a business tax cut is a labor demand shock that traces out the supply of workers and housing.

Remark 2: Identifying Labor Demand Parameters with Baseline Moments and Shocks. Column 3 of matrix $\mathbf{C}$ shows that dividing the effect of net-of-personal-tax rate on population β_3^N by its effect on wages β_3^W identifies $\varepsilon^{LD} = -\frac{\gamma}{\sigma^F} - 1$. In addition, dividing the effect on the number of establishments β_3^E by the wage effect β_3^W also identifies the contribution of firm entry to labor demand: $\frac{\gamma}{\sigma^F}$. Intuitively, a personal-income-tax cut is a labor supply shock that traces out the slope of labor demand.[6] Finally, under the assumption in SZ that the elasticity of the cost of capital with respect to the net-of-business-tax rate $\phi = 1$, β_1^E can be used to identify the elasticity of product demand ε^{PD}.[7] These arguments show that the parameters of labor demand are identified by the same four outcomes used in SZ in the baseline structural model with three shocks.

Remark 3: Identifying Labor Demand Parameters with Business Tax Shocks and New Moments. SZ argued that business tax moments alone could identify parameters of labor demand by inverting the equation for β_1^W. The corrections by MMM-S show that this argument is not valid. We now show that business taxes alone can identify labor demand parameters when we include two new outcomes: productivity and intensive margin of labor demand. Under the assumption in SZ that $\phi = 1$, the effect on the intensive margin of labor demand (β_1^l) together with the wage effect (β_1^W) identifies ε^{PD}. Similarly, Hanemann's equation 6 and the expression for ($\varepsilon^{PD} + 1$) identifies σ^F.[8] Thus, adding these two outcomes allows for full identification of the model using business-tax shocks alone.

Remark 4: Identifying Incidence on Profits with Business Tax Shocks and New Moments. Column 1 of the matrix $\mathbf{C}$ validates the arguments in Section A.2. Equation 9 follows by adding β_1^W and β_1^l. Equation 10 is given by the reduced-form effect β_1^z.

Remark 5: Identification of Labor Demand Parameters with All Shocks and New Moments. Column 3 of the matrix $\mathbf{C}$ shows that personal taxes also identify the elasticity of product demand. Dividing the effect of personal taxes on the intensive margin of labor demand (β_3^l) by the wage effect (β_3^W) identifies the product demand elasticity ε^{PD}. In addition, it is also possible to isolate ε^{PD} after dividing the effect of personal taxes on productivity (β_3^z) by the effect on wages (β_3^W). These results allow us to relax the assumption

[6] Recall that our measure of business taxes includes a component of personal-income taxes for pass-through owners, so this result uses non-business-tax variation that can shift local labor supply.

[7] Specifically, Column 1 implies that $\varepsilon^{PD} = \frac{-1}{\sigma^F \beta_1^E + (\gamma \beta_1^W - \delta)} - 1$ and Column 3 that $\sigma^F = \frac{\beta_3^W}{\gamma \beta_3^E}$.

[8] In particular, adding β_1^l and β_1^W and diving by $(\gamma\beta_1^W - \delta)$ shows that $(1 + \varepsilon^{PD}) = \frac{\beta_1^l + \beta_1^W}{(\gamma\beta_1^W - \delta)}$. Dividing β_1^z by β_1^E and the expression for $(1 + \varepsilon^{PD})$ shows that $\sigma^F = \frac{\beta_1^z}{\beta_1^E} \frac{(\gamma\beta_1^W - \delta)}{\beta_1^l + \beta_1^W}$.

that $\phi = 1$. Specifically, we can use the effect of business taxes on the intensive margin of labor demand (β_1^l) to solve for ϕ—the effect of business taxes on the cost of capital—as a function of ε^{PD}, β_1^W, and calibrated parameters.[9] Thus, adding additional moments yields over-identifying restrictions on key model parameters and allows us to relax prior assumptions in SZ.

Remark 6: Scale Effect and the Effect on the Cost of Capital ϕ. As we discuss in section I, the scale effect of a business tax cut is given by the product of the percentage change in unit costs of production ($\gamma\beta_1^W - \delta\phi$) and ($\varepsilon^{PD} + 1$). Column 1 of the matrix **C** shows that the scale effect is equal to the sum of the wage effect and the effect on the intensive margin of labor demand, so that $\beta_1^W + \beta_1^l = (\varepsilon^{PD} + 1)(\gamma\beta_1^W - \delta\phi)$. Since we expect that tax cuts would increase wages ($\beta_1^W > 0$) and labor demand ($\beta_1^l > 0$), this expression combined with the restriction that $\varepsilon^{PD} < -1$ implies that $\gamma\beta_1^W - \delta\phi < 0$; that is, we expect business tax cuts to reduce unit costs of production. While this condition may hold when we constrain $\phi = 1$, estimating the parameter ϕ allows the structural model to better fit the data.[10] Importantly, the reduced form expressions for incidence in equations 9 and 10 do not depend on this parameter.

Remark 7: Auxiliary Parameters and Role of Bartik Shock Moments. The auxiliary parameters φ, φ^h, and κ are identified by the baseline outcomes in SZ. Together with the prior arguments, β_3^R identifies κ and both β_2^R and β_2^N identify φ^h. Finally, examining the expressions of β_2^E, β_2^l, and β_2^z shows that the Bartik moments provide additional identifying information for model parameters, including φ, σ^F, and ε^{PD}.

C Income Shares and Income-share-weighted Incidence

Another useful extension concerns how to weigh the gains to firm owners, workers, and landowners. After computing the benefits to each of these three agents, SZ then compare the benefits to each one of these agents to the simple sum of the total benefits to the three agents. This calculation implicitly assumes that we have one representative agent of each type with equal income. This calculation is useful from the perspective of understanding the identities of the agents that benefit the most from a tax cut. However, this calculation does not capture the aggregate gains to all workers relative to all landowners and all firm owners in the economy.

[9] Specifically, $(\varepsilon^{PD} + 1) = \frac{\beta_3^z}{\gamma\beta_3^W}$ and thus $\phi = -\frac{\gamma}{\delta}\left(\beta_1^l \frac{\beta_3^W}{\beta_3^z} + \beta_1^W\left(\frac{\beta_3^W}{\beta_3^z} + 1\right)\right)$.

[10] When calibrating $\frac{\delta}{\gamma} = 0.9$ and $\phi = 1$, these restrictions imply that $\dot{w} \leq 0.9$. This relationship holds in the SZ reduced-form results with Bartik controls (e.g., Table 4 Column 2), but does not hold in the reduced-form specification without controls (e.g., Table 4 Column 1). Allowing the elasticity of the cost of capital ϕ to exceed one provides an additional way to rationalize the empirical facts that both wages and employment increase following increases in net-of-business-tax rates and satisfies the assumption that $\varepsilon^{PD} < -1$.

This subsection briefly describes how the income shares relate to our structural parameters. We use these shares to compute aggregate gains for workers, firm owners, and land owners. We provide updated incidence estimates with and without using these income share weights.[11] We report both weighted and unweighted results in Section III to show how results change one deviation at time relative to the initial SZ approach.

Consider the three agents in SZ. Workers have income of wN derived from labor earnings. Since workers spend α on housing, landowners receive income of αwN. Firms owners receive profits and returns from capital. Given the CES structure of the model, firm owners' profits are $\pi = \frac{\text{Total Expenditure}}{-\varepsilon^{PD}}$. Returns to capital, ρK, are $\delta\times$ Costs. Costs are $-(\varepsilon^{PD}+1)\pi$.[12]

Assuming that firm owners and landowners spend their earnings in the product market, total expenditure is given by:

$$\text{Total Expenditure} = (1-\alpha)wN + \alpha wN + \pi - (\varepsilon^{PD}+1)\pi\delta = wN + \pi\left(1-(\varepsilon^{PD}+1)\delta\right).$$

Since Total Expenditure $= -\varepsilon^{PD}\pi$, profits are $\pi = \frac{wN}{-(\varepsilon^{PD}+1)(1-\delta)}$. Total income is thus $wN\left[1+\alpha+\frac{1-\delta(\varepsilon^{PD}+1)}{-(\varepsilon^{PD}+1)(1-\delta)}\right]$, which results in the following income shares:

$$(19)\qquad \underbrace{\frac{1}{1+\alpha+\frac{1-\delta(\varepsilon^{PD}+1)}{-(\varepsilon^{PD}+1)(1-\delta)}}}_{\text{Workers}},\quad \underbrace{\frac{\alpha}{1+\alpha+\frac{1-\delta(\varepsilon^{PD}+1)}{-(\varepsilon^{PD}+1)(1-\delta)}}}_{\text{Land Owners}},\quad \text{and}\quad \underbrace{\frac{\frac{1-\delta(\varepsilon^{PD}+1)}{-(\varepsilon^{PD}+1)(1-\delta)}}{1+\alpha+\frac{1-\delta(\varepsilon^{PD}+1)}{-(\varepsilon^{PD}+1)(1-\delta)}}}_{\text{Firm Owners}}.$$

This expression shows that profits depend on the product demand elasticity. Appendix Figure C.1 illustrates how these shares vary with this elasticity.

II New Data on Employment and Productivity

A Adding the Intensive Margin Labor Response $\dot{l}$

We use confidential micro data from the U.S. Census Bureau's Longitudinal Business Database (LBD) over the 1980-2010 period to compute changes in incumbent labor demand at the establishment level. The LBD links U.S. Census records on private business activity to create consistent establishment identifiers across time (Chow, Fort, Goetz, Goldschlag, Lawrence, Perlman, Stinson and White, 2021). Specifically, we identify all establishments that were in operation prior to changes in business taxes, and compute the log difference in employment

[11] We thank David Albouy for suggesting that we clarify this point and for initial suggestions on how to do so.

[12] This expression follows from the facts that sales equal costs plus profits, and that sales equal $-(\varepsilon^{PD})\pi$.

across ten-year periods for each establishment that was in operation in the previous sample year. We then take the average of this change for the subset of incumbent establishments in each CONSPUMA-year.

B Adding the Compositional Margin $\dot{z}$

To implement the second approach that adds $\dot{z}$, we use productivity data. Unfortunately, establishment-level productivity measures are not readily available across all industries. Instead, we restrict attention for this outcome to manufacturing plants in the U.S. Census Bureau's Annual Survey of Manufactures (ASM). The ASM collects detailed information on plant-level inputs and outputs, which is used to construct measures of total factor productivity (TFP), following Cunningham, Foster, Grim, Haltiwanger, Pabilonia, Stewart and Wolf (2022).[13] We then calculate average TFP among sampled plants in each CONSPUMA-year, and define the percent change in TFP across ten-year sample periods as the log difference in average TFP.

Table 2 shows the reduced-form effects (analogous to those in SZ Table 4) for the original four outcomes as well as these two new outcomes. It provides three panels. The first shows the reduced-form effects of net-of-business-tax rates, the second adds Bartik controls, and the third adds net-of-personal-tax-rate controls. The first two panels re-report the estimates from SZ Table 4 for the original four outcomes. The main new results are for incumbent labor demand in Column 5 and local productivity in Column 6. The table shows that following a business tax cut, establishment-level employment of incumbent establishments increases by 1.2 percentage points. The specification that also includes Bartik shocks results in a similar point estimate of 1.03 and a slightly larger standard error. For productivity, the empirical results show that local TFP does decline following business tax cuts, which is in line with the theory of the composition margin. The point estimate in Panel A is -2.5, which through the lens of the model, suggests that profits increase by 2.5 percentage points. This estimate, however, is somewhat imprecise on its own.

[13] A common challenge in estimating productivity is that output is often measured in terms of revenue rather than in terms of quantities for most industries. To cover most industries in the manufacturing sector, we rely on a measure of revenue productivity.

III New Incidence and Parameter Estimates

A Estimates Using Reduced-Form Approaches

This subsection presents estimates of incidence using reduced-form effects under three different approaches for estimating profit effects enumerated in Table 1. Table 3 reports the results.[14]

For a given column, we report the calibrated values, the estimated effect on each of the three agents in the model, the equal-weighted incidence as in SZ, and the income-share-weighted incidence in the bottom panel. We report both weighted and unweighted incidence results to show how estimates change when changing one thing at a time.

The first column uses our incumbent labor demand approach estimates the effect on firm owners as $1 + \beta_1^l + \beta_1^W$. The second column uses the productivity approach in which the effect on profits equals $-\beta_1^z$. The third column reports the approach that calibrates scale effects (and therefore uses wage impacts alone) to estimate profit impacts. The fourth column takes a simple average of the profit estimates in Columns (1)-(3). The fifth column is a weighted average of the estimates in the first three columns that uses inverse variance weights to minimize the variance of the profit effect estimate.[15] Intuitively, this approach puts less than one-third weight on less precise estimates and more weight on more precise estimates.

In the sixth column, we use the calibration approach with a more responsive product demand elasticity of $\varepsilon^{PD} = -5$. The last two columns report the simple average and inverse variance weighted average of the first two columns and that of Column (6). Note that only Columns (3) and (6) depend on the calibrated values of ε^{PD} for estimating incidence and shares, but all of the income-weighted shares depend on ε^{PD} since it affects the income-share weights. These tables follow the spirit of Table 5 in SZ, but with new approaches for estimating effects on profits.

Consider first Column (3) in Table 3, which shows the estimates when estimating profit effects as $1+\gamma(\varepsilon^{PD}+1)\left(\beta^W - \frac{\delta}{\gamma}\right)$. When calibrating the output elasticity to be $\varepsilon^{PD} = -2.5$, firm owner profits increase by 0.876 percent, which amounts to 28% of the equal-weighted incidence. Column 6 shows the same approach but when $\varepsilon^{PD} = -5$. The new estimates in Column (1), (2), (4), (5), (7) and (8), however, result in larger estimated impacts on profits, yielding firm owner incidence shares that range between 34% and 62%.[16]

[14] We report the analogous results using reduced-form estimates in the specifications with Bartik controls, and Bartik plus personal tax controls in Tables B.1 and B.2, respectively.

[15] Letting $\hat{\Sigma}$ be the estimated covariance of the three profit effect estimates, the weights $\frac{\hat{\Sigma}^{-1}\mathbf{1}}{\mathbf{1}'\hat{\Sigma}^{-1}\mathbf{1}}$ yield the linear combination of the profit estimates with minimum variance (e.g., as in Song and Schmeiser, 1988).

[16] Formal conventional view tests, which evaluate the joint hypothesis that the share of incidence for

The estimate based on the incumbent labor demand in Column (1) substantially exceeds the estimate in Column (3). In the data, the fact that incumbent firms are expanding employment suggests that unit costs are declining, and are thus leading to larger firm scale and higher profits. In contrast, the calibration approach in Column (3) suggests that unit costs are increasing since $\left(\beta^W - \frac{\delta}{\gamma}\right) > 0$.[17] Using different variation from productivity changes, Column (2) also shows larger profit increases. When combining the estimates by taking a simple average in Column (4), the equal-weighted incidence share on firm owners is 51%. Finally, the optimal combination of estimates in Column (5) yields an estimate of 34%. When we use the baseline calibration of $\varepsilon^{PD} = -2.5$, the income-share-weighted estimates increase the share on firm owners, whereas the $\varepsilon^{PD} = -5$ income-share incidence estimates are a bit smaller. The central estimate from this exercise is that firm owners get about half of the incidence. In particular, the inverse-variance weighted average estimate of 50% for firm owners, 38% for workers, and 12% for land owners is from Column (5).

Figure 1 plots the share of incidence for firm owners across four different approaches and different values of the product demand elasticity.[18] "Calibrated' uses the profit expression in equation 1, i.e., $\dot{\pi} = 1 + (1 + \varepsilon^{PD})(\gamma\beta_1^W - \delta\phi)$ along with the other reduced-form moments. "Micro Labor Demand" uses the $\dot{\pi} = 1 + \beta_1^l + \beta_1^W$ approach to compute profits. "TFP" uses the $\dot{\pi} = -\beta_1^z$ approach. The "Simple Average" specification takes an equal weighted average of these three approaches to estimate profits, and the "variance-min." specification uses inverse variance weights to put more weight on precise estimates of profits.

A few insights emerge. First, the lowest estimate for firm owners is the calibrated approach, and it is the only one that is decreasing with the product demand elasticity. Second, the others are either flat (do not depend on ε^{PD}) or are increasing (because the more elastic product demand affects the inverse variance weights). In short, out of several possible methods, the calibration approach gives the lowest incidence to firm owners and is more sensitive to the product demand elasticity than the other approaches.

B Estimates Using Structural Approach

As in our original paper, we support the reduced-form estimates by bringing in additional moments to discipline our estimates. We follow the approach in SZ section VI (see SZ equation 22) by estimating the structural parameters using a classical minimum distance

workers equals 100 percent and the share for firm owners equals 0 percent, are rejected in all specifications other than Column (6), which is a bit less precise.

[17] Note that this unit cost effect depends on the specification. When conditioning on Bartik shocks in Table 4 Column (2) of SZ, the wage estimates suggest unit costs decline, which is consistent with these new profit approaches.

[18] Appendix Figure C.2 is the analogous figure using income-share-weighted estimates.

estimator.[19] Tables 4 and 5 update SZ Tables 6 and 7 by providing new results for parameter estimates and incidence, respectively.

Table 4 provides parameter estimates that update SZ Table 6 Panel A using the refined model. Column (1) uses the four outcomes in SZ with the updated model and sets $\phi = 1$ as in SZ. Specifically, it uses the elements of the matrix of reduced-form effects $\mathbf{C}$ above the horizontal dashed line from equation 17. Column (2) uses only the business tax shocks and includes the incumbent labor and TFP outcomes, i.e., it uses the elements of the matrix of reduced-form effects $\mathbf{C}$ to the left the vertical dashed line and estimates the cost of capital elasticity ϕ. Column (3) uses the full six-outcome model with all three shocks. Column (4) uses the same specification as (3), but instead calibrates ϕ at a lower value than its estimate in Column (3). Column (5), (6), and (7) use the full model with six-outcomes and three shocks, estimates ϕ, and show the results for different values of calibrated parameters.

Each column provides an estimate for a given set of calibrated parameter values as in SZ Table 6. In Column (1), we find similar dispersion in firm productivity, and a similar degree of relative dispersion to SZ. Specifically, firm productivity dispersion is 0.21 or about one-quarter of worker dispersion of 0.81. In SZ Table 6 Column (1), firm dispersion was 0.27, which is about one-third as large as worker dispersion of 0.83. We find that worker dispersion exceeds firm dispersion in most specifications like in SZ.[20] The housing supply elasticities are still estimated imprecisely, likely reflecting in part the heterogeneity in housing supply elasticities across regions in the United States. Our view of these estimates is that they are most informative when evaluated in the context of the resulting effective labor demand and labor supply elasticities, which we report in the next table.

Table 5 presents the impacts on land owners, workers, and firm owners and incidence shares following SZ Table 7. Panel A reports estimates of incidence as well as effective local labor supply and demand elasticities, Panel B gives the equal-weighted share of incidence, and Panel C gives the income-share-weighted shares of incidence. Using the same column ordering as Table 4, each column lists the calibrated values at the top of the table and the specification details at the bottom.

Panel B shows that firm owners enjoy substantial increases in profits in the updated model.[21] The equal-weighted share of incidence for firm owners ranges from 35% to 65%.

[19] We find the structural parameters that minimize the distance between the moments $\mathbf{m}(\boldsymbol{\theta})$ given by the matrix $\mathbf{C}$ above and the reduced form effects $\hat{\boldsymbol{\beta}}$ by solving: $\hat{\boldsymbol{\theta}} = \arg\min_{\boldsymbol{\theta}\in\boldsymbol{\Theta}} \; [\hat{\boldsymbol{\beta}} - \mathbf{m}(\boldsymbol{\theta})]'\mathbf{W}^{-1}[\hat{\boldsymbol{\beta}} - \mathbf{m}(\boldsymbol{\theta})]$, where $\mathbf{W}$ is a weighting matrix that uses the inverse variance of the moments $\boldsymbol{\beta}$ along the diagonal.

[20] The exceptions are the specification in Column (2), which only uses business tax shocks (and thus only 6 moments overall), and the specification with a large housing expenditure share of 0.65 in Column (5).

[21] Formal conventional view tests, which evaluate the joint hypothesis that the share of incidence for workers equals 100 percent and the share for firm owners equals 0 percent, are rejected in all specifications other than the income-share-weighted result in Column (1), which is slightly less precise.

We report different versions of the structural estimates to isolate the effects of updating the framework and adding the new approaches to estimate profit effects. Column (1) is the closest to the original model in SZ as it uses the same outcomes, shocks, and calibration values as SZ Table 7 Column (1). Comparing the share of incidence in Column (1) to the same calibration in SZ Table 7 shows that the estimates are less than 2 percentage points apart (34.6% versus 36.5%). When weighting the Column (1) estimates by income shares, the firm-owner estimate is 45.8%. The estimates in Column (2) and (3) show the influence of the two new approaches for estimating profit impacts—they give a larger share to firm owners than Column (1). In particular, the business-tax-shock specification in Column (2) gives almost two-thirds of incidence to firm owners, and the full model with three shocks and six outcomes in Column (3) gives them a little over half the incidence at 53.3%.

Column (4) calibrates ϕ at a smaller value than is estimated in Column (3), and illustrates that the value of ϕ is not driving the firm owner incidence result to be larger.[22] Column (5) uses a larger value of the housing expenditure share, and the last two columns use more elastic product demand. The results from the last two columns are striking—the firm owner incidence is around 50% even in a setting in which $\varepsilon^{PD} = -4$ or $\varepsilon^{PD} = -5$. One point to consider when thinking about the role of ε^{PD} in SZ and in this paper is that this elasticity also influences the effect on wages, and the structural approach incorporates this interdependence (whereas changing ε^{PD} without changing wages—as in the reduced-form calibration approach—does not). Moreover, in the updated model, the multiple ways to identify profits (e.g., via $\dot{l}$ and via $\dot{z}$) that do not depend directly on ε^{PD}. This feature helps the model reduce the sensitivity of profit estimates to this parameter.

Firm owners bear a lot of incidence in the structural model partly because of low estimated labor supply elasticities. Relative to effective local labor demand elasticities, local labor supply is less responsive to wage fluctuations.[23] The estimates of local labor elasticities are slightly smaller in absolute value than those in SZ Table 6, and this result partly reflects the influence of adding the composition margin ($\dot{z}$) moment. Economically, adding the composition margin to the model means that local labor demand is lower than it would be if entering firms were as productive as incumbents. Since the entrants have lower productivity, local labor demand is lower and this force influences the estimates of the responsiveness of

[22] In Column (3), we estimate that ϕ equals 9.6, implying that business tax cuts have a substantial impact on the local cost of capital. As discussed above, for a local business tax cut to lower unit costs of production and be consistent with firm expansion, it must be that $\delta\phi > \gamma\dot{w}$. In Column (4), we calibrate $\phi = 8$ to illustrate that allowing for larger values of ϕ does not boost the share going to firm owners. Note also that the estimate of ϕ is around half as large in Columns (6) and (7), where we use larger values for ε^{PD}.

[23] The exception is the specification with only business taxes in Column (2), which is consistent with the patterns in the original SZ Table 7 Column (4), which also reported a relatively large labor supply estimate in the business tax only specification.

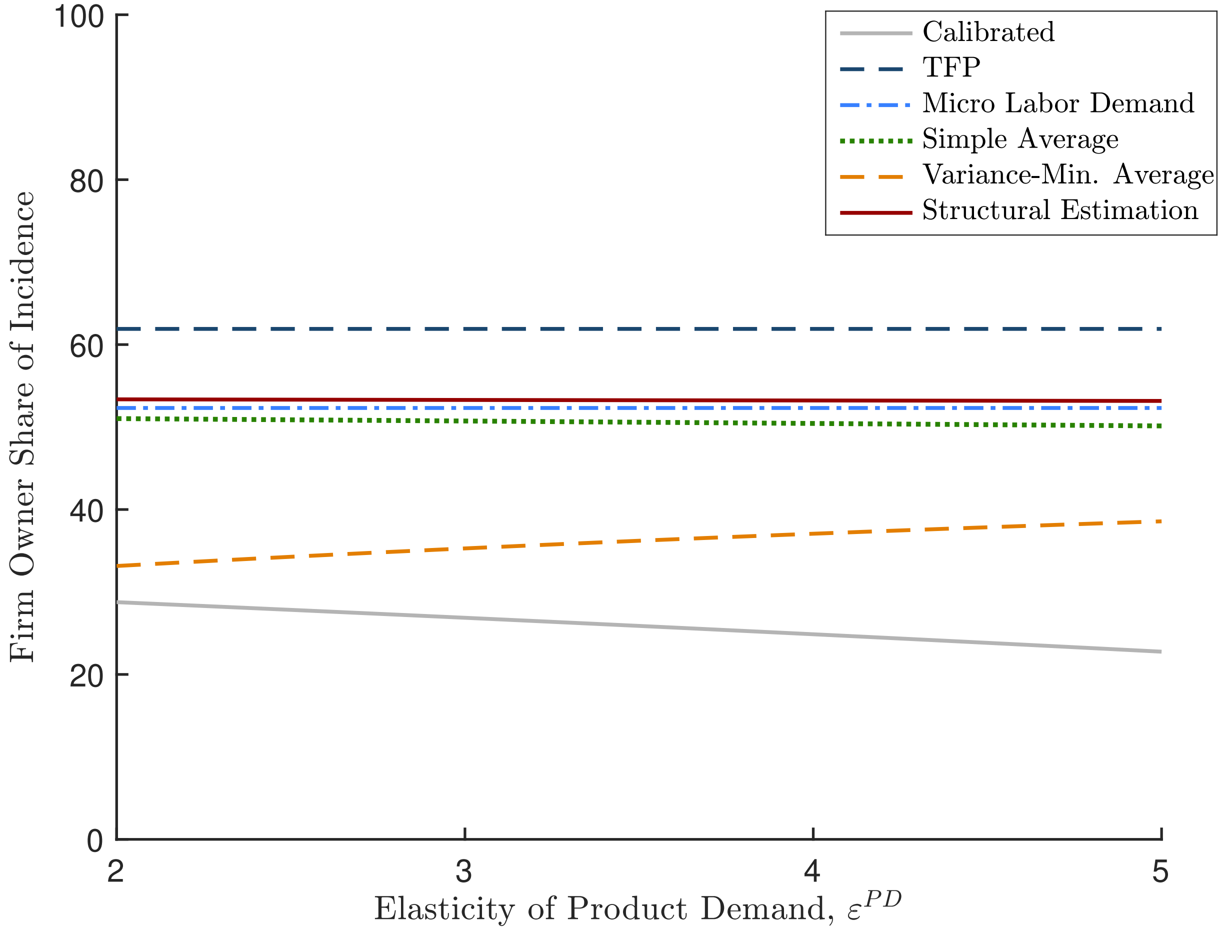
firms and workers. This compositional margin is a strong force in this model. Although it is correct to include in the original SZ model, this force is influential and a bit hard to fit quantitatively. In future work, one could explore relaxing the strength of this part of the model by adding dynamic adjustment in the labor market or other frictions or sources of heterogeneity. Doing so would likely fit the moments better.

That said, the reduced-form evidence from Table 3 does not depend on estimates of effective labor supply and demand elasticities or product demand elasticities, and yet gives similar incidence results.

IV Concluding Discussion

This paper shows that there are several ways to identify profit effects (from firm composition effects and productivity changes) as well as identify parameters in the original SZ. We found that incorporating these insights into our empirical analysis supported the bottom line finding that firm owners bear a substantial portion of incidence. These updates strengthened this bottom line by providing multiple sources of corroborating evidence, as well as an overall average effect that was a bit larger than the original estimate. Incorporating richer models of firm heterogeneity and labor market frictions provide promising ways to continue to improve the analysis of business tax incidence.

Figure 1: Firm Owners' Share of Incidence across Approaches and Specifications



Notes: This figure plots the share of incidence for firm owners across different approaches and different values of the product demand elasticity. "Calibrated" uses the profit expression in equation 1, i.e., $\dot{\pi} = 1 + (1 + \varepsilon^{PD})(\gamma\dot{w} - \delta\phi)$ along with the other reduced-form moments in SZ. "Micro Labor Demand" uses the $\dot{\pi} = 1 + \dot{l} + \dot{w}$ approach to compute profits along with other reduced-form moments. "TFP" uses the $\dot{\pi} = -\dot{z}$ approach along with other reduced-form moments without the Bartik controls. "Simple Average" takes the equal-weighted average of these three approaches. "Variance-Min Average" is a weighted average where the weights are the inverse variance of the these three reduced-form approaches, i.e., Calibrated, Micro Labor Demand, and TFP. Note that the expression for the variance of the profit estimate depends on the product demand elasticity. As a consequence, the inverse variance weights depend on the product demand elasticity. The structural estimation line expands our estimates from the structural model in Table 5 to show results using a continuous range of product demand elasticity values.

Table 1: Identification of Local Incidence on Welfare and Structural Parameters

Panel (a) Local Incidence

Stakeholder (Benefit)	Incidence	Identified By
Workers (Disposable Income)	$\dot{w} - \alpha \dot{r}$	$\beta^W - \alpha \beta^R$
Landowners (Housing Costs)	$\dot{r}$	β^R
Firm Owners Calibration Approach (After-tax Profit)	$1 + \gamma(\varepsilon^{PD} + 1)(\dot{w}_c - \frac{\delta}{\gamma})$	$1 + \gamma(\varepsilon^{PD} + 1)(\beta^W - \frac{\delta}{\gamma})$
Firm Owners Labor Approach (After-tax Profit)	$1 + \dot{l} + \dot{w}$	$1 + \beta^l + \beta^W$
Firm Owners TFP Approach (After-tax Profit)	$-\dot{z}$	$-\beta^z$

Panel (b) Structural Parameters

Worker Mobility	Firm Mobility	Housing Supply	Product Demand
$\sigma^W = \frac{\beta^W - \alpha\beta^R}{\beta^N}$	$\sigma^F = \frac{\beta^z}{\beta^E} \frac{1}{1+\varepsilon^{PD}}$	$\eta = \frac{\beta^N + \beta^W}{\beta^R} - 1$	$\varepsilon^{PD} = \frac{\beta^l + \beta^W}{(\gamma\beta^W - \delta\phi)} - 1$

NOTES: This table shows how reduced-form estimates $\boldsymbol{\beta}^{\text{Business Tax}} = \left[\beta^W, \beta^N, \beta^R, \beta^E, \beta^l, \beta^z\right]'$ map to the incidence on welfare of workers, landowners, and firm-owners at the local level. Note that we calibrate the housing expenditure share (α), the ratio of the capita to labor output elasticities (δ/γ), and the product demand elasticity ε^{PD}. In addition, we can also use other moments to identify productivity dispersion as well as the product demand elasticity. See section B.2 for additional discussion.

Table 2: Effects of Business Tax Cuts on Local Economic Activity Over 10 Years

	(1) Population	(2) Wages	(3) Rents	(4) Number of Establishments	(5) Intensive Margin Labor Demand	(6) TFP
	N	w	r	E	l	z
Panel A						
Δ ln net-of-business-tax rate	4.275***	1.451	1.172	4.074**	1.240	-2.492
	(1.651)	(0.943)	(1.435)	(1.824)	(0.802)	(2.519)
Panel B						
Δ ln net-of-business-tax rate	3.744**	0.777	0.323	3.354**	1.028	-3.171
	(1.484)	(0.820)	(1.366)	(1.428)	(0.836)	(2.517)
Bartik	0.439**	0.557***	0.702***	0.595***	0.174**	0.560**
	(0.188)	(0.083)	(0.265)	(0.192)	(0.075)	(0.263)
Panel C						
Δ ln net-of-business-tax rate	1.516	1.534	1.857	1.749	1.766	-4.017
	(1.926)	(1.124)	(1.571)	(1.549)	(1.109)	(5.180)
Bartik	0.446**	0.554***	0.697***	0.600***	0.172**	0.563**
	(0.184)	(0.079)	(0.259)	(0.190)	(0.071)	(0.264)
Δ ln personal income tax rate	1.731	-0.588	-1.192	1.247	-0.573	0.657
	(1.254)	(0.732)	(1.180)	(1.428)	(0.770)	(2.558)
Observations	1,470	1,470	1,470	1,470	1,470	1,470

Notes: This table extends analysis Table 4 in SZ by adding two outcomes: incumbent employment at the establishment level in Column 5 and local TFP in Column 6. The data are decade changes from 1980-1990, 1990-2000, and 2000-2010 for 490 county-groups (CONSPUMAs). Panels A,B, and C shows the reduced-form effects of net-of-business-tax rates, net-of-business-tax rates and Bartik shocks, and net-of-business-tax rates, Bartik shocks, and net-of-personal-tax rates, respectively.

Table 3: Estimates of Economic Incidence Using Reduced-Form Effects

	(1) Intensive Margin Labor Demand	(2) TFP	(3) Calibrating Product Demand	(4) Average of (1),(2),(3)	(5) Weighted Avg. of (1),(2),(3)	(6) Calibrating Product Demand	(7) Average of (1),(2),(6)	(8) Weighted Avg. of (1),(2),(6)
Panel A. Calibrated parameters								
Output elasticity γ	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Housing share α	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Elasticity of product demand ε^{PD}	-2.500	-2.500	-2.500	-2.500	-2.500	-5.000	-5.000	-5.000
Panel B. Incidence								
Landowners	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172
	(1.435)	(1.435)	(1.435)	(1.435)	(1.435)	(1.435)	(1.435)	(1.435)
Workers	1.099*	1.099*	1.099*	1.099*	1.099*	1.099*	1.099*	1.099*
	(0.593)	(0.593)	(0.593)	(0.593)	(0.593)	(0.593)	(0.593)	(0.593)
Firm Owners	3.691**	2.492	0.876***	2.353**	1.184***	0.669	2.284**	1.426***
	(1.639)	(2.519)	(0.212)	(0.974)	(0.059)	(0.566)	(0.929)	(0.134)
Panel C. Shares of Incidence								
Landowners	0.197	0.246	0.372	0.253	0.339	0.399	0.257	0.317
	(0.140)	(0.257)	(0.263)	(0.202)	(0.239)	(0.307)	(0.209)	(0.235)
Workers	0.184***	0.231*	0.349***	0.238***	0.318***	0.374***	0.241***	0.297***
	(0.052)	(0.132)	(0.114)	(0.074)	(0.100)	(0.129)	(0.076)	(0.092)
Firm Owners	0.619***	0.523	0.278	0.509***	0.343*	0.228	0.501**	0.386*
	(0.108)	(0.337)	(0.215)	(0.193)	(0.191)	(0.293)	(0.204)	(0.203)
Test of standard view (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Panel D. Income Weighted Shares of Incidence								
Landowners	0.072	0.094	0.155	0.097	0.138	0.201	0.143	0.169
	(0.060)	(0.116)	(0.147)	(0.093)	(0.126)	(0.179)	(0.127)	(0.144)
Workers	0.226***	0.292	0.486***	0.303***	0.431***	0.629***	0.446***	0.527***
	(0.047)	(0.197)	(0.123)	(0.091)	(0.100)	(0.134)	(0.103)	(0.102)
Firm Owners	0.702***	0.614**	0.359*	0.600***	0.431***	0.170	0.412***	0.304**
	(0.056)	(0.288)	(0.205)	(0.144)	(0.163)	(0.211)	(0.156)	(0.144)
Test of standard view (p-value)	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.000

Notes: This table uses reduced-form effects to estimate incidence using the expressions in Table 1. Each column uses a different approach for estimating firm owner profits using reduced-form effects of net-of-business taxes on local outcomes as in SZ Table 5. Column 1 uses the intensive margin labor demand approach to estimate profit effects. Column 2 uses the productivity approach. Column 3 uses the approach that calibrates the product demand elasticity to scale up wage effects net of capital costs. Column 4 reports the equal-weighted average of these approaches. Column 5 weights each of these three approaches by the inverse variance to put more weight on more precisely estimated profit effects. Column 6 also uses the calibration approach but with a more responsive product demand elasticity. Column 7 and 8 take the simple average and inverse-variance weighted averages of Columns 1, 2, and 6, respectively.

Table 4: Minimum Distance Estimates of Structural Parameters

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Calibrated parameters							
Output elasticity γ	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Housing share α	0.300	0.300	0.300	0.300	0.650	0.300	0.300
Elasticity of product demand ε^{PD}	-2.500	-2.500	-2.500	-2.500	-2.500	-4.000	-5.000
Estimated parameters							
Idiosyncratic location	0.210**	0.402**	0.554***	0.539***	0.557***	0.276***	0.207***
productivity dispersion σ^F	(0.089)	(0.176)	(0.128)	(0.103)	(0.123)	(0.065)	(0.049)
Idiosyncratic location	0.812***	0.206	1.022	0.974	0.355	1.027	1.034
preference dispersion σ^W	(0.308)	(0.199)	(0.722)	(0.597)	(0.480)	(0.743)	(0.759)
Elasticity of housing	0.974	2.666	0.527	0.376	1.193	0.529	0.528
supply η	(1.307)	(3.948)	(1.205)	(1.347)	(1.681)	(1.209)	(1.210)
Specification Details							
Number of Outcomes	4	6	6	6	6	6	6
Incumbent Labor and TFP Outcomes	No	Yes	Yes	Yes	Yes	Yes	Yes
Business Tax Shocks	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bartik and Personal Tax Shocks	Yes	No	Yes	Yes	Yes	Yes	Yes
Number of Moments	12	6	18	18	18	18	18

Notes: This table extends analysis in Panel A of SZ Table 6 using the updated model with two additional $\dot{l}$ and $\dot{z}$ outcomes (i.e., using equation 17). Column (1) uses the four outcomes in SZ with the updated model and $\phi = 1$ as in SZ. Specifically, it uses the elements of the matrix of reduced-form effects **C** above the horizontal dashed line from equation 17. Column (2) uses only the business tax shocks and includes the incumbent labor and TFP outcomes, i.e., it uses the elements of the matrix of reduced-form effects **C** to the left the vertical dashed line. Column (3) uses the full six-outcome model with all three shocks and estimates the cost of capital elasticity ϕ. Column (4) uses the same specification as (3), but instead calibrates ϕ at a lower value than its estimate in Column (3). Column (5), (6), and (7) use the full model with six-outcomes and three shocks, estimated ϕ, and show the results for different values of calibrated parameters.

Table 5: Estimates of Economic Incidence Using Estimated Structural Parameters

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Incidence							
Calibrated parameters							
Output elasticity γ	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Housing share α	0.300	0.300	0.300	0.300	0.650	0.300	0.300
Elasticity of product demand ε^{PD}	-2.500	-2.500	-2.500	-2.500	-2.500	-4.000	-5.000
Estimated incidence							
Wages $\tilde{w}$	1.088**	1.026	1.315	1.159***	1.145	1.315	1.316
	(0.472)	(0.800)	(1.080)	(0.239)	(1.091)	(1.094)	(1.102)
Landowners $\tilde{r}$	1.036	1.172	1.428	1.395	1.086	1.425	1.424
	(0.910)	(1.435)	(1.464)	(1.388)	(1.131)	(1.459)	(1.457)
Workers $\tilde{w} - \alpha\tilde{r}$	0.777**	0.674	0.886	0.741***	0.439	0.887	0.889
	(0.311)	(0.511)	(0.837)	(0.255)	(0.674)	(0.851)	(0.860)
Firm owners $\tilde{\pi}$	0.958***	3.195**	2.644	2.359***	2.824	2.631	2.626
	(0.106)	(1.421)	(1.636)	(0.054)	(1.718)	(1.648)	(1.655)
Elasticity of labor supply ε^{LS}	0.879***	3.190	0.660	0.656	1.080	0.657	0.653
	(0.310)	(2.965)	(0.406)	(0.433)	(0.905)	(0.415)	(0.419)
Elasticity of labor demand ε^{LD}	-1.715***	-1.373***	-1.271***	-1.278***	-1.269***	-1.544***	-1.726***
	(0.305)	(0.163)	(0.062)	(0.053)	(0.060)	(0.128)	(0.173)
Panel B. Share of Incidence							
Landowners $\tilde{r}$	0.374*	0.233	0.288	0.310	0.250	0.288	0.288
	(0.206)	(0.170)	(0.185)	(0.231)	(0.172)	(0.185)	(0.185)
Workers $\tilde{w} - \alpha\tilde{r}$	0.281***	0.134**	0.179**	0.165*	0.101	0.179**	0.180**
	(0.102)	(0.065)	(0.089)	(0.093)	(0.111)	(0.090)	(0.090)
Firm owners $\tilde{\pi}$	0.346**	0.634***	0.533***	0.525***	0.649***	0.532***	0.532***
	(0.154)	(0.135)	(0.115)	(0.143)	(0.114)	(0.114)	(0.114)
Test of standard view (p-value)	0.038	0.000	0.000	0.000	0.002	0.000	0.000
Panel C. Income-Share Weighted Share of Incidence							
Landowners $\tilde{r}$	0.155	0.086	0.111	0.122	0.183	0.152	0.167
	(0.115)	(0.075)	(0.089)	(0.116)	(0.138)	(0.120)	(0.132)
Workers $\tilde{w} - \alpha\tilde{r}$	0.387***	0.165**	0.230***	0.216***	0.114	0.316***	0.348***
	(0.103)	(0.066)	(0.083)	(0.080)	(0.119)	(0.113)	(0.124)
Firm owners $\tilde{\pi}$	0.458***	0.750***	0.659***	0.662***	0.703***	0.532***	0.484***
	(0.135)	(0.073)	(0.059)	(0.051)	(0.095)	(0.066)	(0.066)
Test of standard view (p-value)	0.113	0.000	0.001	0.000	0.004	0.020	0.038
Specification Details							
Number of Outcomes	4	6	6	6	6	6	6
Incumbent Labor and TFP Outcomes	No	Yes	Yes	Yes	Yes	Yes	Yes
Business Tax Shocks	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bartik and Personal Tax Shocks	Yes	No	Yes	Yes	Yes	Yes	Yes
Number of Moments	12	6	18	18	18	18	18

Notes: This table extends analysis SZ Table 7 using the updated model with additional labor $\dot{l}$ and productivity $\dot{z}$ outcomes (i.e., using equation 17). Column (1) uses the four outcomes in SZ with the updated model and $\phi = 1$ as in SZ. Specifically, it uses the elements of the matrix of reduced-form effects **C** above the horizontal dashed line from equation 17. Column (2) uses only the business tax shocks and includes the incumbent labor and TFP outcomes, i.e., it uses the elements of the matrix of reduced-form effects **C** to the left the vertical dashed line. Column (3) uses the full six-outcome model with all three shocks and estimates the cost of capital elasticity ϕ. Column (4) uses the same specification as (3), but instead calibrates ϕ at a lower value than its estimate in Column (3). Column (5), (6), and (7) use the full model with six-outcomes and three shocks, estimated ϕ, and show the results for different values of calibrated parameters.

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Appendix For Online Publication

A Theory Appendix

A.1 Wage Incidence of Bartik, Tax, and Amenity Shocks

The full expression for the reduced form effects on local wages is given by:

$$\begin{aligned}
\Delta \ln w_{c,t} = & \underbrace{\left(\frac{\delta\phi}{\sigma^F} - 1 - \frac{1}{\sigma^F(\varepsilon^{PD}+1)}\right)\frac{1}{\varepsilon^{LS}-\varepsilon^{LD}}}_{\equiv\beta_1^W} \Delta \ln(1-\tau_{c,t}^b) \\
& + \underbrace{\left[\frac{1}{\sigma^F}\frac{\varphi}{\varepsilon^{LS}-\varepsilon^{LD}} - \frac{\alpha\eta_c}{(\sigma^W(1+\eta_c)+\alpha)}\frac{\varphi^h}{\varepsilon^{LS}-\varepsilon^{LD}}\right]}_{\equiv\beta_2^W} \Delta \ln BK_{c,t} \\
& + \underbrace{\left[-\frac{(1+\eta_c)+\alpha(\kappa-1)}{(\sigma^W(1+\eta_c)+\alpha)}\frac{1}{\varepsilon^{LS}-\varepsilon^{LD}}\right]}_{\equiv\beta_3^W} \Delta \ln(1-\tau_{c,t}^i) \\
& + \underbrace{\frac{-(1+\eta_c)}{(\sigma^W(1+\eta_c)+\alpha)}\frac{1}{\varepsilon^{LS}-\varepsilon^{LD}}}_{\equiv\beta_4^W} \bar{A}_{c,t}.
\end{aligned}$$

The effect of the Bartik shock on wages β_2^W combines two channels. The first term is the effect on the mean productivity term B_c, which depends on the labor demand and supply elasticities and the dispersion of location-specific productivities. The second term accounts for the effect on the housing productivity term B_c^h.

The effect of personal tax changes on wages β_3^W also combines two channels. The first term captures the logic that lower tax rates are an amenity for workers and is identical to β_4^W. The second term (including the terms $\alpha(\kappa-1)$) captures the impact of local personal tax rates on the supply of housing. When $\kappa = 1$, the housing supply effect cancels out with the direct housing demand channel, so that only the amenity component remains.

B Appendix Tables

Table B.1: Estimates of Economic Incidence Using Reduced-Form Effects with Bartik Controls

	(1) Intensive Margin Labor Demand	(2) TFP	(3) Calibrating Product Demand	(4) Average of (1),(2),(3)	(5) Weighted Avg. of (1),(2),(3)	(6) Calibrating Product Demand	(7) Average of (1),(2),(6)	(8) Weighted Avg. of (1),(2),(6)
Panel A. Calibrated parameters								
Output elasticity γ	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Housing share α	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Elasticity of product demand ε^{PD}	-2.500	-2.500	-2.500	-2.500	-2.500	-5.000	-5.000	-5.000
Panel B. Incidence								
Landowners	0.323	0.323	0.323	0.323	0.323	0.323	0.323	0.323
	(1.366)	(1.366)	(1.366)	(1.366)	(1.366)	(1.366)	(1.366)	(1.366)
Workers	0.680	0.680	0.680	0.680	0.680	0.680	0.680	0.680
	(0.521)	(0.521)	(0.521)	(0.521)	(0.521)	(0.521)	(0.521)	(0.521)
Firm Owners	2.805*	3.171	1.028***	2.334**	1.206***	1.074**	2.350**	1.478***
	(1.564)	(2.517)	(0.185)	(0.979)	(0.055)	(0.492)	(0.936)	(0.126)
Panel C. Shares of Incidence								
Landowners	0.085	0.077	0.159	0.097	0.146	0.155	0.096	0.130
	(0.295)	(0.304)	(0.556)	(0.354)	(0.511)	(0.566)	(0.355)	(0.466)
Workers	0.179**	0.163	0.335*	0.204**	0.308*	0.327*	0.203*	0.274*
	(0.088)	(0.121)	(0.191)	(0.103)	(0.170)	(0.191)	(0.104)	(0.146)
Firm Owners	0.737***	0.760**	0.506	0.700**	0.546	0.517	0.701**	0.596
	(0.237)	(0.347)	(0.469)	(0.333)	(0.425)	(0.536)	(0.341)	(0.415)
Test of standard view (p-value)	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Panel D. Income Weighted Shares of Incidence								
Landowners	0.029	0.026	0.056	0.033	0.051	0.077	0.053	0.067
	(0.106)	(0.108)	(0.219)	(0.129)	(0.198)	(0.296)	(0.203)	(0.254)
Workers	0.201***	0.183	0.393**	0.231**	0.359**	0.542***	0.373**	0.474***
	(0.072)	(0.146)	(0.178)	(0.110)	(0.151)	(0.210)	(0.145)	(0.166)
Firm Owners	0.770***	0.791***	0.551*	0.736***	0.590**	0.381	0.574**	0.458*
	(0.099)	(0.216)	(0.306)	(0.183)	(0.259)	(0.357)	(0.240)	(0.268)
Test of standard view (p-value)	0.000	0.000	0.002	0.000	0.000	0.091	0.000	0.006

Notes: This table uses reduced-form effects to estimate incidence using the expressions in Table 1 using the reduced-form specification with Bartik controls. Each column uses a different approach for estimating firm owner profits using reduced-form effects of net-of-business taxes on local outcomes as in SZ Table 5. Column 1 uses the intensive margin labor demand approach to estimate profit effects. Column 2 uses the productivity approach. Column 3 uses the approach that calibrates the product demand elasticity to scale up wage effects net of capital costs. Column 4 reports the equal-weighted average of these approaches. Column 5 weights each of these three approaches by the inverse variance to put more weight on more precisely estimated profit effects. Column 6 also uses the calibration approach but with a more responsive product demand elasticity. Column 7 and 8 take the simple average and inverse-variance weighted averages of Columns 1, 2, and 6, respectively.

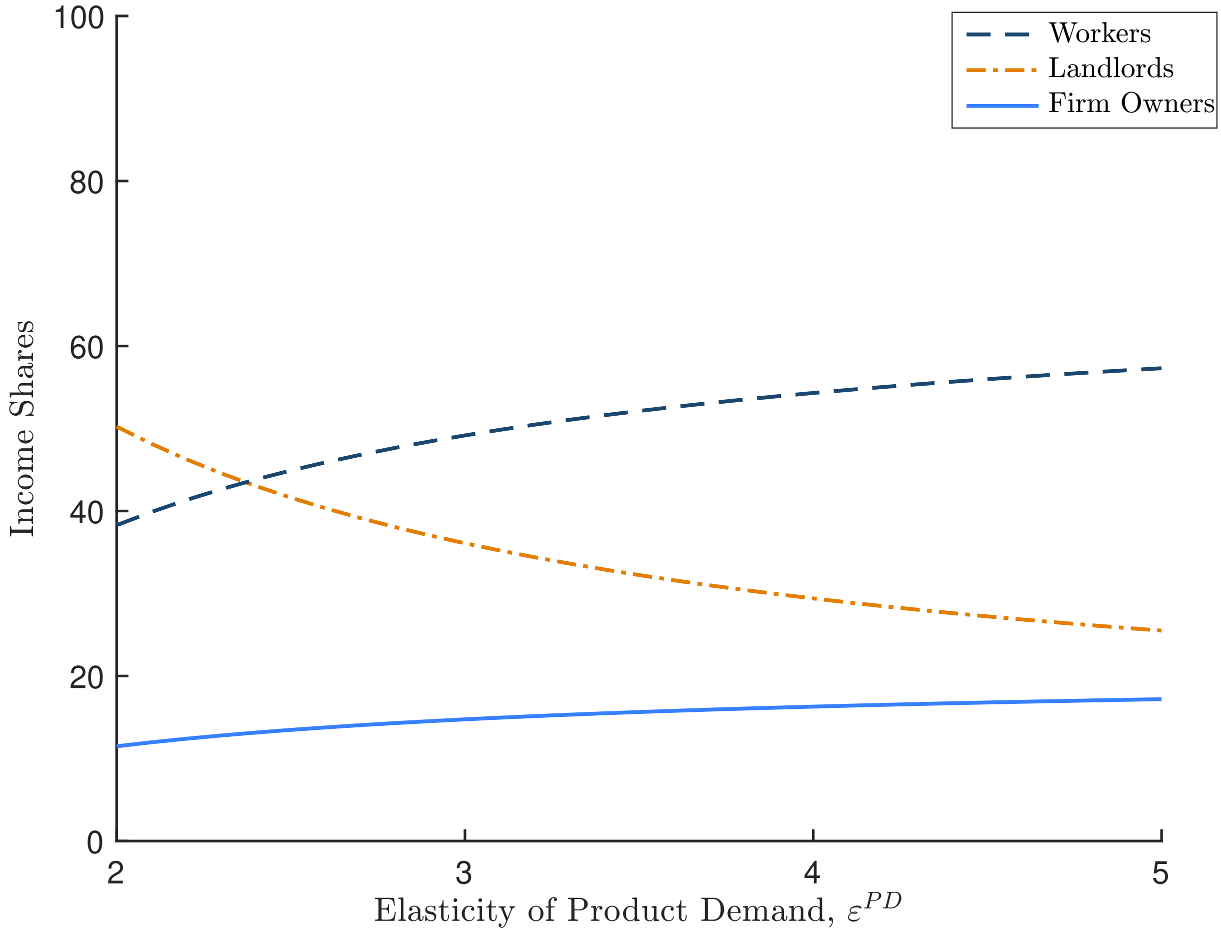
Table B.2: Estimates of Economic Incidence Using Reduced-Form Effects with Bartik and Personal Tax Controls

	(1) Intensive Margin Labor Demand	(2) TFP	(3) Calibrating Product Demand	(4) Average of (1),(2),(3)	(5) Weighted Avg. of (1),(2),(3)	(6) Calibrating Product Demand	(7) Average of (1),(2),(6)	(8) Weighted Avg. of (1),(2),(6)
Panel A. Calibrated parameters								
Output elasticity γ	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Housing share α	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Elasticity of product demand ε^{PD}	-2.500	-2.500	-2.500	-2.500	-2.500	-5.000	-5.000	-5.000
Panel B. Incidence								
Landowners	1.857	1.857	1.857	1.857	1.857	1.857	1.857	1.857
	(1.571)	(1.571)	(1.571)	(1.571)	(1.571)	(1.571)	(1.571)	(1.571)
Workers	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977
	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)
Firm Owners	4.300**	4.017	0.857***	3.058	1.210***	0.620	2.979	1.493***
	(2.072)	(5.180)	(0.253)	(1.896)	(0.084)	(0.674)	(1.852)	(0.190)
Panel C. Shares of Incidence								
Landowners	0.260**	0.271	0.503**	0.315	0.459**	0.538**	0.320	0.429**
	(0.131)	(0.281)	(0.206)	(0.201)	(0.194)	(0.238)	(0.205)	(0.193)
Workers	0.137**	0.143	0.265	0.166*	0.241	0.283	0.168*	0.226
	(0.069)	(0.127)	(0.168)	(0.098)	(0.148)	(0.198)	(0.101)	(0.140)
Firm Owners	0.603***	0.586	0.232	0.519**	0.299*	0.179	0.512**	0.345**
	(0.098)	(0.366)	(0.180)	(0.210)	(0.159)	(0.263)	(0.219)	(0.176)
Test of standard view (p-value)	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Panel D. Income Weighted Shares of Incidence								
Landowners	0.101	0.106	0.239	0.128	0.210	0.308*	0.195	0.253*
	(0.062)	(0.133)	(0.149)	(0.103)	(0.129)	(0.185)	(0.141)	(0.151)
Workers	0.177**	0.186	0.419*	0.224*	0.368**	0.540**	0.342**	0.444**
	(0.077)	(0.190)	(0.223)	(0.130)	(0.186)	(0.257)	(0.166)	(0.197)
Firm Owners	0.722***	0.708**	0.341	0.649***	0.422**	0.152	0.464**	0.302*
	(0.068)	(0.298)	(0.231)	(0.177)	(0.185)	(0.235)	(0.203)	(0.164)
Test of standard view (p-value)	0.000	0.000	0.022	0.000	0.003	0.131	0.000	0.019

Notes: This table uses reduced-form effects to estimate incidence using the expressions in Table 1 using the reduced-form specification with Bartik and personal tax controls. Each column uses a different approach for estimating firm owner profits using reduced-form effects of net-of-business taxes on local outcomes as in SZ Table 5. Column 1 uses the intensive margin labor demand approach to estimate profit effects. Column 2 uses the productivity approach. Column 3 uses the approach that calibrates the product demand elasticity to scale up wage effects net of capital costs. Column 4 reports the equal-weighted average of these approaches. Column 5 weights each of these three approaches by the inverse variance to put more weight on more precisely estimated profit effects. Column 6 also uses the calibration approach but with a more responsive product demand elasticity. Column 7 and 8 take the simple average and inverse-variance weighted averages of Columns 1, 2, and 6, respectively.

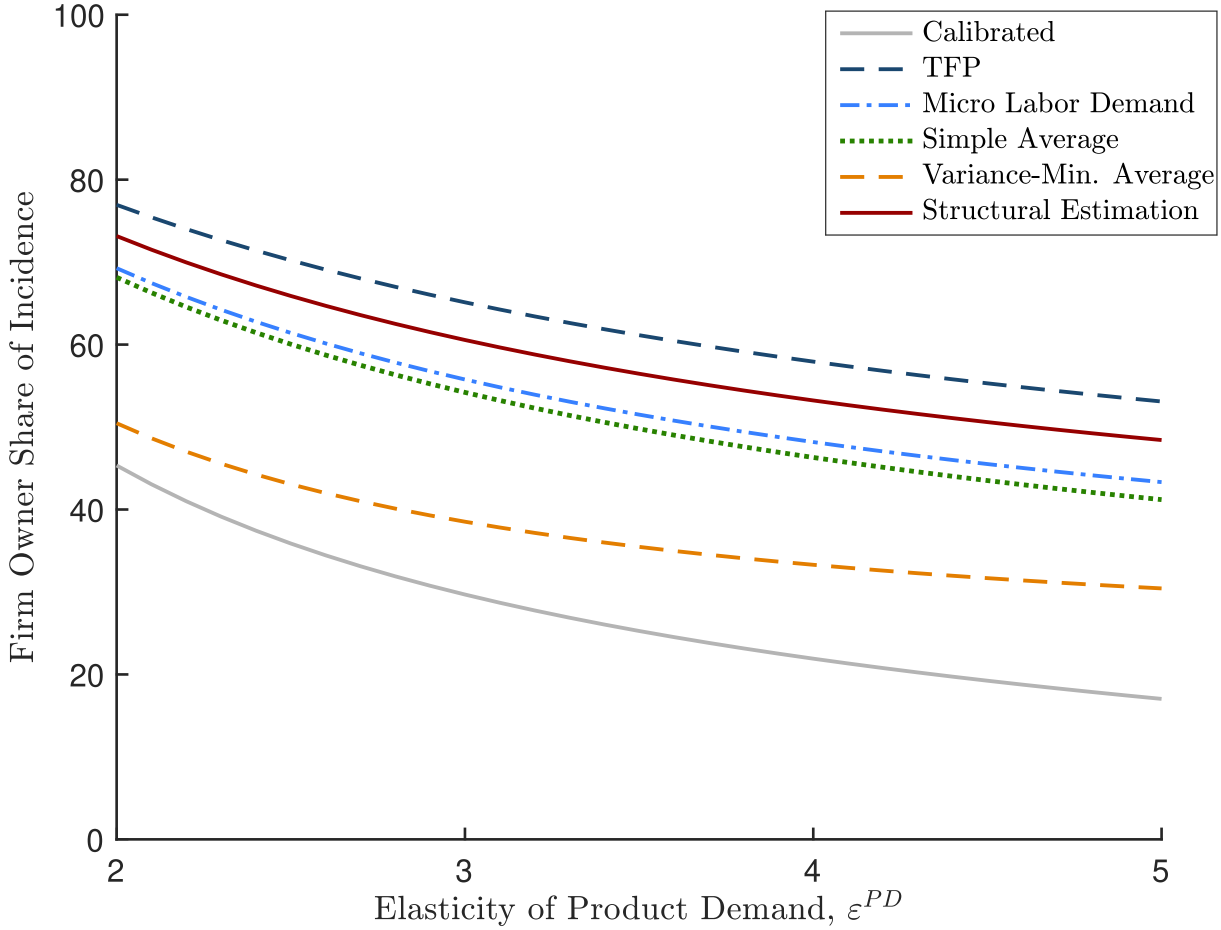
C Appendix Figures

Figure C.1: Income Shares and the Product Demand Elasticity



Notes: This figure plots income shares for workers, firm owners, and land owners for different values of the product demand elasticity.

Figure C.2: Firm Owners' Share of Incidence across Approaches Using Income Share Weights



Notes: This figure plots the income-share weighted incidence for firm owners across different approaches and different values of the product demand elasticity. It reports the same specifications as Figure 1, but with income-share weights.